

Full SAP Calculation Printout



Property Reference	RADESIGN-7146-23 P2		Issued on Date	09/12/2023	
Assessment Reference	SEC1 - ASHP ROI TF 0.15 improv	Prop Type Ref	DS		
Property	Proposed dwelling Plot 2, Rosemullion, The Izzard, Helston, Cornwall, TR12 7PE				
SAP Rating	97 A	DER	-0.45	TER	10.46
Environmental	100 A	% DER < TER			104.30
CO ₂ Emissions (t/year)	-0.15	DFEE	38.92	TFEE	43.50
Compliance Check	See BREL	% DFEE < TFEE			10.52
% DPER < TPER	85.64	DPER	7.88	TPER	54.90
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	49.5100 (1b)	x 2.6000 (2b)	= 128.7260 (1b) - (3b)
First floor	54.9700 (1c)	x 1.8200 (2c)	= 100.0454 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	104.4800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 228.7714 (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	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)			17.8800	1.1450	20.4733		(27)
Door			1.8900	1.0000	1.8900		(26a)
FD			1.7000	1.8000	3.0600		(26)
6-7			1.8400	0.9615	1.7692		(27a)
8-9			1.8400	0.9615	1.7692		(27a)
12			0.9200	0.9615	0.8846		(27a)
15-16			1.8400	0.9615	1.7692		(27a)
Floor 1 P/a 0.67			49.5100	0.1200	5.9412	110.0000	5446.1000 (28a)
Heatloss Floor 2 over garage			19.6900	0.1700	3.3473	20.0000	393.8000 (28b)
External Wall 1 Render	86.5800	16.6700	69.9100	0.1600	11.1856	9.0000	629.1900 (29a)
External Wall 2 Stone	9.2300	3.1000	6.1300	0.1600	0.9808	9.0000	55.1700 (29a)
External Wall 3 Garage	21.0700	1.7000	19.3700	0.1400	2.7118	18.0000	348.6600 (29a)
Wall 4 "attic"	13.6100		13.6100	0.0900	1.2249	9.0000	122.4900 (29a)
External Roof 1 Sloping	84.9400	6.4400	78.5000	0.1300	10.2050	9.0000	706.5000 (30)

Full SAP Calculation Printout



Roof 2 "attic"	9.1400	9.1400	0.0861	0.7872	9.0000	82.2600 (30)
Total net area of external elements Aum(A, m2)		293.7700				(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =		67.9994		(33)
Internal Wall 1 GF		45.6000			9.0000	410.4000 (32c)
Internal Wall 2 FF		52.9100			9.0000	476.1900 (32c)
Internal Floor 1		35.2800			18.0000	635.0400 (32d)
Internal Ceiling 1		35.2800			9.0000	317.5200 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9623.3200 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 92.1068 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	18.9500	0.0300	0.5685
E16 Corner (normal)	33.3000	0.0210	0.6993
E5 Ground floor (normal)	17.5000	0.0390	0.6825
E11 Eaves (insulation at rafter level)	8.3500	-0.0150	-0.1253
E17 Corner (inverted - internal area greater than external area)	26.2300	0.0240	0.6295
E13 Gable (insulation at rafter level)	14.9500	0.1200	1.7940
R4 Ridge (vaulted ceiling)	12.4000	0.0800	0.9920
E6 Intermediate floor within a dwelling	10.7500	0.3200	3.4400
E20 Exposed floor (normal)	7.9500	0.3200	2.5440
E21 Exposed floor (inverted)	12.5500	0.0840	1.0542
E2 Other lintels (including other steel lintels)	10.8000	0.0430	0.4644
E3 Sill	30.3600	0.0340	1.0322
E4 Jamb	6.5800	0.2400	1.5792
R1 Head of roof window	6.5800	0.2400	1.5792
R2 Sill of roof window	6.5800	0.2400	1.5792
R3 Jamb of roof window	13.7200	0.2400	3.2928

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 20.2266 (36)
 Point Thermal bridges 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 88.2260 (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
	11.2628	11.1826	11.1024	10.7014	10.6211	10.2201	10.2201	10.1399	10.3805	10.6211	10.7816	10.9420 (38)
Heat transfer coeff	99.4888	99.4086	99.3284	98.9273	98.8471	98.4461	98.4461	98.3658	98.6065	98.8471	99.0075	99.1680 (39)
Average = Sum(39)m / 12 =												98.9073
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9522	0.9515	0.9507	0.9469	0.9461	0.9422	0.9422	0.9415	0.9438	0.9461	0.9476	0.9492 (40)
HLP (average)												0.9467
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7773 (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	81.6466	80.4340	78.7265	75.5781	73.2206	70.6065	69.1945	70.8901	72.7363	75.5334	78.7467	81.3706	81.3706 (42b)
Hot water usage for other uses	43.0724	41.5061	39.9399	38.3736	36.8073	35.2411	35.2411	36.8073	38.3736	39.9399	41.5061	43.0724	43.0724 (42c)
Average daily hot water use (litres/day)													114.8560 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	124.7190	121.9402	118.6663	113.9517	110.0279	105.8475	104.4355	107.6974	111.1099	115.4733	120.2528	124.4430 (44)	
Energy conte	197.5244	173.6412	182.3857	155.9941	148.1187	130.1519	126.3057	133.3519	137.0096	156.6962	171.3222	194.8476 (45)	
Energy content (annual)													Total = Sum(45)m = 1907.3492
Distribution loss (46)m = 0.15 x (45)m	29.6287	26.0462	27.3579	23.3991	22.2178	19.5228	18.9459	20.0028	20.5514	23.5044	25.6983	29.2271 (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 (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	247.5708	218.8444	232.4321	204.4261	198.1651	178.5839	176.3521	183.3983	185.4416	206.7426	219.7542	244.8940 (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	247.5708	218.8444	232.4321	204.4261	198.1651	178.5839	176.3521	183.3983	185.4416	206.7426	219.7542	244.8940 (64)	
12Total per year (kWh/year)													2496.6052 (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	105.7140	93.8982	100.6804	90.6136	89.2866	82.0211	82.0338	84.3766	84.3013	92.1386	95.7102	104.8240 (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	138.8654	138.8654	138.8654	138.8654	138.8654	138.8654	138.8654	138.8654	138.8654	138.8654	138.8654	138.8654 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	132.8417	147.0747	132.8417	137.2698	132.8417	137.2698	132.8417	132.8417	137.2698	132.8417	137.2698	132.8417 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	263.3735	266.1065	259.2195	244.5577	226.0499	208.6552	197.0345	194.3015	201.1886	215.8503	234.3581	251.7528 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.8865	36.8865	36.8865	36.8865	36.8865	36.8865	36.8865	36.8865	36.8865	36.8865	36.8865	36.8865 (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)	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923 (71)
Water heating gains (Table 5)	142.0887	139.7295	135.3231	125.8523	120.0089	113.9182	110.2605	113.4094	117.0851	123.8422	132.9309	140.8924 (72)
Total internal gains												

Full SAP Calculation Printout



602.9635 617.5704 592.0439 572.3394 543.5601 524.5028 504.7963 505.2123 520.2031 537.1938 569.2183 590.1465 (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
East	1.2600	19.6403	0.7600	0.7000	0.7700	9.1235 (76)
South	8.9300	46.7521	0.7600	0.7000	0.7700	153.9207 (78)
West	7.6900	19.6403	0.7600	0.7000	0.7700	55.6825 (80)
North	1.8400	26.0000	0.6800	0.7000	1.0000	20.4947 (82)
East	0.9200	26.0000	0.6800	0.7000	1.0000	10.2473 (82)
South	1.8400	26.0000	0.6800	0.7000	1.0000	20.4947 (82)
West	1.8400	26.0000	0.6800	0.7000	1.0000	20.4947 (82)

Solar gains	290.4580	527.8372	794.7416	1081.2486	1281.0618	1297.7353	1240.7181	1090.8857	895.5275	604.4101	354.2976	244.2318 (83)
Total gains	893.4216	1145.4076	1386.7855	1653.5880	1824.6219	1822.2381	1745.5144	1596.0979	1415.7306	1141.6039	923.5159	834.3783 (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	26.6888	26.8905	26.9122	27.0213	27.0432	27.1534	27.1534	27.1755	27.1092	27.0432	26.9994	26.9557
alpha	2.7913	2.7927	2.7941	2.8014	2.8029	2.8102	2.8102	2.8117	2.8073	2.8029	2.8000	2.7970
util living area	0.9096	0.8446	0.7502	0.6096	0.4643	0.3341	0.2444	0.2776	0.4466	0.6973	0.8620	0.9222 (86)
Living	19.4846	19.8416	20.2277	20.5769	20.7710	20.8556	20.8801	20.8752	20.8108	20.5056	19.9282	19.4040
Non living	18.3445	18.7842	19.2512	19.6608	19.8753	19.9641	19.9853	19.9827	19.9234	19.5935	18.9023	18.2462
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	20.2248	19.8416	20.2277	20.5769	20.7710	20.8556	20.8801	20.8752	20.8108	20.5056	19.9282	19.6272 (87)
Th 2	20.1233	20.1240	20.1246	20.1279	20.1285	20.1317	20.1317	20.1324	20.1304	20.1285	20.1272	20.1259 (88)
util rest of house	0.8993	0.8288	0.7274	0.5789	0.4276	0.2917	0.1975	0.2272	0.3979	0.6627	0.8450	0.9131 (89)
MIT 2	19.4142	18.7842	19.2512	19.6608	19.8753	19.9641	19.9853	19.9827	19.9234	19.5935	18.9023	18.5849 (90)
Living area fraction									FLA = Living area / (4) =			0.2768 (91)
MIT	19.6385	19.0769	19.5215	19.9144	20.1232	20.2109	20.2330	20.2298	20.1691	19.8459	19.1862	18.8734 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6385	19.0769	19.5215	19.9144	20.1232	20.2109	20.2330	20.2298	20.1691	19.8459	19.1862	18.8734 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8929	0.8073	0.7103	0.5711	0.4273	0.2957	0.2030	0.2329	0.4001	0.6506	0.8236	0.8976 (94)
Useful gains	797.7419	924.6458	984.9802	944.3588	779.7267	538.7784	354.3418	371.7329	566.4371	742.7573	760.6006	748.9105 (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	1526.0137	1409.3024	1293.4014	1089.6210	832.6089	552.3695	357.6546	376.7197	598.4490	913.9347	1196.6287	1455.1352 (97)
Space heating kWh	541.8342	325.6892	229.4654	104.5887	39.3444	0.0000	0.0000	0.0000	0.0000	127.3560	313.9402	525.4311 (98a)
Space heating requirement - total per year (kWh/year)												2207.6494
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	541.8342	325.6892	229.4654	104.5887	39.3444	0.0000	0.0000	0.0000	0.0000	127.3560	313.9402	525.4311 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2207.6494
Space heating per m2										(98c) / (4) =		21.1299 (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 %)												375.5190 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	541.8342	325.6892	229.4654	104.5887	39.3444	0.0000	0.0000	0.0000	0.0000	127.3560	313.9402	525.4311 (98)
Space heating efficiency (main heating system 1)	375.5190	375.5190	375.5190	375.5190	375.5190	0.0000	0.0000	0.0000	0.0000	375.5190	375.5190	375.5190 (210)
Space heating fuel (main heating system)	144.2894	86.7304	61.1062	27.8518	10.4773	0.0000	0.0000	0.0000	0.0000	33.9147	83.6017	139.9213 (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	247.5708	218.8444	232.4321	204.4261	198.1651	178.5839	176.3521	183.3983	185.4416	206.7426	219.7542	244.8940 (64)
Efficiency of water heater (217)m	200.6324	200.6324	200.6324	200.6324	200.6324	200.6324	200.6324	200.6324	200.6324	200.6324	200.6324	200.6324 (217)
Fuel for water heating, kWh/month	123.3952	109.0773	115.8497	101.8909	98.7702	89.0105	87.8981	91.4101	92.4285	103.0455	109.5308	122.0610 (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	13.5590	12.2468	13.5590	13.1216	13.5590	13.1216	13.5590	13.5590	13.1216	13.5590	13.1216	13.5590 (231)
Lighting	25.6837	20.6044	18.5520	13.5920	10.4988	8.5776	9.5774	12.4491	16.1701	21.2160	23.9635	26.3975 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												

Full SAP Calculation Printout



(233a)m	-52.0446	-76.8654	-115.7299	-133.1217	-144.6744	-134.2195	-132.2156	-123.6428	-107.2475	-88.1722	-57.7524	-44.2903	(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	-21.5391	-50.4101	-111.9606	-186.2557	-261.0498	-268.9539	-263.8418	-215.1771	-147.9657	-77.5978	-30.4371	-16.6607	(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													587.8929 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													200.6324
Water heating fuel used													1244.3678 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.5720)													
mechanical ventilation fans (SFP = 0.5720)													159.6458 (230a)
Total electricity for the above, kWh/year													159.6458 (231)
Electricity for lighting (calculated in Appendix L)													207.2822 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-2861.8256 (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													-662.6369 (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	587.8929	0.1568	92.1545 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1244.3678	0.1409	175.3003 (264)
Space and water heating			267.4548 (265)
Pumps, fans and electric keep-hot	159.6458	0.1387	22.1448 (267)
Energy for lighting	207.2822	0.1443	29.9172 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1209.9763	0.1341	-162.2676
PV Unit electricity exported	-1651.8493	0.1234	-203.7700
Total			-366.0376 (269)
Total CO2, kg/year			-46.5207 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			-0.4500 (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	587.8929	1.5802	929.0137 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1244.3678	1.5209	1892.5630 (278)
Space and water heating			2821.5766 (279)
Pumps, fans and electric keep-hot	159.6458	1.5128	241.5122 (281)
Energy for lighting	207.2822	1.5338	317.9364 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1209.9763	1.4956	-1809.6676
PV Unit electricity exported	-1651.8493	0.4527	-747.7885
Total			-2557.4560 (283)
Total Primary energy kWh/year			823.5692 (286)
Dwelling Primary energy Rate (DPER)			7.8800 (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	49.5100 (1b)	x 2.6000 (2b)	= 128.7260 (1b) - (3b)
First floor	54.9700 (1c)	x 1.8200 (2c)	= 100.0454 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	104.4800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 228.7714 (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) = 0.1748 (8)
 Pressure test Yes
 Pressure Test Method Blower Door
 Measured/design AP50 5.0000 (17)
 Infiltration rate 0.4248 (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) = 0.3611 (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												
Effective ac	0.4604	0.4514	0.4424	0.3972	0.3882	0.3431	0.3431	0.3340	0.3611	0.3882	0.4063	0.4243 (22b)
	0.6060	0.6019	0.5978	0.5789	0.5754	0.5588	0.5588	0.5558	0.5652	0.5754	0.5825	0.5900 (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)			16.5700	1.1450	18.9733		(27)
6-7			1.7000	1.5918	2.7060		(27a)
8-9			1.7000	1.5918	2.7060		(27a)
12			0.8500	1.5918	1.3530		(27a)
15-16			1.7000	1.5918	2.7060		(27a)
Floor 1 P/a 0.67			49.5100	0.1300	6.4363		(28a)
Heatloss Floor 2 over garage			19.6900	0.1300	2.5597		(28b)
External Wall 1 Render	86.5800	15.5900	70.9900	0.1800	12.7782		(29a)
External Wall 2 Stone	9.2300	2.8700	6.3600	0.1800	1.1448		(29a)
External Wall 3 Garage	21.0700	1.7000	19.3700	0.1800	3.4866		(29a)
Wall 4 "attic"			13.6100	0.1800	2.4498		(29a)
External Roof 1 Sloping	84.9400	5.9500	78.9900	0.1100	8.6889		(30)
Roof 2 "attic"	9.1400		9.1400	0.1100	1.0054		(30)
Total net area of external elements Aum(A, m2)			293.7700				(31)
Fabric heat loss, W/K = Sum (A x U)					70.5840		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 92.1068 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	18.9500	0.0900	1.7055
E5 Ground floor (normal)	33.3000	0.1600	5.3280
E11 Eaves (insulation at rafter level)	17.5000	0.0400	0.7000
E17 Corner (inverted - internal area greater than external area)	8.3500	-0.0900	-0.7515
E13 Gable (insulation at rafter level)	26.2300	0.0800	2.0984
R4 Ridge (vaulted ceiling)	14.9500	0.0800	1.1960
E6 Intermediate floor within a dwelling	12.4000	0.0000	0.0000
E20 Exposed floor (normal)	10.7500	0.3200	3.4400
E21 Exposed floor (inverted)	7.9500	0.3200	2.5440
E2 Other lintels (including other steel lintels)	12.5500	0.0500	0.6275
E3 Sill	10.8000	0.0500	0.5400
E4 Jamb	30.3600	0.0500	1.5180
R1 Head of roof window	6.5800	0.0800	0.5264
R2 Sill of roof window	6.5800	0.0600	0.3948
R3 Jamb of roof window	13.7200	0.0800	1.0976

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 20.9647 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 91.5487 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)
 (38)m Jan 45.7495 Feb 45.4387 Mar 45.1342 Apr 43.7035 May 43.4359 Jun 42.1899 Jul 42.1899 Aug 41.9591 Sep 42.6698 Oct 43.4359 Nov 43.9774 Dec 44.5435 (38)
 Heat transfer coeff 137.2981 136.9874 136.6828 135.2522 134.9845 133.7385 133.7385 133.5078 134.2185 134.9845 135.5260 136.0921 (39)
 Average = Sum(39)m / 12 = 135.2509

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.3141	1.3111	1.3082	1.2945	1.2920	1.2800	1.2800	1.2778	1.2846	1.2920	1.2971	1.3026 (40)
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												2.7773 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	81.6466	80.4340	78.7265	75.5781	73.2206	70.6065	69.1945	70.8901	72.7363	75.5334	78.7467	81.3706 (42b)
Hot water usage for other uses	43.0724	41.5061	39.9399	38.3736	36.8073	35.2411	35.2411	36.8073	38.3736	39.9399	41.5061	43.0724 (42c)
Average daily hot water use (litres/day)												114.8560 (43)
Daily hot water use	124.7190	121.9402	118.6663	113.9517	110.0279	105.8475	104.4355	107.6974	111.1099	115.4733	120.2528	124.4430 (44)
Energy conte (annual)	197.5244	173.6412	182.3857	155.9941	148.1187	130.1519	126.3057	133.3519	137.0096	156.6962	171.3222	194.8476 (45)
Distribution loss (46)m = 0.15 x (45)m	29.6287	26.0462	27.3579	23.3991	22.2178	19.5228	18.9459	20.0028	20.5514	23.5044	25.6983	29.2271 (46)
Total = Sum(45)m												1907.3492

Full SAP Calculation Printout



Space heating kWh	730.6885	562.5413	471.3598	278.8372	143.6658	0.0000	0.0000	0.0000	0.0000	284.9963	519.5578	747.4260 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3739.0727
Space heating per m2												(98c) / (4) = 35.7874 (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 1)													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)
Space heating requirement	730.6885	562.5413	471.3598	278.8372	143.6658	0.0000	0.0000	0.0000	0.0000	284.9963	519.5578	747.4260	(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)	791.6452	609.4705	510.6823	302.0988	155.6509	0.0000	0.0000	0.0000	0.0000	308.7717	562.9012	809.7790	(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	252.4312	223.2344	237.2925	209.1297	203.0255	183.2875	181.2125	188.2587	190.1452	211.6030	224.4578	249.7544	(64)
Efficiency of water heater (217)m	86.3009	86.0431	85.5685	84.7057	83.2985	79.8000	79.8000	79.8000	79.8000	84.7282	85.8780	86.3605	(216)
Fuel for water heating, kWh/month	292.5014	259.4448	277.3130	246.8897	243.7326	229.6836	227.0834	235.9131	238.2772	249.7432	261.3681	289.1997	(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 (235a)m	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	(231)
Lighting (233a)m	27.5962	22.1387	19.9335	14.6041	11.2806	9.2164	10.2906	13.3761	17.3742	22.7959	25.7479	28.3632	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-58.5369	-79.5513	-110.2689	-119.4025	-124.9949	-115.2978	-113.7810	-109.1478	-100.5624	-88.6506	-63.2482	-50.9573	(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)	-42.7856	-88.6771	-173.8933	-257.8780	-337.9078	-338.4696	-334.5581	-284.7234	-210.6013	-125.7778	-56.7692	-33.9428	(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													4050.9997 (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													3051.1497 (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)													222.7175 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-3420.3834 (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													3990.4835 (238)

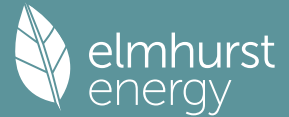
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	4050.9997	0.2100	850.7099 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3051.1497	0.2100	640.7414 (264)
Space and water heating			1491.4514 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	222.7175	0.1443	32.1450 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1134.3995	0.1354	-153.5863
PV Unit electricity exported	-2285.9839	0.1263	-288.6520
Total			-442.2383 (269)
Total CO2, kg/year			1093.2873 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.4600 (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	4050.9997	1.1300	4577.6296 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3051.1497	1.1300	3447.7992 (278)
Space and water heating			8025.4288 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)

Full SAP Calculation Printout



Energy for lighting	222.7175	1.5338	341.6116 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1134.3995	1.5004	-1702.0789
PV Unit electricity exported	-2285.9839	0.4635	-1059.5891
Total			-2761.6680 (283)
Total Primary energy kWh/year			5735.4732 (286)
Target Primary Energy Rate (TPER)			54.9000 (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	49.5100 (1b)	x 2.6000 (2b)	= 128.7260 (1b) - (3b)
First floor	54.9700 (1c)	x 1.8200 (2c)	= 100.0454 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	104.4800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 228.7714 (5)

2. Ventilation rate

	m ³ per hour											
Number of open chimneys	0 * 80 =											0.0000 (6a)
Number of open flues	0 * 20 =											0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =											0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =											0.0000 (6d)
Number of flues attached to other heater	0 * 35 =											0.0000 (6e)
Number of blocked chimneys	0 * 20 =											0.0000 (6f)
Number of intermittent extract fans	4 * 10 =											40.0000 (7a)
Number of passive vents	0 * 10 =											0.0000 (7b)
Number of flueless gas fires	0 * 40 =											0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =											0.1748 (8)
Pressure test												Yes
Pressure Test Method												Blower Door
Measured/design AP50												1.0000 (17)
Infiltration rate												0.2248 (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) =											0.1911 (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	0.2437	0.2389	0.2341	0.2102	0.2055	0.1816	0.1816	0.1768	0.1911	0.2055	0.2150	0.2246 (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	0.5297	0.5285	0.5274	0.5221	0.5211	0.5165	0.5165	0.5156	0.5183	0.5211	0.5231	0.5252 (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)			17.8800	1.1450	20.4733		(27)
Door			1.8900	1.0000	1.8900		(26a)
FD			1.7000	1.8000	3.0600		(26)
6-7			1.8400	0.9615	1.7692		(27a)
8-9			1.8400	0.9615	1.7692		(27a)
12			0.9200	0.9615	0.8846		(27a)
15-16			1.8400	0.9615	1.7692		(27a)
Floor 1 P/a 0.67			49.5100	0.1200	5.9412	110.0000	5446.1000 (28a)
Heatloss Floor 2 over garage			19.6900	0.1700	3.3473	20.0000	393.8000 (28b)
External Wall 1 Render	86.5800	16.6700	69.9100	0.1600	11.1856	9.0000	629.1900 (29a)
External Wall 2 Stone	9.2300	3.1000	6.1300	0.1600	0.9808	9.0000	55.1700 (29a)
External Wall 3 Garage	21.0700	1.7000	19.3700	0.1400	2.7118	18.0000	348.6600 (29a)
Wall 4 "attic"	13.6100		13.6100	0.0900	1.2249	9.0000	122.4900 (29a)
External Roof 1 Sloping	84.9400	6.4400	78.5000	0.1300	10.2050	9.0000	706.5000 (30)
Roof 2 "attic"	9.1400		9.1400	0.0861	0.7872	9.0000	82.2600 (30)
Total net area of external elements Aum(A, m ²)			293.7700				(31)
Fabric heat loss, W/K = Sum (A x U)					67.9994		(32)
Internal Wall 1 GF			45.6000			9.0000	410.4000 (32c)
Internal Wall 2 FF			52.9100			9.0000	476.1900 (32c)
Internal Floor 1			35.2800			18.0000	635.0400 (32d)
Internal Ceiling 1			35.2800			9.0000	317.5200 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 9623.3200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							92.1068 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E16 Corner (normal)				18.9500	0.0300	0.5685	
E5 Ground floor (normal)				33.3000	0.0210	0.6993	
E11 Eaves (insulation at rafter level)				17.5000	0.0390	0.6825	
E17 Corner (inverted - internal area greater than external area)				8.3500	-0.0150	-0.1253	
E13 Gable (insulation at rafter level)				26.2300	0.0240	0.6295	
R4 Ridge (vaulted ceiling)				14.9500	0.1200	1.7940	

Full SAP Calculation Printout



E6 Intermediate floor within a dwelling	12.4000	0.0800	0.9920
E20 Exposed floor (normal)	10.7500	0.3200	3.4400
E21 Exposed floor (inverted)	7.9500	0.3200	2.5440
E2 Other lintels (including other steel lintels)	12.5500	0.0840	1.0542
E3 Sill	10.8000	0.0430	0.4644
E4 Jamb	30.3600	0.0340	1.0322
R1 Head of roof window	6.5800	0.2400	1.5792
R2 Sill of roof window	6.5800	0.2400	1.5792
R3 Jamb of roof window	13.7200	0.2400	3.2928
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			20.2266 (36)
Point Thermal bridges			0.0000
Total fabric heat loss	(33) + (36) + (36a) =		88.2260 (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	39.9887	39.9016	39.8163	39.4156	39.3406	38.9916	38.9916	38.9270	39.1261	39.3406	39.4923	39.6509 (38)
Average = Sum(39)m / 12 =	128.2147	128.1276	128.0423	127.6416	127.5666	127.2176	127.2176	127.1530	127.3520	127.5666	127.7183	127.8768 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2272	1.2263	1.2255	1.2217	1.2210	1.2176	1.2176	1.2170	1.2189	1.2210	1.2224	1.2239 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7773 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	30.5636	30.1097	29.4705	28.2919	27.4094	26.4308	25.9023	26.5370	27.2281	28.2752	29.4780	30.4602 (42b)
Hot water usage for other uses	43.0724	41.5061	39.9399	38.3736	36.8073	35.2411	35.2411	36.8073	38.3736	39.9399	41.5061	43.0724 (42c)
Average daily hot water use (litres/day)												67.4940 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	73.6360	71.6158	69.4103	66.6655	64.2167	61.6719	61.1433	63.3443	65.6017	68.2151	70.9842	73.5327 (44)
Energy content (annual)	116.6214	101.9800	106.6811	91.2617	86.4480	75.8328	73.9475	78.4335	80.8935	92.5672	101.1300	115.1344 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
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 (57)
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 (59)
Total heat required for water heating calculated for each month												
WWHRS	99.1282	86.6830	90.6789	77.5725	73.4808	64.4579	62.8554	66.6685	68.7594	78.6821	85.9605	97.8642 (62)
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 (63a)
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 (63b)
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 (63c)
Output from w/h	99.1282	86.6830	90.6789	77.5725	73.4808	64.4579	62.8554	66.6685	68.7594	78.6821	85.9605	97.8642 (64)
12Total per year (kWh/year)												952.7914 (64)
Electric shower(s)	56.6879	50.5094	55.1543	52.6331	53.6207	51.1490	52.8539	53.6207	52.6331	55.1543	54.1172	56.6879 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												644.8215 (64a)
Heat gains from water heating, kWh/month	38.9540	34.2981	36.4583	32.5514	31.7754	28.9017	28.9273	30.0723	30.3481	33.4591	35.0194	38.6380 (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	138.8654	138.8654	138.8654	138.8654	138.8654	138.8654	138.8654	138.8654	138.8654	138.8654	138.8654	138.8654 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	132.8417	147.0747	132.8417	137.2698	132.8417	137.2698	132.8417	132.8417	137.2698	132.8417	137.2698	132.8417 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	263.3735	266.1065	259.2195	244.5577	226.0499	208.6552	197.0345	194.3015	201.1886	215.8503	234.3581	251.7528 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.8865	36.8865	36.8865	36.8865	36.8865	36.8865	36.8865	36.8865	36.8865	36.8865	36.8865	36.8865 (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)	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923 (71)
Water heating gains (Table 5)	52.3576	51.0388	49.0031	45.2103	42.7089	40.1413	38.8808	40.4198	42.1502	44.9719	48.6381	51.9328 (72)
Total internal gains	513.2324	528.8797	505.7239	491.6974	466.2601	450.7259	433.4166	432.2226	445.2681	458.3235	484.9255	501.1869 (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
East	1.2600	19.6403	0.7600	0.7000	0.7700	9.1235 (76)
South	8.9300	46.7521	0.7600	0.7000	0.7700	153.9207 (78)
West	7.6900	19.6403	0.7600	0.7000	0.7700	55.6825 (80)
North	1.8400	26.0000	0.6800	0.7000	1.0000	20.4947 (82)
East	0.9200	26.0000	0.6800	0.7000	1.0000	10.2473 (82)
South	1.8400	26.0000	0.6800	0.7000	1.0000	20.4947 (82)
West	1.8400	26.0000	0.6800	0.7000	1.0000	20.4947 (82)
Solar gains	290.4580	527.8372	794.7416	1081.2486	1281.0618	1297.7353
						1240.7181
						1090.8857
						895.5275
						604.4101
						354.2976
						244.2318 (83)

Full SAP Calculation Printout



Total gains 803.6904 1056.7169 1300.4655 1572.9460 1747.3219 1748.4611 1674.1347 1523.1082 1340.7956 1062.7336 839.2231 745.4187 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	20.8490	20.8631	20.8770	20.9426	20.9549	21.0124	21.0124	21.0231	20.9902	20.9549	20.9300	20.9041
alpha	2.3899	2.3909	2.3918	2.3962	2.3970	2.4008	2.4008	2.4015	2.3993	2.3970	2.3953	2.3936
util living area	0.9377	0.8901	0.8177	0.6991	0.5612	0.4228	0.3179	0.3593	0.5479	0.7792	0.9049	0.9467 (86)
MIT	18.2344	18.7625	19.4180	20.1116	20.5889	20.8500	20.9450	20.9247	20.7118	20.0039	18.9718	18.1213 (87)
Th 2	19.8983	19.8990	19.8996	19.9027	19.9033	19.9059	19.9059	19.9064	19.9049	19.9033	19.9021	19.9009 (88)
util rest of house	0.9291	0.8759	0.7953	0.6646	0.5137	0.3609	0.2443	0.2817	0.4830	0.7435	0.8901	0.9392 (89)
MIT 2	17.4005	17.9129	18.5406	19.1858	19.6058	19.8181	19.8829	19.8729	19.7218	19.1109	18.1291	17.2916 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	17.6313	18.1481	18.7834	19.4421	19.8779	20.1037	20.1769	20.1640	19.9958	19.3581	18.3623	17.5212 (92)
Temperature adjustment												0.0000
adjusted MIT	17.6313	18.1481	18.7834	19.4421	19.8779	20.1037	20.1769	20.1640	19.9958	19.3581	18.3623	17.5212 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9054	0.8480	0.7688	0.6488	0.5125	0.3725	0.2630	0.3006	0.4888	0.7231	0.8635	0.9172 (94)
Useful gains	727.6604	896.0723	999.8083	1020.4664	895.5083	651.3539	440.3416	457.8444	655.3533	768.4148	724.6672	683.6999 (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	1709.2673	1697.4469	1572.7985	1345.6054	1043.2288	700.1729	455.0395	478.6097	750.8482	1117.2419	1438.4062	1703.4791 (97)
Space heating kWh	730.3155	538.5237	426.3047	234.1001	109.9041	0.0000	0.0000	0.0000	0.0000	259.5274	513.8920	758.7158 (98a)
Space heating requirement - total per year (kWh/year)												3571.2833
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	730.3155	538.5237	426.3047	234.1001	109.9041	0.0000	0.0000	0.0000	0.0000	259.5274	513.8920	758.7158 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3571.2833
Space heating per m2												(98c) / (4) =
												34.1815 (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	1195.8456	941.4104	966.3627	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8458	0.8888	0.8644	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1011.4468	836.7190	835.2824	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1896.8533	1817.6648	1658.6667	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	637.4927	729.8237	612.5980	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	159.3732	182.4559	153.1495	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												494.9786 (107)
Energy for space heating												34.1815 (99)
Energy for space cooling												4.7375 (108)
Total												38.9190 (109)
Fabric Energy Efficiency (DFEE)												38.9 (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 (m2)	Storey height (m)	Volume (m3)
Ground floor	49.5100 (1b)	x	2.6000 (2b)
First floor	54.9700 (1c)	x	1.8200 (2c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	104.4800		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	228.7714 (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)

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) =												
Pressure test		40.0000 / (5) =	0.1748	(8)								
Pressure Test Method			Yes									
Measured/design AP50			Blower Door									
Infiltration rate			5.0000	(17)								
Number of sides sheltered			0.4248	(18)								
			2	(19)								
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.8500	(20)								
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.3611	(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
Adj infiltr 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
	0.4604	0.4514	0.4424	0.3972	0.3882	0.3431	0.3431	0.3340	0.3611	0.3882	0.4063	0.4243
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000
Effective ac	0.6060	0.6019	0.5978	0.5789	0.5754	0.5588	0.5588	0.5558	0.5652	0.5754	0.5825	0.5900
												(22)
												(22a)
												(22b)
												(23)
												(23c)
												(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)			16.5700	1.1450	18.9733		(27)
6-7			1.7000	1.5918	2.7060		(27a)
8-9			1.7000	1.5918	2.7060		(27a)
12			0.8500	1.5918	1.3530		(27a)
15-16			1.7000	1.5918	2.7060		(27a)
Floor 1 P/a 0.67			49.5100	0.1300	6.4363		(28a)
Heatloss Floor 2 over garage			19.6900	0.1300	2.5597		(28b)
External Wall 1 Render	86.5800	15.5900	70.9900	0.1800	12.7782		(29a)
External Wall 2 Stone	9.2300	2.8700	6.3600	0.1800	1.1448		(29a)
External Wall 3 Garage	21.0700	1.7000	19.3700	0.1800	3.4866		(29a)
Wall 4 "attic"	13.6100		13.6100	0.1800	2.4498		(29a)
External Roof 1 Sloping	84.9400	5.9500	78.9900	0.1100	8.6889		(30)
Roof 2 "attic"	9.1400		9.1400	0.1100	1.0054		(30)
Total net area of external elements Aum(A, m2)			293.7700				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	70.5840	(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 92.1068 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	18.9500	0.0900	1.7055
E5 Ground floor (normal)	33.3000	0.1600	5.3280
E11 Eaves (insulation at rafter level)	17.5000	0.0400	0.7000
E17 Corner (inverted - internal area greater than external area)	8.3500	-0.0900	-0.7515
E13 Gable (insulation at rafter level)	26.2300	0.0800	2.0984
R4 Ridge (vaulted ceiling)	14.9500	0.0800	1.1960
E6 Intermediate floor within a dwelling	12.4000	0.0000	0.0000
E20 Exposed floor (normal)	10.7500	0.3200	3.4400
E21 Exposed floor (inverted)	7.9500	0.3200	2.5440
E2 Other lintels (including other steel lintels)	12.5500	0.0500	0.6275
E3 Sill	10.8000	0.0500	0.5400
E4 Jamb	30.3600	0.0500	1.5180
R1 Head of roof window	6.5800	0.0800	0.5264
R2 Sill of roof window	6.5800	0.0600	0.3948
R3 Jamb of roof window	13.7200	0.0800	1.0976

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 20.9647 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 91.5487 (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	45.7495	45.4387	45.1342	43.7035	43.4359	42.1899	42.1899	41.9591	42.6698	43.4359	43.9774	44.5435
Heat transfer coeff	137.2981	136.9874	136.6828	135.2522	134.9845	133.7385	133.7385	133.5078	134.2185	134.9845	135.5260	136.0921
Average = Sum(39)m / 12 =												135.2509

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.3141	1.3111	1.3082	1.2945	1.2920	1.2800	1.2800	1.2778	1.2846	1.2920	1.2971	1.3026
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7773	(42)
Hot water usage for mixer showers													0.0000	(42a)
Hot water usage for baths	30.5636	30.1097	29.4705	28.2919	27.4094	26.4308	25.9023	26.5370	27.2281	28.2752	29.4780	30.4602	30.4602	(42b)
Hot water usage for other uses	43.0724	41.5061	39.9399	38.3736	36.8073	35.2411	35.2411	36.8073	38.3736	39.9399	41.5061	43.0724	43.0724	(42c)
Average daily hot water use (litres/day)													67.4940	(43)
Daily hot water use	73.6360	71.6158	69.4103	66.6655	64.2167	61.6719	61.1433	63.3443	65.6017	68.2151	70.9842	73.5327	73.5327	(44)
Energy conte	116.6214	101.9800	106.6811	91.2617	86.4480	75.8328	73.9475	78.4335	80.8935	92.5672	101.1300	115.1344	115.1344	(45)
Energy content (annual)										Total = Sum(45)m =			1120.9311	
Distribution loss (46)m = 0.15 x (45)m													0.0000	(46)
Water storage loss:													0.0000	(46)
Total storage loss													0.0000	(46)
If cylinder contains dedicated solar storage													0.0000	(56)
													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															
	99.1282	86.6830	90.6789	77.5725	73.4808	64.4579	62.8554	66.6685	68.7594	78.6821	85.9605	97.8642	97.8642	97.8642	(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	99.1282	86.6830	90.6789	77.5725	73.4808	64.4579	62.8554	66.6685	68.7594	78.6821	85.9605	97.8642	97.8642	97.8642	(64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											952.7914	(64)		
Electric shower(s)	56.6879	50.5094	55.1543	52.6331	53.6207	51.1490	52.8539	53.6207	52.6331	55.1543	54.1172	56.6879	56.6879	56.6879	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											644.8215	(64a)			
Heat gains from water heating, kWh/month															
	38.9540	34.2981	36.4583	32.5514	31.7754	28.9017	28.9273	30.0723	30.3481	33.4591	35.0194	38.6380	38.6380	38.6380	(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	(66)
	138.8654	138.8654	138.8654	138.8654	138.8654	138.8654	138.8654	138.8654	138.8654	138.8654	138.8654	138.8654	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	132.8146	147.0447	132.8146	137.2417	132.8146	137.2417	132.8146	132.8146	137.2417	132.8146	137.2417	132.8146	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	263.3735	266.1065	259.2195	244.5577	226.0499	208.6552	197.0345	194.3015	201.1886	215.8503	234.3581	251.7528	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.8865	36.8865	36.8865	36.8865	36.8865	36.8865	36.8865	36.8865	36.8865	36.8865	36.8865	36.8865	(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)													
	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	(71)
Water heating gains (Table 5)													
	52.3576	51.0388	49.0031	45.2103	42.7089	40.1413	38.8808	40.4198	42.1502	44.9719	48.6381	51.9328	(72)
Total internal gains													
	513.2053	528.8497	505.6968	491.6694	466.2330	450.6979	433.3895	432.1955	445.2401	458.2964	484.8975	501.1598	(73)

6. Solar gains

[Jan]		Area	Solar flux	g	FF	Access	Gains						
		m2	Table 6a	or Table 6b	Specific data	factor	W						
			W/m2		or Table 6c	Table 6d							
East		1.1700	19.6403	0.6300	0.7000	0.7700	7.0227 (76)						
South		8.2800	46.7521	0.6300	0.7000	0.7700	118.3050 (78)						
West		7.1200	19.6403	0.6300	0.7000	0.7700	42.7365 (80)						
North		1.7000	26.0000	0.6300	0.7000	1.0000	17.5430 (82)						
East		0.8500	26.0000	0.6300	0.7000	1.0000	8.7715 (82)						
South		1.7000	26.0000	0.6300	0.7000	1.0000	17.5430 (82)						
West		1.7000	26.0000	0.6300	0.7000	1.0000	17.5430 (82)						
Solar gains	229.4646	418.6166	633.8208	866.9733	1030.6210	1045.3577	998.8968	876.0614	715.8386	480.3451	280.2070	192.7386	(83)
Total gains	742.6699	947.4663	1139.5175	1358.6426	1496.8540	1496.0556	1432.2864	1308.2569	1161.0787	938.6415	765.1045	693.8984	(84)

7. Mean internal temperature (heating season)

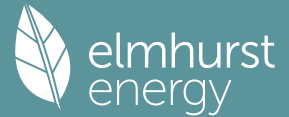
Temperature during heating periods in the living area from Table 9, Th1 (C)													
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(85)
tau	19.4696	19.5138	19.5573	19.7641	19.8033	19.9878	19.9878	20.0224	19.9164	19.8033	19.7242	19.6422	
alpha	2.2980	2.3009	2.3038	2.3176	2.3202	2.3325	2.3325	2.3348	2.3278	2.3202	2.3149	2.3095	
util living area	0.9480	0.9130	0.8585	0.7605	0.6353	0.4933	0.3788	0.4231	0.6173	0.8234	0.9223	0.9548	(86)
MIT	17.9278	18.4054	19.0554	19.8256	20.4070	20.7693	20.9102	20.8813	20.5910	19.7705	18.7086	17.8476	(87)
Th 2	19.8298	19.8321	19.8344	19.8451	19.8471	19.8565	19.8565	19.8582	19.8529	19.8471	19.8431	19.8388	(88)
util rest of house	0.9404	0.9008	0.8388	0.7279	0.5859	0.4234	0.2906	0.3322	0.5490	0.7908	0.9093	0.9481	(89)
MIT 2	17.0574	17.5248	18.1551	18.8886	19.4132	19.7203	19.8189	19.8052	19.5897	18.8613	17.8372	16.9842	(90)
Living area fraction	FLA = Living area / (4) =												
MIT	17.2983	17.7686	18.4043	19.1480	19.6883	20.0106	20.1210	20.1031	19.8668	19.1130	18.0784	17.2232	(92)
Temperature adjustment	0.0000												
adjusted MIT	17.2983	17.7686	18.4043	19.1480	19.6883	20.0106	20.1210	20.1031	19.8668	19.1130	18.0784	17.2232	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(94)
	0.9176	0.8728	0.8093	0.7055	0.5785	0.4333	0.3119	0.3527	0.5499	0.7658	0.8829	0.9269	
Useful gains	681.4446	826.9209	922.2353	958.5571	865.9639	648.2639	446.6933	461.3939	638.4566	718.8531	675.5174	643.2050	(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	1784.6436	1762.8330	1627.1117	1386.0602	1078.2970	723.6118	470.8877	494.3875	774.0168	1149.1189	1487.8598	1772.3528	(97)
Space heating kWh	820.7800	628.9329	524.4281	307.8023	157.9758	0.0000	0.0000	0.0000	0.0000	320.1178	584.8866	840.0860	(98a)
Space heating requirement - total per year (kWh/year)	4185.0094												
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	820.7800	628.9329	524.4281	307.8023	157.9758	0.0000	0.0000	0.0000	0.0000	320.1178	584.8866	840.0860	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)	4185.0094												
Space heating per m2	(98c) / (4) =											40.0556 (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	1257.1421	989.6651	1014.6591	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.7818	0.8360	0.8064	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	982.8399	827.3423	818.2224	0.0000	0.0000	0.0000	0.0000 (102)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	1615.2809	1547.6928	1418.1023	0.0000	0.0000	0.0000	0.0000 (103)
Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	455.3575	535.9408	446.3106	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	113.8394	133.9852	111.5777	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling requirement	0.0000	0.0000	0.0000	0.0000	0.0000	113.8394	133.9852	111.5777	0.0000	0.0000	0.0000	0.0000 (107)
Energy for space heating												359.4022 (107)
Energy for space cooling												40.0556 (99)
Total												3.4399 (108)
Fabric Energy Efficiency (TFEE)												43.4955 (109)
												43.5 (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	49.5100 (1b)	x 2.6000 (2b)	= 128.7260 (1b) - (3b)
First floor	54.9700 (1c)	x 1.8200 (2c)	= 100.0454 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	104.4800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	228.7714 (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												
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)			17.8800	1.1450	20.4733		(27)
Door			1.8900	1.0000	1.8900		(26a)
FD			1.7000	1.8000	3.0600		(26)
6-7			1.8400	0.9615	1.7692		(27a)
8-9			1.8400	0.9615	1.7692		(27a)
12			0.9200	0.9615	0.8846		(27a)
15-16			1.8400	0.9615	1.7692		(27a)
Floor 1 P/a 0.67			49.5100	0.1200	5.9412	110.0000	5446.1000 (28a)
Heatloss Floor 2 over garage			19.6900	0.1700	3.3473	20.0000	393.8000 (28b)
External Wall 1 Render	86.5800	16.6700	69.9100	0.1600	11.1856	9.0000	629.1900 (29a)
External Wall 2 Stone	9.2300	3.1000	6.1300	0.1600	0.9808	9.0000	55.1700 (29a)
External Wall 3 Garage	21.0700	1.7000	19.3700	0.1400	2.7118	18.0000	348.6600 (29a)
Wall 4 "attic"	13.6100		13.6100	0.0900	1.2249	9.0000	122.4900 (29a)
External Roof 1 Sloping	84.9400	6.4400	78.5000	0.1300	10.2050	9.0000	706.5000 (30)
Roof 2 "attic"	9.1400		9.1400	0.0861	0.7872	9.0000	82.2600 (30)
Total net area of external elements Aum(A, m ²)			293.7700				(31)

Full SAP Calculation Printout



Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	67.9994		(33)
Internal Wall 1 GF	45.6000		9.0000	410.4000 (32c)
Internal Wall 2 FF	52.9100		9.0000	476.1900 (32c)
Internal Floor 1	35.2800		18.0000	635.0400 (32d)
Internal Ceiling 1	35.2800		9.0000	317.5200 (32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	9623.3200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		92.1068 (35)

List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E16 Corner (normal)	18.9500	0.0300	0.5685
E5 Ground floor (normal)	33.3000	0.0210	0.6993
E11 Eaves (insulation at rafter level)	17.5000	0.0390	0.6825
E17 Corner (inverted - internal area greater than external area)	8.3500	-0.0150	-0.1253
E13 Gable (insulation at rafter level)	26.2300	0.0240	0.6295
R4 Ridge (vaulted ceiling)	14.9500	0.1200	1.7940
E6 Intermediate floor within a dwelling	12.4000	0.0800	0.9920
E20 Exposed floor (normal)	10.7500	0.3200	3.4400
E21 Exposed floor (inverted)	7.9500	0.3200	2.5440
E2 Other lintels (including other steel lintels)	12.5500	0.0840	1.0542
E3 Sill	10.8000	0.0430	0.4644
E4 Jamb	30.3600	0.0340	1.0322
R1 Head of roof window	6.5800	0.2400	1.5792
R2 Sill of roof window	6.5800	0.2400	1.5792
R3 Jamb of roof window	13.7200	0.2400	3.2928

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		20.2266 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	88.2260 (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
	11.2628	11.1826	11.1024	10.7014	10.6211	10.2201	10.2201	10.1399	10.3805	10.6211	10.7816	10.9420 (38)
Heat transfer coeff	99.4888	99.4086	99.3284	98.9273	98.8471	98.4461	98.4461	98.3658	98.6065	98.8471	99.0075	99.1680 (39)
Average = Sum(39)m / 12 =												98.9073

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9522	0.9515	0.9507	0.9469	0.9461	0.9422	0.9422	0.9415	0.9438	0.9461	0.9476	0.9492 (40)
HLP (average)												0.9467
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

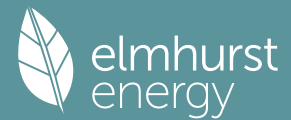
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7773 (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	81.6466	80.4340	78.7265	75.5781	73.2206	70.6065	69.1945	70.8901	72.7363	75.5334	78.7467	81.3706	81.3706 (42b)
Hot water usage for other uses	43.0724	41.5061	39.9399	38.3736	36.8073	35.2411	35.2411	36.8073	38.3736	39.9399	41.5061	43.0724	43.0724 (42c)
Average daily hot water use (litres/day)													114.8560 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	124.7190	121.9402	118.6663	113.9517	110.0279	105.8475	104.4355	107.6974	111.1099	115.4733	120.2528	124.4430 (44)	
Energy conte	197.5244	173.6412	182.3857	155.9941	148.1187	130.1519	126.3057	133.3519	137.0096	156.6962	171.3222	194.8476 (45)	
Energy content (annual)													Total = Sum(45)m = 1907.3492
Distribution loss (46)m = 0.15 x (45)m	29.6287	26.0462	27.3579	23.3991	22.2178	19.5228	18.9459	20.0028	20.5514	23.5044	25.6983	29.2271	29.2271 (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	247.5708	218.8444	232.4321	204.4261	198.1651	178.5839	176.3521	183.3983	185.4416	206.7426	219.7542	244.8940	244.8940 (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	247.5708	218.8444	232.4321	204.4261	198.1651	178.5839	176.3521	183.3983	185.4416	206.7426	219.7542	244.8940	244.8940 (64)
													Total per year (kWh/year) = Sum(64)m = 2496.6052 (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)
													Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month	105.7140	93.8982	100.6804	90.6136	89.2866	82.0211	82.0338	84.3766	84.3013	92.1386	95.7102	104.8240	104.8240 (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	
	166.6385	166.6385	166.6385	166.6385	166.6385	166.6385	166.6385	166.6385	166.6385	166.6385	166.6385	166.6385	166.6385 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.3429	26.0621	21.1952	16.0461	11.9946	10.1264	10.9419	14.2227	19.0897	24.2388	28.2902	30.1585	30.1585 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	393.0948	397.1739	386.8947	365.0115	337.3880	311.4257	294.0813	290.0022	300.2814	322.1646	349.7882	375.7504	375.7504 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.4412	54.4412	54.4412	54.4412	54.4412	54.4412	54.4412	54.4412	54.4412	54.4412	54.4412	54.4412	54.4412 (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)	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923 (71)
Water heating gains (Table 5)	142.0887	139.7295	135.3231	125.8523	120.0089	113.9182	110.2605	113.4094	117.0851	123.8422	132.9309	140.8924	140.8924 (72)
Total internal gains	674.5138	672.9529	653.4003	616.8973	579.3788	545.4576	525.2710	527.6217	546.4436	580.2329	620.9966	656.7886	656.7886 (73)

Full SAP Calculation Printout



6. Solar gains

[Jan]		Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W					
East		1.2600	19.6403	0.7600	0.7000	0.7700	9.1235 (76)					
South		8.9300	46.7521	0.7600	0.7000	0.7700	153.9207 (78)					
West		7.6900	19.6403	0.7600	0.7000	0.7700	55.6825 (80)					
North		1.8400	26.0000	0.6800	0.7000	1.0000	20.4947 (82)					
East		0.9200	26.0000	0.6800	0.7000	1.0000	10.2473 (82)					
South		1.8400	26.0000	0.6800	0.7000	1.0000	20.4947 (82)					
West		1.8400	26.0000	0.6800	0.7000	1.0000	20.4947 (82)					
Solar gains	290.4580	527.8372	794.7416	1081.2486	1281.0618	1297.7353	1240.7181	1090.8857	895.5275	604.4101	354.2976	244.2318 (83)
Total gains	964.9718	1200.7901	1448.1419	1698.1458	1860.4406	1843.1929	1765.9891	1618.5074	1441.9711	1184.6430	975.2942	901.0204 (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	26.8688	26.8905	26.9122	27.0213	27.0432	27.1534	27.1534	27.1755	27.1092	27.0432	26.9994	26.9557	
alpha	2.7913	2.7927	2.7941	2.8014	2.8029	2.8102	2.8102	2.8117	2.8073	2.8029	2.8000	2.7970	
util living area	0.8946	0.8313	0.7344	0.5987	0.4569	0.3306	0.2417	0.2739	0.4397	0.6828	0.8478	0.9089 (86)	
Living	19.5684	19.8927	20.2661	20.5913	20.7757	20.8566	20.8804	20.8758	20.8139	20.5269	19.9791	19.4860	
Non living	18.4478	18.8457	19.2957	19.6764	19.8799	19.9649	19.9855	19.9831	19.9261	19.6167	18.9635	18.3478	
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	20.2676	19.8927	20.2661	20.5913	20.7757	20.8566	20.8804	20.8758	20.8139	20.5269	19.9791	19.6977 (87)	
Th 2	20.1233	20.1240	20.1246	20.1279	20.1285	20.1317	20.1317	20.1324	20.1304	20.1285	20.1272	20.1259 (88)	
util rest of house	0.8830	0.8147	0.7110	0.5681	0.4205	0.2886	0.1952	0.2241	0.3915	0.6478	0.8296	0.8986 (89)	
MIT 2	19.4554	18.8457	19.2957	19.6764	19.8799	19.9649	19.9855	19.9831	19.9261	19.6167	18.9635	18.6682 (90)	
Living area fraction										FLA = Living area / (4) =			0.2768 (91)
MIT	19.6802	19.1355	19.5643	19.9296	20.1279	20.2117	20.2332	20.2302	20.1719	19.8686	19.2446	18.9532 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.6802	19.1355	19.5643	19.9296	20.1279	20.2117	20.2332	20.2302	20.1719	19.8686	19.2446	18.9532 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8765	0.7935	0.6948	0.5608	0.4205	0.2925	0.2007	0.2298	0.3939	0.6366	0.8084	0.8823 (94)	
Useful gains	845.7937	952.8169	1006.2094	952.3336	782.2890	539.2219	354.4606	371.9417	567.9517	754.1810	788.4507	794.9853 (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	1530.1577	1415.1353	1297.6562	1091.1326	833.0735	552.4488	357.6766	376.7580	598.7247	916.1748	1202.4067	1463.0438 (97)	
Space heating kWh	509.1668	310.6780	216.8364	99.9353	37.7836	0.0000	0.0000	0.0000	0.0000	120.5234	298.0483	497.0355 (98a)	
Space heating requirement - total per year (kWh/year)												2090.0075	
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	509.1668	310.6780	216.8364	99.9353	37.7836	0.0000	0.0000	0.0000	0.0000	120.5234	298.0483	497.0355 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												2090.0075	
Space heating per m ²												(98c) / (4) =	20.0039 (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 %)													375.5190 (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	509.1668	310.6780	216.8364	99.9353	37.7836	0.0000	0.0000	0.0000	0.0000	120.5234	298.0483	497.0355 (98)	
Space heating efficiency (main heating system 1)	375.5190	375.5190	375.5190	375.5190	375.5190	0.0000	0.0000	0.0000	0.0000	375.5190	375.5190	375.5190 (210)	
Space heating fuel (main heating system)	135.5902	82.7330	57.7431	26.6126	10.0617	0.0000	0.0000	0.0000	0.0000	32.0952	79.3697	132.3596 (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	247.5708	218.8444	232.4321	204.4261	198.1651	178.5839	176.3521	183.3983	185.4416	206.7426	219.7542	244.8940 (64)	
Efficiency of water heater (217)m	200.6324	200.6324	200.6324	200.6324	200.6324	200.6324	200.6324	200.6324	200.6324	200.6324	200.6324	200.6324 (216)	
Fuel for water heating, kWh/month	123.3952	109.0773	115.8497	101.8909	98.7702	89.0105	87.8981	91.4101	92.4285	103.0455	109.5308	122.0610 (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	13.5590	12.2468	13.5590	13.1216	13.5590	13.1216	13.5590	13.1216	13.5590	13.1216	13.5590	13.5590 (231)	
Lighting	25.6837	20.6044	18.5520	13.5920	10.4988	8.5776	9.5774	12.4491	16.1701	21.2160	23.9635	26.3975 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-51.9137	-76.7100	-115.4677	-132.9526	-144.5956	-134.2195	-132.2156	-123.6428	-107.2475	-88.0515	-57.6460	-44.1984 (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



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	-21.6701	-50.5655	-112.2228	-186.4248	-261.1285	-268.9539	-263.8418	-215.1771	-147.9657	-77.7185	-30.5434	-16.7525	(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												556.5650	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												200.6324	
Water heating fuel used												1244.3678	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.5720) mechanical ventilation fans (SFP = 0.5720)												159.6458	(230a)
Total electricity for the above, kWh/year												159.6458	(231)
Electricity for lighting (calculated in Appendix L)												207.2822	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2861.8256	(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												-693.9647	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	556.5650	16.4900	91.7776	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1244.3678	16.4900	205.1962	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	159.6458	16.4900	26.3256	(249)
Energy for lighting	207.2822	16.4900	34.1808	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1208.8609	16.4900	-199.3412	
PV Unit electricity exported	-1652.9646	5.5900	-92.4007	
Total			-291.7419	(252)
Total energy cost			65.7384	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.1583	(257)
SAP value		97.4336	
SAP rating (Section 12)		97	(258)
SAP band		A	

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

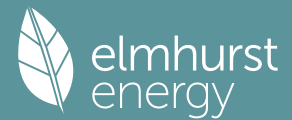
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	556.5650	0.1567	87.2313	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1244.3678	0.1409	175.3003	(264)
Space and water heating			262.5316	(265)
Pumps, fans and electric keep-hot	159.6458	0.1387	22.1448	(267)
Energy for lighting	207.2822	0.1443	29.9172	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1208.8609	0.1341	-162.0993	
PV Unit electricity exported	-1652.9646	0.1234	-203.9598	
Total			-366.0591	(269)
Total CO2, kg/year			-51.4655	(272)
CO2 emissions per m2			-0.4900	(273)
EI value			100.4614	
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

1. Overall dwelling characteristics

Area (m2)	Storey height (m)	Volume (m3)
--------------	----------------------	----------------

Full SAP Calculation Printout



4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.7773 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths	81.6466	80.4340	78.7265	75.5781	73.2206	70.6065	69.1945	70.8901	72.7363	75.5334	78.7467	81.3706 (42b)
Hot water usage for other uses	43.0724	41.5061	39.9399	38.3736	36.8073	35.2411	35.2411	36.8073	38.3736	39.9399	41.5061	43.0724 (42c)
Average daily hot water use (litres/day)												114.8560 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	124.7190	121.9402	118.6663	113.9517	110.0279	105.8475	104.4355	107.6974	111.1099	115.4733	120.2528	124.4430 (44)
Distribution loss (46)m = 0.15 x (45)m	197.5244	173.6412	182.3857	155.9941	148.1187	130.1519	126.3057	133.3519	137.0096	156.6962	171.3222	194.8476 (45)
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)												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	247.5708	218.8444	232.4321	204.4261	198.1651	178.5839	176.3521	183.3983	185.4416	206.7426	219.7542	244.8940 (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	247.5708	218.8444	232.4321	204.4261	198.1651	178.5839	176.3521	183.3983	185.4416	206.7426	219.7542	244.8940 (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	105.7140	93.8982	100.6804	90.6136	89.2866	82.0211	82.0338	84.3766	84.3013	92.1386	95.7102	104.8240 (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	166.6385	166.6385	166.6385	166.6385	166.6385	166.6385	166.6385	166.6385	166.6385	166.6385	166.6385	166.6385 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.3429	26.0621	21.1952	16.0461	11.9946	10.1264	10.9419	14.2227	19.0897	24.2388	28.2902	30.1585 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	393.0948	397.1739	386.8947	365.0115	337.3880	311.4257	294.0813	290.0022	300.2814	322.1646	349.7882	375.7504 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.4412	54.4412	54.4412	54.4412	54.4412	54.4412	54.4412	54.4412	54.4412	54.4412	54.4412	54.4412 (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)	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923 (71)
Water heating gains (Table 5)	142.0887	139.7295	135.3231	125.8523	120.0089	113.9182	110.2605	113.4094	117.0851	123.8422	132.9309	140.8924 (72)
Total internal gains	674.5138	672.9529	653.4003	616.8973	579.3788	545.4576	525.2710	527.6217	546.4436	580.2329	620.9966	656.7886 (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					
East	1.2600	27.2069	0.7600	0.7000	0.7700	12.6385 (76)						
South	8.9300	59.9387	0.7600	0.7000	0.7700	197.3348 (78)						
West	7.6900	27.2069	0.7600	0.7000	0.7700	77.1347 (80)						
North	1.8400	37.0000	0.6800	0.7000	1.0000	29.1655 (82)						
East	0.9200	37.0000	0.6800	0.7000	1.0000	14.5827 (82)						
South	1.8400	37.0000	0.6800	0.7000	1.0000	29.1655 (82)						
West	1.8400	37.0000	0.6800	0.7000	1.0000	29.1655 (82)						
Solar gains	389.1871	610.0721	909.0509	1262.1012	1421.2977	1579.2935	1369.7127	1296.3008	1083.6586	729.7456	455.3601	317.3031 (83)
Total gains	1063.7009	1283.0250	1562.4512	1878.9985	2000.6765	2124.7511	1894.9837	1823.9226	1630.1022	1309.9785	1076.3567	974.0917 (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	26.2549	26.3796	26.4424	26.6113	26.6113	26.7609	26.8040	26.8040	26.6326	26.4634	26.3796	26.2549
alpha	2.7503	2.7586	2.7628	2.7741	2.7741	2.7841	2.7869	2.7869	2.7755	2.7642	2.7586	2.7503
util living area	0.8298	0.7672	0.6740	0.5487	0.4350	0.3147	0.2683	0.2629	0.3755	0.5766	0.7531	0.8442 (86)
Living	19.9975	20.1913	20.4260	20.6514	20.7842	20.8559	20.8730	20.8748	20.8396	20.6859	20.3555	19.9821
Non living	18.9662	19.1980	19.4721	19.7308	19.8753	19.9513	19.9688	19.9705	19.9352	19.7771	19.4035	18.9508
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	20.4872	20.1913	20.4260	20.6514	20.7842	20.8559	20.8730	20.8748	20.8396	20.6859	20.3555	20.1245 (87)
Th 2	20.1046	20.1085	20.1104	20.1156	20.1156	20.1201	20.1214	20.1214	20.1162	20.1111	20.1085	20.1046 (88)

Full SAP Calculation Printout



util rest of house	0.8101	0.7438	0.6462	0.5171	0.3993	0.2769	0.2246	0.2174	0.3283	0.5331	0.7229	0.8248 (89)
MIT 2	19.6508	19.1980	19.4721	19.7308	19.8753	19.9513	19.9688	19.9705	19.9352	19.7771	19.4035	19.1587 (90)
Living area fraction									fLA = Living area / (4) =			0.2768 (91)
MIT	19.8823	19.4730	19.7361	19.9856	20.1269	20.2017	20.2191	20.2208	20.1855	20.0287	19.6670	19.4260 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8823	19.4730	19.7361	19.9856	20.1269	20.2017	20.2191	20.2208	20.1855	20.0287	19.6670	19.4260 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8048	0.7254	0.6338	0.5123	0.3997	0.2805	0.2295	0.2226	0.3320	0.5288	0.7063	0.8082	(94)
Useful gains	856.0616	930.7498	990.2496	962.6426	799.7500	595.9449	434.8858	405.9438	541.2687	692.7261	760.2761	787.2371	(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	1311.6123	1253.7974	1206.6610	1073.3857	846.4897	609.5008	440.7144	410.9645	560.6266	780.6950	999.8584	1214.2493	(97)
Space heating kWh	338.9297	217.0880	161.0101	79.7350	34.7744	0.0000	0.0000	0.0000	0.0000	65.4489	172.4993	317.6971	(98a)
Space heating requirement - total per year (kWh/year)												1387.1824	
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	338.9297	217.0880	161.0101	79.7350	34.7744	0.0000	0.0000	0.0000	0.0000	65.4489	172.4993	317.6971	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1387.1824	
Space heating per m2										(98c) / (4) =		13.2770	(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 %)													374.2516 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement	338.9297	217.0880	161.0101	79.7350	34.7744	0.0000	0.0000	0.0000	0.0000	65.4489	172.4993	317.6971	(98)
Space heating efficiency (main heating system 1)	374.2516	374.2516	374.2516	374.2516	374.2516	0.0000	0.0000	0.0000	0.0000	374.2516	374.2516	374.2516	(210)
Space heating fuel (main heating system)	90.5620	58.0059	43.0219	21.3052	9.2917	0.0000	0.0000	0.0000	0.0000	17.4879	46.0918	84.8886	(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	247.5708	218.8444	232.4321	204.4261	198.1651	178.5839	176.3521	183.3983	185.4416	206.7426	219.7542	244.8940	(64)
Efficiency of water heater													200.4155 (216)
(217)m	200.4155	200.4155	200.4155	200.4155	200.4155	200.4155	200.4155	200.4155	200.4155	200.4155	200.4155	200.4155	(217)
Fuel for water heating, kWh/month	123.5288	109.1953	115.9751	102.0012	98.8771	89.1068	87.9933	91.5090	92.5286	103.1570	109.6493	122.1931	(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	13.5590	12.2468	13.5590	13.1216	13.5590	13.1216	13.5590	13.5590	13.1216	13.5590	13.1216	13.5590	(231)
Lighting	25.6837	20.6044	18.5520	13.5920	10.4988	8.5776	9.5774	12.4491	16.1701	21.2160	23.9635	26.3975	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-65.8831	-85.4882	-126.1067	-144.7176	-152.2645	-145.9656	-138.4819	-134.7173	-119.9252	-99.9173	-69.8924	-54.9740	(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	-35.0199	-65.0512	-139.7792	-233.9952	-302.9557	-349.1955	-303.1718	-273.4937	-194.8007	-104.7845	-46.1194	-26.0482	(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													370.6550 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													200.4155
Water heating fuel used													1245.7146 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.5720)													
mechanical ventilation fans (SFP = 0.5720)													159.6458 (230a)
Total electricity for the above, kWh/year													159.6458 (231)
Electricity for lighting (calculated in Appendix L)													207.2822 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-3412.7488 (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													-1429.4511 (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	370.6550	21.5100	79.7279 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1245.7146	21.5100	267.9532 (247)
Energy for instantaneous electric shower(s)	0.0000	21.5100	0.0000 (247a)
Pumps, fans and electric keep-hot	159.6458	21.5100	34.3398 (249)
Energy for lighting	207.2822	21.5100	44.5864 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1338.3337	21.5100	-287.8756
PV Unit electricity exported	-2074.4151	5.5900	-115.9598
Total			-403.8354 (252)
Total energy cost			22.7720 (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	370.6550	0.1567	58.0731 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1245.7146	0.1409	175.4900 (264)
Space and water heating			233.5631 (265)
Pumps, fans and electric keep-hot	159.6458	0.1387	22.1448 (267)
Energy for lighting	207.2822	0.1443	29.9172 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1338.3337	0.1347	-180.2147
PV Unit electricity exported	-2074.4151	0.1242	-257.7230
Total			-437.9378 (269)
Total CO2, kg/year			-152.3125 (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	370.6550	1.5800	585.6300 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1245.7146	1.5209	1894.6114 (278)
Space and water heating			2480.2414 (279)
Pumps, fans and electric keep-hot	159.6458	1.5128	241.5122 (281)
Energy for lighting	207.2822	1.5338	317.9364 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1338.3337	1.4977	-2004.3672
PV Unit electricity exported	-2074.4151	0.4560	-945.8870
Total			-2950.2542 (283)
Total Primary energy kWh/year			89.4358 (286)

SAP 10 EPC IMPROVEMENTS

SEC1 - ASHP ROI TF 0.15 improv

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

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

Recommended measures:
N Solar water heating SAP change + 1.4 Cost change -£ 61 CO2 change -42 kg (27.5%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£61	0.40 kg/m ²	A 99 A 101
Total Savings	£61	0.40 kg/m²	

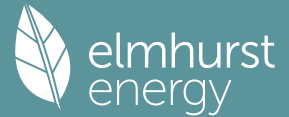
Potential energy efficiency rating: A 99
Potential environmental impact rating: A 101

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	£427	£354	£73
Space heating	£114	£131	-£17
Water heating	£268	£178	£90
Lighting	£45	£45	£0
Generated (PV)	-£404	-£392	-£11
Total cost of fuels	£23	-£38	£62
Total cost of uses	£23	-£38	£62
Delivered energy	-14 kWh/m ²	-17 kWh/m ²	3 kWh/m ²
Carbon dioxide emissions	-0.2 tonnes	-0.2 tonnes	0.0 tonnes
CO2 emissions per m ²	-1 kg/m ²	-2 kg/m ²	0 kg/m ²
Primary energy	1 kWh/m ²	-3 kWh/m ²	4 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	49.5100 (1b)	x 2.6000 (2b)	= 128.7260 (1b) - (3b)
First floor	54.9700 (1c)	x 1.8200 (2c)	= 100.0454 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	104.4800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 228.7714 (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)			17.8800	1.1450	20.4733		(27)
Door			1.8900	1.0000	1.8900		(26a)
FD			1.7000	1.8000	3.0600		(26)
6-7			1.8400	0.9615	1.7692		(27a)
8-9			1.8400	0.9615	1.7692		(27a)
12			0.9200	0.9615	0.8846		(27a)
15-16			1.8400	0.9615	1.7692		(27a)
Floor 1 P/a 0.67			49.5100	0.1200	5.9412	110.0000	5446.1000 (28a)
Heatloss Floor 2 over garage			19.6900	0.1700	3.3473	20.0000	393.8000 (28b)
External Wall 1 Render	86.5800	16.6700	69.9100	0.1600	11.1856	9.0000	629.1900 (29a)
External Wall 2 Stone	9.2300	3.1000	6.1300	0.1600	0.9808	9.0000	55.1700 (29a)
External Wall 3 Garage	21.0700	1.7000	19.3700	0.1400	2.7118	18.0000	348.6600 (29a)
Wall 4 "attic"	13.6100		13.6100	0.0900	1.2249	9.0000	122.4900 (29a)
External Roof 1 Sloping	84.9400	6.4400	78.5000	0.1300	10.2050	9.0000	706.5000 (30)
Roof 2 "attic"	9.1400		9.1400	0.0861	0.7872	9.0000	82.2600 (30)
Total net area of external elements Aum(A, m ²)			293.7700				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	67.9994	(33)
Internal Wall 1 GF			45.6000			9.0000	410.4000 (32c)
Internal Wall 2 FF			52.9100			9.0000	476.1900 (32c)
Internal Floor 1			35.2800			18.0000	635.0400 (32d)
Internal Ceiling 1			35.2800			9.0000	317.5200 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) =
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							9623.3200 (34)
List of Thermal Bridges							92.1068 (35)
K1 Element				Length	Psi-value	Total	
E16 Corner (normal)				18.9500	0.0300	0.5685	
E5 Ground floor (normal)				33.3000	0.0210	0.6993	
E11 Eaves (insulation at rafter level)				17.5000	0.0390	0.6825	
E17 Corner (inverted - internal area greater than external area)				8.3500	-0.0150	-0.1253	
E13 Gable (insulation at rafter level)				26.2300	0.0240	0.6295	
R4 Ridge (vaulted ceiling)				14.9500	0.1200	1.7940	
E6 Intermediate floor within a dwelling				12.4000	0.0800	0.9920	
E20 Exposed floor (normal)				10.7500	0.3200	3.4400	
E21 Exposed floor (inverted)				7.9500	0.3200	2.5440	
E2 Other lintels (including other steel lintels)				12.5500	0.0840	1.0542	
E3 Sill				10.8000	0.0430	0.4644	
E4 Jamb				30.3600	0.0340	1.0322	
R1 Head of roof window				6.5800	0.2400	1.5792	
R2 Sill of roof window				6.5800	0.2400	1.5792	
R3 Jamb of roof window				13.7200	0.2400	3.2928	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							20.2266 (36)

Full SAP Calculation Printout



Point Thermal bridges																		(36a) =	0.0000	
Total fabric heat loss																		(33) + (36) + (36a) =	88.2260 (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								
	11.2628	11.1826	11.1024	10.7014	10.6211	10.2201	10.2201	10.1399	10.3805	10.6211	10.7816	10.9420	(38)							
Heat transfer coeff	99.4888	99.4086	99.3284	98.9273	98.8471	98.4461	98.4461	98.3658	98.6065	98.8471	99.0075	99.1680	(39)							
Average = Sum(39)m / 12 =													98.9073							
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec								
	0.9522	0.9515	0.9507	0.9469	0.9461	0.9422	0.9422	0.9415	0.9438	0.9461	0.9476	0.9492	(40)							
HLP (average)													0.9467							
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31								

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7773 (42)	
Hot water usage for mixer showers													0.0000 (42a)	
Hot water usage for baths	81.6466	80.4340	78.7265	75.5781	73.2206	70.6065	69.1945	70.8901	72.7363	75.5334	78.7467	81.3706	(42b)	
Hot water usage for other uses	43.0724	41.5061	39.9399	38.3736	36.8073	35.2411	35.2411	36.8073	38.3736	39.9399	41.5061	43.0724	(42c)	
Average daily hot water use (litres/day)													114.8560 (43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	124.7190	121.9402	118.6663	113.9517	110.0279	105.8475	104.4355	107.6974	111.1099	115.4733	120.2528	124.4430	(44)	
Energy conte	197.5244	173.6412	182.3857	155.9941	148.1187	130.1519	126.3057	133.3519	137.0096	156.6962	171.3222	194.8476	(45)	
Energy content (annual)												Total = Sum(45)m =	1907.3492	
Distribution loss (46)m = 0.15 x (45)m													29.6287	(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)													26.7840 (56)	
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	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	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	247.5708	218.8444	231.0364	197.6725	185.3708	165.9772	163.3252	171.3018	180.0387	205.3469	219.7542	244.8940	(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)	
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													608.6530 (H24)	
Heat delivered to space heating													0.0000 (H29)	
Solar input	-0.0000	-16.2308	-57.6692	-78.6890	-101.8882	-93.7718	-93.0474	-81.8187	-56.9550	-28.5830	-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	247.5708	202.6135	173.3672	118.9835	83.4826	72.2054	70.2778	89.4832	123.0837	176.7638	219.7542	244.8940	(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	105.7140	93.8982	99.5638	85.2108	79.0511	71.9357	71.6122	74.6995	79.9790	91.0220	95.7102	104.8240	(65)	

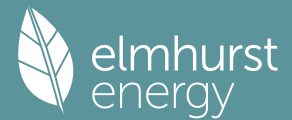
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m	166.6385	166.6385	166.6385	166.6385	166.6385	166.6385	166.6385	166.6385	166.6385	166.6385	166.6385	166.6385	(66)	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.3429	26.0621	21.1952	16.0461	11.9946	10.1264	10.9419	14.2227	19.0897	24.2388	28.2902	30.1585	(67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	393.0948	397.1739	386.8947	365.0115	337.3880	311.4257	294.0813	290.0022	300.2814	322.1646	349.7882	375.7504	(68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.4412	54.4412	54.4412	54.4412	54.4412	54.4412	54.4412	54.4412	54.4412	54.4412	54.4412	54.4412	(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)	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	(71)	
Water heating gains (Table 5)	142.0887	139.7295	133.8223	118.3483	106.2515	99.9107	96.2530	100.4025	111.0819	122.3414	132.9309	140.8924	(72)	
Total internal gains	674.5138	672.9529	651.8995	609.3933	565.6215	531.4502	511.2636	514.6148	540.4404	578.7321	620.9966	656.7886	(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	
East	1.2600	19.6403	0.7600	0.7000	0.7700	9.1235 (76)

Full SAP Calculation Printout



South	8.9300	46.7521	0.7600	0.7000	0.7700	153.9207 (78)
West	7.6900	19.6403	0.7600	0.7000	0.7700	55.6825 (80)
North	1.8400	26.0000	0.6800	0.7000	1.0000	20.4947 (82)
East	0.9200	26.0000	0.6800	0.7000	1.0000	10.2473 (82)
South	1.8400	26.0000	0.6800	0.7000	1.0000	20.4947 (82)
West	1.8400	26.0000	0.6800	0.7000	1.0000	20.4947 (82)

Solar gains	290.4580	527.8372	794.7416	1081.2486	1281.0618	1297.7353	1240.7181	1090.8857	895.5275	604.4101	354.2976	244.2318 (83)
Total gains	964.9718	1200.7901	1446.6411	1690.6418	1846.6832	1829.1854	1751.9817	1605.5004	1435.9679	1183.1422	975.2942	901.0204 (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	26.8688	26.8905	26.9122	27.0213	27.0432	27.1534	27.1534	27.1755	27.1092	27.0432	26.9994	26.9577
alpha	2.7913	2.7927	2.7941	2.8014	2.8029	2.8102	2.8102	2.8117	2.8073	2.8029	2.8000	2.7950
util living area	0.8946	0.8313	0.7348	0.6005	0.4597	0.3330	0.2436	0.2760	0.4413	0.6833	0.8478	0.9089 (86)
Living	19.5684	19.8927	20.2652	20.5889	20.7739	20.8559	20.8802	20.8755	20.8132	20.5262	19.9791	19.4860
Non living	18.4478	18.8457	19.2946	19.6738	19.8782	19.9644	19.9854	19.9829	19.9255	19.6159	18.9635	18.3478
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	20.2676	19.8927	20.2652	20.5889	20.7739	20.8559	20.8802	20.8755	20.8132	20.5262	19.9791	19.6977 (87)
Th 2	20.1233	20.1240	20.1246	20.1279	20.1285	20.1317	20.1317	20.1324	20.1304	20.1285	20.1272	20.1259 (88)
util rest of house	0.8830	0.8147	0.7114	0.5699	0.4232	0.2907	0.1968	0.2259	0.3929	0.6484	0.8296	0.8986 (89)
MIT 2	19.4554	18.8457	19.2946	19.6738	19.8782	19.9644	19.9854	19.9829	19.9255	19.6159	18.9635	18.6682 (90)
Living area fraction									FLA = Living area / (4) =			0.2768 (91)
MIT	19.6802	19.1355	19.5633	19.9271	20.1261	20.2112	20.2331	20.2299	20.1712	19.8678	19.2446	18.9532 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6802	19.1355	19.5633	19.9271	20.1261	20.2112	20.2331	20.2299	20.1712	19.8678	19.2446	18.9532 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8765	0.7935	0.6952	0.5625	0.4231	0.2946	0.2023	0.2316	0.3953	0.6371	0.8084	0.8823 (94)
Useful gains	845.7937	952.8169	1005.7065	951.0218	781.3207	538.9272	354.3799	371.8217	567.6120	753.7952	788.4507	794.9853 (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	1530.1577	1415.1353	1297.5557	1090.8844	832.8981	552.3961	357.6617	376.7360	598.6629	916.0994	1202.4067	1463.0438 (97)
Space heating kWh	509.1668	310.6780	217.1358	100.7011	38.3735	0.0000	0.0000	0.0000	0.0000	120.7543	298.0483	497.0355 (98a)
Space heating requirement - total per year (kWh/year)												2091.8934
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	509.1668	310.6780	217.1358	100.7011	38.3735	0.0000	0.0000	0.0000	0.0000	120.7543	298.0483	497.0355 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2091.8934
Space heating per m2										(98c) / (4) =		20.0220 (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 %) 375.5190 (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	509.1668	310.6780	217.1358	100.7011	38.3735	0.0000	0.0000	0.0000	0.0000	120.7543	298.0483	497.0355 (98)
Space heating efficiency (main heating system 1)	375.5190	375.5190	375.5190	375.5190	375.5190	0.0000	0.0000	0.0000	0.0000	375.5190	375.5190	375.5190 (210)
Space heating fuel (main heating system)	135.5902	82.7330	57.8229	26.8165	10.2188	0.0000	0.0000	0.0000	0.0000	32.1567	79.3697	132.3596 (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	247.5708	202.6135	173.3672	118.9835	83.4826	72.2054	70.2778	89.4832	123.0837	176.7638	219.7542	244.8940 (64)
Efficiency of water heater												200.6324 (216)
(217)m	200.6324	200.6324	200.6324	200.6324	200.6324	200.6324	200.6324	200.6324	200.6324	200.6324	200.6324	200.6324 (217)
Fuel for water heating, kWh/month	123.3952	100.9874	86.4104	59.3042	41.6097	35.9889	35.0281	44.6005	61.3479	88.1033	109.5308	122.0610 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	20.3535	18.3838	20.3535	19.6969	20.3535	19.6969	20.3535	20.3535	19.6969	20.3535	19.6969	20.3535 (231)
Lighting	25.6837	20.6044	18.5520	13.5920	10.4988	8.5776	9.5774	12.4491	16.1701	21.2160	23.9635	26.3975 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-52.0162	-76.6335	-113.6549	-127.8349	-134.4505	-123.6151	-121.7404	-115.9522	-103.8480	-87.5075	-57.8108	-44.2811 (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	-21.5676	-50.6420	-114.0356	-191.5425	-271.2736	-279.5583	-274.3170	-222.8677	-151.3652	-78.2626	-30.3787	-16.6699 (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											557.0672	(211)
Space heating fuel - main system 2											0.0000	(213)
Space heating fuel - secondary											0.0000	(215)
Efficiency of water heater											200.6324	
Water heating fuel used											908.3675	(219)
Space cooling fuel											0.0000	(221)

Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.5720)												
mechanical ventilation fans (SFP = 0.5720)											159.6458	(230a)
pump for solar water heating											80.0000	(230g)
Total electricity for the above, kWh/year											239.6458	(231)
Electricity for lighting (calculated in Appendix L)											207.2822	(232)

Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation											-2861.8256	(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											-949.4627	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	557.0672	16.4900	91.8604	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	908.3675	16.4900	149.7898	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	159.6458	16.4900	26.3256	(249)
Pump for solar water heating	80.0000	16.4900	13.1920	(249)
Energy for lighting	207.2822	16.4900	34.1808	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1159.3450	16.4900	-191.1760	
PV Unit electricity exported	-1702.4806	5.5900	-95.1687	
Total			-286.3446	(252)
Total energy cost			29.0040	(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] =	0.0699	(257)
SAP value			98.8677	
SAP rating (Section 12)			99	(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	557.0672	0.1567	87.3018	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	908.3675	0.1459	132.5688	(264)
Space and water heating			219.8706	(265)
Pumps, fans and electric keep-hot	239.6458	0.1387	33.2418	(267)
Energy for lighting	207.2822	0.1443	29.9172	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1159.3450	0.1346	-156.0084	
PV Unit electricity exported	-1702.4806	0.1231	-209.5712	
Total			-365.5796	(269)
Total CO2, kg/year			-82.5499	(272)
CO2 emissions per m2			-0.7900	(273)
EI value			100.7400	
EI rating			101	(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	49.5100 (1b)	x 2.6000 (2b)	= 128.7260	(1b) - (3b)
First floor	54.9700 (1c)	x 1.8200 (2c)	= 100.0454	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	104.4800			(4)
Dwelling volume		(3a) + (3b) + (3c) + (3d) + (3e)...(3n) =	228.7714	(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)			17.8800	1.1450	20.4733			(27)					
Door			1.8900	1.0000	1.8900			(26a)					
FD			1.7000	1.8000	3.0600			(26)					
6-7			1.8400	0.9615	1.7692			(27a)					
8-9			1.8400	0.9615	1.7692			(27a)					
12			0.9200	0.9615	0.8846			(27a)					
15-16			1.8400	0.9615	1.7692			(27a)					
Floor 1 P/a 0.67			49.5100	0.1200	5.9412	110.0000	5446.1000	(28a)					
Heatloss Floor 2 over garage			19.6900	0.1700	3.3473	20.0000	393.8000	(28b)					
External Wall 1 Render	86.5800	16.6700	69.9100	0.1600	11.1856	9.0000	629.1900	(29a)					
External Wall 2 Stone	9.2300	3.1000	6.1300	0.1600	0.9808	9.0000	55.1700	(29a)					
External Wall 3 Garage	21.0700	1.7000	19.3700	0.1400	2.7118	18.0000	348.6600	(29a)					
Wall 4 "attic"	13.6100		13.6100	0.0900	1.2249	9.0000	122.4900	(29a)					
External Roof 1 Sloping	84.9400	6.4400	78.5000	0.1300	10.2050	9.0000	706.5000	(30)					
Roof 2 "attic"	9.1400		9.1400	0.0861	0.7872	9.0000	82.2600	(30)					
Total net area of external elements Aum(A, m2)			293.7700					(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	67.9994		(33)					
Internal Wall 1 GF			45.6000			9.0000	410.4000	(32c)					
Internal Wall 2 FF			52.9100			9.0000	476.1900	(32c)					
Internal Floor 1			35.2800			18.0000	635.0400	(32d)					
Internal Ceiling 1			35.2800			9.0000	317.5200	(32e)					
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) =	9623.3200 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								92.1068 (35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value	Total							
E16 Corner (normal)				18.9500	0.0300	0.5685							
E5 Ground floor (normal)				33.3000	0.0210	0.6993							
E11 Eaves (insulation at rafter level)				17.5000	0.0390	0.6825							
E17 Corner (inverted - internal area greater than external area)				8.3500	-0.0150	-0.1253							
E13 Gable (insulation at rafter level)				26.2300	0.0240	0.6295							
R4 Ridge (vaulted ceiling)				14.9500	0.1200	1.7940							
E6 Intermediate floor within a dwelling				12.4000	0.0800	0.9920							
E20 Exposed floor (normal)				10.7500	0.3200	3.4400							
E21 Exposed floor (inverted)				7.9500	0.3200	2.5440							
E2 Other lintels (including other steel lintels)				12.5500	0.0840	1.0542							
E3 Sill				10.8000	0.0430	0.4644							
E4 Jamb				30.3600	0.0340	1.0322							
R1 Head of roof window				6.5800	0.2400	1.5792							
R2 Sill of roof window				6.5800	0.2400	1.5792							
R3 Jamb of roof window				13.7200	0.2400	3.2928							
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							20.2266	(36)					
Point Thermal bridges							(36a) =	0.0000					
Total fabric heat loss							(33) + (36) + (36a) =	88.2260 (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	
	13.5890	13.1077	12.8671	12.2254	12.2254	11.6639	11.5035	11.5035	12.1452	12.7869	13.1077	13.5890	(38)
Heat transfer coeff	101.8150	101.3337	101.0931	100.4514	100.4514	99.8899	99.7295	99.7295	100.3712	101.0129	101.3337	101.8150	(39)
Average = Sum(39)m / 12 =												100.7522	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9745	0.9699	0.9676	0.9614	0.9614	0.9561	0.9545	0.9545	0.9607	0.9668	0.9699	0.9745	(40)
HLP (average)												0.9643	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7773 (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	0.0000	0.0000	(42a)
Hot water usage for other uses	81.6466	80.4340	78.7265	75.5781	73.2206	70.6065	69.1945	70.8901	72.7363	75.5334	78.7467	81.3706	81.3706	81.3706	81.3706	81.3706	(42b)
Average daily hot water use (litres/day)	43.0724	41.5061	39.9399	38.3736	36.8073	35.2411	35.2411	36.8073	38.3736	39.9399	41.5061	43.0724	43.0724	43.0724	43.0724	43.0724	(42c)
																	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
Energy content (annual)	124.7190	121.9402	118.6663	113.9517	110.0279	105.8475	104.4355	107.6974	111.1099	115.4733	120.2528	124.4430	124.4430	124.4430	124.4430	124.4430	(44)
Distribution loss (46)m = 0.15 x (45)m	197.5244	173.6412	182.3857	155.9941	148.1187	130.1519	126.3057	133.3519	137.0096	156.6962	171.3222	194.8476	194.8476	194.8476	194.8476	194.8476	(45)
Water storage loss:	29.6287	26.0462	27.3579	23.3991	22.2178	19.5228	18.9459	20.0028	20.5514	23.5044	25.6983	29.2271	29.2271	29.2271	29.2271	29.2271	(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	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	26.7840	26.7840	26.7840	(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	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	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	247.5708	218.8444	231.0364	197.6725	185.3708	165.9772	163.3252	171.3018	180.0387	205.3469	219.7542	244.8940	244.8940	244.8940	244.8940	244.8940	(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	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	-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																	771.7055 (H24)
Heat delivered to space heating																	0.0000 (H29)
Solar input																	771.7055
Solar input	-9.4418	-27.6617	-72.8994	-96.3152	-114.1097	-114.2565	-102.6992	-99.8084	-75.9072	-45.7412	-12.8654	-0.0000	-0.0000	-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	0.0000	0.0000	(63d)
Output from w/h	238.1290	191.1827	158.1370	101.3573	71.2611	51.7207	60.6260	71.4935	104.1315	159.6057	206.8888	244.8940	244.8940	244.8940	244.8940	244.8940	(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	0.0000	0.0000	(64a)
Heat gains from water heating, kWh/month	105.7140	93.8982	99.5638	85.2108	79.0511	71.9357	71.6122	74.6995	79.9790	91.0220	95.7102	104.8240	104.8240	104.8240	104.8240	104.8240	(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	166.6385	166.6385	166.6385	166.6385	166.6385	166.6385	166.6385	166.6385	166.6385	166.6385	166.6385	166.6385	166.6385	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.3429	26.0621	21.1952	16.0461	11.9946	10.1264	10.9419	14.2227	19.0897	24.2388	28.2902	30.1585	30.1585	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	393.0948	397.1739	386.8947	365.0115	337.3880	311.4257	294.0813	290.0022	300.2814	322.1646	349.7882	375.7504	375.7504	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.4412	54.4412	54.4412	54.4412	54.4412	54.4412	54.4412	54.4412	54.4412	54.4412	54.4412	54.4412	54.4412	(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)	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	-111.0923	(71)
Water heating gains (Table 5)	142.0887	139.7295	133.8223	118.3483	106.2515	99.9107	96.2530	100.4025	111.0819	122.3414	132.9309	140.8924	140.8924	(72)
Total internal gains	674.5138	672.9529	651.8995	609.3933	565.6215	531.4502	511.2636	514.6148	540.4404	578.7321	620.9966	656.7886	656.7886	(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									
East	1.2600	27.2069	0.7600	0.7000	0.7700	12.6385 (76)								
South	8.9300	59.9387	0.7600	0.7000	0.7700	197.3348 (78)								
West	7.6900	27.2069	0.7600	0.7000	0.7700	77.1347 (80)								
North	1.8400	37.0000	0.6800	0.7000	1.0000	29.1655 (82)								
East	0.9200	37.0000	0.6800	0.7000	1.0000	14.5827 (82)								
South	1.8400	37.0000	0.6800	0.7000	1.0000	29.1655 (82)								
West	1.8400	37.0000	0.6800	0.7000	1.0000	29.1655 (82)								
Solar gains	389.1871	610.0721	909.0509	1262.1012	1421.2977	1579.2935	1369.7127	1296.3008	1083.6586	729.7456	455.3601	317.3031	317.3031	(83)
Total gains	1063.7009	1283.0250	1560.9504	1871.4945	1986.9192	2110.7437	1880.9763	1810.9156	1624.0990	1308.4777	1076.3567	974.0917	974.0917	(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	26.2549	26.3796	26.4424	26.6113	26.6113	26.7609	26.8040	26.8040	26.6326	26.4634	26.3796	26.2549	26.2549	(86)			
alpha	2.7503	2.7586	2.7628	2.7741	2.7741	2.7841	2.7869	2.7869	2.7755	2.7642	2.7586	2.7503	2.7503	(86)			
util living area	0.8298	0.7672	0.6744	0.5503	0.4376	0.3166	0.2702	0.2647	0.3767	0.5771	0.7531	0.8442	0.8442	(86)			

Full SAP Calculation Printout



Living	19.9975	20.1913	20.4253	20.6496	20.7827	20.8554	20.8727	20.8746	20.8392	20.6855	20.3555	19.9821
Non living	18.9662	19.1980	19.4713	19.7289	19.8738	19.9509	19.9686	19.9703	19.9348	19.7767	19.4035	18.9508
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	20.4872	20.1913	20.4253	20.6496	20.7827	20.8554	20.8727	20.8746	20.8392	20.6855	20.3555	20.1245 (87)
Th 2	20.1046	20.1085	20.1104	20.1156	20.1156	20.1201	20.1214	20.1214	20.1162	20.1111	20.1085	20.1046 (88)
util rest of house	0.8101	0.7438	0.6466	0.5187	0.4017	0.2787	0.2262	0.2189	0.3294	0.5335	0.7229	0.8248 (89)
MIT 2	19.6508	19.1980	19.4713	19.7289	19.8738	19.9509	19.9686	19.9703	19.9348	19.7767	19.4035	19.1587 (90)
Living area fraction									FLA = Living area / (4) =			0.2768 (91)
MIT	19.8823	19.4730	19.7354	19.9838	20.1253	20.2013	20.2189	20.2206	20.1852	20.0282	19.6670	19.4260 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8823	19.4730	19.7354	19.9838	20.1253	20.2013	20.2189	20.2206	20.1852	20.0282	19.6670	19.4260 (93)

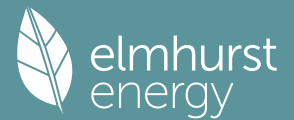
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8048	0.7254	0.6341	0.5138	0.4021	0.2822	0.2311	0.2241	0.3332	0.5292	0.7063	0.8082 (94)
Useful gains	856.0616	930.7498	989.8644	961.6409	798.9129	595.6835	434.7539	405.8335	541.0704	692.5044	760.2761	787.2371 (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	1311.6123	1253.7974	1206.5849	1073.1976	846.3375	609.4540	440.6903	410.9442	560.5905	780.6527	999.8584	1214.2493 (97)
Space heating kWh	338.9297	217.0880	161.2400	80.3208	35.2839	0.0000	0.0000	0.0000	0.0000	65.5823	172.4993	317.6971 (98a)
Space heating requirement - total per year (kWh/year)												1388.6411
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	338.9297	217.0880	161.2400	80.3208	35.2839	0.0000	0.0000	0.0000	0.0000	65.5823	172.4993	317.6971 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1388.6411
Space heating per m2										(98c) / (4) =		13.2910 (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 %)													374.2516 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement	338.9297	217.0880	161.2400	80.3208	35.2839	0.0000	0.0000	0.0000	0.0000	65.5823	172.4993	317.6971 (98)	
Space heating efficiency (main heating system 1)	374.2516	374.2516	374.2516	374.2516	374.2516	0.0000	0.0000	0.0000	0.0000	374.2516	374.2516	374.2516 (210)	
Space heating fuel (main heating system)	90.5620	58.0059	43.0833	21.4617	9.4278	0.0000	0.0000	0.0000	0.0000	17.5236	46.0918	84.8886 (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	238.1290	191.1827	158.1370	101.3573	71.2611	51.7207	60.6260	71.4935	104.1315	159.6057	206.8888	244.8940 (64)	
Efficiency of water heater (217)m	200.4155	200.4155	200.4155	200.4155	200.4155	200.4155	200.4155	200.4155	200.4155	200.4155	200.4155	200.4155 (216)	
Fuel for water heating, kWh/month	118.8176	95.3932	78.9046	50.5736	35.5567	25.8067	30.2502	35.6726	51.9578	79.6374	103.2299	122.1931 (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	20.3535	18.3838	20.3535	19.6969	20.3535	19.6969	20.3535	20.3535	19.6969	20.3535	19.6969	20.3535 (231)	
Lighting	25.6837	20.6044	18.5520	13.5920	10.4988	8.5776	9.5774	12.4491	16.1701	21.2160	23.9635	26.3975 (232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-65.9360	-85.0925	-123.0817	-136.9163	-139.4322	-130.1771	-125.6004	-123.3133	-113.9839	-98.4040	-69.8985	-55.1088 (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	-34.9670	-65.4469	-142.8043	-241.7965	-315.7879	-364.9840	-316.0533	-284.8977	-200.7420	-106.2978	-46.1133	-25.9135 (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													371.0448 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													200.4155
Water heating fuel used													827.9935 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.5720)													
mechanical ventilation fans (SFP = 0.5720)													159.6458 (230a)
pump for solar water heating													80.0000 (230g)
Total electricity for the above, kWh/year													239.6458 (231)
Electricity for lighting (calculated in Appendix L)													207.2822 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-3412.7488 (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	-1766.7824	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	371.0448	21.5100	79.8117 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	827.9935	21.5100	178.1014 (247)
Energy for instantaneous electric shower(s)	0.0000	21.5100	0.0000 (247a)
Pumps, fans and electric keep-hot	159.6458	21.5100	34.3398 (249)
Pump for solar water heating	80.0000	21.5100	17.2080 (249)
Energy for lighting	207.2822	21.5100	44.5864 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1266.9445	21.5100	-272.5198
PV Unit electricity exported	-2145.8043	5.5900	-119.9505
Total			-392.4702 (252)
Total energy cost			-38.4229 (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	371.0448	0.1567	58.1277 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	827.9935	0.1470	121.7527 (264)
Space and water heating			179.8805 (265)
Pumps, fans and electric keep-hot	239.6458	0.1387	33.2418 (267)
Energy for lighting	207.2822	0.1443	29.9172 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1266.9445	0.1353	-171.3783
PV Unit electricity exported	-2145.8043	0.1239	-265.9202
Total			-437.2985 (269)
Total CO2, kg/year			-194.2590 (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	371.0448	1.5799	586.2219 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	827.9935	1.5440	1278.4172 (278)
Space and water heating			1864.6390 (279)
Pumps, fans and electric keep-hot	239.6458	1.5128	362.5362 (281)
Energy for lighting	207.2822	1.5338	317.9364 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1266.9445	1.5000	-1900.3733
PV Unit electricity exported	-2145.8043	0.4548	-975.9397
Total			-2876.3130 (283)
Total Primary energy kWh/year			-331.2014 (286)