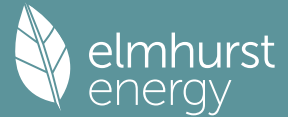


Full SAP Calculation Printout



Property Reference	OP-D320 P4ROSE				Issued on Date	29/11/2024
Assessment Reference	P4ROSE	Prop Type Ref	P4ROSE			
Property	P4ROSE					
SAP Rating	80 C	DER	4.02	TER	9.44	
Environmental	96 A	% DER < TER				57.42
CO ₂ Emissions (t/year)	0.61	DFEE	42.71	TFEE	43.49	
Compliance Check	See BREL	% DFEE < TFEE				1.80
% DPER < TPER	14.80	DPER	42.20	TPER	49.53	
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001
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)
Ground floor	84.2200 (1b)	x 2.4600 (2b)	= 207.1812 (1b) - (3b)
First floor	81.5200 (1c)	x 2.6100 (2c)	= 212.7672 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	165.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 419.9484 (5)

2. Ventilation rate

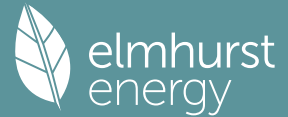
	m ³ per hour											
Number of open chimneys	0 * 80 = 0.0000 (6a)											
Number of open flues	0 * 20 = 0.0000 (6b)											
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)											
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)											
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)											
Number of blocked chimneys	0 * 20 = 0.0000 (6f)											
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)											
Number of passive vents	0 * 10 = 0.0000 (7b)											
Number of flueless gas fires	0 * 40 = 0.0000 (7c)											
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 0.0000 / (5) = 0.0000 (8)											
Pressure test	Yes											
Pressure Test Method	Blower Door											
Measured/design AP50	3.5000 (17)											
Infiltration rate	0.1750 (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) = 0.1487 (21)											
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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	0.1897	0.1859	0.1822	0.1636	0.1599	0.1413	0.1413	0.1376	0.1487	0.1599	0.1673	0.1748 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												69.6000 (23c)
Effective ac	0.3417	0.3379	0.3342	0.3156	0.3119	0.2933	0.2933	0.2896	0.3007	0.3119	0.3193	0.3268 (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
Front Door			4.2800	1.0000	4.2800		(26)
Windows (Uw = 1.30)			38.0900	1.2357	47.0694		(27)
Ground Floor			84.2200	0.1100	9.2642		(28a)
Exposed Floor			2.0300	0.1400	0.2842		(28b)
External Wall	223.2500	42.3700	180.8800	0.1700	30.7496		(29a)
Roof - ceiling	81.5200		81.5200	0.1100	8.9672		(30)
Bay Roof	4.7400		4.7400	0.1100	0.5214		(30)
Total net area of external elements Aum (A, m ²)			395.7600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	101.1360		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				20.9100	0.0500	1.0455	

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	14.1600	10.6334	0.6300	0.7000	0.7700	46.0158 (74)
East	12.7000	19.6403	0.6300	0.7000	0.7700	76.2295 (76)
South	8.7000	46.7521	0.6300	0.7000	0.7700	124.3059 (78)

Full SAP Calculation Printout



West		2.5300				19.6403				0.6300				0.7000				0.7700				15.1859 (80)			

Solar gains	261.7371	470.3474	703.2592	962.6327	1155.1422	1178.9155	1123.3564	975.9518	793.0792	536.4549	318.0955	220.9483	(83)												
Total gains	1024.3397	1251.4476	1450.9727	1683.1418	1837.6909	1801.8856	1720.1664	1573.7754	1410.6946	1211.1364	1035.6493	966.8563	(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	27.1630	27.2459	27.3292	27.7537	27.8402	28.2809	28.2809	28.3707	28.1030	27.8402	27.6678	27.4974	
alpha	2.8109	2.8164	2.8219	2.8502	2.8560	2.8854	2.8854	2.8914	2.8735	2.8560	2.8445	2.8332	
util living area	0.9626	0.9361	0.8919	0.8015	0.6716	0.5212	0.3963	0.4438	0.6550	0.8534	0.9411	0.9676	(86)
Living	18.6258	19.0038	19.5182	20.1461	20.6055	20.8659	20.9549	20.9372	20.7311	20.1087	19.2657	18.5727	
Non living	17.2708	17.7482	18.3922	19.1663	19.7021	19.9908	20.0715	20.0614	19.8594	19.1412	18.0928	17.2097	
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	14	
MIT	19.7854	19.0038	19.5182	20.1461	20.6055	20.8659	20.9549	20.9372	20.7311	20.1087	19.2657	19.0480	(87)
Th 2	20.0645	20.0671	20.0697	20.0826	20.0852	20.0982	20.0982	20.1008	20.0930	20.0852	20.0800	20.0748	(88)
util rest of house	0.9572	0.9273	0.8771	0.7751	0.6295	0.4612	0.3218	0.3667	0.5970	0.8275	0.9316	0.9630	(89)
MIT 2	18.9508	17.7482	18.3922	19.1663	19.7021	19.9908	20.0715	20.0614	19.8594	19.1412	18.0928	17.9325	(90)
Living area fraction	FLA = Living area / (4) =												
MIT	19.0842	17.9490	18.5722	19.3230	19.8465	20.1307	20.2128	20.2014	19.9988	19.2959	18.2803	18.1109	(92)
Temperature adjustment	0.0000												
adjusted MIT	19.0842	17.9490	18.5722	19.3230	19.8465	20.1307	20.2128	20.2014	19.9988	19.2959	18.2803	18.1109	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9505	0.9009	0.8475	0.7501	0.6176	0.4635	0.3316	0.3757	0.5904	0.8005	0.9064	0.9498	(94)
Useful gains	973.6679	1127.3785	1229.7512	1262.5945	1134.9372	835.1026	570.3593	591.2024	832.8887	969.4846	938.6930	918.3439	(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	2505.7959	2204.9602	2033.6930	1728.9975	1347.1786	900.3574	588.1277	616.8816	966.3575	1438.0292	1860.3908	2329.0935	(97)
Space heating kWh	1139.9032	724.1349	598.1327	335.8102	157.9076	0.0000	0.0000	0.0000	0.0000	348.5971	663.6224	1049.5977	(98a)
Space heating requirement - total per year (kWh/year)	5017.7058												
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	1139.9032	724.1349	598.1327	335.8102	157.9076	0.0000	0.0000	0.0000	0.0000	348.5971	663.6224	1049.5977	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)	5017.7058												
Space heating per m2	(98c) / (4) = 30.2746 (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 %)													254.5257 (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	1139.9032	724.1349	598.1327	335.8102	157.9076	0.0000	0.0000	0.0000	0.0000	348.5971	663.6224	1049.5977	(98)
Space heating efficiency (main heating system 1)	254.5257	254.5257	254.5257	254.5257	254.5257	0.0000	0.0000	0.0000	0.0000	254.5257	254.5257	254.5257	(210)
Space heating fuel (main heating system)	447.8538	284.5036	234.9989	131.9356	62.0399	0.0000	0.0000	0.0000	0.0000	136.9595	260.7290	412.3739	(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	387.0670	343.0951	365.6510	323.3172	314.8572	254.6252	250.5513	260.6481	263.7295	326.4723	345.1935	383.0003	(64)
Efficiency of water heater (217)m	280.7540	280.7540	280.7540	280.7540	280.7540	280.7540	280.7540	280.7540	280.7540	280.7540	280.7540	280.7540	(216)
Fuel for water heating, kWh/month	137.8670	122.2049	130.2389	115.1603	112.1470	90.6934	89.2423	92.8386	93.9362	116.2841	122.9523	136.4185	(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	77.3671	69.8800	77.3671	74.8714	77.3671	74.8714	77.3671	77.3671	74.8714	77.3671	74.8714	77.3671	(231)
Lighting	35.3368	28.3485	25.5247	18.7005	14.4448	11.8015	13.1770	17.1280	22.2476	29.1900	32.9701	36.3189	(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	1971.3943 (211)												
Space heating fuel - main system 2	0.0000 (213)												

Full SAP Calculation Printout



Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	280.7540
Water heating fuel used	1359.9835 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.7780)	
mechanical ventilation fans (SFP = 1.7780)	910.9353 (230a)
Total electricity for the above, kWh/year	910.9353 (231)
Electricity for lighting (calculated in Appendix L)	285.1884 (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	4527.5015 (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	1971.3943	0.1556	306.7452 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1359.9835	0.1415	192.4869 (264)
Space and water heating			499.2320 (265)
Pumps, fans and electric keep-hot	910.9353	0.1387	126.3580 (267)
Energy for lighting	285.1884	0.1443	41.1615 (268)
Total CO2, kg/year			666.7515 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.0200 (273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1971.3943	1.5760	3106.9199 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1359.9835	1.5234	2071.7893 (278)
Space and water heating			5178.7092 (279)
Pumps, fans and electric keep-hot	910.9353	1.5128	1378.0629 (281)
Energy for lighting	285.1884	1.5338	437.4315 (282)
Total Primary energy kWh/year			6994.2036 (286)
Dwelling Primary energy Rate (DPER)			42.2000 (287)

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

1. Overall dwelling characteristics

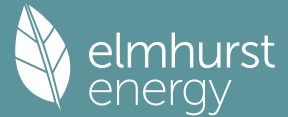
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	84.2200 (1b)	x 2.4600 (2b)	= 207.1812 (1b) - (3b)
First floor	81.5200 (1c)	x 2.6100 (2c)	= 212.7672 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	165.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	419.9484 (5)

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) = 0.0952 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3452 (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) = 0.2935 (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	0.3742	0.3668	0.3595	0.3228	0.3155	0.2788	0.2788	0.2715	0.2935	0.3155	0.3301	0.3448 (22b)

Full SAP Calculation Printout



Effective ac 0.5700 0.5673 0.5646 0.5521 0.5498 0.5389 0.5389 0.5368 0.5431 0.5498 0.5545 0.5594 (25)

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	
TER Opaque door			4.2800	1.0000	4.2800			(26)
TER Opening Type (Uw = 1.20)			37.1600	1.1450	42.5496			(27)
Ground Floor			84.2200	0.1300	10.9486			(28a)
Exposed Floor			2.0300	0.1300	0.2639			(28b)
External Wall	223.2500	41.4400	181.8100	0.1800	32.7258			(29a)
Roof - ceiling	81.5200		81.5200	0.1100	8.9672			(30)
Bay Roof	4.7400		4.7400	0.1100	0.5214			(30)
Total net area of external elements Aum(A, m2)			395.7600					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	100.2565		(33)

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

100.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	20.9100	0.0500	1.0455	
E3 Sill	24.8100	0.0500	1.2405	
E4 Jamb	50.7000	0.0500	2.5350	
E5 Ground floor (normal)	46.0000	0.1600	7.3600	
E6 Intermediate floor within a dwelling	32.9200	0.0000	0.0000	
E10 Eaves (insulation at ceiling level)	25.8500	0.0600	1.5510	
E12 Gable (insulation at ceiling level)	16.3300	0.0600	0.9798	
E16 Corner (normal)	42.7200	0.0900	3.8448	
E24 Eaves (insulation at ceiling level - inverted)	6.0000	0.2400	1.4400	
E14 Flat roof	9.1600	0.0800	0.7328	
E17 Corner (inverted - internal area greater than external area)	22.4400	-0.0900	-2.0196	
E20 Exposed floor (normal)	3.5900	0.3200	1.1488	
E21 Exposed floor (inverted)	3.5900	0.3200	1.1488	

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

21.0074 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 121.2639 (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	78.9922	78.6155	78.2463	76.5120	76.1876	74.6771	74.6771	74.3973	75.2589	76.1876	76.8440	77.5302	(38)
Heat transfer coeff	200.2561	199.8795	199.5102	197.7759	197.4515	195.9410	195.9410	195.6613	196.5228	197.4515	198.1079	198.7941	(39)
Average = Sum(39)m / 12 =												197.7744	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2083	1.2060	1.2038	1.1933	1.1913	1.1822	1.1822	1.1805	1.1857	1.1913	1.1953	1.1994	(40)
HLP (average)												1.1933	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9568 (42)
Hot water usage for mixer showers													
73.7961	72.6871	71.0711	67.9791	65.6972	63.1526	61.7062	63.3100	65.0681	67.8003	70.9587	73.5134		(42a)
Hot water usage for baths													
31.8580	31.3848	30.7186	29.4901	28.5702	27.5502	26.9992	27.6609	28.3812	29.4727	30.7265	31.7503		(42b)
Hot water usage for other uses													
44.9109	43.2778	41.6446	40.0115	38.3784	36.7453	36.7453	38.3784	40.0115	41.6446	43.2778	44.9109		(42c)
Average daily hot water use (litres/day)												138.4030	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	150.5650	147.3497	143.4343	137.4806	132.6458	127.4480	125.4507	129.3492	133.4608	138.9176	144.9629	150.1745	(44)
Energy conte	238.4581	209.8240	220.4531	188.2041	178.5668	156.7122	151.7217	160.1614	164.5705	188.5098	206.5262	235.1371	(45)
Energy content (annual)										Total = Sum(45)m =		2298.8451	

Distribution loss (46)m = 0.15 x (45)m

35.7687 31.4736 33.0680 28.2306 26.7850 23.5068 22.7583 24.0242 24.6856 28.2765 30.9789 35.2706 (46)

Water storage loss:

Store volume 230.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.7973 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.9706 (55)

Total storage loss 30.0872 27.1756 30.0872 29.1167 30.0872 29.1167 30.0872 30.0872 29.1167 30.0872 29.1167 30.0872 30.0872 (56)

If cylinder contains dedicated solar storage 30.0872 27.1756 30.0872 29.1167 30.0872 29.1167 30.0872 30.0872 29.1167 30.0872 29.1167 30.0872 30.0872 (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 291.8078 258.0108 273.8028 239.8328 231.9164 208.3409 205.0713 213.5110 216.1992 241.8595 258.1549 288.4867 (62)

WWHRS -33.7365 -29.8368 -31.2434 -25.8708 -24.1107 -20.6317 -19.3389 -20.5650 -21.3463 -25.1649 -28.5088 -33.1118 (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 258.0713 228.1739 242.5593 213.9620 207.8057 187.7092 185.7324 192.9460 194.8529 216.6945 229.6461 255.3749 (64)

Total per year (kWh/year) = Sum(64)m = 2613.5283 (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)

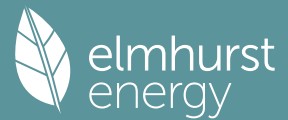
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month 121.9670 108.3159 115.9804 103.8808 102.0531 93.4097 93.1272 95.9333 96.0226 105.3592 109.9729 120.8628 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.8414	147.8414	147.8414	147.8414	147.8414	147.8414	147.8414	147.8414	147.8414	147.8414	147.8414	147.8414	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
170.0520	188.2718	170.0520	175.7204	170.0520	175.7204	170.0520	175.7204	170.0520	175.7204	170.0520	175.7204	170.0520	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													

Full SAP Calculation Printout



Cooking gains	337.1793	340.6782	331.8612	313.0908	289.3965	267.1272	252.2500	248.7511	257.5681	276.3385	300.0328	322.3021	(68)
	(calculated in Appendix L, equation L15 or L15a), also see Table 5												
Pumps, fans	37.7841	37.7841	37.7841	37.7841	37.7841	37.7841	37.7841	37.7841	37.7841	37.7841	37.7841	37.7841	(69)
Losses e.g. evaporation	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)
	(negative values) (Table 5)												
Water heating gains	-118.2731	-118.2731	-118.2731	-118.2731	-118.2731	-118.2731	-118.2731	-118.2731	-118.2731	-118.2731	-118.2731	-118.2731	(71)
	(Table 5)												
Total internal gains	163.9342	161.1844	155.8876	144.2789	137.1682	129.7358	125.1709	128.9427	133.3648	141.6119	152.7402	162.4500	(72)
	741.5179	760.4868	728.1531	703.4424	666.9691	639.9357	614.8253	615.0981	634.0057	658.3548	698.8457	725.1564	(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					13.8100	10.6334		0.6300	0.7000	0.7700		44.8784 (74)	
East					12.3900	19.6403		0.6300	0.7000	0.7700		74.3687 (76)	
South					8.4900	46.7521		0.6300	0.7000	0.7700		121.3054 (78)	
West					2.4700	19.6403		0.6300	0.7000	0.7700		14.8257 (80)	

Solar gains	255.3783	458.9153	686.1513	939.1905	1126.9899	1150.1741	1095.9734	952.1769	773.7783	523.4122	310.3666	215.5811 (83)	
Total gains	996.8962	1219.4021	1414.3045	1642.6329	1793.9589	1790.1099	1710.7987	1567.2751	1407.7839	1181.7669	1009.2124	940.7375 (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	22.9900	23.0333	23.0760	23.2783	23.3166	23.4963	23.4963	23.5299	23.4267	23.3166	23.2393	23.1591	
alpha	2.5327	2.5356	2.5384	2.5519	2.5544	2.5664	2.5664	2.5687	2.5618	2.5544	2.5493	2.5439	
util living area	0.9668	0.9452	0.9097	0.8372	0.7270	0.5835	0.4568	0.5060	0.7056	0.8796	0.9495	0.9711	(86)
MIT	18.1291	18.5070	19.0598	19.7661	20.3546	20.7451	20.9018	20.8698	20.5593	19.7700	18.8251	18.0651	(87)
Th 2	19.9134	19.9152	19.9170	19.9254	19.9269	19.9343	19.9343	19.9356	19.9314	19.9269	19.9238	19.9205	(88)
util rest of house	0.9617	0.9369	0.8957	0.8113	0.6821	0.5123	0.3613	0.4095	0.6420	0.8546	0.9405	0.9666	(89)
MIT 2	16.5583	17.0364	17.7315	18.6064	19.3033	19.7342	19.8792	19.8575	19.5537	18.6324	17.4502	16.4810	(90)
Living area fraction	16.8094	17.2715	17.9439	18.7918	19.4714	19.8958	20.0427	20.0194	19.7145	18.8143	17.6700	16.7343	(92)
MIT	16.8094	17.2715	17.9439	18.7918	19.4714	19.8958	20.0427	20.0194	19.7145	18.8143	17.6700	16.7343	(93)
Temperature adjustment												0.0000	
adjusted MIT	16.8094	17.2715	17.9439	18.7918	19.4714	19.8958	20.0427	20.0194	19.7145	18.8143	17.6700	16.7343	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9393	0.9080	0.8618	0.7780	0.6606	0.5095	0.3716	0.4177	0.6273	0.8210	0.9129	0.9461	(94)
Useful gains	936.3812	1107.2693	1218.8202	1278.0263	1185.0093	912.0956	635.6582	654.5756	883.0582	970.2825	921.2925	889.9933	(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	2505.0910	2472.8157	2283.1795	1956.3688	1534.4697	1037.6696	674.5628	708.1689	1103.3790	1621.9239	2093.9994	2491.7383	(97)
Space heating kWh	1167.1200	917.6472	791.8833	488.4066	259.9985	0.0000	0.0000	0.0000	0.0000	484.8212	844.3489	1191.6983	(98a)
Space heating requirement - total per year (kWh/year)												6145.9241	
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	1167.1200	917.6472	791.8833	488.4066	259.9985	0.0000	0.0000	0.0000	0.0000	484.8212	844.3489	1191.6983	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6145.9241	
Space heating per m ²										(98c) / (4) =		37.0817	(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	1167.1200	917.6472	791.8833	488.4066	259.9985	0.0000	0.0000	0.0000	0.0000	484.8212	844.3489	1191.6983	(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)	1264.4854	994.2006	857.9451	529.1513	281.6885	0.0000	0.0000	0.0000	0.0000	525.2668	914.7876	1291.1141	(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	258.0713	228.1739	242.5593	213.9620	207.8057	187.7092	185.7324	192.9460	194.8529	216.6945	229.6461	255.3749	(64)
Efficiency of water heater (217)m	87.0228	86.8495	86.5121	85.8505	84.5634	79.8000	79.8000	79.8000	79.8000	85.8106	86.7090	79.8000	(216)
Fuel for water heating, kWh/month	296.5559	262.7235	280.3760	249.2264	245.7395	235.2246	232.7474	241.7870	244.1765	252.5266	264.8470	293.3083	(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	35.3334	28.3458	25.5222	18.6987	14.4434	11.8004	13.1758	17.1264	22.2454	29.1872	32.9669	36.3155	(232)

Full SAP Calculation Printout



Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-71.9433	-98.1205	-136.4521	-148.1909	-155.4022	-143.3424	-141.3655	-135.4301	-124.5574	-109.4557	-77.8201	-62.5762	(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	-51.3713	-106.6221	-209.3881	-310.9790	-407.9744	-408.9161	-404.2865	-343.9316	-254.1450	-151.5148	-68.2474	-40.7516	(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												6658.6394	(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												3099.2388	(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)												285.1611	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-4162.7845	(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												5966.2548	(238)

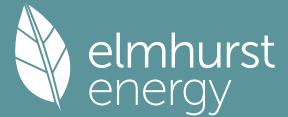
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	6658.6394	0.2100	1398.3143	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3099.2388	0.2100	650.8402	(264)
Space and water heating			2049.1544	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	285.1611	0.1443	41.1576	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1404.6565	0.1353	-190.1012	
PV Unit electricity exported	-2758.1280	0.1262	-348.1304	
Total			-538.2315	(269)
Total CO2, kg/year			1564.0097	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.4400	(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	6658.6394	1.1300	7524.2625	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3099.2388	1.1300	3502.1399	(278)
Space and water heating			11026.4024	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	285.1611	1.5338	437.3896	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1404.6565	1.5002	-2107.2969	
PV Unit electricity exported	-2758.1280	0.4633	-1277.9158	
Total			-3385.2127	(283)
Total Primary energy kWh/year			8208.6801	(286)
Target Primary Energy Rate (TPER)			49.5300	(287)

Full SAP Calculation Printout



Property Reference	OP-D320 P4ROSE				Issued on Date	29/11/2024	
Assessment Reference	P4ROSE			Prop Type Ref	P4ROSE		
Property	P4ROSE						
SAP Rating		80 C	DER	4.02	TER	9.44	
Environmental		96 A	% DER < TER				57.42
CO ₂ Emissions (t/year)		0.61	DFEE	42.71	TFEE	43.49	
Compliance Check		See BREL	% DFEE < TFEE				1.80
% DPER < TPER		14.80	DPER	42.20	TPER	49.53	
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
Client							

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	84.2200 (1b)	x 2.4600 (2b)	= 207.1812 (1b) - (3b)
First floor	81.5200 (1c)	x 2.6100 (2c)	= 212.7672 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	165.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 419.9484 (5)

2. Ventilation rate

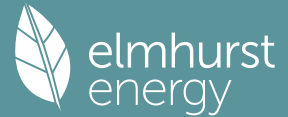
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 40.0000 / (5) = 0.0952 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.5000 (17)
Infiltration rate	0.2702 (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) = 0.2297 (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	0.2929	0.2871	0.2814	0.2527	0.2469	0.2182	0.2182	0.2125	0.2297	0.2469	0.2584	0.2699 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5429	0.5412	0.5396	0.5319	0.5305	0.5238	0.5238	0.5226	0.5264	0.5305	0.5334	0.5364 (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
Front Door			4.2800	1.0000	4.2800		(26)
Windows (Uw = 1.30)			38.0900	1.2357	47.0694		(27)
Ground Floor			84.2200	0.1100	9.2642		(28a)
Exposed Floor			2.0300	0.1400	0.2842		(28b)
External Wall	223.2500	42.3700	180.8800	0.1700	30.7496		(29a)
Roof - ceiling	81.5200		81.5200	0.1100	8.9672		(30)
Bay Roof	4.7400		4.7400	0.1100	0.5214		(30)
Total net area of external elements Aum(A, m ²)			395.7600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		101.1360		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				20.9100	0.0500	1.0455	
E3 Sill				24.8100	0.0500	1.2405	
E4 Jamb				50.7000	0.0500	2.5350	
E5 Ground floor (normal)				46.0000	0.1600	7.3600	

Full SAP Calculation Printout



E6 Intermediate floor within a dwelling	32.9200	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	25.8500	0.0600	1.5510
E12 Gable (insulation at ceiling level)	16.3300	0.0600	0.9798
E16 Corner (normal)	42.7200	0.0900	3.8448
E24 Eaves (insulation at ceiling level - inverted)	6.0000	0.2400	1.4400
E14 Flat roof	9.1600	0.0800	0.7328
E17 Corner (inverted - internal area greater than external area)	22.4400	-0.0900	-2.0196
E20 Exposed floor (normal)	3.5900	0.3200	1.1488
E21 Exposed floor (inverted)	3.5900	0.3200	1.1488
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			21.0074 (36)
Point Thermal Bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	122.1434 (37)

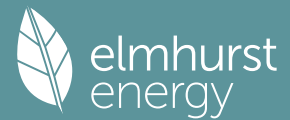
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	75.2353	75.0045	74.7783	73.7157	73.5169	72.5913	72.5913	72.4200	72.9478	73.5169	73.9191	74.3395 (38)
Average = Sum(39)m / 12 =	197.3787	197.1479	196.9217	195.8591	195.6603	194.7347	194.7347	194.5633	195.0912	195.6603	196.0625	196.4829 (39)
												195.8581
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1909	1.1895	1.1881	1.1817	1.1805	1.1749	1.1749	1.1739	1.1771	1.1805	1.1830	1.1855 (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												2.9568 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	31.8580	31.3848	30.7186	29.4901	28.5702	27.5502	26.9992	27.6609	28.3812	29.4727	30.7265	31.7503 (42b)
Hot water usage for other uses	44.9109	43.2778	41.6446	40.0115	38.3784	36.7453	36.7453	38.3784	40.0115	41.6446	43.2778	44.9109 (42c)
Average daily hot water use (litres/day)												70.3654 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	76.7689	74.6626	72.3632	69.5016	66.9486	64.2955	63.7445	66.0392	68.3927	71.1173	74.0042	76.6612 (44)
Energy content (annual)	121.5831	106.3185	111.2195	95.1442	90.1257	79.0588	77.0935	81.7704	84.3351	96.5055	105.4326	120.0328 (45)
Distribution loss (46)m = 0.15 x (45)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 (46)
Water storage loss:												
Total storage 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 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary 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 (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	103.3456	90.3708	94.5366	80.8726	76.6068	67.2000	65.5294	69.5048	71.6848	82.0297	89.6177	102.0279 (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	103.3456	90.3708	94.5366	80.8726	76.6068	67.2000	65.5294	69.5048	71.6848	82.0297	89.6177	102.0279 (64)
12Total per year (kWh/year)												993.3267 (64)
Electric shower(s)	59.0984	52.6572	57.4996	54.8712	55.9008	53.3240	55.1014	55.9008	54.8712	57.4996	56.4184	59.0984 (64a)
Heat gains from water heating, kWh/month	40.6110	35.7570	38.0091	33.9359	33.1269	30.1310	30.1577	31.3514	31.6390	34.8823	36.5090	40.2816 (65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 672.2409 (64a)												

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	147.8414	147.8414	147.8414	147.8414	147.8414	147.8414	147.8414	147.8414	147.8414	147.8414	147.8414	147.8414 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	170.0683	188.2898	170.0683	175.7372	170.0683	175.7372	170.0683	170.0683	175.7372	170.0683	175.7372	170.0683 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	337.1793	340.6782	331.8612	313.0908	289.3965	267.1272	252.2500	248.7511	257.5681	276.3385	300.0328	322.3021 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.7841	37.7841	37.7841	37.7841	37.7841	37.7841	37.7841	37.7841	37.7841	37.7841	37.7841	37.7841 (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)	-118.2731	-118.2731	-118.2731	-118.2731	-118.2731	-118.2731	-118.2731	-118.2731	-118.2731	-118.2731	-118.2731	-118.2731 (71)
Water heating gains (Table 5)	54.5847	53.2098	51.0874	47.1332	44.5254	41.8486	40.5346	42.1390	43.9431	46.8848	50.7070	54.1419 (72)
Total internal gains	629.1847	649.5303	620.3693	603.3136	571.3426	552.0654	530.2052	528.3108	544.6008	560.6440	593.8294	613.8647 (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	14.1600	10.6334	0.6300	0.7000	0.7700	46.0158 (74)						
East	12.7000	19.6403	0.6300	0.7000	0.7700	76.2295 (76)						
South	8.7000	46.7521	0.6300	0.7000	0.7700	124.3059 (78)						
West	2.5300	19.6403	0.6300	0.7000	0.7700	15.1859 (80)						
Solar gains	261.7371	470.3474	703.2592	962.6327	1155.1422	1178.9155	1123.3564	975.9518	793.0792	536.4549	318.0955	220.9483 (83)
Total gains	890.9218	1119.8777	1323.6284	1565.9463	1726.4848	1730.9809	1653.5616	1504.2626	1337.6800	1097.0989	911.9249	834.8130 (84)

Full SAP Calculation Printout



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 from living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	23.3252	23.3525	23.3793	23.5061	23.5300	23.6418	23.6418	23.6627	23.5986	23.5300	23.4817	23.4315
alpha	2.5550	2.5568	2.5586	2.5671	2.5687	2.5761	2.5761	2.5775	2.5732	2.5687	2.5654	2.5621
util living area	0.9740	0.9538	0.9198	0.8483	0.7384	0.5949	0.4674	0.5201	0.7224	0.8940	0.9591	0.9778 (86)
MIT	18.0538	18.4438	19.0110	19.7325	20.3368	20.7358	20.8977	20.8625	20.5371	19.7167	18.7487	17.9801 (87)
Th 2	19.9273	19.9284	19.9295	19.9346	19.9356	19.9401	19.9401	19.9409	19.9384	19.9356	19.9337	19.9316 (88)
util rest of house	0.9699	0.9466	0.9071	0.8237	0.6945	0.5238	0.3710	0.4227	0.6602	0.8713	0.9515	0.9742 (89)
MIT 2	17.2335	17.6190	18.1761	18.8741	19.4337	19.7775	19.8950	19.8761	19.6264	18.8756	17.9283	17.1633 (90)
Living area fraction	17.3647	17.7509	18.3096	19.0114	19.5781	19.9307	20.0553	20.0338	19.7720	19.0101	18.0595	17.2939 (92)
MIT	17.3647	17.7509	18.3096	19.0114	19.5781	19.9307	20.0553	20.0338	19.7720	19.0101	18.0595	17.2939 (92)
Temperature adjustment												0.0000
adjusted MIT	17.3647	17.7509	18.3096	19.0114	19.5781	19.9307	20.0553	20.0338	19.7720	19.0101	18.0595	17.2939 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9557	0.9268	0.8823	0.7981	0.6779	0.5231	0.3821	0.4319	0.6490	0.8461	0.9330	0.9615 (94)
Useful gains	851.4296	1037.8924	1167.8178	1249.7564	1170.3591	905.4612	631.8589	649.6319	868.1657	928.3026	850.8167	802.6902 (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	2578.6854	2533.5200	2325.5670	1980.4069	1541.4216	1038.0818	672.8682	707.0049	1106.5576	1645.5127	2148.7424	2572.7216 (97)
Space heating kWh	1285.0783	1005.0617	861.3654	526.0684	276.0705	0.0000	0.0000	0.0000	0.0000	533.6043	934.5065	1316.9034 (98a)
Space heating requirement - total per year (kWh/year)												6738.6584
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	1285.0783	1005.0617	861.3654	526.0684	276.0705	0.0000	0.0000	0.0000	0.0000	533.6043	934.5065	1316.9034 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6738.6584
Space heating per m2										(98c) / (4) =		40.6580 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1830.5065	1441.0371	1478.6814	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7424	0.8052	0.7667	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1359.0205	1160.2592	1133.7147	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1948.2138	1860.9540	1689.8662	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	424.2192	521.3170	413.7767	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fc = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	106.0548	130.3292	103.4442	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												339.8282 (107)
Energy for space heating												40.6580 (99)
Energy for space cooling												2.0504 (108)
Total												42.7084 (109)
Fabric Energy Efficiency (DFEE)												42.7 (109)

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

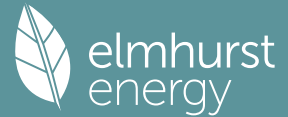
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	84.2200 (1b)	x 2.4600 (2b)	= 207.1812 (1b) - (3b)
First floor	81.5200 (1c)	x 2.6100 (2c)	= 212.7672 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	165.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 419.9484 (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)

Full SAP Calculation Printout



Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 40.0000 / (5) = 0.0952 (8)
Pressure Test
Pressure Test Method
Measured/design AP50
Infiltration rate
Number of sides sheltered
Shelter factor
Infiltration rate adjusted to include shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
(21) = (18) x (20) = 0.2935 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	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	0.3742	0.3668	0.3595	0.3228	0.3155	0.2788	0.2788	0.2715	0.2935	0.3155	0.3301	0.3448	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													(23c)
Effective ac	0.5700	0.5673	0.5646	0.5521	0.5498	0.5389	0.5389	0.5368	0.5431	0.5498	0.5545	0.5594	(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	
TER Opaque door			4.2800	1.0000	4.2800			(26)
TER Opening Type (Uw = 1.20)			37.1600	1.1450	42.5496			(27)
Ground Floor			84.2200	0.1300	10.9486			(28a)
Exposed Floor			2.0300	0.1300	0.2639			(28b)
External Wall	223.2500	41.4400	181.8100	0.1800	32.7258			(29a)
Roof - ceiling	81.5200		81.5200	0.1100	8.9672			(30)
Bay Roof	4.7400		4.7400	0.1100	0.5214			(30)
Total net area of external elements Aum(A, m ²)			395.7600					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 100.2565			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	20.9100	0.0500	1.0455	
E3 Sill	24.8100	0.0500	1.2405	
E4 Jamb	50.7000	0.0500	2.5350	
E5 Ground floor (normal)	46.0000	0.1600	7.3600	
E6 Intermediate floor within a dwelling	32.9200	0.0000	0.0000	
E10 Eaves (insulation at ceiling level)	25.8500	0.0600	1.5510	
E12 Gable (insulation at ceiling level)	16.3300	0.0600	0.9798	
E16 Corner (normal)	42.7200	0.0900	3.8448	
E24 Eaves (insulation at ceiling level - inverted)	6.0000	0.2400	1.4400	
E14 Flat roof	9.1600	0.0800	0.7328	
E17 Corner (inverted - internal area greater than external area)	22.4400	-0.0900	-2.0196	
E20 Exposed floor (normal)	3.5900	0.3200	1.1488	
E21 Exposed floor (inverted)	3.5900	0.3200	1.1488	

Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Point Thermal bridges
Total fabric heat loss
(33) + (36) + (36a) = 121.2639 (37)

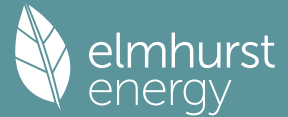
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)
Jan 78.9922 Feb 78.6155 Mar 78.2463 Apr 76.5120 May 76.1876 Jun 74.6771 Jul 74.6771 Aug 74.3973 Sep 75.2589 Oct 76.1876 Nov 76.8440 Dec 77.5302 (38)
Heat transfer coeff
200.2561 199.8795 199.5102 197.7759 197.4515 195.9410 195.9410 195.6613 196.5228 197.4515 198.1079 198.7941 (39)
Average = Sum(39)m / 12 = 197.7744

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.2083	1.2060	1.2038	1.1933	1.1913	1.1822	1.1822	1.1805	1.1857	1.1913	1.1953	1.1994	(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													2.9568 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	31.8580	31.3848	30.7186	29.4901	28.5702	27.5502	26.9992	27.6609	28.3812	29.4727	30.7265	31.7503	(42b)
Hot water usage for other uses	44.9109	43.2778	41.6446	40.0115	38.3784	36.7453	36.7453	38.3784	40.0115	41.6446	43.2778	44.9109	(42c)
Average daily hot water use (litres/day)													70.3654 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	76.7689	74.6626	72.3632	69.5016	66.9486	64.2955	63.7445	66.0392	68.3927	71.1173	74.0042	76.6612	(44)
Energy conte	121.5831	106.3185	111.2195	95.1442	90.1257	79.0588	77.0935	81.7704	84.3351	96.5055	105.4326	120.0328	(45)
Energy content (annual)													Total = Sum(45)m = 1168.6197
Distribution loss (46)m = 0.15 x (45)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	(46)
Water storage loss:													
Total storage 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	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary 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	(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	103.3456	90.3708	94.5366	80.8726	76.6068	67.2000	65.5294	69.5048	71.6848	82.0297	89.6177	102.0279	(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	103.3456	90.3708	94.5366	80.8726	76.6068	67.2000	65.5294	69.5048	71.6848	82.0297	89.6177	102.0279	(64)
12Total per year (kWh/year)													993.3267 (64)
Electric shower(s)													993 (64)

Full SAP Calculation Printout



	59.0984	52.6572	57.4996	54.8712	55.9008	53.3240	55.1014	55.9008	54.8712	57.4996	56.4184	59.0984 (64a)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											672.2409 (64a)
Heat gains from water heating, kWh/month	40.6110	35.7570	38.0091	33.9359	33.1269	30.1310	30.1577	31.3514	31.6390	34.8823	36.5090	40.2816 (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
	147.8414	147.8414	147.8414	147.8414	147.8414	147.8414	147.8414	147.8414	147.8414	147.8414	147.8414	147.8414 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	170.0520	188.2718	170.0520	175.7204	170.0520	175.7204	170.0520	175.7204	170.0520	175.7204	175.7204	170.0520 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	337.1793	340.6782	331.8612	313.0908	289.3965	267.1272	252.2500	248.7511	257.5681	276.3385	300.0328	322.3021 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.7841	37.7841	37.7841	37.7841	37.7841	37.7841	37.7841	37.7841	37.7841	37.7841	37.7841	37.7841 (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)	-118.2731	-118.2731	-118.2731	-118.2731	-118.2731	-118.2731	-118.2731	-118.2731	-118.2731	-118.2731	-118.2731	-118.2731 (71)
Water heating gains (Table 5)	54.5847	53.2098	51.0874	47.1332	44.5254	41.8486	40.5346	42.1390	43.9431	46.8848	50.7070	54.1419 (72)
Total internal gains	629.1684	649.5122	620.3530	603.2968	571.3263	552.0486	530.1889	528.2945	544.5840	560.6278	593.8126	613.8484 (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	13.8100				10.6334		0.6300		0.7000		0.7700		44.8784 (74)	
East	12.3900				19.6403		0.6300		0.7000		0.7700		74.3687 (76)	
South	8.4900				46.7521		0.6300		0.7000		0.7700		121.3054 (78)	
West	2.4700				19.6403		0.6300		0.7000		0.7700		14.8257 (80)	
Solar gains	255.3783	458.9153	686.1513	939.1905	1126.9899	1150.1741	1095.9734	952.1769	773.7783	523.4122	310.3666	215.5811 (83)		
Total gains	884.5467	1108.4275	1306.5043	1542.4873	1698.3161	1702.2227	1626.1623	1480.4714	1318.3622	1084.0399	904.1792	829.4295 (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	22.9900	23.0333	23.0760	23.2783	23.3166	23.4963	23.4963	23.5299	23.4267	23.3166	23.2393	23.1591
alpha	2.5327	2.5356	2.5384	2.5519	2.5544	2.5664	2.5664	2.5687	2.5618	2.5544	2.5493	2.5439
util living area	0.9744	0.9550	0.9224	0.8533	0.7461	0.6033	0.4756	0.5280	0.7293	0.8970	0.9600	0.9781 (86)
MIT	18.0062	18.3936	18.9614	19.6946	20.3096	20.7237	20.8921	20.8560	20.5205	19.6887	18.7157	17.9414 (87)
Th 2	19.9134	19.9152	19.9170	19.9254	19.9269	19.9343	19.9343	19.9356	19.9314	19.9269	19.9238	19.9205 (88)
util rest of house	0.9704	0.9480	0.9100	0.8291	0.7025	0.5318	0.3777	0.4295	0.6672	0.8747	0.9525	0.9746 (89)
MIT 2	17.1777	17.5611	18.1198	18.8323	19.4037	19.7639	19.8866	19.8675	19.6077	18.8432	17.8896	17.1180 (90)
Living area fraction	17.3102	17.6942	18.2544	18.9702	19.5486	19.9174	20.0474	20.0256	19.7537	18.9784	18.0217	17.2496 (91)
MIT	17.3102	17.6942	18.2544	18.9702	19.5486	19.9174	20.0474	20.0256	19.7537	18.9784	18.0217	17.2496 (92)
Temperature adjustment												0.0000
adjusted MIT	17.3102	17.6942	18.2544	18.9702	19.5486	19.9174	20.0474	20.0256	19.7537	18.9784	18.0217	17.2496 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9562	0.9282	0.8852	0.8031	0.6850	0.5306	0.3887	0.4385	0.6554	0.8494	0.9341	0.9619 (94)
Ext temp.	845.8158	1028.8903	1156.5016	1238.7345	1163.4104	903.1368	632.1692	649.2000	864.0463	920.7619	844.5687	797.8541 (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	2605.3678	2557.3002	2345.1156	1991.6347	1549.7083	1041.8956	675.4818	709.3857	1111.0772	1654.3307	2163.6731	2594.1923 (97)
Space heating requirement - total per year (kWh/year)	1309.1067	1027.0914	884.3288	542.0881	287.4056	0.0000	0.0000	0.0000	0.0000	545.7752	949.7552	1336.4756 (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)	1309.1067	1027.0914	884.3288	542.0881	287.4056	0.0000	0.0000	0.0000	0.0000	545.7752	949.7552	1336.4756 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6882.0267
Space heating per m2												41.5230 (99)

8c. Space cooling requirement

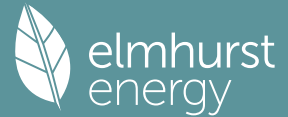
Calculated for June, July and August. See Table 10b												
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.7334	0.7972	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1350.8165	1155.9574	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1914.6185	1828.9464	0.0000	0.0000	0.0000	0.0000 (102)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	405.9375	500.7038	397.3441	0.0000	0.0000	0.0000	0.0000 (103)
Cooled fraction												
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (104)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	101.4844	125.1760	99.3360	0.0000	0.0000	0.0000	0.0000 (105)

Full SAP Calculation Printout



Space cooling requirement	325.9963 (107)
Energy for space heating	41.5230 (99)
Energy for space cooling	1.9669 (108)
Total	43.4899 (109)
Fabric Energy Efficiency (TFEE)	43.5 (109)

Full SAP Calculation Printout



Property Reference	OP-D320 P4ROSE				Issued on Date	29/11/2024
Assessment Reference	P4ROSE	Prop Type Ref	P4ROSE			
Property	P4ROSE					
SAP Rating	80 C	DER	4.02	TER	9.44	
Environmental	96 A	% DER < TER				57.42
CO ₂ Emissions (t/year)	0.61	DFEE	42.71	TFEE	43.49	
Compliance Check	See BREL	% DFEE < TFEE				1.80
% DPER < TPER	14.80	DPER	42.20	TPER	49.53	
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001
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)
Ground floor	84.2200 (1b)	x 2.4600 (2b)	= 207.1812 (1b) - (3b)
First floor	81.5200 (1c)	x 2.6100 (2c)	= 212.7672 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	165.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 419.9484 (5)

2. Ventilation rate

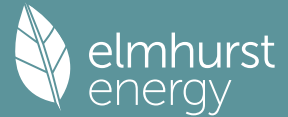
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.5000 (17)
Infiltration rate	0.1750 (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) = 0.1487 (21)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 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	0.1897 0.1859 0.1822 0.1636 0.1599 0.1413 0.1413 0.1376 0.1487 0.1599 0.1673 0.1748 (22b)
Balanced mechanical ventilation with heat recovery	
If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	69.6000 (23c)
Effective ac	0.3417 0.3379 0.3342 0.3156 0.3119 0.2933 0.2933 0.2896 0.3007 0.3119 0.3193 0.3268 (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
Front Door			4.2800	1.0000	4.2800		(26)
Windows (Uw = 1.30)			38.0900	1.2357	47.0694		(27)
Ground Floor			84.2200	0.1100	9.2642		(28a)
Exposed Floor			2.0300	0.1400	0.2842		(28b)
External Wall	223.2500	42.3700	180.8800	0.1700	30.7496		(29a)
Roof - ceiling	81.5200		81.5200	0.1100	8.9672		(30)
Bay Roof	4.7400		4.7400	0.1100	0.5214		(30)
Total net area of external elements Aum (A, m ²)			395.7600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	101.1360		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				20.9100	0.0500	1.0455	

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	14.1600	10.6334	0.6300	0.7000	0.7700	46.0158 (74)
East	12.7000	19.6403	0.6300	0.7000	0.7700	76.2295 (76)
South	8.7000	46.7521	0.6300	0.7000	0.7700	124.3059 (78)

Full SAP Calculation Printout



West		2.5300				19.6403				0.6300				0.7000				0.7700				15.1859 (80)			

Solar gains	261.7371	470.3474	703.2592	962.6327	1155.1422	1178.9155	1123.3564	975.9518	793.0792	536.4549	318.0955	220.9483	(83)												
Total gains	1024.3397	1251.4476	1450.9727	1683.1418	1837.6909	1801.8856	1720.1664	1573.7754	1410.6946	1211.1364	1035.6493	966.8563	(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	27.1630	27.2459	27.3292	27.7537	27.8402	28.2809	28.2809	28.3707	28.1030	27.8402	27.6678	27.4974	
alpha	2.8109	2.8164	2.8219	2.8502	2.8560	2.8854	2.8854	2.8914	2.8735	2.8560	2.8445	2.8332	
util living area	0.9626	0.9361	0.8919	0.8015	0.6716	0.5212	0.3963	0.4438	0.6550	0.8534	0.9411	0.9676	(86)
Living	18.6258	19.0038	19.5182	20.1461	20.6055	20.8659	20.9549	20.9372	20.7311	20.1087	19.2657	18.5727	
Non living	17.2708	17.7482	18.3922	19.1663	19.7021	19.9908	20.0715	20.0614	19.8594	19.1412	18.0928	17.2097	
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	14	
MIT	19.7854	19.0038	19.5182	20.1461	20.6055	20.8659	20.9549	20.9372	20.7311	20.1087	19.2657	19.0480	(87)
Th 2	20.0645	20.0671	20.0697	20.0826	20.0852	20.0982	20.0982	20.1008	20.0930	20.0852	20.0800	20.0748	(88)
util rest of house	0.9572	0.9273	0.8771	0.7751	0.6295	0.4612	0.3218	0.3667	0.5970	0.8275	0.9316	0.9630	(89)
MIT 2	18.9508	17.7482	18.3922	19.1663	19.7021	19.9908	20.0715	20.0614	19.8594	19.1412	18.0928	17.9325	(90)
Living area fraction	FLA = Living area / (4) =												
MIT	19.0842	17.9490	18.5722	19.3230	19.8465	20.1307	20.2128	20.2014	19.9988	19.2959	18.2803	18.1109	(92)
Temperature adjustment	0.0000												
adjusted MIT	19.0842	17.9490	18.5722	19.3230	19.8465	20.1307	20.2128	20.2014	19.9988	19.2959	18.2803	18.1109	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9505	0.9009	0.8475	0.7501	0.6176	0.4635	0.3316	0.3757	0.5904	0.8005	0.9064	0.9498	(94)
Useful gains	973.6679	1127.3785	1229.7512	1262.5945	1134.9372	835.1026	570.3593	591.2024	832.8887	969.4846	938.6930	918.3439	(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	2505.7959	2204.9602	2033.6930	1728.9975	1347.1786	900.3574	588.1277	616.8816	966.3575	1438.0292	1860.3908	2329.0935	(97)
Space heating kWh	1139.9032	724.1349	598.1327	335.8102	157.9076	0.0000	0.0000	0.0000	0.0000	348.5971	663.6224	1049.5977	(98a)
Space heating requirement - total per year (kWh/year)	5017.7058												
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	1139.9032	724.1349	598.1327	335.8102	157.9076	0.0000	0.0000	0.0000	0.0000	348.5971	663.6224	1049.5977	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)	5017.7058												
Space heating per m2	(98c) / (4) = 30.2746 (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 %)													254.5257 (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	1139.9032	724.1349	598.1327	335.8102	157.9076	0.0000	0.0000	0.0000	0.0000	348.5971	663.6224	1049.5977	(98)
Space heating efficiency (main heating system 1)	254.5257	254.5257	254.5257	254.5257	254.5257	0.0000	0.0000	0.0000	0.0000	254.5257	254.5257	254.5257	(210)
Space heating fuel (main heating system)	447.8538	284.5036	234.9989	131.9356	62.0399	0.0000	0.0000	0.0000	0.0000	136.9595	260.7290	412.3739	(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	387.0670	343.0951	365.6510	323.3172	314.8572	254.6252	250.5513	260.6481	263.7295	326.4723	345.1935	383.0003	(64)
Efficiency of water heater (217)m	280.7540	280.7540	280.7540	280.7540	280.7540	280.7540	280.7540	280.7540	280.7540	280.7540	280.7540	280.7540	(216)
Fuel for water heating, kWh/month	137.8670	122.2049	130.2389	115.1603	112.1470	90.6934	89.2423	92.8386	93.9362	116.2841	122.9523	136.4185	(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	77.3671	69.8800	77.3671	74.8714	77.3671	74.8714	77.3671	77.3671	74.8714	77.3671	74.8714	77.3671	(231)
Lighting	35.3368	28.3485	25.5247	18.7005	14.4448	11.8015	13.1770	17.1280	22.2476	29.1900	32.9701	36.3189	(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	1971.3943 (211)												
Space heating fuel - main system 2	0.0000 (213)												

Full SAP Calculation Printout



Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	280.7540
Water heating fuel used	1359.9835 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.7780)	
mechanical ventilation fans (SFP = 1.7780)	910.9353 (230a)
Total electricity for the above, kWh/year	910.9353 (231)
Electricity for lighting (calculated in Appendix L)	285.1884 (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	4527.5015 (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	1971.3943	0.1556	306.7452 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1359.9835	0.1415	192.4869 (264)
Space and water heating			499.2320 (265)
Pumps, fans and electric keep-hot	910.9353	0.1387	126.3580 (267)
Energy for lighting	285.1884	0.1443	41.1615 (268)
Total CO2, kg/year			666.7515 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.0200 (273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1971.3943	1.5760	3106.9199 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1359.9835	1.5234	2071.7893 (278)
Space and water heating			5178.7092 (279)
Pumps, fans and electric keep-hot	910.9353	1.5128	1378.0629 (281)
Energy for lighting	285.1884	1.5338	437.4315 (282)
Total Primary energy kWh/year			6994.2036 (286)
Dwelling Primary energy Rate (DPER)			42.2000 (287)

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

1. Overall dwelling characteristics

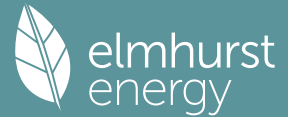
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	84.2200 (1b)	x 2.4600 (2b)	= 207.1812 (1b) - (3b)
First floor	81.5200 (1c)	x 2.6100 (2c)	= 212.7672 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	165.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	419.9484 (5)

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) = 0.0952 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3452 (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) = 0.2935 (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	0.3742	0.3668	0.3595	0.3228	0.3155	0.2788	0.2788	0.2715	0.2935	0.3155	0.3301	0.3448 (22b)

Full SAP Calculation Printout



Effective ac 0.5700 0.5673 0.5646 0.5521 0.5498 0.5389 0.5389 0.5368 0.5431 0.5498 0.5545 0.5594 (25)

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	
TER Opaque door			4.2800	1.0000	4.2800			(26)
TER Opening Type (Uw = 1.20)			37.1600	1.1450	42.5496			(27)
Ground Floor			84.2200	0.1300	10.9486			(28a)
Exposed Floor			2.0300	0.1300	0.2639			(28b)
External Wall	223.2500	41.4400	181.8100	0.1800	32.7258			(29a)
Roof - ceiling	81.5200		81.5200	0.1100	8.9672			(30)
Bay Roof	4.7400		4.7400	0.1100	0.5214			(30)
Total net area of external elements Aum(A, m2)			395.7600					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	100.2565		(33)

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

100.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	20.9100	0.0500	1.0455	
E3 Sill	24.8100	0.0500	1.2405	
E4 Jamb	50.7000	0.0500	2.5350	
E5 Ground floor (normal)	46.0000	0.1600	7.3600	
E6 Intermediate floor within a dwelling	32.9200	0.0000	0.0000	
E10 Eaves (insulation at ceiling level)	25.8500	0.0600	1.5510	
E12 Gable (insulation at ceiling level)	16.3300	0.0600	0.9798	
E16 Corner (normal)	42.7200	0.0900	3.8448	
E24 Eaves (insulation at ceiling level - inverted)	6.0000	0.2400	1.4400	
E14 Flat roof	9.1600	0.0800	0.7328	
E17 Corner (inverted - internal area greater than external area)	22.4400	-0.0900	-2.0196	
E20 Exposed floor (normal)	3.5900	0.3200	1.1488	
E21 Exposed floor (inverted)	3.5900	0.3200	1.1488	

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

21.0074 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 121.2639 (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	78.9922	78.6155	78.2463	76.5120	76.1876	74.6771	74.6771	74.3973	75.2589	76.1876	76.8440	77.5302	(38)
Heat transfer coeff	200.2561	199.8795	199.5102	197.7759	197.4515	195.9410	195.9410	195.6613	196.5228	197.4515	198.1079	198.7941	(39)
Average = Sum(39)m / 12 =												197.7744	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2083	1.2060	1.2038	1.1933	1.1913	1.1822	1.1822	1.1805	1.1857	1.1913	1.1953	1.1994	(40)
HLP (average)												1.1933	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9568 (42)
Hot water usage for mixer showers													
73.7961	72.6871	71.0711	67.9791	65.6972	63.1526	61.7062	63.3100	65.0681	67.8003	70.9587	73.5134	(42a)	
Hot water usage for baths													
31.8580	31.3848	30.7186	29.4901	28.5702	27.5502	26.9992	27.6609	28.3812	29.4727	30.7265	31.7503	(42b)	
Hot water usage for other uses													
44.9109	43.2778	41.6446	40.0115	38.3784	36.7453	36.7453	38.3784	40.0115	41.6446	43.2778	44.9109	(42c)	
Average daily hot water use (litres/day)												138.4030	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	150.5650	147.3497	143.4343	137.4806	132.6458	127.4480	125.4507	129.3492	133.4608	138.9176	144.9629	150.1745	(44)
Energy conte	238.4581	209.8240	220.4531	188.2041	178.5668	156.7122	151.7217	160.1614	164.5705	188.5098	206.5262	235.1371	(45)
Energy content (annual)										Total = Sum(45)m =		2298.8451	

Water storage loss:

Store volume

230.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day):

1.7973 (48)

Temperature factor from Table 2b

0.5400 (49)

Enter (49) or (54) in (55)

0.9706 (55)

Total storage loss

30.0872 27.1756 30.0872 29.1167 30.0872 29.1167 30.0872 30.0872 29.1167 30.0872 29.1167 30.0872 30.0872 (56)

If cylinder contains dedicated solar storage

30.0872 27.1756 30.0872 29.1167 30.0872 29.1167 30.0872 30.0872 29.1167 30.0872 29.1167 30.0872 30.0872 (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

291.8078 258.0108 273.8028 239.8328 231.9164 208.3409 205.0713 213.5110 216.1992 241.8595 258.1549 288.4867 (62)

WWHRS -33.7365 -29.8368 -31.2434 -25.8708 -24.1107 -20.6317 -19.3389 -20.5650 -21.3463 -25.1649 -28.5088 -33.1118 (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 258.0713 228.1739 242.5593 213.9620 207.8057 187.7092 185.7324 192.9460 194.8529 216.6945 229.6461 255.3749 (64)

Total per year (kWh/year) = Sum(64)m = 2613.5283 (64)

12Total per year (kWh/year)

Electric shower(s) 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

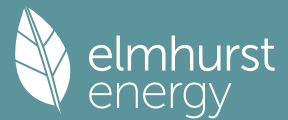
Heat gains from water heating, kWh/month

121.9670 108.3159 115.9804 103.8808 102.0531 93.4097 93.1272 95.9333 96.0226 105.3592 109.9729 120.8628 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.8414	147.8414	147.8414	147.8414	147.8414	147.8414	147.8414	147.8414	147.8414	147.8414	147.8414	147.8414	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
170.0520	188.2718	170.0520	175.7204	170.0520	175.7204	170.0520	170.0520	170.0520	175.7204	170.0520	175.7204	170.0520	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													

Full SAP Calculation Printout



Cooking gains	337.1793	340.6782	331.8612	313.0908	289.3965	267.1272	252.2500	248.7511	257.5681	276.3385	300.0328	322.3021	(68)
	(calculated in Appendix L, equation L15 or L15a), also see Table 5												
Pumps, fans	37.7841	37.7841	37.7841	37.7841	37.7841	37.7841	37.7841	37.7841	37.7841	37.7841	37.7841	37.7841	(69)
Losses e.g. evaporation	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)
	(negative values) (Table 5)												
Water heating gains	-118.2731	-118.2731	-118.2731	-118.2731	-118.2731	-118.2731	-118.2731	-118.2731	-118.2731	-118.2731	-118.2731	-118.2731	(71)
	(Table 5)												
Total internal gains	163.9342	161.1844	155.8876	144.2789	137.1682	129.7358	125.1709	128.9427	133.3648	141.6119	152.7402	162.4500	(72)
	741.5179	760.4868	728.1531	703.4424	666.9691	639.9357	614.8253	615.0981	634.0057	658.3548	698.8457	725.1564	(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				13.8100	10.6334		0.6300		0.7000		0.7700		44.8784 (74)
East				12.3900	19.6403		0.6300		0.7000		0.7700		74.3687 (76)
South				8.4900	46.7521		0.6300		0.7000		0.7700		121.3054 (78)
West				2.4700	19.6403		0.6300		0.7000		0.7700		14.8257 (80)

Solar gains	255.3783	458.9153	686.1513	939.1905	1126.9899	1150.1741	1095.9734	952.1769	773.7783	523.4122	310.3666		215.5811 (83)
Total gains	996.8962	1219.4021	1414.3045	1642.6329	1793.9589	1790.1099	1710.7987	1567.2751	1407.7839	1181.7669	1009.2124		940.7375 (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	22.9900	23.0333	23.0760	23.2783	23.3166	23.4963	23.4963	23.5299	23.4267	23.3166	23.2393	23.1591	
alpha	2.5327	2.5356	2.5384	2.5519	2.5544	2.5664	2.5664	2.5687	2.5618	2.5544	2.5493	2.5439	
util living area	0.9668	0.9452	0.9097	0.8372	0.7270	0.5835	0.4568	0.5060	0.7056	0.8796	0.9495	0.9711	(86)
MIT	18.1291	18.5070	19.0598	19.7661	20.3546	20.7451	20.9018	20.8698	20.5593	19.7700	18.8251	18.0651	(87)
Th 2	19.9134	19.9152	19.9170	19.9254	19.9269	19.9343	19.9343	19.9356	19.9314	19.9269	19.9238	19.9205	(88)
util rest of house	0.9617	0.9369	0.8957	0.8113	0.6821	0.5123	0.3613	0.4095	0.6420	0.8546	0.9405	0.9666	(89)
MIT 2	16.5583	17.0364	17.7315	18.6064	19.3033	19.7342	19.8792	19.8575	19.5537	18.6324	17.4502	16.4810	(90)
Living area fraction	FLA = Living area / (4) =												
MIT	16.8094	17.2715	17.9439	18.7918	19.4714	19.8958	20.0427	20.0194	19.7145	18.8143	17.6700	16.7343	(92)
Temperature adjustment	0.0000												
adjusted MIT	16.8094	17.2715	17.9439	18.7918	19.4714	19.8958	20.0427	20.0194	19.7145	18.8143	17.6700	16.7343	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9393	0.9080	0.8618	0.7780	0.6606	0.5095	0.3716	0.4177	0.6273	0.8210	0.9129	0.9461	(94)
Useful gains	936.3812	1107.2693	1218.8202	1278.0263	1185.0093	912.0956	635.6582	654.5756	883.0582	970.2825	921.2925	889.9933	(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	2505.0910	2472.8157	2283.1795	1956.3688	1534.4697	1037.6696	674.5628	708.1689	1103.3790	1621.9239	2093.9994	2491.7383	(97)
Space heating kWh	1167.1200	917.6472	791.8833	488.4066	259.9985	0.0000	0.0000	0.0000	0.0000	484.8212	844.3489	1191.6983	(98a)
Space heating requirement - total per year (kWh/year)	6145.9241												
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	1167.1200	917.6472	791.8833	488.4066	259.9985	0.0000	0.0000	0.0000	0.0000	484.8212	844.3489	1191.6983	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)	6145.9241												
Space heating per m ²	(98c) / (4) = 37.0817												(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	1167.1200	917.6472	791.8833	488.4066	259.9985	0.0000	0.0000	0.0000	0.0000	484.8212	844.3489	1191.6983	(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)	1264.4854	994.2006	857.9451	529.1513	281.6885	0.0000	0.0000	0.0000	0.0000	525.2668	914.7876	1291.1141	(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	258.0713	228.1739	242.5593	213.9620	207.8057	187.7092	185.7324	192.9460	194.8529	216.6945	229.6461	255.3749	(64)
Efficiency of water heater (217)m	87.0228	86.8495	86.5121	85.8505	84.5634	79.8000	79.8000	79.8000	79.8000	85.8106	86.7090	79.8000	(216)
Fuel for water heating, kWh/month	296.5559	262.7235	280.3760	249.2264	245.7395	235.2246	232.7474	241.7870	244.1765	252.5266	264.8470	293.3083	(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	35.3334	28.3458	25.5222	18.6987	14.4434	11.8004	13.1758	17.1264	22.2454	29.1872	32.9669	36.3155	(232)

Full SAP Calculation Printout



Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-71.9433	-98.1205	-136.4521	-148.1909	-155.4022	-143.3424	-141.3655	-135.4301	-124.5574	-109.4557	-77.8201	-62.5762	(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	-51.3713	-106.6221	-209.3881	-310.9790	-407.9744	-408.9161	-404.2865	-343.9316	-254.1450	-151.5148	-68.2474	-40.7516	(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												6658.6394	(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												3099.2388	(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)												285.1611	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-4162.7845	(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												5966.2548	(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	6658.6394	0.2100	1398.3143	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3099.2388	0.2100	650.8402	(264)
Space and water heating			2049.1544	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	285.1611	0.1443	41.1576	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1404.6565	0.1353	-190.1012	
PV Unit electricity exported	-2758.1280	0.1262	-348.1304	
Total			-538.2315	(269)
Total CO2, kg/year			1564.0097	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.4400	(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	6658.6394	1.1300	7524.2625	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3099.2388	1.1300	3502.1399	(278)
Space and water heating			11026.4024	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	285.1611	1.5338	437.3896	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1404.6565	1.5002	-2107.2969	
PV Unit electricity exported	-2758.1280	0.4633	-1277.9158	
Total			-3385.2127	(283)
Total Primary energy kWh/year			8208.6801	(286)
Target Primary Energy Rate (TPER)			49.5300	(287)