

Full SAP Calculation Printout



Property Reference	RADESIGN-7146-23 P1		Issued on Date	09/12/2023	
Assessment Reference	SEC1 - ASHP ROI TF 0.15 improv	Prop Type Ref	DS		
Property	Proposed dwelling Plot 1, Rosemullion, The Izzard, Helston, Cornwall, TR12 7PE				
SAP Rating	97 A	DER	-0.07	TER	8.25
Environmental	100 A	% DER < TER			100.85
CO ₂ Emissions (t/year)	-0.13	DFEE	35.90	TFEE	40.04
Compliance Check	See BREL	% DFEE < TFEE			10.35
% DPER < TPER	80.74	DPER	8.40	TPER	43.62
Assessor Details	Mr. Stuart Thomas			Assessor ID	V220-0003
Client	RA Design, RA Design				

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	76.5700 (1b)	x 2.4700 (2b)	= 189.1279 (1b) - (3b)
First floor	73.6100 (1c)	x 2.0800 (2c)	= 153.1088 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	150.1800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	342.2367 (5)

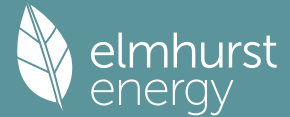
2. Ventilation rate

	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	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												1.0000 (17)
Infiltration rate												0.0500 (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) =											0.0425 (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	0.0542	0.0531	0.0521	0.0468	0.0457	0.0404	0.0404	0.0393	0.0425	0.0457	0.0478	0.0499 (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) =												81.0000 (23c)
Effective ac	0.1492	0.1481	0.1471	0.1417	0.1407	0.1354	0.1354	0.1343	0.1375	0.1407	0.1428	0.1449 (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
Window (Uw = 1.20)			17.0200	1.1450	19.4885		(27)
Door			1.8900	1.0000	1.8900		(26a)
FD			1.7000	1.8000	3.0600		(26)
5-7			1.8400	0.9615	1.7692		(27a)
8-9			1.8400	0.9615	1.7692		(27a)
14-16			2.7600	0.9615	2.6538		(27a)
17			0.9200	0.9615	0.8846		(27a)
Floor 1 P/a 0.48			76.5700	0.1200	9.1884	110.0000	8422.7000 (28a)
Heatloss Floor 2 over garage			17.3900	0.1700	2.9563	20.0000	347.8000 (28b)
External Wall 1 Render	62.9700	10.7100	52.2600	0.1600	8.3616	9.0000	470.3400 (29a)
External Wall 2 Stone	31.5000	8.2000	23.3000	0.1600	3.7280	9.0000	209.7000 (29a)
External Wall 3 Garage	16.2600	1.7000	14.5600	0.1400	2.0384	18.0000	262.0800 (29a)
Wall 4 "attic"	26.4800		26.4800	0.0900	2.3832	9.0000	238.3200 (29a)
External Roof 1 Sloping	111.0100	7.3600	103.6500	0.1300	13.4745	9.0000	932.8500 (30)

Full SAP Calculation Printout



Roof 2 "attic"	15.4700	15.4700	0.0861	1.3323	9.0000	139.2300	(30)
Total net area of external elements Aum(A, m2)		357.6500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	74.9782			(33)
Internal Wall 1 GF		67.2000			9.0000	604.8000	(32c)
Internal Wall 2 FF		96.9200			9.0000	872.2800	(32c)
Internal Floor 1		56.2200			18.0000	1011.9600	(32d)
Internal Ceiling 1		56.2200			9.0000	505.9800	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 14018.0400 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 93.3416 (35)

List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E16 Corner (normal)	13.2500	0.0300	0.3975
E5 Ground floor (normal)	37.1000	0.0210	0.7791
E11 Eaves (insulation at rafter level)	25.6000	0.0390	0.9984
E17 Corner (inverted - internal area greater than external area)	2.6500	-0.0150	-0.0398
E13 Gable (insulation at rafter level)	26.3000	0.0240	0.6312
R4 Ridge (vaulted ceiling)	19.0000	0.1200	2.2800
E6 Intermediate floor within a dwelling	26.6500	0.0800	2.1320
E20 Exposed floor (normal)	13.3000	0.3200	4.2560
E21 Exposed floor (inverted)	6.2000	0.3200	1.9840
E2 Other lintels (including other steel lintels)	13.2500	0.0840	1.1130
E3 Sill	11.5000	0.0430	0.4945
E4 Jamb	31.3000	0.0340	1.0642
R1 Head of roof window	7.5200	0.2400	1.8048
R2 Sill of roof window	7.5200	0.2400	1.8048
R3 Jamb of roof window	15.6800	0.2400	3.7632

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 23.4630 (36)
 Point Thermal bridges 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 98.4412 (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
	16.8490	16.7290	16.6090	16.0090	15.8890	15.2890	15.2890	15.1690	15.5290	15.8890	16.1290	16.3690
Heat transfer coeff	115.2901	115.1701	115.0501	114.4501	114.3301	113.7302	113.7302	113.6102	113.9702	114.3301	114.5701	114.8101
Average = Sum(39)m / 12 =												114.4201
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.7677	0.7669	0.7661	0.7621	0.7613	0.7573	0.7573	0.7565	0.7589	0.7613	0.7629	0.7645
HLP (average)												0.7619
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9345 (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
Hot water usage for baths												
	84.6975	83.4396	81.6682	78.4022	75.9566	73.2448	71.7801	73.5390	75.4542	78.3559	81.6892	84.4111
Hot water usage for other uses												
	44.6819	43.0571	41.4323	39.8075	38.1827	36.5579	36.5579	38.1827	39.8075	41.4323	43.0571	44.6819
Average daily hot water use (litres/day) 119.1478 (43)												
Daily hot water use												
	129.3794	126.4967	123.1005	118.2097	114.1393	109.8027	108.3380	111.7217	115.2617	119.7882	124.7463	129.0930
Energy content (annual) 204.9053 180.1296 189.2009 161.8231 153.6534 135.0153 131.0254 138.3348 142.1292 162.5514 177.7240 202.1285 (45)												
Distribution loss (46)m = 0.15 x (45)m Total = Sum(45)m = 1978.6210												
Water storage loss: 30.7358 27.0194 28.3801 24.2735 23.0480 20.2523 19.6538 20.7502 21.3194 24.3827 26.6586 30.3193 (46)												
Store volume 250.0000 (47)												
a) If manufacturer declared loss factor is known (kWh/day): 1.6000 (48)												
Temperature factor from Table 2b 0.5400 (49)												
Enter (49) or (54) in (55) 0.8640 (55)												
Total storage loss 26.7840 24.1920 26.7840 25.9200 26.7840 25.9200 26.7840 26.7840 25.9200 26.7840 25.9200 26.7840 (56)												
If cylinder contains dedicated solar storage 26.7840 24.1920 26.7840 25.9200 26.7840 25.9200 26.7840 26.7840 25.9200 26.7840 25.9200 26.7840 (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 254.9517 225.3328 239.2473 210.2551 203.6998 183.4473 181.0718 188.3812 190.5612 212.5978 226.1560 252.1749 (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 254.9517 225.3328 239.2473 210.2551 203.6998 183.4473 181.0718 188.3812 190.5612 212.5978 226.1560 252.1749 (64)												
Total per year (kWh/year) = Sum(64)m = 2567.8770 (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 108.1681 96.0556 102.9464 92.5518 91.1269 83.6382 83.6031 86.0335 86.0036 94.0855 97.8388 107.2448 (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
	146.7235	146.7235	146.7235	146.7235	146.7235	146.7235	146.7235	146.7235	146.7235	146.7235	146.7235	146.7235
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 167.7656 185.7404 167.7656 173.3577 167.7656 173.3577 167.7656 167.7656 173.3577 167.7656 173.3577 167.7656 (67)												
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 320.7184 324.0464 315.6598 297.8058 275.2683 254.0862 239.9352 236.6072 244.9937 262.8478 285.3853 306.5674 (68)												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 37.6723 37.6723 37.6723 37.6723 37.6723 37.6723 37.6723 37.6723 37.6723 37.6723 37.6723 37.6723 (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) -117.3788 -117.3788 -117.3788 -117.3788 -117.3788 -117.3788 -117.3788 -117.3788 -117.3788 -117.3788 -117.3788 -117.3788 (71)												
Water heating gains (Table 5) 145.3873 142.9399 138.3689 128.5442 122.4824 116.1641 112.3697 115.6364 119.4494 126.4590 135.8873 144.1463 (72)												
Total internal gains												

Full SAP Calculation Printout



700.8882 719.7439 688.8113 666.7247 632.5332 610.6251 587.0875 587.0261 604.8179 624.0894 661.6474 685.4963 (73)

6. Solar gains

[Jan]		Area m2	Solar flux Table 6a W/m2	Specific data g or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W						
North		9.1400	10.6334	0.7600	0.7000	0.7700	35.8313 (74)						
East		4.4100	19.6403	0.7600	0.7000	0.7700	31.9323 (76)						
South		3.4700	46.7521	0.7600	0.7000	0.7700	59.8102 (78)						
North		1.8400	26.0000	0.6800	0.7000	1.0000	20.4947 (82)						
East		1.8400	26.0000	0.6800	0.7000	1.0000	20.4947 (82)						
South		2.7600	26.0000	0.6800	0.7000	1.0000	30.7420 (82)						
West		0.9200	26.0000	0.6800	0.7000	1.0000	10.2473 (82)						
Solar gains	209.5525	399.1589	646.6958	950.9103	1187.9783	1229.7827	1164.9389	982.7890	752.4849	469.3846	258.9637	174.0254	(83)
Total gains	910.4407	1118.9028	1335.5071	1617.6350	1820.5116	1840.4077	1752.0265	1569.8152	1357.3028	1093.4740	920.6111	859.5217	(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	33.7748	33.8100	33.8452	34.0227	34.0584	34.2381	34.2381	34.2742	34.1660	34.0584	33.9870	33.9160
alpha	3.2517	3.2540	3.2563	3.2682	3.2706	3.2825	3.2825	3.2849	3.2777	3.2706	3.2658	3.2611
util living area	0.9518	0.9132	0.8421	0.7032	0.5375	0.3839	0.2823	0.3269	0.5343	0.7968	0.9220	0.9590 (86)
Living	19.6024	19.8807	20.2360	20.6007	20.8014	20.8799	20.8990	20.8946	20.8305	20.5139	19.9887	19.5445
Non living	18.6108	18.9597	19.3991	19.8372	20.0639	20.1484	20.1656	20.1631	20.1018	19.7471	19.1026	18.5398
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.2850	19.8807	20.2360	20.6007	20.8014	20.8799	20.8990	20.8946	20.8305	20.5139	19.9887	19.7481 (87)
Th 2	20.2814	20.2821	20.2828	20.2863	20.2870	20.2905	20.2905	20.2912	20.2891	20.2870	20.2856	20.2842 (88)
util rest of house	0.9462	0.9038	0.8260	0.6774	0.5038	0.3442	0.2379	0.2784	0.4886	0.7707	0.9118	0.9541 (89)
MIT 2	19.6154	18.9597	19.3991	19.8372	20.0639	20.1484	20.1656	20.1631	20.1018	19.7471	19.1026	18.8542 (90)
Living area fraction									FLA = Living area / (4) =			
MIT	19.7443	19.1371	19.5603	19.9842	20.2060	20.2893	20.3068	20.3040	20.2421	19.8947	19.2732	19.0263 (91)
Temperature adjustment												0.0000
adjusted MIT	19.7443	19.1371	19.5603	19.9842	20.2060	20.2893	20.3068	20.3040	20.2421	19.8947	19.2732	19.0263 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9414	0.8860	0.8080	0.6658	0.4998	0.3441	0.2389	0.2793	0.4855	0.7548	0.8945	0.9436 (94)
Useful gains	857.1234	991.3200	1079.0796	1077.0086	909.9108	633.3189	418.5880	438.5055	658.9043	825.3319	823.5120	811.0535 (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	1780.5804	1639.6839	1502.5835	1268.5877	972.4879	647.0453	421.5769	443.5345	700.0155	1062.6669	1394.6890	1702.2086 (97)
Space heating kWh	687.0520	435.7006	315.0869	137.9370	46.5573	0.0000	0.0000	0.0000	0.0000	176.5772	411.2474	663.0194 (98a)
Space heating requirement - total per year (kWh/year)												2873.1778
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	687.0520	435.7006	315.0869	137.9370	46.5573	0.0000	0.0000	0.0000	0.0000	176.5772	411.2474	663.0194 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2873.1778
Space heating per m2												(98c) / (4) =
												19.1316 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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 %)												366.3334 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	687.0520	435.7006	315.0869	137.9370	46.5573	0.0000	0.0000	0.0000	0.0000	176.5772	411.2474	663.0194 (98)
Space heating efficiency (main heating system 1)	366.3334	366.3334	366.3334	366.3334	366.3334	0.0000	0.0000	0.0000	0.0000	366.3334	366.3334	366.3334 (210)
Space heating fuel (main heating system)	187.5483	118.9355	86.0110	37.6534	12.7090	0.0000	0.0000	0.0000	0.0000	48.2012	112.2604	180.9880 (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	254.9517	225.3328	239.2473	210.2551	203.6998	183.4473	181.0718	188.3812	190.5612	212.5978	226.1560	252.1749 (64)
Efficiency of water heater (217)m	199.0374	199.0374	199.0374	199.0374	199.0374	199.0374	199.0374	199.0374	199.0374	199.0374	199.0374	199.0374 (216)
Fuel for water heating, kWh/month	128.0924	113.2113	120.2022	105.6360	102.3425	92.1673	90.9738	94.6462	95.7414	106.8130	113.6249	126.6973 (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	29.6457	26.7767	29.6457	28.6894	29.6457	28.6894	29.6457	29.6457	28.6894	29.6457	28.6894	29.6457 (231)
Lighting	32.4359	26.0213	23.4293	17.1653	13.2590	10.8327	12.0953	15.7219	20.4212	26.7937	30.2634	33.3374 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												

Full SAP Calculation Printout



(233a)m	-63.7018	-91.6716	-133.8401	-150.4788	-162.1133	-150.3949	-148.5193	-139.4655	-122.6620	-103.8051	-70.1187	-54.6681	(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	-26.4539	-58.7724	-122.3832	-192.9108	-262.1157	-266.6898	-263.0535	-220.1277	-158.9715	-88.5175	-36.8189	-20.7769	(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												784.3068	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												199.0374	
Water heating fuel used												1290.1482	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.8360)													
mechanical ventilation fans (SFP = 0.8360)												349.0541	(230a)
Total electricity for the above, kWh/year												349.0541	(231)
Electricity for lighting (calculated in Appendix L)												261.7764	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-3109.0309	(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												-423.7454	(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	784.3068	0.1566	122.8295 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1290.1482	0.1409	181.7735 (264)
Space and water heating			304.6030 (265)
Pumps, fans and electric keep-hot	349.0541	0.1387	48.4181 (267)
Energy for lighting	261.7764	0.1443	37.7824 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1391.4392	0.1345	-187.1801
PV Unit electricity exported	-1717.5917	0.1246	-214.0567
Total			-401.2367 (269)
Total CO2, kg/year			-10.4332 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			-0.0700 (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	784.3068	1.5797	1238.9909 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1290.1482	1.5210	1962.2803 (278)
Space and water heating			3201.2712 (279)
Pumps, fans and electric keep-hot	349.0541	1.5128	528.0490 (281)
Energy for lighting	261.7764	1.5338	401.5214 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1391.4392	1.4972	-2083.2281
PV Unit electricity exported	-1717.5917	0.4574	-785.6496
Total			-2868.8777 (283)
Total Primary energy kWh/year			1261.9639 (286)
Dwelling Primary energy Rate (DPER)			8.4000 (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	76.5700 (1b)	x 2.4700 (2b)	= 189.1279 (1b) - (3b)
First floor	73.6100 (1c)	x 2.0800 (2c)	= 153.1088 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	150.1800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 342.2367 (5)

2. Ventilation rate

m3 per hour

Full SAP Calculation Printout



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) = 0.1169 (8)
 Pressure test Yes
 Pressure Test Method Blower Door
 Measured/design AP50 5.0000 (17)
 Infiltration rate 0.3669 (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) = 0.3118 (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
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
Adj infilt rate												
Effective ac	0.3976	0.3898	0.3820	0.3430	0.3352	0.2963	0.2963	0.2885	0.3118	0.3352	0.3508	0.3664
	0.5790	0.5760	0.5730	0.5588	0.5562	0.5439	0.5439	0.5416	0.5486	0.5562	0.5615	0.5671

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			1.7000	1.0000	1.7000		(26)
TER Semi-glazed door			1.8900	1.0000	1.8900		(26a)
TER Opening Type (Uw = 1.20)			17.0200	1.1450	19.4885		(27)
5-7			1.8400	1.5918	2.9288		(27a)
8-9			1.8400	1.5918	2.9288		(27a)
14-16			2.7600	1.5918	4.3933		(27a)
17			0.9200	1.5918	1.4644		(27a)
Floor 1 P/a 0.48			76.5700	0.1300	9.9541		(28a)
Heatloss Floor 2 over garage			17.3900	0.1300	2.2607		(28b)
External Wall 1 Render	62.9700	10.7100	52.2600	0.1800	9.4068		(29a)
External Wall 2 Stone	31.5000	8.2000	23.3000	0.1800	4.1940		(29a)
External Wall 3 Garage	16.2600	1.7000	14.5600	0.1800	2.6208		(29a)
Wall 4 "attic"	26.4800		26.4800	0.1800	4.7664		(29a)
External Roof 1 Sloping	111.0100	7.3600	103.6500	0.1100	11.4015		(30)
Roof 2 "attic"	15.4700		15.4700	0.1100	1.7017		(30)
Total net area of external elements Aum(A, m2)			357.6500				(31)
Fabric heat loss, W/K = Sum (A x U)					81.0999		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 93.3416 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	13.2500	0.0900	1.1925
E5 Ground floor (normal)	37.1000	0.1600	5.9360
E11 Eaves (insulation at rafter level)	25.6000	0.0400	1.0240
E17 Corner (inverted - internal area greater than external area)	2.6500	-0.0900	-0.2385
E13 Gable (insulation at rafter level)	26.3000	0.0800	2.1040
R4 Ridge (vaulted ceiling)	19.0000	0.0800	1.5200
E6 Intermediate floor within a dwelling	26.6500	0.0000	0.0000
E20 Exposed floor (normal)	13.3000	0.3200	4.2560
E21 Exposed floor (inverted)	6.2000	0.3200	1.9840
E2 Other lintels (including other steel lintels)	13.2500	0.0500	0.6625
E3 Sill	11.5000	0.0500	0.5750
E4 Jamb	31.3000	0.0500	1.5650
R1 Head of roof window	7.5200	0.0800	0.6016
R2 Sill of roof window	7.5200	0.0600	0.4512
R3 Jamb of roof window	15.6800	0.0800	1.2544

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 22.8877 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 103.9876 (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
(38)m	65.3962	65.0495	64.7098	63.1138	62.8152	61.4251	61.4251	61.1677	61.9606	62.8152	63.4193	64.0508
Heat transfer coeff	169.3838	169.0372	168.6974	167.1014	166.8028	165.4128	165.4128	165.1553	165.9482	166.8028	167.4069	168.0384
Average = Sum(39)m / 12 =												167.1000

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1279	1.1256	1.1233	1.1127	1.1107	1.1014	1.1014	1.0997	1.1050	1.1107	1.1147	1.1189
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Hot water usage for baths	84.6975	83.4396	81.6682	78.4022	75.9566	73.2448	71.7801	73.5390	75.4542	78.3559	81.6892	84.4111
Hot water usage for other uses	44.6819	43.0571	41.4323	39.8075	38.1827	36.5579	36.5579	38.1827	39.8075	41.4323	43.0571	44.6819
Average daily hot water use (litres/day)												119.1478
Daily hot water use	129.3794	126.4967	123.1005	118.2097	114.1393	109.8027	108.3380	111.7217	115.2617	119.7882	124.7463	129.0930
Energy conte	204.9053	180.1296	189.2009	161.8231	153.6534	135.0153	131.0254	138.3348	142.1292	162.5514	177.7240	202.1285
Energy content (annual)												1978.6210
Distribution loss (46)m = 0.15 x (45)m	30.7358	27.0194	28.3801	24.2735	23.0480	20.2523	19.6538	20.7502	21.3194	24.3827	26.6586	30.3193

Full SAP Calculation Printout



Space heating kWh	978.2892	770.2053	656.8176	390.5844	198.1483	0.0000	0.0000	0.0000	0.0000	404.8290	707.5298	997.4450 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5103.8485
Space heating per m2												(98c) / (4) = 33.9849 (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	978.2892	770.2053	656.8176	390.5844	198.1483	0.0000	0.0000	0.0000	0.0000	404.8290	707.5298	997.4450 (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)	1059.9016	834.4586	711.6117	423.1684	214.6785	0.0000	0.0000	0.0000	0.0000	438.6013	766.5545	1080.6555 (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	259.8121	229.7228	244.1077	214.9587	208.5602	188.1509	185.9322	193.2416	195.2648	217.4582	230.8596	257.0353 (64)
Efficiency of water heater												79.8000 (216)
(217)m	86.7470	86.5573	86.1669	85.3817	83.9451	79.8000	79.8000	79.8000	79.8000	85.4329	86.4026	86.7943 (217)
Fuel for water heating, kWh/month	299.5057	265.3998	283.2965	251.7622	248.4484	235.7780	232.9977	242.1574	244.6928	254.5367	267.1904	296.1429 (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	34.5802	27.7415	24.9782	18.3001	14.1355	11.5488	12.8949	16.7613	21.7712	28.5650	32.2641	35.5413 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-79.4124	-106.0013	-144.3035	-153.3068	-158.0355	-144.8263	-142.8356	-138.1707	-129.2152	-116.5890	-85.0687	-69.3592 (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	-64.9281	-133.6512	-260.5044	-384.1543	-501.4001	-501.5955	-495.8532	-422.9250	-314.0581	-188.8785	-85.9041	-51.5866 (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												5529.6300 (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												3121.9086 (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)												279.0822 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-4872.5635 (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												4144.0573 (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	5529.6300	0.2100	1161.2223 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3121.9086	0.2100	655.6008 (264)
Space and water heating			1816.8231 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	279.0822	0.1443	40.2802 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1467.1243	0.1358	-199.2467
PV Unit electricity exported	-3405.4392	0.1264	-430.5758
Total			-629.8225 (269)
Total CO2, kg/year			1239.2101 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.2500 (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	5529.6300	1.1300	6248.4819 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3121.9086	1.1300	3527.7567 (278)
Space and water heating			9776.2386 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)

Full SAP Calculation Printout



Energy for lighting	279.0822	1.5338	428.0656 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1467.1243	1.5020	-2203.6049
PV Unit electricity exported	-3405.4392	0.4641	-1580.5892
Total			-3784.1942 (283)
Total Primary energy kWh/year			6550.2109 (286)
Target Primary Energy Rate (TPER)			43.6200 (287)

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	76.5700 (1b)	x 2.4700 (2b)	= 189.1279 (1b) - (3b)
First floor	73.6100 (1c)	x 2.0800 (2c)	= 153.1088 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	150.1800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 342.2367 (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) =											0.1169 (8)
Pressure test												Yes
Pressure Test Method												Blower Door
Measured/design AP50												1.0000 (17)
Infiltration rate												0.1669 (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) =											0.1418 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	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)
Adj infilt rate	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)
Effective ac	0.1809	0.1773	0.1738	0.1560	0.1525	0.1348	0.1348	0.1312	0.1418	0.1525	0.1596	0.1667 (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	0.5164	0.5157	0.5151	0.5122	0.5116	0.5091	0.5091	0.5086	0.5101	0.5116	0.5127	0.5139 (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
Window (Uw = 1.20)			17.0200	1.1450	19.4885		(27)
Door			1.8900	1.0000	1.8900		(26a)
FD			1.7000	1.8000	3.0600		(26)
5-7			1.8400	0.9615	1.7692		(27a)
8-9			1.8400	0.9615	1.7692		(27a)
14-16			2.7600	0.9615	2.6538		(27a)
17			0.9200	0.9615	0.8846		(27a)
Floor 1 P/a 0.48			76.5700	0.1200	9.1884	110.0000	8422.7000 (28a)
Heatloss Floor 2 over garage			17.3900	0.1700	2.9563	20.0000	347.8000 (28b)
External Wall 1 Render	62.9700	10.7100	52.2600	0.1600	8.3616	9.0000	470.3400 (29a)
External Wall 2 Stone	31.5000	8.2000	23.3000	0.1600	3.7280	9.0000	209.7000 (29a)
External Wall 3 Garage	16.2600	1.7000	14.5600	0.1400	2.0384	18.0000	262.0800 (29a)
Wall 4 "attic"	26.4800		26.4800	0.0900	2.3832	9.0000	238.3200 (29a)
External Roof 1 Sloping	111.0100	7.3600	103.6500	0.1300	13.4745	9.0000	932.8500 (30)
Roof 2 "attic"	15.4700		15.4700	0.0861	1.3323	9.0000	139.2300 (30)
Total net area of external elements Aum(A, m ²)			357.6500				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	74.9782	(33)
Internal Wall 1 GF			67.2000			9.0000	604.8000 (32c)
Internal Wall 2 FF			96.9200			9.0000	872.2800 (32c)
Internal Floor 1			56.2200			18.0000	1011.9600 (32d)
Internal Ceiling 1			56.2200			9.0000	505.9800 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) =
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							14018.0400 (34)
List of Thermal Bridges							93.3416 (35)
K1 Element				Length	Psi-value	Total	
E16 Corner (normal)				13.2500	0.0300	0.3975	
E5 Ground floor (normal)				37.1000	0.0210	0.7791	
E11 Eaves (insulation at rafter level)				25.6000	0.0390	0.9984	
E17 Corner (inverted - internal area greater than external area)				2.6500	-0.0150	-0.0398	
E13 Gable (insulation at rafter level)				26.3000	0.0240	0.6312	
R4 Ridge (vaulted ceiling)				19.0000	0.1200	2.2800	

Full SAP Calculation Printout



E6 Intermediate floor within a dwelling	26.6500	0.0800	2.1320
E20 Exposed floor (normal)	13.3000	0.3200	4.2560
E21 Exposed floor (inverted)	6.2000	0.3200	1.9840
E2 Other lintels (including other steel lintels)	13.2500	0.0840	1.1130
E3 Sill	11.5000	0.0430	0.4945
E4 Jamb	31.3000	0.0340	1.0642
R1 Head of roof window	7.5200	0.2400	1.8048
R2 Sill of roof window	7.5200	0.2400	1.8048
R3 Jamb of roof window	15.6800	0.2400	3.7632

Thermal bridges (Sum(L x Psi) calculated using Appendix K)
 Point Thermal bridges (36a) = 23.4630 (36)
 Total fabric heat loss (33) + (36) + (36a) = 98.4412 (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	58.3161	58.2443	58.1740	57.8438	57.7821	57.4945	57.4945	57.4412	57.6052	57.7821	57.9070	58.0377
Average = Sum(39)m / 12 =	156.7572	156.6855	156.6152	156.2850	156.2232	155.9356	155.9356	155.8824	156.0464	156.2232	156.3482	156.4789

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0438	1.0433	1.0428	1.0407	1.0402	1.0383	1.0383	1.0380	1.0391	1.0402	1.0411	1.0419
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.9345
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
Hot water usage for baths	31.6968	31.2260	30.5631	29.3408	28.4256	27.4108	26.8626	27.5209	28.2376	29.3235	30.5710	31.5896
Hot water usage for other uses	44.6819	43.0571	41.4323	39.8075	38.1827	36.5579	36.5579	38.1827	39.8075	41.4323	43.0571	44.6819
Average daily hot water use (litres/day)												70.0078
Daily hot water use	76.3787	74.2831	71.9954	69.1484	66.6083	63.9687	63.4205	65.7036	68.0451	70.7558	73.6281	76.2715
Energy content (annual)	120.9651	105.7782	110.6543	94.6606	89.6676	78.6570	76.7016	81.3548	83.9064	96.0150	104.8967	119.4227
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
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
If cylinder contains dedicated solar storage												
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
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
Total heat required for water heating calculated for each month	102.8204	89.9114	94.0561	80.4615	76.2175	66.8584	65.1964	69.1516	71.3205	81.6127	89.1622	101.5093
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
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
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
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
Output from w/h	102.8204	89.9114	94.0561	80.4615	76.2175	66.8584	65.1964	69.1516	71.3205	81.6127	89.1622	101.5093
12Total per year (kWh/year)												988.2780
Electric shower(s)	58.7982	52.3897	57.2075	54.5924	55.6168	53.0531	54.8215	55.6168	54.5924	57.2075	56.1318	58.7982
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												668.8259
Heat gains from water heating, kWh/month	40.4046	35.5753	37.8159	33.7635	32.9586	29.9779	30.0045	31.1921	31.4782	34.7051	36.3235	40.0769

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabolic gains (Table 5), Watts	146.7235	146.7235	146.7235	146.7235	146.7235	146.7235	146.7235	146.7235	146.7235	146.7235	146.7235	146.7235
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	167.7656	185.7404	167.7656	173.3577	167.7656	173.3577	167.7656	167.7656	173.3577	167.7656	173.3577	167.7656
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	320.7184	324.0464	315.6598	297.8058	275.2683	254.0862	239.9352	236.6072	244.9937	262.8478	285.3853	306.5674
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6723	37.6723	37.6723	37.6723	37.6723	37.6723	37.6723	37.6723	37.6723	37.6723	37.6723	37.6723
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
Losses e.g. evaporation (negative values) (Table 5)	-117.3788	-117.3788	-117.3788	-117.3788	-117.3788	-117.3788	-117.3788	-117.3788	-117.3788	-117.3788	-117.3788	-117.3788
Water heating gains (Table 5)	54.3073	52.9394	50.8278	46.8937	44.2992	41.6359	40.3286	41.9249	43.7198	46.6466	50.4493	53.8668
Total internal gains	609.8083	629.7433	601.2703	585.0743	554.3500	536.0969	515.0464	513.3146	529.0883	544.2770	576.2094	595.2168

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	9.1400	10.6334	0.7600	0.7000	0.7700	35.8313
East	4.4100	19.6403	0.7600	0.7000	0.7700	31.9323
South	3.4700	46.7521	0.7600	0.7000	0.7700	59.8102
North	1.8400	26.0000	0.6800	0.7000	1.0000	20.4947
East	1.8400	26.0000	0.6800	0.7000	1.0000	20.4947
South	2.7600	26.0000	0.6800	0.7000	1.0000	30.7420
West	0.9200	26.0000	0.6800	0.7000	1.0000	10.2473
Solar gains	209.5525	399.1589	646.6958	950.9103	1187.9783	1229.7827
						1164.9389
						982.7890
						752.4849
						469.3846
						258.9637
						174.0254

Full SAP Calculation Printout



Total gains 819.3607 1028.9022 1247.9661 1535.9846 1742.3283 1765.8795 1679.9853 1496.1037 1281.5732 1013.6616 835.1731 769.2422 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												
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	24.8403	24.8517	24.8628	24.9154	24.9252	24.9712	24.9712	24.9797	24.9535	24.9252	24.9053	24.8845
alpha	2.6560	2.6568	2.6575	2.6610	2.6617	2.6647	2.6647	2.6653	2.6636	2.6617	2.6604	2.6590
util living area	0.9681	0.9432	0.8967	0.7974	0.6581	0.5039	0.3853	0.4416	0.6611	0.8697	0.9501	0.9727 (86)
MIT	18.3162	18.7165	19.3051	20.0189	20.5488	20.8405	20.9428	20.9169	20.6619	19.9055	18.9685	18.2320 (87)
Th 2	20.0470	20.0474	20.0478	20.0496	20.0499	20.0515	20.0515	20.0518	20.0509	20.0499	20.0492	20.0485 (88)
util rest of house	0.9637	0.9355	0.8827	0.7709	0.6154	0.4432	0.3097	0.3620	0.6025	0.8459	0.9420	0.9689 (89)
MIT 2	17.5776	17.9718	18.5466	19.2274	19.7080	19.9521	20.0251	20.0111	19.8203	19.1385	18.2267	17.4953 (90)
Living area fraction	fLA = Living area / (4) = 0.1926 (91)											
MIT	17.7198	18.1152	18.6926	19.3798	19.8699	20.1232	20.2019	20.1855	19.9824	19.2862	18.3695	17.6371 (92)
Temperature adjustment	0.0000											
adjusted MIT	17.7198	18.1152	18.6926	19.3798	19.8699	20.1232	20.2019	20.1855	19.9824	19.2862	18.3695	17.6371 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9485	0.9149	0.8582	0.7497	0.6067	0.4480	0.3221	0.3737	0.5978	0.8227	0.9228	0.9551 (94)
Useful gains	777.1350	941.3792	1071.0045	1151.6044	1057.1004	791.0885	541.1157	559.1329	766.1567	833.8954	770.6926	734.7126 (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	2103.6499	2070.6306	1909.5492	1637.8331	1276.3262	861.2564	561.6589	590.0917	917.9197	1356.9809	1761.9688	2102.6269 (97)
Space heating kWh	986.9271	758.8570	623.8772	350.0847	163.1040	0.0000	0.0000	0.0000	0.0000	389.1756	713.7189	1017.7282 (98a)
Space heating requirement - total per year (kWh/year)	5003.4728											
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	986.9271	758.8570	623.8772	350.0847	163.1040	0.0000	0.0000	0.0000	0.0000	389.1756	713.7189	1017.7282 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	5003.4728											
Space heating per m2	(98c) / (4) = 33.3165 (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	1465.7949	1153.9236	1184.7060	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8104	0.8621	0.8246	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1187.8708	994.7448	976.8941	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1880.7211	1789.5393	1595.0561	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	498.8522	591.3272	459.9126	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	124.7130	147.8318	114.9781	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement	387.5230 (107)											
Energy for space heating	33.3165 (99)											
Energy for space cooling	2.5804 (108)											
Total	35.8969 (109)											
Fabric Energy Efficiency (DFEE)	35.9 (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 (m ²)	Storey height (m)	Volume (m ³)
Ground floor	76.5700 (1b)	x	2.4700 (2b) = 189.1279 (1b) - (3b)
First floor	73.6100 (1c)	x	2.0800 (2c) = 153.1088 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	150.1800		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 342.2367 (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)

Full SAP Calculation Printout



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) = 0.1169 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3669	(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) =		0.3118 (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 infiltr rate												
	0.3976	0.3898	0.3820	0.3430	0.3352	0.2963	0.2963	0.2885	0.3118	0.3352	0.3508	0.3664 (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	0.5790	0.5760	0.5730	0.5588	0.5562	0.5439	0.5439	0.5416	0.5486	0.5562	0.5615	0.5671 (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			1.7000	1.0000	1.7000		(26)
TER Semi-glazed door			1.8900	1.0000	1.8900		(26a)
TER Opening Type (Uw = 1.20)			17.0200	1.1450	19.4885		(27)
5-7			1.8400	1.5918	2.9288		(27a)
8-9			1.8400	1.5918	2.9288		(27a)
14-16			2.7600	1.5918	4.3933		(27a)
17			0.9200	1.5918	1.4644		(27a)
Floor 1 P/a 0.48			76.5700	0.1300	9.9541		(28a)
Heatloss Floor 2 over garage			17.3900	0.1300	2.2607		(28b)
External Wall 1 Render	62.9700	10.7100	52.2600	0.1800	9.4068		(29a)
External Wall 2 Stone	31.5000	8.2000	23.3000	0.1800	4.1940		(29a)
External Wall 3 Garage	16.2600	1.7000	14.5600	0.1800	2.6208		(29a)
Wall 4 "attic"	26.4800		26.4800	0.1800	4.7664		(29a)
External Roof 1 Sloping	111.0100	7.3600	103.6500	0.1100	11.4015		(30)
Roof 2 "attic"	15.4700		15.4700	0.1100	1.7017		(30)
Total net area of external elements Aum(A, m2)			357.6500				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 81.0999		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							93.3416 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	13.2500	0.0900	1.1925
E5 Ground floor (normal)	37.1000	0.1600	5.9360
E11 Eaves (insulation at rafter level)	25.6000	0.0400	1.0240
E17 Corner (inverted - internal area greater than external area)	2.6500	-0.0900	-0.2385
E13 Gable (insulation at rafter level)	26.3000	0.0800	2.1040
R4 Ridge (vaulted ceiling)	19.0000	0.0800	1.5200
E6 Intermediate floor within a dwelling	26.6500	0.0000	0.0000
E20 Exposed floor (normal)	13.3000	0.3200	4.2560
E21 Exposed floor (inverted)	6.2000	0.3200	1.9840
E2 Other lintels (including other steel lintels)	13.2500	0.0500	0.6625
E3 Sill	11.5000	0.0500	0.5750
E4 Jamb	31.3000	0.0500	1.5650
R1 Head of roof window	7.5200	0.0800	0.6016
R2 Sill of roof window	7.5200	0.0600	0.4512
R3 Jamb of roof window	15.6800	0.0800	1.2544
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			22.8877 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	103.9876 (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
	65.3962	65.0495	64.7098	63.1138	62.8152	61.4251	61.4251	61.1677	61.9606	62.8152	63.4193	64.0508 (38)
Heat transfer coeff	169.3838	169.0372	168.6974	167.1014	166.8028	165.4128	165.4128	165.1553	165.9482	166.8028	167.4069	168.0384 (39)
Average = Sum(39)m / 12 =												167.1000

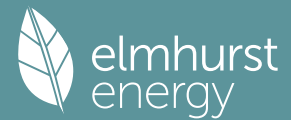
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1.1279	1.1256	1.1233	1.1127	1.1107	1.1014	1.1014	1.0997	1.1050	1.1107	1.1147	1.1189 (40)
HLP (average)												1.1127
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9345 (42)
Hot water usage for mixer showers													0.0000 (42a)
Hot water usage for baths	31.6968	31.2260	30.5631	29.3408	28.4256	27.4108	26.8626	27.5209	28.2376	29.3235	30.5710	31.5896	(42b)
Hot water usage for other uses	44.6819	43.0571	41.4323	39.8075	38.1827	36.5579	36.5579	38.1827	39.8075	41.4323	43.0571	44.6819	(42c)
Average daily hot water use (litres/day)													70.0078 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	76.3787	74.2831	71.9954	69.1484	66.6083	63.9687	63.4205	65.7036	68.0451	70.7558	73.6281	76.2715 (44)
Energy conte	120.9651	105.7782	110.6543	94.6606	89.6676	78.6570	76.7016	81.3548	83.9064	96.0150	104.8967	119.4227 (45)
Energy content (annual)										Total = Sum(45)m =		1162.6801
Distribution loss (46)m = 0.15 x (45)m												
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)

Full SAP Calculation Printout



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	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	0.0000	0.0000	(61)	
Total heat required for water heating calculated for each month																
	102.8204	89.9114	94.0561	80.4615	76.2175	66.8584	65.1964	69.1516	71.3205	81.6127	89.1622	101.5093	101.5093	988.2780	(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	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	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	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	0.0000	0.0000	(63d)	
Output from w/h	102.8204	89.9114	94.0561	80.4615	76.2175	66.8584	65.1964	69.1516	71.3205	81.6127	89.1622	101.5093	101.5093	988.2780	(64)	
													Total per year (kWh/year) = Sum(64)m =		988	(64)
12Total per year (kWh/year)																
Electric shower(s)	58.7982	52.3897	57.2075	54.5924	55.6168	53.0531	54.8215	55.6168	54.5924	57.2075	56.1318	58.7982	58.7982	668.8259	(64a)	
													Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		668.8259	(64a)
Heat gains from water heating, kWh/month																
	40.4046	35.5753	37.8159	33.7635	32.9586	29.9779	30.0045	31.1921	31.4782	34.7051	36.3235	40.0769	40.0769		(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		
	146.7235	146.7235	146.7235	146.7235	146.7235	146.7235	146.7235	146.7235	146.7235	146.7235	146.7235	146.7235	146.7235	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5														
	166.4269	184.2584	166.4269	171.9745	166.4269	171.9745	166.4269	166.4269	171.9745	166.4269	171.9745	166.4269	166.4269	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5														
	320.7184	324.0464	315.6598	297.8058	275.2683	254.0862	239.9352	236.6072	244.9937	262.8478	285.3853	306.5674	306.5674	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5														
	37.6723	37.6723	37.6723	37.6723	37.6723	37.6723	37.6723	37.6723	37.6723	37.6723	37.6723	37.6723	37.6723	(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	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)														
	-117.3788	-117.3788	-117.3788	-117.3788	-117.3788	-117.3788	-117.3788	-117.3788	-117.3788	-117.3788	-117.3788	-117.3788	-117.3788	(71)
Water heating gains (Table 5)														
	54.3073	52.9394	50.8278	46.8937	44.2992	41.6359	40.3286	41.9249	43.7198	46.6466	50.4493	53.8668	53.8668	(72)
Total internal gains	608.4696	628.2612	599.9316	583.6910	553.0114	534.7136	513.7077	511.9760	527.7050	542.9383	574.8261	593.8781	593.8781	(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		9.1400	10.6334	0.6300	0.7000	0.7700	29.7023 (74)							
East		4.4100	19.6403	0.6300	0.7000	0.7700	26.4702 (76)							
South		3.4700	46.7521	0.6300	0.7000	0.7700	49.5795 (78)							
North		1.8400	26.0000	0.6300	0.7000	1.0000	18.9877 (82)							
East		1.8400	26.0000	0.6300	0.7000	1.0000	18.9877 (82)							
South		2.7600	26.0000	0.6300	0.7000	1.0000	28.4815 (82)							
West		0.9200	26.0000	0.6300	0.7000	1.0000	9.4938 (82)							
Solar gains	181.7028	347.4863	565.5961	834.3785	1043.8102	1080.9237	1023.7893	862.9568	659.1321	409.3897	224.8145	150.7152	150.7152	(83)
Total gains	790.1724	975.7476	1165.5278	1418.0696	1596.8215	1615.6373	1537.4970	1374.9328	1186.8371	952.3280	799.6407	744.5934	744.5934	(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	22.9886	23.0358	23.0822	23.3026	23.3443	23.5405	23.5405	23.5772	23.4646	23.3443	23.2601	23.1727		
alpha	2.5326	2.5357	2.5388	2.5535	2.5563	2.5694	2.5694	2.5718	2.5643	2.5563	2.5507	2.5448		
util living area	0.9712	0.9511	0.9140	0.8315	0.7083	0.5574	0.4342	0.4914	0.7064	0.8895	0.9560	0.9750	0.9750	(86)
MIT	18.0608	18.4406	19.0279	19.7916	20.3971	20.7723	20.9132	20.8789	20.5591	19.7264	18.7613	18.0000	18.0000	(87)
Th 2	19.9781	19.9800	19.9818	19.9905	19.9921	19.9997	19.9997	20.0011	19.9968	19.9921	19.9888	19.9854	19.9854	(88)
util rest of house	0.9669	0.9441	0.9014	0.8068	0.6655	0.4915	0.3478	0.4026	0.6471	0.8676	0.9484	0.9713	0.9713	(89)
MIT 2	17.2809	17.6568	18.2341	18.9737	19.5323	19.8571	19.9598	19.9418	19.6940	18.9298	17.9840	17.2254	17.2254	(90)
Living area fraction	17.4311	17.8077	18.3869	19.1312	19.6988	20.0333	20.1434	20.1222	19.8606	19.0832	18.1337	17.3746	17.3746	(91)
MIT	17.4311	17.8077	18.3869	19.1312	19.6988	20.0333	20.1434	20.1222	19.8606	19.0832	18.1337	17.3746	17.3746	(92)
Temperature adjustment												0.0000	0.0000	(93)
adjusted MIT	17.4311	17.8077	18.3869	19.1312	19.6988	20.0333	20.1434	20.1222	19.8606	19.0832	18.1337	17.3746	17.3746	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9519	0.9237	0.8763	0.7821	0.6517	0.4939	0.3608	0.4141	0.6381	0.8427	0.9294	0.9576	
Useful gains	752.1355	901.3285	1021.2987	1109.0214	1040.6468	797.9449	554.6817	569.3018	757.2870	802.5308	743.1560	713.0576	
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	2224.1983	2181.8880	2005.2951	1709.6533	1334.2244	898.7392	586.1257	614.7464	955.9664	1415.0157	1847.1168	2213.8350	
Space heating kWh	1095.2147	860.5360	732.0933	432.4550	218.4217	0.0000	0.0000	0.0000	0.0000	455.6888	794.8518	1116.5784	
Space heating requirement - total per year (kWh/year)												5705.8397	
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	
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	1095.2147	860.5360	732.0933	432.4550	218.4217	0.0000	0.0000	0.0000	0.0000	455.6888	794.8518	1116.5784	
Space heating requirement after solar contribution - total per year (kWh/year)												5705.8397	
Space heating per m2												(98c) / (4) =	37.9933 (99)

8c. Space cooling requirement

Full SAP Calculation Printout



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												
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	1554.8799	1224.0544	1255.1806	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.7540	0.8140	0.7723	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1172.4281	996.3430	969.3304	0.0000	0.0000	0.0000	0.0000 (102)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	1714.4413	1631.8304	1460.9732	0.0000	0.0000	0.0000	0.0000 (103)
Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	390.2495	472.8026	365.7823	0.0000	0.0000	0.0000	0.0000 (104)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	fC = cooled area / (4) =			1.0000 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	97.5624	118.2007	91.4456	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling requirement									0.0000	0.0000	0.0000	0.0000 (107)
Energy for space heating												307.2086 (107)
Energy for space cooling												37.9933 (99)
Total												2.0456 (108)
Fabric Energy Efficiency (TFEE)												40.0389 (109)
												40.0 (109)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	76.5700 (1b)	x 2.4700 (2b)	= 189.1279 (1b) - (3b)
First floor	73.6100 (1c)	x 2.0800 (2c)	= 153.1088 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	150.1800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	342.2367 (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	1.0000	(17)
Infiltration rate	0.0500	(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) =	0.0425 (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	0.0542	0.0531	0.0521	0.0468	0.0457	0.0404	0.0404	0.0393	0.0425	0.0457	0.0478	0.0499 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												81.0000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.1492	0.1481	0.1471	0.1417	0.1407	0.1354	0.1354	0.1343	0.1375	0.1407	0.1428	0.1449 (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
Window (Uw = 1.20)			17.0200	1.1450	19.4885		(27)
Door			1.8900	1.0000	1.8900		(26a)
FD			1.7000	1.8000	3.0600		(26)
5-7			1.8400	0.9615	1.7692		(27a)
8-9			1.8400	0.9615	1.7692		(27a)
14-16			2.7600	0.9615	2.6538		(27a)
17			0.9200	0.9615	0.8846		(27a)
Floor 1 P/a 0.48			76.5700	0.1200	9.1884	110.0000	8422.7000 (28a)
Heatloss Floor 2 over garage			17.3900	0.1700	2.9563	20.0000	347.8000 (28b)
External Wall 1 Render	62.9700	10.7100	52.2600	0.1600	8.3616	9.0000	470.3400 (29a)
External Wall 2 Stone	31.5000	8.2000	23.3000	0.1600	3.7280	9.0000	209.7000 (29a)
External Wall 3 Garage	16.2600	1.7000	14.5600	0.1400	2.0384	18.0000	262.0800 (29a)
Wall 4 "attic"	26.4800		26.4800	0.0900	2.3832	9.0000	238.3200 (29a)
External Roof 1 Sloping	111.0100	7.3600	103.6500	0.1300	13.4745	9.0000	932.8500 (30)
Roof 2 "attic"	15.4700		15.4700	0.0861	1.3323	9.0000	139.2300 (30)
Total net area of external elements Aum(A, m ²)			357.6500				(31)

Full SAP Calculation Printout



Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	74.9782		(33)
Internal Wall 1 GF	67.2000		9.0000	604.8000 (32c)
Internal Wall 2 FF	96.9200		9.0000	872.2800 (32c)
Internal Floor 1	56.2200		18.0000	1011.9600 (32d)
Internal Ceiling 1	56.2200		9.0000	505.9800 (32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	14018.0400	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		93.3416	(35)

List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E16 Corner (normal)	13.2500	0.0300	0.3975
E5 Ground floor (normal)	37.1000	0.0210	0.7791
E11 Eaves (insulation at rafter level)	25.6000	0.0390	0.9984
E17 Corner (inverted - internal area greater than external area)	2.6500	-0.0150	-0.0398
E13 Gable (insulation at rafter level)	26.3000	0.0240	0.6312
R4 Ridge (vaulted ceiling)	19.0000	0.1200	2.2800
E6 Intermediate floor within a dwelling	26.6500	0.0800	2.1320
E20 Exposed floor (normal)	13.3000	0.3200	4.2560
E21 Exposed floor (inverted)	6.2000	0.3200	1.9840
E2 Other lintels (including other steel lintels)	13.2500	0.0840	1.1130
E3 Sill	11.5000	0.0430	0.4945
E4 Jamb	31.3000	0.0340	1.0642
R1 Head of roof window	7.5200	0.2400	1.8048
R2 Sill of roof window	7.5200	0.2400	1.8048
R3 Jamb of roof window	15.6800	0.2400	3.7632

Thermal bridges (Sum(L x Psi) calculated using Appendix K)			23.4630	(36)
Point Thermal bridges			0.0000	
Total fabric heat loss	(33) + (36) + (36a) =		98.4412	(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
	16.8490	16.7290	16.6090	16.0090	15.8890	15.2890	15.2890	15.1690	15.5290	15.8890	16.1290	16.3690
Heat transfer coeff	115.2901	115.1701	115.0501	114.4501	114.3301	113.7302	113.7302	113.6102	113.9702	114.3301	114.5701	114.8101
Average = Sum(39)m / 12 =												114.4201
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.7677	0.7669	0.7661	0.7621	0.7613	0.7573	0.7573	0.7565	0.7589	0.7613	0.7629	0.7645
HLP (average)												0.7619
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

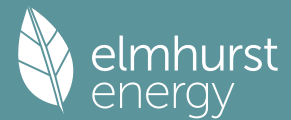
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9345	(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	0.0000	(42a)
Hot water usage for baths	84.6975	83.4396	81.6682	78.4022	75.9566	73.2448	71.7801	73.5390	75.4542	78.3559	81.6892	84.4111	84.4111	(42b)
Hot water usage for other uses	44.6819	43.0571	41.4323	39.8075	38.1827	36.5579	36.5579	38.1827	39.8075	41.4323	43.0571	44.6819	44.6819	(42c)
Average daily hot water use (litres/day)													119.1478	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	129.3794	126.4967	123.1005	118.2097	114.1393	109.8027	108.3380	111.7217	115.2617	119.7882	124.7463	129.0930	129.0930	(44)
Energy conte	204.9053	180.1296	189.2009	161.8231	153.6534	135.0153	131.0254	138.3348	142.1292	162.5514	177.7240	202.1285	202.1285	(45)
Energy content (annual)													1978.6210	
Distribution loss (46)m = 0.15 x (45)m	30.7358	27.0194	28.3801	24.2735	23.0480	20.2523	19.6538	20.7502	21.3194	24.3827	26.6586	30.3193	30.3193	(46)
Water storage loss:													250.0000	(47)
Store volume													1.6000	(48)
a) If manufacturer declared loss factor is known (kWh/day):													0.5400	(49)
Temperature factor from Table 2b													0.8640	(55)
Enter (49) or (54) in (55)														
Total storage loss	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	(56)
If cylinder contains dedicated solar storage	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	(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	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	0.0000	(61)
Total heat required for water heating calculated for each month	254.9517	225.3328	239.2473	210.2551	203.6998	183.4473	181.0718	188.3812	190.5612	212.5978	226.1560	252.1749	252.1749	(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	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	-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	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	0.0000	(63d)
Output from w/h	254.9517	225.3328	239.2473	210.2551	203.6998	183.4473	181.0718	188.3812	190.5612	212.5978	226.1560	252.1749	252.1749	(64)
													2567.8770	(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	0.0000	(64a)
													0.0000	(64a)
Heat gains from water heating, kWh/month	108.1681	96.0556	102.9464	92.5518	91.1269	83.6382	83.6031	86.0335	86.0036	94.0855	97.8388	107.2448	107.2448	(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
	176.0681	176.0681	176.0681	176.0681	176.0681	176.0681	176.0681	176.0681	176.0681	176.0681	176.0681	176.0681
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	37.0572	32.9138	26.7673	20.2646	15.1480	12.7886	13.8185	17.9618	24.1084	30.6111	35.7277	38.0871
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	478.6841	483.6514	471.1341	444.4863	410.8481	379.2331	358.1123	353.1450	365.6623	392.3101	425.9483	457.5633
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.5413	55.5413	55.5413	55.5413	55.5413	55.5413	55.5413	55.5413	55.5413	55.5413	55.5413	55.5413
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
Losses e.g. evaporation (negative values) (Table 5)	-117.3788	-117.3788	-117.3788	-117.3788	-117.3788	-117.3788	-117.3788	-117.3788	-117.3788	-117.3788	-117.3788	-117.3788
Water heating gains (Table 5)	145.3873	142.9399	138.3689	128.5442	122.4824	116.1641	112.3697	115.6364	119.4494	126.4590	135.8873	144.1463
Total internal gains	775.3592	773.7358	750.5009	707.5257	662.7092	622.4165	598.5312	600.9739	623.4507	663.6109	711.7938	754.0274

Full SAP Calculation Printout



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		9.1400	10.6334	0.7600	0.7000	0.7700	35.8313 (74)					
East		4.4100	19.6403	0.7600	0.7000	0.7700	31.9323 (76)					
South		3.4700	46.7521	0.7600	0.7000	0.7700	59.8102 (78)					
North		1.8400	26.0000	0.6800	0.7000	1.0000	20.4947 (82)					
East		1.8400	26.0000	0.6800	0.7000	1.0000	20.4947 (82)					
South		2.7600	26.0000	0.6800	0.7000	1.0000	30.7420 (82)					
West		0.9200	26.0000	0.6800	0.7000	1.0000	10.2473 (82)					
Solar gains	209.5525	399.1589	646.6958	950.9103	1187.9783	1229.7827	1164.9389	982.7890	752.4849	469.3846	258.9637	174.0254 (83)
Total gains	984.9117	1172.8947	1397.1968	1658.4359	1850.6875	1852.1991	1763.4701	1583.7629	1375.9356	1132.9955	970.7575	928.0527 (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	33.7748	33.8100	33.8452	34.0227	34.0584	34.2381	34.2381	34.2742	34.1660	34.0584	33.9870	33.9160	
alpha	3.2517	3.2540	3.2563	3.2682	3.2706	3.2825	3.2825	3.2849	3.2777	3.2706	3.2658	3.2611	
util living area	0.9414	0.9035	0.8278	0.6927	0.5305	0.3817	0.2805	0.3241	0.5285	0.7840	0.9118	0.9500 (86)	
Living	19.6769	19.9272	20.2755	20.6146	20.8054	20.8803	20.8992	20.8949	20.8329	20.5348	20.0335	19.6152	
Non living	18.7042	19.0172	19.4463	19.8528	20.0680	20.1488	20.1657	20.1633	20.1040	19.7708	19.1577	18.6288	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.3232	19.9272	20.2755	20.6146	20.8054	20.8803	20.8992	20.8949	20.8329	20.5348	20.0335	19.8089 (87)	
Th 2	20.2814	20.2821	20.2828	20.2863	20.2870	20.2905	20.2905	20.2912	20.2891	20.2870	20.2856	20.2842 (88)	
util rest of house	0.9347	0.8932	0.8110	0.6666	0.4969	0.3421	0.2364	0.2761	0.4830	0.7571	0.9006	0.9443 (89)	
MIT 2	19.6526	19.0172	19.4463	19.8528	20.0680	20.1488	20.1657	20.1633	20.1040	19.7708	19.1577	18.9271 (90)	
Living area fraction										FLA = Living area / (4) =		0.1926 (91)	
MIT	19.7818	19.1924	19.6060	19.9995	20.2100	20.2897	20.3069	20.3042	20.2444	19.9179	19.3263	19.0969 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.7818	19.1924	19.6060	19.9995	20.2100	20.2897	20.3069	20.3042	20.2444	19.9179	19.3263	19.0969 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9295	0.8750	0.7933	0.6556	0.4932	0.3421	0.2374	0.2770	0.4800	0.7417	0.8828	0.9327 (94)
Useful gains	915.5099	1026.3123	1108.4417	1087.2807	912.7389	633.6032	418.6562	438.6570	660.4813	840.3766	856.9742	865.6265 (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	1784.8940	1646.0628	1507.8491	1270.3379	972.9464	647.0906	421.5881	443.5592	700.2729	1065.3188	1400.7742	1710.3174 (97)
Space heating kWh	646.8218	416.4724	297.1591	131.8012	44.7943	0.0000	0.0000	0.0000	0.0000	167.3570	391.5360	628.4501 (98a)
Space heating requirement - total per year (kWh/year)												2724.3919
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	646.8218	416.4724	297.1591	131.8012	44.7943	0.0000	0.0000	0.0000	0.0000	167.3570	391.5360	628.4501 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2724.3919
Space heating per m2										(98c) / (4) =		18.1408 (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 %)													366.3334 (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	646.8218	416.4724	297.1591	131.8012	44.7943	0.0000	0.0000	0.0000	0.0000	167.3570	391.5360	628.4501 (98)	
Space heating efficiency (main heating system 1)	366.3334	366.3334	366.3334	366.3334	366.3334	0.0000	0.0000	0.0000	0.0000	366.3334	366.3334	366.3334 (210)	
Space heating fuel (main heating system)	176.5664	113.6867	81.1171	35.9785	12.2278	0.0000	0.0000	0.0000	0.0000	45.6843	106.8797	171.5514 (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	254.9517	225.3328	239.2473	210.2551	203.6998	183.4473	181.0718	188.3812	190.5612	212.5978	226.1560	252.1749 (64)	
Efficiency of water heater (217)m	199.0374	199.0374	199.0374	199.0374	199.0374	199.0374	199.0374	199.0374	199.0374	199.0374	199.0374	199.0374 (216)	
Fuel for water heating, kWh/month	128.0924	113.2113	120.2022	105.6360	102.3425	92.1673	90.9738	94.6462	95.7414	106.8130	113.6249	126.6973 (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	29.6457	26.7767	29.6457	28.6894	29.6457	28.6894	29.6457	28.6894	29.6457	28.6894	29.6457	29.6457 (231)	
Lighting	32.4359	26.0213	23.4293	17.1653	13.2590	10.8327	12.0953	15.7219	20.4212	26.7937	30.2634	33.3374 (232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-63.5352	-91.4762	-133.4926	-150.2769	-162.0338	-150.3949	-148.5193	-139.4655	-122.6620	-103.6470	-69.9845	-54.5507 (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)	

Full SAP Calculation Printout



Ground floor					76.5700 (1b)	x	2.4700 (2b)	=	189.1279 (1b)	-	(3b)
First floor					73.6100 (1c)	x	2.0800 (2c)	=	153.1088 (1c)	-	(3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)				150.1800							(4)
Dwelling volume									(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	342.2367 (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												0 * 10 = 0.0000 (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)												0.0000 / (5) = 0.0000 (8)
Pressure test												Yes
Pressure Test Method												Blower Door
Measured/design AP50												1.0000 (17)
Infiltration rate												0.0500 (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) = 0.0425 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	8.0000	7.4000	7.1000	6.3000	6.3000	5.6000	5.4000	5.4000	6.2000	7.0000	7.4000	8.0000 (22)
Adj infilt rate	2.0000	1.8500	1.7750	1.5750	1.5750	1.4000	1.3500	1.3500	1.5500	1.7500	1.8500	2.0000 (22a)
Balanced mechanical ventilation with heat recovery	0.0850	0.0786	0.0754	0.0669	0.0669	0.0595	0.0574	0.0574	0.0659	0.0744	0.0786	0.0850 (22b)
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) =												81.0000 (23c)
Effective ac	0.1800	0.1736	0.1704	0.1619	0.1619	0.1545	0.1524	0.1524	0.1609	0.1694	0.1736	0.1800 (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
Window (Uw = 1.20)			17.0200	1.1450	19.4885		(27)
Door			1.8900	1.0000	1.8900		(26a)
FD			1.7000	1.8000	3.0600		(26)
5-7			1.8400	0.9615	1.7692		(27a)
8-9			1.8400	0.9615	1.7692		(27a)
14-16			2.7600	0.9615	2.6538		(27a)
17			0.9200	0.9615	0.8846		(27a)
Floor 1 P/a 0.48			76.5700	0.1200	9.1884	110.0000	8422.7000 (28a)
Heatloss Floor 2 over garage			17.3900	0.1700	2.9563	20.0000	347.8000 (28b)
External Wall 1 Render	62.9700	10.7100	52.2600	0.1600	8.3616	9.0000	470.3400 (29a)
External Wall 2 Stone	31.5000	8.2000	23.3000	0.1600	3.7280	9.0000	209.7000 (29a)
External Wall 3 Garage	16.2600	1.7000	14.5600	0.1400	2.0384	18.0000	262.0800 (29a)
Wall 4 "attic"	26.4800		26.4800	0.0900	2.3832	9.0000	238.3200 (29a)
External Roof 1 Sloping	111.0100	7.3600	103.6500	0.1300	13.4745	9.0000	932.8500 (30)
Roof 2 "attic"	15.4700		15.4700	0.0861	1.3323	9.0000	139.2300 (30)
Total net area of external elements Aum (A, m2)			357.6500				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	74.9782	(33)
Internal Wall 1 GF			67.2000			9.0000	604.8000 (32c)
Internal Wall 2 FF			96.9200			9.0000	872.2800 (32c)
Internal Floor 1			56.2200			18.0000	1011.9600 (32d)
Internal Ceiling 1			56.2200			9.0000	505.9800 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 14018.0400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							93.3416 (35)

List of Thermal Bridges												
K1 Element					Length	Psi-value	Total					
E16 Corner (normal)					13.2500	0.0300	0.3975					
E5 Ground floor (normal)					37.1000	0.0210	0.7791					
E11 Eaves (insulation at rafter level)					25.6000	0.0390	0.9984					
E17 Corner (inverted - internal area greater than external area)					2.6500	-0.0150	-0.0398					
E13 Gable (insulation at rafter level)					26.3000	0.0240	0.6312					
R4 Ridge (vaulted ceiling)					19.0000	0.1200	2.2800					
E6 Intermediate floor within a dwelling					26.6500	0.0800	2.1320					
E20 Exposed floor (normal)					13.3000	0.3200	4.2560					
E21 Exposed floor (inverted)					6.2000	0.3200	1.9840					
E2 Other lintels (including other steel lintels)					13.2500	0.0840	1.1130					
E3 Sill					11.5000	0.0430	0.4945					
E4 Jamb					31.3000	0.0340	1.0642					
R1 Head of roof window					7.5200	0.2400	1.8048					
R2 Sill of roof window					7.5200	0.2400	1.8048					
R3 Jamb of roof window					15.6800	0.2400	3.7632					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												23.4630 (36)
Point Thermal bridges												(36a) = 0.0000
Total fabric heat loss												(33) + (36) + (36a) = 98.4412 (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	20.3289	19.6089	19.2489	18.2889	18.2889	17.4489	17.2089	17.2089	18.1689	19.1289	19.6089	20.3289 (38)
Average = Sum(39)m / 12 =	118.7700	118.0500	117.6901	116.7301	116.7301	115.8901	115.6501	115.6501	116.6101	117.5701	118.0500	118.7700 (39)
HLP	0.7909	0.7861	0.7837	0.7773	0.7773	0.7717	0.7701	0.7701	0.7765	0.7829	0.7861	0.7909 (40)
HLP (average)												0.7803
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

Full SAP Calculation Printout



4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.9345 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths	84.6975	83.4396	81.6682	78.4022	75.9566	73.2448	71.7801	73.5390	75.4542	78.3559	81.6892	84.4111 (42b)
Hot water usage for other uses	44.6819	43.0571	41.4323	39.8075	38.1827	36.5579	36.5579	38.1827	39.8075	41.4323	43.0571	44.6819 (42c)
Average daily hot water use (litres/day)												119.1478 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	129.3794	126.4967	123.1005	118.2097	114.1393	109.8027	108.3380	111.7217	115.2617	119.7882	124.7463	129.0930 (44)
Distribution loss (46)m = 0.15 x (45)m	204.9053	180.1296	189.2009	161.8231	153.6534	135.0153	131.0254	138.3348	142.1292	162.5514	177.7240	202.1285 (45)
Water storage loss:												1978.6210
Store volume												250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8640 (55)
Total storage loss												26.7840 (56)
If cylinder contains dedicated solar storage												26.7840 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	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	254.9517	225.3328	239.2473	210.2551	203.6998	183.4473	181.0718	188.3812	190.5612	212.5978	226.1560	252.1749 (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	254.9517	225.3328	239.2473	210.2551	203.6998	183.4473	181.0718	188.3812	190.5612	212.5978	226.1560	252.1749 (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)
Heat gains from water heating, kWh/month	108.1681	96.0556	102.9464	92.5518	91.1269	83.6382	83.6031	86.0335	86.0036	94.0855	97.8388	107.2448 (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	176.0681	176.0681	176.0681	176.0681	176.0681	176.0681	176.0681	176.0681	176.0681	176.0681	176.0681	176.0681 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	37.0572	32.9138	26.7673	20.2646	15.1480	12.7886	13.8185	17.9618	24.1084	30.6111	35.7277	38.0871 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	478.6841	483.6514	471.1341	444.4863	410.8481	379.2331	358.1123	353.1450	365.6623	392.3101	425.9483	457.5633 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.5413	55.5413	55.5413	55.5413	55.5413	55.5413	55.5413	55.5413	55.5413	55.5413	55.5413	55.5413 (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)	-117.3788	-117.3788	-117.3788	-117.3788	-117.3788	-117.3788	-117.3788	-117.3788	-117.3788	-117.3788	-117.3788	-117.3788 (71)
Water heating gains (Table 5)	145.3873	142.9399	138.3689	128.5442	122.4824	116.1641	112.3697	115.6364	119.4494	126.4590	135.8873	144.1463 (72)
Total internal gains	775.3592	773.7358	750.5009	707.5257	662.7092	622.4165	598.5312	600.9739	623.4507	663.6109	711.7938	754.0274 (73)

6. Solar gains												
[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W					
North	9.1400	14.5103	0.7600	0.7000	0.7700	48.8954 (74)						
East	4.4100	27.2069	0.7600	0.7000	0.7700	44.2346 (76)						
South	3.4700	59.9387	0.7600	0.7000	0.7700	76.6799 (78)						
North	1.8400	37.0000	0.6800	0.7000	1.0000	29.1655 (82)						
East	1.8400	37.0000	0.6800	0.7000	1.0000	29.1655 (82)						
South	2.7600	37.0000	0.6800	0.7000	1.0000	43.7482 (82)						
West	0.9200	37.0000	0.6800	0.7000	1.0000	14.5827 (82)						
Solar gains	286.4718	471.9075	757.6387	1134.3132	1341.7334	1520.1106	1307.5796	1191.6774	932.2015	580.1893	339.8660	230.4653 (83)
Total gains	1061.8311	1245.6433	1508.1397	1841.8389	2004.4426	2142.5271	1906.1108	1792.6513	1555.6522	1243.8002	1051.6598	984.4927 (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	32.7852	32.9852	33.0861	33.3582	33.3582	33.5999	33.6697	33.6697	33.3925	33.1198	32.9852	32.7852
alpha	3.1857	3.1990	3.2057	3.2239	3.2239	3.2400	3.2446	3.2446	3.2262	3.2080	3.1990	3.1857
util living area	0.8978	0.8545	0.7734	0.6396	0.5044	0.3635	0.3103	0.3109	0.4553	0.6833	0.8407	0.9062 (86)
Living	20.0387	20.1998	20.4308	20.6746	20.8133	20.8794	20.8931	20.8938	20.8581	20.6926	20.3689	20.0366
Non living	19.1440	19.3431	19.6210	19.9081	20.0620	20.1344	20.1490	20.1498	20.1125	19.9354	19.5561	19.1433
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.5082	20.1998	20.4308	20.6746	20.8133	20.8794	20.8931	20.8938	20.8581	20.6926	20.3689	20.1713 (87)
Th 2	20.2613	20.2654	20.2675	20.2731	20.2731	20.2779	20.2793	20.2793	20.2738	20.2682	20.2654	20.2613 (88)

Full SAP Calculation Printout



util rest of house	0.8852	0.8384	0.7517	0.6117	0.4711	0.3277	0.2689	0.2668	0.4094	0.6457	0.8192	0.8939 (89)
MIT 2	19.8159	19.3431	19.6210	19.9081	20.0620	20.1344	20.1490	20.1498	20.1125	19.9354	19.5561	19.3448 (90)
Living area fraction									fLA = Living area / (4) =			0.1926 (91)
MIT	19.9492	19.5080	19.7769	20.0557	20.2067	20.2778	20.2923	20.2930	20.2560	20.0812	19.7126	19.5039 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9492	19.5080	19.7769	20.0557	20.2067	20.2778	20.2923	20.2930	20.2560	20.0812	19.7126	19.5039 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8793	0.8195	0.7359	0.6030	0.4680	0.3277	0.2696	0.2677	0.4082	0.6354	0.8008	0.8792	(94)
Useful gains	933.6514	1020.8366	1109.7798	1110.6127	938.1067	702.1454	513.9426	479.8188	635.0541	790.3377	842.1916	865.6058	(95)
Ext temp.	7.0000	7.1000	7.8000	9.3000	11.7000	14.1000	15.8000	16.1000	14.6000	12.3000	9.8000	7.5000	(96)
Heat loss rate W	1537.9755	1464.7702	1409.5641	1255.5135	992.9844	715.9510	519.5330	484.9239	659.5522	914.8369	1170.1850	1425.7087	(97)
Space heating kWh	449.6171	298.3234	223.0395	104.3286	40.8289	0.0000	0.0000	0.0000	0.0000	92.6274	236.1552	416.7165	(98a)
Space heating requirement - total per year (kWh/year)												1861.6366	
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	449.6171	298.3234	223.0395	104.3286	40.8289	0.0000	0.0000	0.0000	0.0000	92.6274	236.1552	416.7165	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1861.6366	
Space heating per m2										(98c) / (4) =		12.3960	(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 %)													364.9927 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement	449.6171	298.3234	223.0395	104.3286	40.8289	0.0000	0.0000	0.0000	0.0000	92.6274	236.1552	416.7165	(98)
Space heating efficiency (main heating system 1)	364.9927	364.9927	364.9927	364.9927	364.9927	0.0000	0.0000	0.0000	0.0000	364.9927	364.9927	364.9927	(210)
Space heating fuel (main heating system)	123.1852	81.7341	61.1079	28.5837	11.1862	0.0000	0.0000	0.0000	0.0000	25.3779	64.7014	114.1712	(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	254.9517	225.3328	239.2473	210.2551	203.6998	183.4473	181.0718	188.3812	190.5612	212.5978	226.1560	252.1749	(64)
Efficiency of water heater (217)m	198.8000	198.8000	198.8000	198.8000	198.8000	198.8000	198.8000	198.8000	198.8000	198.8000	198.8000	198.8000	(216)
Fuel for water heating, kWh/month	128.2453	113.3465	120.3457	105.7621	102.4647	92.2773	91.0824	94.7592	95.8557	106.9406	113.7605	126.8485	(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	29.6457	26.7767	29.6457	28.6894	29.6457	28.6894	29.6457	29.6457	28.6894	29.6457	28.6894	29.6457	(231)
Lighting	32.4359	26.0213	23.4293	17.1653	13.2590	10.8327	12.0953	15.7219	20.4212	26.7937	30.2634	33.3374	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-79.6580	-100.8072	-144.6421	-163.1980	-170.6098	-164.4897	-155.6856	-152.1317	-136.7257	-116.4459	-83.8118	-66.9743	(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	-42.0318	-74.3205	-150.2014	-239.2448	-301.1920	-343.9678	-299.5956	-276.5866	-205.8740	-117.3496	-54.6403	-31.7617	(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												510.0477	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												198.8000	
Water heating fuel used												1291.6885	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.8360)													
mechanical ventilation fans (SFP = 0.8360)													349.0541 (230a)
Total electricity for the above, kWh/year													349.0541 (231)
Electricity for lighting (calculated in Appendix L)													261.7764 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-3671.9459 (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													-1259.3793 (238)

10a. Fuel costs - using BEDF prices (533)

Full SAP Calculation Printout



	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	510.0477	21.5100	109.7113 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1291.6885	21.5100	277.8422 (247)
Energy for instantaneous electric shower(s)	0.0000	21.5100	0.0000 (247a)
Pumps, fans and electric keep-hot	349.0541	21.5100	75.0815 (249)
Energy for lighting	261.7764	21.5100	56.3081 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1535.1797	21.5100	-330.2172
PV Unit electricity exported	-2136.7662	5.5900	-119.4452
Total			-449.6624 (252)
Total energy cost			69.2807 (255)

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	510.0477	0.1567	79.9014 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1291.6885	0.1409	181.9906 (264)
Space and water heating			261.8920 (265)
Pumps, fans and electric keep-hot	349.0541	0.1387	48.4181 (267)
Energy for lighting	261.7764	0.1443	37.7824 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1535.1797	0.1350	-207.2496
PV Unit electricity exported	-2136.7662	0.1255	-268.1802
Total			-475.4298 (269)
Total CO2, kg/year			-127.3373 (272)

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	510.0477	1.5799	805.8331 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1291.6885	1.5210	1964.6230 (278)
Space and water heating			2770.4561 (279)
Pumps, fans and electric keep-hot	349.0541	1.5128	528.0490 (281)
Energy for lighting	261.7764	1.5338	401.5214 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1535.1797	1.4989	-2301.1506
PV Unit electricity exported	-2136.7662	0.4607	-984.3839
Total			-3285.5345 (283)
Total Primary energy kWh/year			414.4920 (286)

SAP 10 EPC IMPROVEMENTS

SEC1 - ASHP ROI TF 0.15 improv

Current energy efficiency rating: A 97
Current environmental impact rating: A 100

	Recommended
N Solar water heating	Recommended
U Solar photovoltaic panels	Already installed
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.1	-£ 64	-43 kg (33.6%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£64	0.29 kg/m ²	A 98 A 100
Total Savings	£64	0.29 kg/m²	
Potential energy efficiency rating:			A 98
Potential environmental impact rating:			A 100

Fuel prices for cost data on this page from database revision number 533 TEST (30 Nov 2023)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, South West England):

	Current	Potential	Saving
Electricity	£519	£445	£74
Space heating	£185	£202	-£17
Water heating	£278	£187	£91
Lighting	£56	£56	£0
Generated (PV)	-£450	-£440	-£10
Total cost of fuels	£69	£5	£64
Total cost of uses	£69	£5	£64
Delivered energy	-8 kWh/m ²	-11 kWh/m ²	2 kWh/m ²
Carbon dioxide emissions	-0.1 tonnes	-0.2 tonnes	0.0 tonnes
CO2 emissions per m ²	-1 kg/m ²	-1 kg/m ²	0 kg/m ²
Primary energy	3 kWh/m ²	-0 kWh/m ²	3 kWh/m ²

Full SAP Calculation Printout



SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	76.5700 (1b)	x 2.4700 (2b)	= 189.1279 (1b) - (3b)
First floor	73.6100 (1c)	x 2.0800 (2c)	= 153.1088 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	150.1800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 342.2367 (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												1.0000 (17)	
Infiltration rate												0.0500 (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) =											0.0425 (21)	
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	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)	
Adj infilt rate	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)	
Balanced mechanical ventilation with heat recovery	0.0542	0.0531	0.0521	0.0468	0.0457	0.0404	0.0404	0.0393	0.0425	0.0457	0.0478	0.0499 (22b)	
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) =												81.0000 (23c)	
Effective ac	0.1492	0.1481	0.1471	0.1417	0.1407	0.1354	0.1354	0.1343	0.1375	0.1407	0.1428	0.1449 (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
Window (Uw = 1.20)			17.0200	1.1450	19.4885		(27)
Door			1.8900	1.0000	1.8900		(26a)
FD			1.7000	1.8000	3.0600		(26)
5-7			1.8400	0.9615	1.7692		(27a)
8-9			1.8400	0.9615	1.7692		(27a)
14-16			2.7600	0.9615	2.6538		(27a)
17			0.9200	0.9615	0.8846		(27a)
Floor 1 P/a 0.48			76.5700	0.1200	9.1884	110.0000	8422.7000 (28a)
Heatloss Floor 2 over garage			17.3900	0.1700	2.9563	20.0000	347.8000 (28b)
External Wall 1 Render	62.9700	10.7100	52.2600	0.1600	8.3616	9.0000	470.3400 (29a)
External Wall 2 Stone	31.5000	8.2000	23.3000	0.1600	3.7280	9.0000	209.7000 (29a)
External Wall 3 Garage	16.2600	1.7000	14.5600	0.1400	2.0384	18.0000	262.0800 (29a)
Wall 4 "attic"	26.4800		26.4800	0.0900	2.3832	9.0000	238.3200 (29a)
External Roof 1 Sloping	111.0100	7.3600	103.6500	0.1300	13.4745	9.0000	932.8500 (30)
Roof 2 "attic"	15.4700		15.4700	0.0861	1.3323	9.0000	139.2300 (30)
Total net area of external elements Aum(A, m ²)			357.6500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	74.9782		(33)
Internal Wall 1 GF			67.2000			9.0000	604.8000 (32c)
Internal Wall 2 FF			96.9200			9.0000	872.2800 (32c)
Internal Floor 1			56.2200			18.0000	1011.9600 (32d)
Internal Ceiling 1			56.2200			9.0000	505.9800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	14018.0400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							93.3416 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E16 Corner (normal)				13.2500	0.0300	0.3975	
E5 Ground floor (normal)				37.1000	0.0210	0.7791	
E11 Eaves (insulation at rafter level)				25.6000	0.0390	0.9984	
E17 Corner (inverted - internal area greater than external area)				2.6500	-0.0150	-0.0398	
E13 Gable (insulation at rafter level)				26.3000	0.0240	0.6312	
R4 Ridge (vaulted ceiling)				19.0000	0.1200	2.2800	
E6 Intermediate floor within a dwelling				26.6500	0.0800	2.1320	
E20 Exposed floor (normal)				13.3000	0.3200	4.2560	
E21 Exposed floor (inverted)				6.2000	0.3200	1.9840	
E2 Other lintels (including other steel lintels)				13.2500	0.0840	1.1130	
E3 Sill				11.5000	0.0430	0.4945	
E4 Jamb				31.3000	0.0340	1.0642	
R1 Head of roof window				7.5200	0.2400	1.8048	
R2 Sill of roof window				7.5200	0.2400	1.8048	
R3 Jamb of roof window				15.6800	0.2400	3.7632	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							23.4630 (36)

Full SAP Calculation Printout



East	4.4100	19.6403	0.7600	0.7000	0.7700	31.9323 (76)
South	3.4700	46.7521	0.7600	0.7000	0.7700	59.8102 (78)
North	1.8400	26.0000	0.6800	0.7000	1.0000	20.4947 (82)
East	1.8400	26.0000	0.6800	0.7000	1.0000	20.4947 (82)
South	2.7600	26.0000	0.6800	0.7000	1.0000	30.7420 (82)
West	0.9200	26.0000	0.6800	0.7000	1.0000	10.2473 (82)

Solar gains	209.5525	399.1589	646.6958	950.9103	1187.9783	1229.7827	1164.9389	982.7890	752.4849	469.3846	258.9637	174.0254 (83)
Total gains	984.9117	1172.8947	1395.6960	1650.9319	1836.9302	1838.1917	1749.4626	1570.7560	1369.9324	1131.4947	970.7575	928.0527 (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	33.7748	33.8100	33.8452	34.0227	34.0584	34.2381	34.2381	34.2742	34.1660	34.0584	33.9870	33.9160
alpha	3.2517	3.2540	3.2563	3.2682	3.2706	3.2825	3.2825	3.2849	3.2777	3.2706	3.2658	3.2611
util living area	0.9414	0.9035	0.8282	0.6946	0.5337	0.3843	0.2827	0.3267	0.5303	0.7845	0.9118	0.9500 (86)
Living	19.6769	19.9272	20.2746	20.6121	20.8036	20.8798	20.8990	20.8946	20.8322	20.5340	20.0335	19.6152
Non living	18.7042	19.0172	19.4452	19.8500	20.0662	20.1484	20.1656	20.1632	20.1033	19.7699	19.1577	18.6288
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.3232	19.9272	20.2746	20.6121	20.8036	20.8798	20.8990	20.8946	20.8322	20.5340	20.0335	19.8089 (87)
Th 2	20.2814	20.2821	20.2828	20.2863	20.2870	20.2905	20.2905	20.2912	20.2891	20.2870	20.2856	20.2842 (88)
util rest of house	0.9347	0.8932	0.8113	0.6686	0.5000	0.3446	0.2382	0.2783	0.4848	0.7576	0.9006	0.9443 (89)
MIT 2	19.6526	19.0172	19.4452	19.8500	20.0662	20.1484	20.1656	20.1632	20.1033	19.7699	19.1577	18.9271 (90)
Living area fraction												0.1926 (91)
MIT	19.7818	19.1924	19.6049	19.9967	20.2082	20.2892	20.3068	20.3040	20.2436	19.9171	19.3263	19.0969 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7818	19.1924	19.6049	19.9967	20.2082	20.2892	20.3068	20.3040	20.2436	19.9171	19.3263	19.0969 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9295	0.8750	0.7937	0.6575	0.4962	0.3445	0.2393	0.2792	0.4818	0.7422	0.8828	0.9327 (94)
Useful gains	915.5099	1026.3123	1107.7480	1085.4312	911.4662	633.2648	418.5724	438.5159	659.9801	839.8210	856.9742	865.6265 (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	1784.8940	1646.0628	1507.7250	1270.0233	972.7401	647.0367	421.5744	443.5362	700.1912	1065.2211	1400.7742	1710.3174 (97)
Space heating kWh	646.8218	416.4724	297.5829	132.9063	45.5878	0.0000	0.0000	0.0000	0.0000	167.6977	391.5360	628.4501 (98a)
Space heating requirement - total per year (kWh/year)												2727.0549
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	646.8218	416.4724	297.5829	132.9063	45.5878	0.0000	0.0000	0.0000	0.0000	167.6977	391.5360	628.4501 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2727.0549
Space heating per m2												(98c) / (4) = 18.1586 (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 %)	366.3334 (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	646.8218	416.4724	297.5829	132.9063	45.5878	0.0000	0.0000	0.0000	0.0000	167.6977	391.5360	628.4501 (98)
Space heating efficiency (main heating system 1)	366.3334	366.3334	366.3334	366.3334	366.3334	0.0000	0.0000	0.0000	0.0000	366.3334	366.3334	366.3334 (210)
Space heating fuel (main heating system)	176.5664	113.6867	81.2328	36.2801	12.4444	0.0000	0.0000	0.0000	0.0000	45.7773	106.8797	171.5514 (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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Water heating requirement	254.9517	209.1095	179.9601	124.3195	88.1055	76.1937	74.1128	93.8287	127.9239	182.5888	226.1560	252.1749 (64)
Efficiency of water heater (217)m	199.0374	199.0374	199.0374	199.0374	199.0374	199.0374	199.0374	199.0374	199.0374	199.0374	199.0374	199.0374 (216)
Fuel for water heating, kWh/month	128.0924	105.0604	90.4152	62.4604	44.2658	38.2811	37.2356	47.1412	64.2713	91.7359	113.6249	126.6973 (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	36.4402	32.9137	36.4402	35.2647	36.4402	35.2647	36.4402	36.4402	35.2647	36.4402	35.2647	36.4402 (231)
Lighting	32.4359	26.0213	23.4293	17.1653	13.2590	10.8327	12.0953	15.7219	20.4212	26.7937	30.2634	33.3374 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-63.6386	-91.4007	-131.8249	-145.7220	-153.1014	-141.1046	-139.3118	-132.6020	-119.5189	-103.1259	-70.1483	-54.6354 (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	-26.5171	-59.0432	-124.3983	-197.6676	-271.1276	-275.9801	-272.2609	-226.9912	-162.1147	-89.1967	-36.7893	-20.8095 (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)

Full SAP Calculation Printout



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											744.4189	(211)
Space heating fuel - main system 2											0.0000	(213)
Space heating fuel - secondary											0.0000	(215)
Efficiency of water heater											199.0374	
Water heating fuel used											949.2816	(219)
Space cooling fuel											0.0000	(221)

Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.8360)												
mechanical ventilation fans (SFP = 0.8360)											349.0541	(230a)
pump for solar water heating											80.0000	(230g)
Total electricity for the above, kWh/year											429.0541	(231)
Electricity for lighting (calculated in Appendix L)											261.7764	(232)

Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation											-3109.0309	(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											-724.5000	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	744.4189	16.4900	122.7547	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	949.2816	16.4900	156.5365	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	349.0541	16.4900	57.5590	(249)
Pump for solar water heating	80.0000	16.4900	13.1920	(249)
Energy for lighting	261.7764	16.4900	43.1669	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1346.1346	16.4900	-221.9776	
PV Unit electricity exported	-1762.8963	5.5900	-98.5459	
Total			-320.5235	(252)
Total energy cost			72.6856	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):			0.3600	(256)
Energy cost factor (ECF)		[(255) x (256)] / [(4) + 45.0] =	0.1341	(257)
SAP value			97.8268	
SAP rating (Section 12)			98	(258)
SAP band			A	

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	744.4189	0.1566	116.5570	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	949.2816	0.1458	138.4301	(264)
Space and water heating			254.9870	(265)
Pumps, fans and electric keep-hot	429.0541	0.1387	59.5151	(267)
Energy for lighting	261.7764	0.1443	37.7824	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1346.1346	0.1349	-181.5660	
PV Unit electricity exported	-1762.8963	0.1244	-219.2746	
Total			-400.8406	(269)
Total CO2, kg/year			-48.5561	(272)
CO2 emissions per m2			-0.3200	(273)
EI value			100.3334	
EI rating			100	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	76.5700 (1b)	x 2.4700 (2b)	= 189.1279	(1b) - (3b)
First floor	73.6100 (1c)	x 2.0800 (2c)	= 153.1088	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	150.1800			(4)
Dwelling volume		(3a) + (3b) + (3c) + (3d) + (3e)...(3n) =	342.2367	(5)

Full SAP Calculation Printout



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												0 * 10 =	0.0000 (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) =											0.0000 / (5) =	0.0000 (8)
Pressure test												Yes	
Pressure Test Method												Blower Door	
Measured/design AP50												1.0000 (17)	
Infiltration rate												0.0500 (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) =	0.0425 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	8.0000	7.4000	7.1000	6.3000	6.3000	5.6000	5.4000	5.4000	6.2000	7.0000	7.4000	8.0000 (22)	
Wind factor	2.0000	1.8500	1.7750	1.5750	1.5750	1.4000	1.3500	1.3500	1.5500	1.7500	1.8500	2.0000 (22a)	
Adj infilt rate	0.0850	0.0786	0.0754	0.0669	0.0669	0.0595	0.0574	0.0574	0.0659	0.0744	0.0786	0.0850 (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) =												81.0000 (23c)	
Effective ac	0.1800	0.1736	0.1704	0.1619	0.1619	0.1545	0.1524	0.1524	0.1609	0.1694	0.1736	0.1800 (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					
Window (Uw = 1.20)			17.0200	1.1450	19.4885		(27)					
Door			1.8900	1.0000	1.8900		(26a)					
FD			1.7000	1.8000	3.0600		(26)					
5-7			1.8400	0.9615	1.7692		(27a)					
8-9			1.8400	0.9615	1.7692		(27a)					
14-16			2.7600	0.9615	2.6538		(27a)					
17			0.9200	0.9615	0.8846		(27a)					
Floor 1 P/a 0.48			76.5700	0.1200	9.1884	110.0000	8422.7000 (28a)					
Heatloss Floor 2 over garage			17.3900	0.1700	2.9563	20.0000	347.8000 (28b)					
External Wall 1 Render	62.9700	10.7100	52.2600	0.1600	8.3616	9.0000	470.3400 (29a)					
External Wall 2 Stone	31.5000	8.2000	23.3000	0.1600	3.7280	9.0000	209.7000 (29a)					
External Wall 3 Garage	16.2600	1.7000	14.5600	0.1400	2.0384	18.0000	262.0800 (29a)					
Wall 4 "attic"	26.4800		26.4800	0.0900	2.3832	9.0000	238.3200 (29a)					
External Roof 1 Sloping	111.0100	7.3600	103.6500	0.1300	13.4745	9.0000	932.8500 (30)					
Roof 2 "attic"	15.4700		15.4700	0.0861	1.3323	9.0000	139.2300 (30)					
Total net area of external elements Aum(A, m2)			357.6500				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	74.9782	(33)					
Internal Wall 1 GF			67.2000			9.0000	604.8000 (32c)					
Internal Wall 2 FF			96.9200			9.0000	872.2800 (32c)					
Internal Floor 1			56.2200			18.0000	1011.9600 (32d)					
Internal Ceiling 1			56.2200			9.0000	505.9800 (32e)					
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) =					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							14018.0400 (34)					
List of Thermal Bridges							93.3416 (35)					
K1 Element				Length	Psi-value	Total						
E16 Corner (normal)				13.2500	0.0300	0.3975						
E5 Ground floor (normal)				37.1000	0.0210	0.7791						
E11 Eaves (insulation at rafter level)				25.6000	0.0390	0.9984						
E17 Corner (inverted - internal area greater than external area)				2.6500	-0.0150	-0.0398						
E13 Gable (insulation at rafter level)				26.3000	0.0240	0.6312						
R4 Ridge (vaulted ceiling)				19.0000	0.1200	2.2800						
E6 Intermediate floor within a dwelling				26.6500	0.0800	2.1320						
E20 Exposed floor (normal)				13.3000	0.3200	4.2560						
E21 Exposed floor (inverted)				6.2000	0.3200	1.9840						
E2 Other lintels (including other steel lintels)				13.2500	0.0840	1.1130						
E3 Sill				11.5000	0.0430	0.4945						
E4 Jamb				31.3000	0.0340	1.0642						
R1 Head of roof window				7.5200	0.2400	1.8048						
R2 Sill of roof window				7.5200	0.2400	1.8048						
R3 Jamb of roof window				15.6800	0.2400	3.7632						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							23.4630 (36)					
Point Thermal bridges							(36a) =					
Total fabric heat loss							(33) + (36) + (36a) =					
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
	20.3289	19.6089	19.2489	18.2889	18.2889	17.4489	17.2089	17.2089	18.1689	19.1289	19.6089	20.3289 (38)
Heat transfer coeff	118.7700	118.0500	117.6901	116.7301	116.7301	115.8901	115.6501	115.6501	116.6101	117.5701	118.0500	118.7700 (39)
Average = Sum(39)m / 12 =												117.1801
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.7909	0.7861	0.7837	0.7773	0.7773	0.7717	0.7701	0.7701	0.7765	0.7829	0.7861	0.7909 (40)
HLP (average)												0.7803
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9345 (42)
Hot water usage for mixer showers												

Full SAP Calculation Printout



Hot water usage for baths	0.0000	0.0000	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 other uses	84.6975	83.4396	81.6682	78.4022	75.9566	73.2448	71.7801	73.5390	75.4542	78.3559	81.6892	84.4111	84.4111	84.4111	(42b)	
Average daily hot water use (litres/day)	44.6819	43.0571	41.4323	39.8075	38.1827	36.5579	36.5579	38.1827	39.8075	41.4323	43.0571	44.6819	44.6819	44.6819	(42c)	
															(43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec				
Energy content (annual)	129.3794	126.4967	123.1005	118.2097	114.1393	109.8027	108.3380	111.7217	115.2617	119.7882	124.7463	129.0930	129.0930	129.0930	(44)	
Distribution loss (46)m = 0.15 x (45)m	204.9053	180.1296	189.2009	161.8231	153.6534	135.0153	131.0254	138.3348	142.1292	162.5514	177.7240	202.1285	202.1285	202.1285	(45)	
Total = Sum(45)m =															1978.6210	
Water storage loss:	30.7358	27.0194	28.3801	24.2735	23.0480	20.2523	19.6538	20.7502	21.3194	24.3827	26.6586	30.3193	30.3193	30.3193	(46)	
Store volume															250.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):															1.6000	(48)
Temperature factor from Table 2b															0.5400	(49)
Enter (49) or (54) in (55)															0.8640	(55)
Total storage loss	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	26.7840	25.9200	(56)
If cylinder contains dedicated solar storage	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	26.7840	25.9200	(57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624	23.2624	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	0.0000	0.0000	(61)	
Total heat required for water heating calculated for each month	254.9517	225.3328	237.8516	203.5015	190.9055	170.8405	168.0448	176.2848	185.1583	211.2021	226.1560	252.1749	252.1749	252.1749	(62)	
WWHS	0.0000	0.0000	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	-0.0000	-0.0000	(63b)	
Aperture area of solar collector															3.0000	(H1)
Zero-loss collector efficiency															0.8000	(H2)
Collector linear heat loss coefficient															1.8000	(H3)
Collector 2nd order heat loss coefficient															0.0000	(H4)
Collector loop efficiency															0.9000	(H5)
Incidence angle modifier															1.0000	(H6)
Overshading factor															0.8000	(H8)
Overall heat loss coefficient of system															6.5000	(H10)
Heat loss coefficient of collector loop															3.9667	(H11)
Dedicated solar storage volume															75.0000	(H12)
Effective solar volume															75.0000	(H14)
Reference volume															225.0000	(H15)
Storage tank correction coefficient															1.3161	(H16)
Heat delivered to hot water															777.9356	(H24)
Heat delivered to space heating															0.0000	(H29)
Solar input															777.9356	(64)
Solar input	-9.4109	-27.7088	-73.2437	-97.0424	-115.2558	-115.5804	-103.7928	-100.7636	-76.4075	-45.8916	-12.8383	-0.0000	-0.0000	-0.0000	(63c)	
FGHS	0.0000	0.0000	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	245.5408	197.6240	164.6078	106.4591	75.6497	55.2602	64.2520	75.5212	108.7509	165.3106	213.3177	252.1749	252.1749	252.1749	(64)	
Total per year (kWh/year) = Sum(64)m =															1724.4689	(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	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	108.1681	96.0556	101.8298	87.1489	80.8914	73.5528	73.1815	76.3563	81.6813	92.9689	97.8388	107.2448	107.2448	107.2448	(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	176.0681	176.0681	176.0681	176.0681	176.0681	176.0681	176.0681	176.0681	176.0681	176.0681	176.0681	176.0681	176.0681	176.0681	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	37.0572	32.9138	26.7673	20.2646	15.1480	12.7886	13.8185	17.9618	24.1084	30.6111	35.7277	38.0871	38.0871	38.0871	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	478.6841	483.6514	471.1341	444.4863	410.8481	379.2331	358.1123	353.1450	365.6623	392.3101	425.9483	457.5633	457.5633	457.5633	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.5413	55.5413	55.5413	55.5413	55.5413	55.5413	55.5413	55.5413	55.5413	55.5413	55.5413	55.5413	55.5413	55.5413	(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	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-117.3788	-117.3788	-117.3788	-117.3788	-117.3788	-117.3788	-117.3788	-117.3788	-117.3788	-117.3788	-117.3788	-117.3788	-117.3788	-117.3788	(71)
Water heating gains (Table 5)	145.3873	142.9399	136.8681	121.0402	108.7250	102.1567	98.3622	102.6294	113.4462	124.9582	135.8873	144.1463	144.1463	144.1463	(72)
Total internal gains	775.3592	773.7358	749.0001	700.0217	648.9519	608.4090	584.5237	587.9670	617.4475	662.1101	711.7938	754.0274	754.0274	754.0274	(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	9.1400	14.5103	0.7600	0.7000	0.7700	48.8954	(74)							
East	4.4100	27.2069	0.7600	0.7000	0.7700	44.2346	(76)							
South	3.4700	59.9387	0.7600	0.7000	0.7700	76.6799	(78)							
North	1.8400	37.0000	0.6800	0.7000	1.0000	29.1655	(82)							
East	1.8400	37.0000	0.6800	0.7000	1.0000	29.1655	(82)							
South	2.7600	37.0000	0.6800	0.7000	1.0000	43.7482	(82)							
West	0.9200	37.0000	0.6800	0.7000	1.0000	14.5827	(82)							
Solar gains	286.4718	471.9075	757.6387	1134.3132	1341.7334	1520.1106	1307.5796	1191.6774	932.2015	580.1893	339.8660	230.4653	230.4653	(83)
Total gains	1061.8311	1245.6433	1506.6389	1834.3349	1990.6853	2128.5196	1892.1033	1779.6444	1549.6490	1242.2994	1051.6598	984.4927	984.4927	(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	32.7852	32.9852	33.0861	33.3582	33.3582	33.5999	33.6697	33.6697	33.3925	33.1198	32.9852	32.7852	32.7852	32.7852	32.7852	(85)
alpha	3.1857	3.1990	3.2057	3.2239	3.2239	3.2400	3.2446	3.2446	3.2262	3.2080	3.1990	3.1857	3.1857	3.1857	3.1857	(85)
util living area	0.8978	0.8545	0.7738	0.6414	0.5073	0.3657	0.3125	0.3131	0.4568	0.6838	0.8407	0.9062	0.9062	0.9062	0.9062	(86)

Full SAP Calculation Printout



Living	20.0387	20.1998	20.4301	20.6727	20.8118	20.8789	20.8929	20.8935	20.8576	20.6921	20.3689	20.0366
Non living	19.1440	19.3431	19.6201	19.9060	20.0605	20.1340	20.1488	20.1496	20.1121	19.9349	19.5561	19.1433
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.5082	20.1998	20.4301	20.6727	20.8118	20.8789	20.8929	20.8935	20.8576	20.6921	20.3689	20.1713 (87)
Th 2	20.2613	20.2654	20.2675	20.2731	20.2731	20.2779	20.2793	20.2793	20.2738	20.2682	20.2654	20.2613 (88)
util rest of house	0.8852	0.8384	0.7521	0.6135	0.4739	0.3298	0.2708	0.2687	0.4108	0.6462	0.8192	0.8939 (89)
MIT 2	19.8159	19.3431	19.6201	19.9060	20.0605	20.1340	20.1488	20.1496	20.1121	19.9349	19.5561	19.3448 (90)
Living area fraction									FLA = Living area / (4) =			0.1926 (91)
MIT	19.9492	19.5080	19.7761	20.0536	20.2052	20.2774	20.2921	20.2928	20.2556	20.0807	19.7126	19.5039 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9492	19.5080	19.7761	20.0536	20.2052	20.2774	20.2921	20.2928	20.2556	20.0807	19.7126	19.5039 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8793	0.8195	0.7362	0.6047	0.4707	0.3297	0.2715	0.2695	0.4096	0.6359	0.8008	0.8792	(94)
Useful gains	933.6514	1020.8366	1109.2315	1109.1983	937.0236	701.8474	513.8002	479.6901	634.7653	789.9994	842.1916	865.6058	(95)
Ext temp.	7.0000	7.1000	7.8000	9.3000	11.7000	14.1000	15.8000	16.1000	14.6000	12.3000	9.8000	7.5000	(96)
Heat loss rate W	1537.9755	1464.7702	1409.4661	1255.2739	992.8076	715.9033	519.5099	484.9029	659.5050	914.7782	1170.1850	1425.7087	(97)
Space heating kWh	449.6171	298.3234	223.3746	105.1745	41.5033	0.0000	0.0000	0.0000	0.0000	92.8354	236.1552	416.7165	(98a)
Space heating requirement - total per year (kWh/year)												1863.7000	
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	449.6171	298.3234	223.3746	105.1745	41.5033	0.0000	0.0000	0.0000	0.0000	92.8354	236.1552	416.7165	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1863.7000	
Space heating per m2										(98c) / (4) =		12.4098	(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 %)													364.9927	(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	449.6171	298.3234	223.3746	105.1745	41.5033	0.0000	0.0000	0.0000	0.0000	92.8354	236.1552	416.7165	(98)		
Space heating efficiency (main heating system 1)	364.9927	364.9927	364.9927	364.9927	364.9927	0.0000	0.0000	0.0000	0.0000	364.9927	364.9927	364.9927	(210)		
Space heating fuel (main heating system)	123.1852	81.7341	61.1998	28.8155	11.3710	0.0000	0.0000	0.0000	0.0000	25.4349	64.7014	114.1712	(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	245.5408	197.6240	164.6078	106.4591	75.6497	55.2602	64.2520	75.5212	108.7509	165.3106	213.3177	252.1749	(64)		
Efficiency of water heater (217)m	198.8000	198.8000	198.8000	198.8000	198.8000	198.8000	198.8000	198.8000	198.8000	198.8000	198.8000	198.8000	(216)		
Fuel for water heating, kWh/month	123.5114	99.4085	82.8007	53.5509	38.0532	27.7969	32.3199	37.9885	54.7037	83.1542	107.3027	126.8485	(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	36.4402	32.9137	36.4402	35.2647	36.4402	35.2647	36.4402	36.4402	35.2647	36.4402	35.2647	36.4402	(221)		
Lighting	32.4359	26.0213	23.4293	17.1653	13.2590	10.8327	12.0953	15.7219	20.4212	26.7937	30.2634	33.3374	(232)		
Electricity generated by PVs (Appendix M) (negative quantity)	-79.7095	-100.4278	-141.8885	-156.2842	-159.3465	-150.6055	-144.3883	-141.9876	-131.2895	-115.0111	-83.8163	-67.1095	(233a)		
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)		
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)		
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)		
Electricity generated by PVs (Appendix M) (negative quantity)	-41.9803	-74.6999	-152.9550	-246.1587	-312.4553	-357.8520	-310.8930	-286.7307	-211.3102	-118.7844	-54.6358	-31.6265	(233b)		
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)		
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)		
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)		
Annual totals kWh/year															
Space heating fuel - main system 1													510.6130	(211)	
Space heating fuel - main system 2													0.0000	(213)	
Space heating fuel - secondary													0.0000	(215)	
Efficiency of water heater													198.8000		
Water heating fuel used													867.4390	(219)	
Space cooling fuel													0.0000	(221)	
Electricity for pumps and fans:															
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.8360)															
mechanical ventilation fans (SFP = 0.8360)														349.0541	(230a)
pump for solar water heating														80.0000	(230g)
Total electricity for the above, kWh/year														429.0541	(231)
Electricity for lighting (calculated in Appendix L)														261.7764	(232)
Energy saving/generation technologies (Appendices M ,N and Q)															
PV generation														-3671.9459	(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															

Full SAP Calculation Printout



Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	-1603.0635	(238)

 10a. Fuel costs - using BEDF prices (533)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	510.6130	21.5100	109.8329 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	867.4390	21.5100	186.5861 (247)
Energy for instantaneous electric shower(s)	0.0000	21.5100	0.0000 (247a)
Pumps, fans and electric keep-hot	349.0541	21.5100	75.0815 (249)
Pump for solar water heating	80.0000	21.5100	17.2080 (249)
Energy for lighting	261.7764	21.5100	56.3081 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1471.8642	21.5100	-316.5980
PV Unit electricity exported	-2200.0817	5.5900	-122.9846
Total			-439.5826 (252)
Total energy cost			5.4341 (255)

 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	510.6130	0.1566	79.9807 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	867.4390	0.1469	127.4267 (264)
Space and water heating			207.4075 (265)
Pumps, fans and electric keep-hot	429.0541	0.1387	59.5151 (267)
Energy for lighting	261.7764	0.1443	37.7824 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1471.8642	0.1355	-199.4087
PV Unit electricity exported	-2200.0817	0.1252	-275.4579
Total			-474.8666 (269)
Total CO2, kg/year			-170.1617 (272)

 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	510.6130	1.5799	806.6921 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	867.4390	1.5434	1338.8487 (278)
Space and water heating			2145.5408 (279)
Pumps, fans and electric keep-hot	429.0541	1.5128	649.0730 (281)
Energy for lighting	261.7764	1.5338	401.5214 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1471.8642	1.5008	-2208.9034
PV Unit electricity exported	-2200.0817	0.4596	-1011.0669
Total			-3219.9702 (283)
Total Primary energy kWh/year			-23.8351 (286)