

Full SAP Calculation Printout



Property Reference	Barnwood Bay DET Plot 223				Issued on Date	01/09/2023
Assessment Reference	Hampton Woods	Prop Type Ref	Plot 223			
Property	Plot 223, Hampton Woods, Peterborough, PE7					
SAP Rating	90 B	DER	11.12	TER	11.71	
Environmental	90 B	% DER < TER				5.04
CO ₂ Emissions (t/year)	0.95	DFEE	40.06	TFEE	40.87	
Compliance Check	See BREL	% DFEE < TFEE				1.99
% DPER < TPER	2.40	DPER	59.69	TPER	61.16	
Assessor Details	Mr. Ben Tunningley				Assessor ID	AU36-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	47.6000 (1b)	x 2.3000 (2b)	= 109.4800 (1b) -
First floor	46.1000 (1c)	x 2.5500 (2c)	= 117.5550 (1c) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	227.0350 (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)

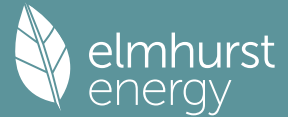
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0100 (17)
Infiltration rate	0.2005 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1855 (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	0.2365	0.2318	0.2272	0.2040	0.1994	0.1762	0.1762	0.1716	0.1855	0.1994	0.2086	0.2179 (22b)
Mechanical extract ventilation - decentralised												
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)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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
entrance			2.1000	0.9000	1.8900		(26)
rear/utility entrance			2.1000	1.1000	2.3100		(26a)
glazing (Uw = 1.30)			25.2000	1.2357	31.1407		(27)

Full SAP Calculation Printout



ground			46.1000	0.1200	5.5320	75.0000	3457.5000 (28a)
external wall	137.5400	29.4000	108.1400	0.2400	25.9536	60.0000	6488.3996 (29a)
cold	46.1000		46.1000	0.0700	3.2270	9.0000	414.9000 (30)
bay	1.1000		1.1000	0.1600	0.1760	9.0000	9.9000 (30)
Total net area of external elements Aum(A, m2)			230.8400				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	70.2293			(33)
stud			221.3000			9.0000	1991.7000 (32c)
internal			46.1000			18.0000	829.8000 (32d)
internal			46.1000			9.0000	414.9000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13607.0996 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 145.2199 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	18.4000	0.0500	0.9200
E2 Other lintels (including other steel lintels)	14.6000	0.0090	0.1314
E3 Sill	44.1000	0.0140	0.6174
E4 Jamb	29.2000	0.0550	1.6060
E5 Ground floor (normal)	27.6000	0.0000	0.0000
E6 Intermediate floor within a dwelling	16.4000	0.0460	0.7544
E10 Eaves (insulation at ceiling level)	11.2000	0.0520	0.5824
E12 Gable (insulation at ceiling level)	19.4000	0.0480	0.9312
E16 Corner (normal)	4.6000	-0.0970	-0.4462
E17 Corner (inverted - internal area greater than external area)			

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.0966 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 75.3259 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.4608	37.4608	37.4608	37.4608	37.4608	37.4608	37.4608	37.4608	37.4608	37.4608	37.4608	37.4608	(38)
Heat transfer coeff	112.7867	112.7867	112.7867	112.7867	112.7867	112.7867	112.7867	112.7867	112.7867	112.7867	112.7867	112.7867	(39)
Average = Sum(39)m / 12 =													112.7867
HLP	1.2037	1.2037	1.2037	1.2037	1.2037	1.2037	1.2037	1.2037	1.2037	1.2037	1.2037	1.2037	(40)
HLP (average)													1.2037
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6731 (42)
Hot water usage for mixer showers	69.0381	68.0006	66.4887	63.5961	61.4614	59.0808	57.7276	59.2280	60.8728	63.4288	66.3836	68.7736	(42a)
Hot water usage for baths	29.8119	29.3691	28.7456	27.5961	26.7353	25.7808	25.2652	25.8843	26.5584	27.5798	28.7530	29.7111	(42b)
Hot water usage for other uses	42.0048	40.4773	38.9499	37.4224	35.8950	34.3675	34.3675	35.8950	37.4224	38.9499	40.4773	42.0048	(42c)
Average daily hot water use (litres/day)													129.4773 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	140.8547	137.8470	134.1843	128.6146	124.0916	119.2291	117.3604	121.0073	124.8536	129.9585	135.6140	140.4894	(44)
Energy conte	223.0795	196.2923	206.2362	176.0669	167.0512	146.6060	141.9372	149.8324	153.9570	176.3524	193.2069	219.9725	(45)
Energy content (annual)										Total = Sum(45)m =			2150.5905
Distribution loss (46)m = 0.15 x (45)m	33.4619	29.4439	30.9354	26.4100	25.0577	21.9909	21.2906	22.4749	23.0935	26.4529	28.9810	32.9959	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.2920	12.8964	14.2515	13.7354	14.1575	13.6647	14.0972	14.1162	13.6823	14.1798	13.7765	14.2845	(61)
Total heat required for water heating calculated for each month	237.3714	209.1887	220.4877	189.8023	181.2086	160.2707	156.0344	163.9485	167.6393	190.5322	206.9834	234.2570	(62)
WWHRS	-60.8004	-53.7723	-56.3073	-46.6247	-43.4525	-37.1826	-34.8528	-37.0624	-38.4706	-45.3526	-51.3789	-59.6744	(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	176.5711	155.4164	164.1804	143.1776	137.7561	123.0881	121.1816	126.8861	129.1687	145.1796	155.6045	174.5826	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =			1752.7928 (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	77.7469	68.4913	72.1364	61.9761	59.0839	52.1627	50.7184	53.3483	54.6113	62.1821	67.6854	76.7120	(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	133.6527	133.6527	133.6527	133.6527	133.6527	133.6527	133.6527	133.6527	133.6527	133.6527	133.6527	133.6527	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	123.9388	137.2180	123.9388	128.0701	123.9388	128.0701	123.9388	123.9388	128.0701	123.9388	128.0701	123.9388	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													

Full SAP Calculation Printout



	245.7226	248.2724	241.8469	228.1678	210.9004	194.6714	183.8295	181.2797	187.7051	201.3843	218.6517	234.8806 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3653	36.3653	36.3653	36.3653	36.3653	36.3653	36.3653	36.3653	36.3653	36.3653	36.3653	36.3653 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222 (71)
Water heating gains (Table 5)	104.4985	101.9216	96.9576	86.0779	79.4138	72.4482	68.1699	71.7047	75.8490	83.5781	94.0075	103.1075 (72)
Total internal gains	540.2557	553.5078	528.8391	508.4116	480.3488	458.2855	439.0340	440.0190	454.7201	474.9970	506.8252	528.0228 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
North	6.7500	10.6334	0.4600	0.0000	0.7700	25.4228 (74)
East	1.3500	19.6403	0.4600	0.0000	0.7700	9.3914 (76)
South	7.6000	46.7521	0.4600	0.0000	0.7700	125.8528 (78)
West	9.5000	19.6403	0.4600	0.0000	0.7700	66.0875 (80)

Solar gains	226.7546	402.3516	588.2731	783.9883	922.4810	933.7330	892.8764	787.8627	656.3365	455.3496	274.6542	192.0123 (83)
Total gains	767.0103	955.8594	1117.1121	1292.3999	1402.8298	1392.0185	1331.9104	1227.8817	1111.0566	930.3466	781.4793	720.0351 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	33.5124	33.5124	33.5124	33.5124	33.5124	33.5124	33.5124	33.5124	33.5124	33.5124	33.5124	33.5124
alpha	3.2342	3.2342	3.2342	3.2342	3.2342	3.2342	3.2342	3.2342	3.2342	3.2342	3.2342	3.2342
util living area	0.9668	0.9364	0.8846	0.7842	0.6437	0.4867	0.3628	0.4071	0.6152	0.8436	0.9443	0.9724 (86)
MIT	19.0743	19.4472	19.9087	20.4077	20.7539	20.9253	20.9781	20.9680	20.8404	20.3455	19.6008	18.9855 (87)
Th 2	19.9170	19.9170	19.9170	19.9170	19.9170	19.9170	19.9170	19.9170	19.9170	19.9170	19.9170	19.9170 (88)
util rest of house	0.9605	0.9248	0.8644	0.7486	0.5897	0.4142	0.2775	0.3173	0.5412	0.8081	0.9321	0.9670 (89)
MIT 2	17.6998	18.1650	18.7321	19.3218	19.7018	19.8671	19.9074	19.9019	19.7985	19.2699	18.3653	17.5880 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	17.9565	18.4045	18.9518	19.5246	19.8983	20.0648	20.1074	20.1010	19.9931	19.4708	18.5960	17.8490 (92)
Temperature adjustment	-0.1500											
adjusted MIT	17.8065	18.2545	18.8018	19.3746	19.7483	19.9148	19.9574	19.9510	19.8431	19.3208	18.4460	17.6990 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9429	0.9017	0.8390	0.7285	0.5807	0.4141	0.2808	0.3203	0.5357	0.7846	0.9098	0.9512 (94)
Useful gains	723.2192	861.9139	937.2968	941.4621	814.6046	576.4109	374.0064	393.2378	595.2253	729.9712	711.0155	684.8725 (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	1523.3531	1506.2082	1387.4836	1181.3972	907.7357	599.4354	378.6682	400.5051	647.7424	983.5916	1279.6815	1522.5095 (97)
Space heating kWh	595.2997	432.9658	334.9390	172.7533	69.2895	0.0000	0.0000	0.0000	0.0000	188.6936	409.4396	623.2019 (98a)
Space heating requirement - total per year (kWh/year)												2826.5823
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)												
Space heating kWh	595.2997	432.9658	334.9390	172.7533	69.2895	0.0000	0.0000	0.0000	0.0000	188.6936	409.4396	623.2019 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2826.5823
Space heating per m2												(98c) / (4) = 30.1663 (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 %)												89.0000 (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	595.2997	432.9658	334.9390	172.7533	69.2895	0.0000	0.0000	0.0000	0.0000	188.6936	409.4396	623.2019 (98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000 (210)
Space heating fuel (main heating system)	668.8760	486.4784	376.3360	194.1048	77.8534	0.0000	0.0000	0.0000	0.0000	212.0153	460.0445	700.2268 (211)
Space heating efficiency (main heating system 2)												

Full SAP Calculation Printout



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 (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	176.5711	155.4164	164.1804	143.1776	137.7561	123.0881	121.1816	126.8861	129.1687	145.1796	155.6045	174.5826 (64)
Efficiency of water heater	88.6053	88.5446	88.4335	88.2214	87.8616	87.3000	87.3000	87.3000	87.3000	88.2527	88.5253	87.3000 (216)
Fuel for water heating, kWh/month	199.2782	175.5234	185.6540	162.2934	156.7876	140.9944	138.8106	145.3449	147.9596	164.5044	175.7741	88.6223 (217)
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	10.4558	9.4439	10.4558	10.1185	10.4558	10.1185	10.4558	10.4558	10.1185	10.4558	10.1185	10.4558 (231)
Lighting	24.7578	19.8616	17.8832	13.1020	10.1204	8.2684	9.2321	12.0003	15.5872	20.4512	23.0996	25.4459 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-12.6548	-20.8419	-35.4040	-46.1861	-54.8195	-52.9933	-52.0249	-46.2582	-36.9507	-26.0191	-14.7695	-10.5287 (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	-3.0867	-7.6046	-18.2529	-32.3368	-47.2335	-49.2372	-48.0659	-37.9601	-24.3433	-11.8179	-4.3456	-2.3373 (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												3175.9352 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												87.3000
Water heating fuel used												1989.9206 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(MEVDecentralised, Database: total watage = 4.9570, total flow = 37.0000, SFP = 0.1340)												
mechanical ventilation fans (SFP = 0.1340)												37.1082 (230a)
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												123.1082 (231)
Electricity for lighting (calculated in Appendix L)												199.8097 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-696.0724 (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												4792.7013 (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	3175.9352	0.2100	666.9464 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1989.9206	0.2100	417.8833 (264)
Space and water heating			1084.8297 (265)
Pumps, fans and electric keep-hot	123.1082	0.1387	17.0766 (267)
Energy for lighting	199.8097	0.1443	28.8387 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-409.4507	0.1318	-53.9629
PV Unit electricity exported	-286.6217	0.1220	-34.9597
Total			-88.9226 (269)
Total CO2, kg/year			1041.8224 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.1200 (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	3175.9352	1.1300	3588.8068 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1989.9206	1.1300	2248.6103 (278)
Space and water heating			5837.4171 (279)
Pumps, fans and electric keep-hot	123.1082	1.5128	186.2381 (281)
Energy for lighting	199.8097	1.5338	306.4747 (282)
Energy saving/generation technologies			

Full SAP Calculation Printout



PV Unit electricity used in dwelling	-409.4507	1.4869	-608.8234
PV Unit electricity exported	-286.6217	0.4475	-128.2698
Total			-737.0932 (283)
Total Primary energy kWh/year			5593.0367 (286)
Dwelling Primary energy Rate (DPER)			59.6900 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	47.6000 (1b)	x 2.3000 (2b)	= 109.4800 (1b) -
First floor	46.1000 (1c)	x 2.5500 (2c)	= 117.5550 (1c) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	227.0350 (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	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1321 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3821 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3535 (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	0.4507	0.4418	0.4330	0.3888	0.3800	0.3358	0.3358	0.3270	0.3535	0.3800	0.3977	0.4153 (22b)
Effective ac	0.6016	0.5976	0.5937	0.5756	0.5722	0.5564	0.5564	0.5535	0.5625	0.5722	0.5791	0.5863 (25)

3. Heat losses and heat loss parameter

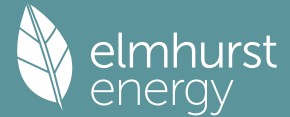
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1000	1.0000	2.1000		(26)
TER Semi-glazed door			2.1000	1.0000	2.1000		(26a)
TER Opening Type (Uw = 1.20)			19.2300	1.1450	22.0191		(27)
ground			46.1000	0.1300	5.9930		(28a)
external wall	137.5400	23.4300	114.1100	0.1800	20.5398		(29a)
cold	46.1000		46.1000	0.1100	5.0710		(30)
bay	1.1000		1.1000	0.1100	0.1210		(30)
Total net area of external elements Aum(A, m ²)			230.8400				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	57.9439	(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 145.2199 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	18.4000	0.0500	0.9200
E2 Other lintels (including other steel lintels)	14.6000	0.0500	0.7300
E3 Sill	44.1000	0.0500	2.2050
E4 Jamb	29.2000	0.1600	4.6720
E5 Ground floor (normal)	27.6000	0.0000	0.0000
E6 Intermediate floor within a dwelling	16.4000	0.0600	0.9840
E10 Eaves (insulation at ceiling level)	11.2000	0.0600	0.6720
E12 Gable (insulation at ceiling level)			

Full SAP Calculation Printout



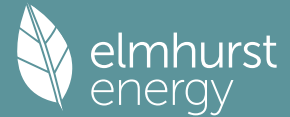
E16 Corner (normal)									19.4000	0.0900	1.7460		
E17 Corner (inverted - internal area greater than external area)									4.6000	-0.0900	-0.4140		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)													11.5150 (36)
Point Thermal bridges													(36a) = 0.0000
Total fabric heat loss													(33) + (36) + (36a) = 69.4589 (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	
	45.0697	44.7742	44.4846	43.1243	42.8698	41.6850	41.6850	41.4656	42.1414	42.8698	43.3847	43.9229	(38)
Heat transfer coeff	114.5285	114.2331	113.9435	112.5832	112.3287	111.1439	111.1439	110.9245	111.6003	112.3287	112.8435	113.3818	(39)
Average = Sum(39)m / 12 =													112.5820
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2223	1.2191	1.2160	1.2015	1.1988	1.1862	1.1862	1.1838	1.1910	1.1988	1.2043	1.2101	(40)
HLP (average)													1.2015
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.6731 (42)
Hot water usage for mixer showers	69.0381	68.0006	66.4887	63.5961	61.4614	59.0808	57.7276	59.2280	60.8728	63.4288	66.3836	68.7736 (42a)
Hot water usage for baths	29.8119	29.3691	28.7456	27.5961	26.7353	25.7808	25.2652	25.8843	26.5584	27.5798	28.7530	29.7111 (42b)
Hot water usage for other uses	42.0048	40.4773	38.9499	37.4224	35.8950	34.3675	34.3675	35.8950	37.4224	38.9499	40.4773	42.0048 (42c)
Average daily hot water use (litres/day)												129.4773 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	140.8547	137.8470	134.1843	128.6146	124.0916	119.2291	117.3604	121.0073	124.8536	129.9585	135.6140	140.4894 (44)
Energy conte	223.0795	196.2923	206.2362	176.0669	167.0512	146.6060	141.9372	149.8324	153.9570	176.3524	193.2069	219.9725 (45)
Energy content (annual)										Total = Sum(45)m =		2150.5905
Distribution loss (46)m = 0.15 x (45)m	33.4619	29.4439	30.9354	26.4100	25.0577	21.9909	21.2906	22.4749	23.0935	26.4529	28.9810	32.9959 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	274.0384	242.3197	257.1951	225.3820	218.0101	195.9211	192.8961	200.7913	203.2721	227.3113	242.5220	270.9314 (62)
WWHRS	-31.5613	-27.9131	-29.2290	-24.2028	-22.5561	-19.3014	-18.0920	-19.2390	-19.9700	-23.5424	-26.6707	-30.9769 (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	242.4770	214.4066	227.9661	201.1792	195.4539	176.6197	174.8041	181.5522	183.3021	203.7689	215.8513	239.9545 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2457.3357 (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	86.9137	76.7741	81.3133	70.8710	68.2842	61.0753	59.9338	62.5590	63.5195	71.3769	76.5701	85.8806 (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	133.6527	133.6527	133.6527	133.6527	133.6527	133.6527	133.6527	133.6527	133.6527	133.6527	133.6527	133.6527 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	124.5036	137.8433	124.5036	128.6538	124.5036	128.6538	124.5036	124.5036	128.6538	124.5036	128.6538	124.5036 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	245.7226	248.2724	241.8469	228.1678	210.9004	194.6714	183.8295	181.2797	187.7051	201.3843	218.6517	234.8806 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3653	36.3653	36.3653	36.3653	36.3653	36.3653	36.3653	36.3653	36.3653	36.3653	36.3653	36.3653 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222 (71)
Water heating gains (Table 5)	116.8194	114.2471	109.2920	98.4320	91.7799	84.8268	80.5562	84.0847	88.2215	95.9367	106.3473	115.4309 (72)
Total internal gains	553.1414	566.4586	541.7384	521.3493	493.2797	471.2478	451.9852	452.9638	467.6762	487.9204	519.7486	540.9110 (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							

Full SAP Calculation Printout



North	5.1500	10.6334	0.6300	0.7000	0.7700	16.7360 (74)
East	1.0300	19.6403	0.6300	0.7000	0.7700	6.1824 (76)
South	5.8000	46.7521	0.6300	0.7000	0.7700	82.8706 (78)
West	7.2500	19.6403	0.6300	0.7000	0.7700	43.5168 (80)

Solar gains	149.3058	264.9262	387.3427	516.2050	607.3893	614.7961	587.8957	518.7545	432.1570	299.8218	180.8450	126.4300 (83)
Total gains	702.4472	831.3849	929.0811	1037.5544	1100.6690	1086.0439	1039.8809	971.7183	899.8332	787.7422	700.5936	667.3410 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	33.0027	33.0880	33.1721	33.5730	33.6490	34.0077	34.0077	34.0750	33.8687	33.6490	33.4955	33.3365
alpha	3.2002	3.2059	3.2115	3.2382	3.2433	3.2672	3.2672	3.2717	3.2579	3.2433	3.2330	3.2224
util living area	0.9740	0.9554	0.9244	0.8558	0.7440	0.5871	0.4482	0.4927	0.7025	0.8883	0.9577	0.9776 (86)
MIT	18.9388	19.2454	19.6666	20.1998	20.6188	20.8751	20.9611	20.9467	20.7666	20.2090	19.4868	18.8917 (87)
Th 2	19.9022	19.9047	19.9072	19.9188	19.9210	19.9311	19.9311	19.9330	19.9272	19.9210	19.9166	19.9120 (88)
util rest of house	0.9688	0.9468	0.9095	0.8272	0.6935	0.5085	0.3481	0.3907	0.6298	0.8596	0.9481	0.9731 (89)
MIT 2	17.5201	17.9075	18.4350	19.0913	19.5739	19.8436	19.9131	19.9063	19.7457	19.1196	18.2247	17.4667 (90)
Living area fraction	17.7851	18.1574	18.6650	19.2983	19.7690	20.0363	20.1088	20.1006	fLA = Living area / (4) =	19.3231	18.4604	0.1868 (91)
MIT	17.7851	18.1574	18.6650	19.2983	19.7690	20.0363	20.1088	20.1006	19.9364	19.3231	18.4604	17.7328 (92)
Temperature adjustment												0.0000
adjusted MIT	17.7851	18.1574	18.6650	19.2983	19.7690	20.0363	20.1088	20.1006	19.9364	19.3231	18.4604	17.7328 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9545	0.9283	0.8880	0.8079	0.6856	0.5168	0.3654	0.4075	0.6305	0.8400	0.9303	0.9602 (94)
Useful gains	670.5051	771.7657	825.0145	838.2636	754.5749	561.2239	379.9414	395.9830	567.3721	661.7203	651.7615	640.7715 (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	1544.4287	1514.4297	1386.1218	1170.6722	906.3841	604.2106	389.9868	410.4911	651.3450	979.8507	1281.9449	1534.3746 (97)
Space heating kWh	650.1992	499.0703	417.4638	239.3341	112.9460	0.0000	0.0000	0.0000	0.0000	236.6890	453.7320	664.8407 (98a)
Space heating requirement - total per year (kWh/year)												3274.2751
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	650.1992	499.0703	417.4638	239.3341	112.9460	0.0000	0.0000	0.0000	0.0000	236.6890	453.7320	664.8407 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3274.2751
Space heating per m2										(98c) / (4) =		34.9442 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (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	650.1992	499.0703	417.4638	239.3341	112.9460	0.0000	0.0000	0.0000	0.0000	236.6890	453.7320	664.8407 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	703.6788	540.1193	451.8007	259.0196	122.2360	0.0000	0.0000	0.0000	0.0000	256.1569	491.0520	719.5245 (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	242.4770	214.4066	227.9661	201.1792	195.4539	176.6197	174.8041	181.5522	183.3021	203.7689	215.8513	239.9545 (64)
Efficiency of water heater (217)m	86.3869	86.1280	85.6597	84.7546	83.2494	80.3000	80.3000	80.3000	80.3000	84.7032	85.9332	80.3000 (216)
Fuel for water heating, kWh/month	280.6872	248.9394	266.1298	237.3668	234.7812	219.9498	217.6888	226.0924	228.2716	240.5680	251.1851	277.5815 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	25.8694	20.7534	18.6861	13.6903	10.5747	8.6397	9.6466	12.5391	16.2870	21.3694	24.1367	26.5884 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-43.6324	-61.0594	-87.1255	-97.2134	-104.1842	-96.9868	-95.7451	-90.6693	-81.6613	-69.4200	-47.7896	-37.7727 (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	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-26.0634	-54.6584	-108.3387	-162.3033	-214.2286	-215.1422	-212.6499	-180.2594	-132.3761	-78.0770	-34.7658	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year												
Space heating fuel - main system 1											3543.5878	(211)
Space heating fuel - main system 2											0.0000	(213)
Space heating fuel - secondary											0.0000	(215)
Efficiency of water heater											80.3000	
Water heating fuel used											2929.2416	(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)											208.7809	(232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation											-2352.7492	(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											4414.8611	(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	3543.5878	0.2100	744.1534 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2929.2416	0.2100	615.1407 (264)
Space and water heating			1359.2942 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	208.7809	0.1443	30.1335 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-913.2596	0.1348	-123.0637
PV Unit electricity exported	-1439.4896	0.1260	-181.3286
Total			-304.3922 (269)
Total CO2, kg/year			1096.9647 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.7100 (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	3543.5878	1.1300	4004.2542 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2929.2416	1.1300	3310.0430 (278)
Space and water heating			7314.2973 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	208.7809	1.5338	320.2351 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-913.2596	1.4980	-1368.0906
PV Unit electricity exported	-1439.4896	0.4624	-665.6048
Total			-2033.6953 (283)
Total Primary energy kWh/year			5730.9378 (286)
Target Primary Energy Rate (TPER)			61.1600 (287)

Full SAP Calculation Printout



Property Reference	Barnwood Bay DET Plot 223				Issued on Date	01/09/2023
Assessment Reference	Hampton Woods	Prop Type Ref	Plot 223			
Property	Plot 223, Hampton Woods, Peterborough, PE7					
SAP Rating	90 B	DER	11.12	TER	11.71	
Environmental	90 B	% DER < TER				5.04
CO ₂ Emissions (t/year)	0.95	DFEE	40.06	TFEE	40.87	
Compliance Check	See BREL	% DFEE < TFEE				1.99
% DPER < TPER	2.40	DPER	59.69	TPER	61.16	
Assessor Details	Mr. Ben Tunningley				Assessor ID	AU36-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	47.6000 (1b)	x 2.3000 (2b)	= 109.4800 (1b) -
First floor	46.1000 (1c)	x 2.5500 (2c)	= 117.5550 (1c) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	227.0350 (5)

2. Ventilation rate

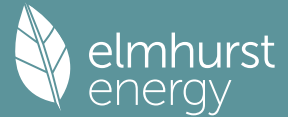
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1321 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0100 (17)
Infiltration rate	0.3326 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3077 (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	0.3923	0.3846	0.3769	0.3385	0.3308	0.2923	0.2923	0.2846	0.3077	0.3308	0.3462	0.3615 (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	0.5770	0.5740	0.5710	0.5573	0.5547	0.5427	0.5427	0.5405	0.5473	0.5547	0.5599	0.5654 (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
entrance			2.1000	0.9000	1.8900		(26)
rear/utility entrance			2.1000	1.1000	2.3100		(26a)
glazing (Uw = 1.30)			25.2000	1.2357	31.1407		(27)
ground			46.1000	0.1200	5.5320	75.0000	3457.5000 (28a)
external wall	137.5400	29.4000	108.1400	0.2400	25.9536	60.0000	6488.3996 (29a)

Full SAP Calculation Printout



cold	46.1000	46.1000	0.0700	3.2270	9.0000	414.9000 (30)
bay	1.1000	1.1000	0.1600	0.1760	9.0000	9.9000 (30)
Total net area of external elements Aum(A, m2)		230.8400				(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =	70.2293			(33)
stud		221.3000			9.0000	1991.7000 (32c)
internal		46.1000			18.0000	829.8000 (32d)
internal		46.1000			9.0000	414.9000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13607.0996 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 145.2199 (35)

List of Thermal Bridges						
K1 Element	Length	Psi-value	Total			
E2 Other lintels (including other steel lintels)	18.4000	0.0500	0.9200			
E3 Sill	14.6000	0.0090	0.1314			
E4 Jamb	44.1000	0.0140	0.6174			
E5 Ground floor (normal)	29.2000	0.0550	1.6060			
E6 Intermediate floor within a dwelling	27.6000	0.0000	0.0000			
E10 Eaves (insulation at ceiling level)	16.4000	0.0460	0.7544			
E12 Gable (insulation at ceiling level)	11.2000	0.0520	0.5824			
E16 Corner (normal)	19.4000	0.0480	0.9312			
E17 Corner (inverted - internal area greater than external area)	4.6000	-0.0970	-0.4462			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)						5.0966 (36)
Point Thermal bridges					(36a) =	0.0000
Total fabric heat loss					(33) + (36) + (36a) =	75.3259 (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)
Heat transfer coeff	43.2261	43.0022	42.7828	41.7521	41.5592	40.6615	40.6615	40.4953	41.0073	41.5592	41.9494	42.3572	(39)
Average = Sum(39)m / 12 =	118.5520	118.3281	118.1087	117.0780	116.8851	115.9874	115.9874	115.8212	116.3332	116.8851	117.2752	117.6831	(39)
												117.0770	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(40)
HLP (average)	1.2652	1.2628	1.2605	1.2495	1.2474	1.2379	1.2379	1.2361	1.2415	1.2474	1.2516	1.2560	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

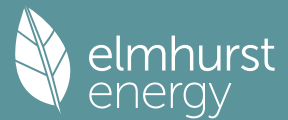
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6731 (42)
Hot water usage for mixer showers													(42a)
Hot water usage for baths													(42b)
Hot water usage for other uses													(42c)
Average daily hot water use (litres/day)													(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	71.8166	69.8464	67.6955	65.0185	62.6302	60.1483	59.6327	61.7793	63.9808	66.5296	69.2303	71.7158	(44)
Energy content (annual)	113.7400	99.4604	104.0455	89.0070	84.3123	73.9593	72.1206	76.4957	78.8948	90.2801	98.6313	112.2897	(45)
Distribution loss (46)m = 0.15 x (45)m													(46)
Water storage loss:													
Total storage loss													(56)
If cylinder contains dedicated solar storage													(57)
Primary loss													(59)
Combi loss													(61)
Total heat required for water heating calculated for each month													(62)
WWHRS	96.6790	84.5413	88.4386	75.6560	71.6655	62.8654	61.3025	65.0213	67.0606	76.7381	83.8366	95.4462	(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	96.6790	84.5413	88.4386	75.6560	71.6655	62.8654	61.3025	65.0213	67.0606	76.7381	83.8366	95.4462	(64)
12Total per year (kWh/year)													(64)
Electric shower(s)	55.2880	49.2621	53.7923	51.3333	52.2966	49.8859	51.5487	52.2966	51.3333	53.7923	52.7808	55.2880	(64a)
Heat gains from water heating, kWh/month	37.9918	33.4509	35.5577	31.7473	30.9905	28.1878	28.2128	29.3295	29.5985	32.6326	34.1544	37.6836	(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)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.6527	133.6527	133.6527	133.6527	133.6527	133.6527	133.6527	133.6527	133.6527	133.6527	133.6527	133.6527	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	123.9388	137.2180	123.9388	128.0701	123.9388	128.0701	123.9388	123.9388	128.0701	123.9388	128.0701	123.9388	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	245.7226	248.2724	241.8469	228.1678	210.9004	194.6714	183.8295	181.2797	187.7051	201.3843	218.6517	234.8806	(68)

Full SAP Calculation Printout



Pumps, fans	36.3653	36.3653	36.3653	36.3653	36.3653	36.3653	36.3653	36.3653	36.3653	36.3653	36.3653	36.3653	(69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Water heating gains (Table 5)	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	(71)
Total internal gains	51.0642	49.7781	47.7927	44.0935	41.6539	39.1498	37.9204	39.4213	41.1090	43.8610	47.4366	50.6499	(72)
	483.8214	498.3642	476.6742	463.4272	439.5889	424.9871	408.7846	407.7356	419.9801	432.2799	457.2542	472.5652	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c				Access factor Table 6d	Gains W	
North					6.7500	10.6334	0.4600	0.0000				0.7700	25.4228 (74)	
East					1.3500	19.6403	0.4600	0.0000				0.7700	9.3914 (76)	
South					7.6000	46.7521	0.4600	0.0000				0.7700	125.8528 (78)	
West					9.5000	19.6403	0.4600	0.0000				0.7700	66.0875 (80)	
Solar gains	226.7546	402.3516	588.2731	783.9883	922.4810	933.7330	892.8764	787.8627	656.3365	455.3496	274.6542	192.0123	(83)	
Total gains	710.5759	900.7158	1064.9472	1247.4155	1362.0699	1358.7201	1301.6609	1195.5983	1076.3166	887.6295	731.9084	664.5775	(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)													
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
alpha	31.8826	31.9430	32.0023	32.2840	32.3373	32.5876	32.5876	32.6344	32.4907	32.3373	32.2297	32.1180	
util living area	3.1255	3.1295	3.1335	3.1523	3.1558	3.1725	3.1725	3.1756	3.1660	3.1558	3.1486	3.1412	
	0.9736	0.9470	0.9007	0.8051	0.6681	0.5067	0.3796	0.4260	0.6396	0.8629	0.9541	0.9781	(86)
MIT	18.8633	19.2536	19.7487	20.3130	20.7049	20.9101	20.9729	20.9607	20.8092	20.2505	19.4486	18.7932	(87)
Th 2	19.8682	19.8701	19.8719	19.8806	19.8822	19.8898	19.8898	19.8912	19.8869	19.8822	19.8789	19.8755	(88)
util rest of house	0.9682	0.9369	0.8821	0.7705	0.6132	0.4309	0.2889	0.3310	0.5637	0.8294	0.9435	0.9737	(89)
MIT 2	17.9478	18.3306	18.8091	19.3401	19.6802	19.8430	19.8806	19.8768	19.7759	19.3010	18.5336	17.8839	(90)
Living area fraction	18.1188	18.5030	18.9846	19.5218	19.8716	20.0423	20.0846	20.0792	19.9689	19.4783	18.7045	18.0538	(91)
MIT	18.1188	18.5030	18.9846	19.5218	19.8716	20.0423	20.0846	20.0792	19.9689	19.4783	18.7045	18.0538	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1188	18.5030	18.9846	19.5218	19.8716	20.0423	20.0846	20.0792	19.9689	19.4783	18.7045	18.0538	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9570	0.9213	0.8645	0.7580	0.6126	0.4418	0.3052	0.3476	0.5697	0.8150	0.9290	0.9638	(94)
Ext temp.	680.0370	829.7903	920.6554	945.5381	834.4113	600.2823	397.2982	415.6315	613.2260	723.4417	679.9597	640.5009	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Space heating kWh	1638.2480	1609.6120	1474.5358	1243.5804	955.1377	631.2379	404.1686	426.1323	682.7483	1037.7410	1360.9223	1630.3523	(97)
Space heating requirement - total per year (kWh/year)	712.9090	524.0402	412.0870	214.5904	89.8205	0.0000	0.0000	0.0000	0.0000	233.8387	490.2930	736.4494	(98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)	712.9090	524.0402	412.0870	214.5904	89.8205	0.0000	0.0000	0.0000	0.0000	233.8387	490.2930	736.4494	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3414.0282	
Space heating per m2												(98c) / (4) =	36.4357 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b													
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	1090.2816	858.3068	880.2408	0.0000	0.0000	0.0000	0.0000	(100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.8719	0.9162	0.8931	0.0000	0.0000	0.0000	0.0000	(101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	950.6561	786.3720	786.1000	0.0000	0.0000	0.0000	0.0000	(102)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	1539.0970	1474.8045	1353.2698	0.0000	0.0000	0.0000	0.0000	(103)
Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	423.6775	512.1938	421.9743	0.0000	0.0000	0.0000	0.0000	(104)
Intermittency factor (Table 10b)									fC = cooled area / (4) =			1.0000	(105)
Space cooling kWh	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 requirement	0.0000	0.0000	0.0000	0.0000	0.0000	105.9194	128.0485	105.4936	0.0000	0.0000	0.0000	0.0000	(107)
												339.4614	(107)

Full SAP Calculation Printout



Energy for space heating	36.4357 (99)
Energy for space cooling	3.6229 (108)
Total	40.0586 (109)
Fabric Energy Efficiency (DFEE)	40.1 (109)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	47.6000 (1b)	x 2.3000 (2b)	= 109.4800 (1b) -
First floor	46.1000 (1c)	x 2.5500 (2c)	= 117.5550 (1c) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	227.0350 (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	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 30.0000 / (5) = 0.1321 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3821 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3535 (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	0.4507	0.4418	0.4330	0.3888	0.3800	0.3358	0.3358	0.3270	0.3535	0.3800	0.3977	0.4153 (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	0.6016	0.5976	0.5937	0.5756	0.5722	0.5564	0.5564	0.5535	0.5625	0.5722	0.5791	0.5863 (25)

3. Heat losses and heat loss parameter

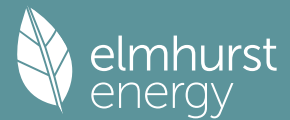
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1000	1.0000	2.1000		(26)
TER Semi-glazed door			2.1000	1.0000	2.1000		(26a)
TER Opening Type (Uw = 1.20)			19.2300	1.1450	22.0191		(27)
ground			46.1000	0.1300	5.9930		(28a)
external wall	137.5400	23.4300	114.1100	0.1800	20.5398		(29a)
cold	46.1000		46.1000	0.1100	5.0710		(30)
bay	1.1000		1.1000	0.1100	0.1210		(30)
Total net area of external elements Aum(A, m ²)			230.8400				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 57.9439		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 145.2199 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	18.4000	0.0500	0.9200
E3 Sill	14.6000	0.0500	0.7300
E4 Jamb	44.1000	0.0500	2.2050
E5 Ground floor (normal)	29.2000	0.1600	4.6720
E6 Intermediate floor within a dwelling	27.6000	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	16.4000	0.0600	0.9840

Full SAP Calculation Printout



E12 Gable (insulation at ceiling level)	11.2000	0.0600	0.6720										
E16 Corner (normal)	19.4000	0.0900	1.7460										
E17 Corner (inverted - internal area greater than external area)	4.6000	-0.0900	-0.4140										
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												11.5150 (36)	
Point Thermal bridges												0.0000	
Total fabric heat loss												(33) + (36) + (36a) =	69.4589 (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	45.0697	44.7742	44.4846	43.1243	42.8698	41.6850	41.6850	41.4656	42.1414	42.8698	43.3847	43.9229	(38)
Average = Sum(39)m / 12 =	114.5285	114.2331	113.9435	112.5832	112.3287	111.1439	111.1439	110.9245	111.6003	112.3287	112.8435	113.3818	(39)
												112.5820	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.2223	1.2191	1.2160	1.2015	1.1988	1.1862	1.1862	1.1838	1.1910	1.1988	1.2043	1.2101	(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													2.6731 (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	29.8119	29.3691	28.7456	27.5961	26.7353	25.7808	25.2652	25.8843	26.5584	27.5798	28.7530	29.7111	(42b)
Hot water usage for other uses	42.0048	40.4773	38.9499	37.4224	35.8950	34.3675	34.3675	35.8950	37.4224	38.9499	40.4773	42.0048	(42c)
Average daily hot water use (litres/day)													65.8264 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	71.8166	69.8464	67.6955	65.0185	62.6302	60.1483	59.6327	61.7793	63.9808	66.5296	69.2303	71.7158	(44)
Energy content (annual)	113.7400	99.4604	104.0455	89.0070	84.3123	73.9593	72.1206	76.4957	78.8948	90.2801	98.6313	112.2897	(45)
Distribution loss (46)m = 0.15 x (45)m													1093.2366
Distribution 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	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	96.6790	84.5413	88.4386	75.6560	71.6655	62.8654	61.3025	65.0213	67.0606	76.7381	83.8366	95.4462	(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	96.6790	84.5413	88.4386	75.6560	71.6655	62.8654	61.3025	65.0213	67.0606	76.7381	83.8366	95.4462	(64)
12Total per year (kWh/year)													929.2511 (64)
Electric shower(s)	55.2880	49.2621	53.7923	51.3333	52.2966	49.8859	51.5487	52.2966	51.3333	53.7923	52.7808	55.2880	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													628.8980 (64a)
Heat gains from water heating, kWh/month	37.9918	33.4509	35.5577	31.7473	30.9905	28.1878	28.2128	29.3295	29.5985	32.6326	34.1544	37.6836	(65)

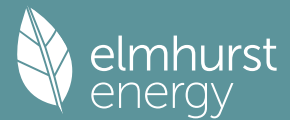
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	133.6527	133.6527	133.6527	133.6527	133.6527	133.6527	133.6527	133.6527	133.6527	133.6527	133.6527	133.6527	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	124.5036	137.8433	124.5036	128.6538	124.5036	128.6538	124.5036	124.5036	128.6538	124.5036	128.6538	124.5036	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	245.7226	248.2724	241.8469	228.1678	210.9004	194.6714	183.8295	181.2797	187.7051	201.3843	218.6517	234.8806	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3653	36.3653	36.3653	36.3653	36.3653	36.3653	36.3653	36.3653	36.3653	36.3653	36.3653	36.3653	(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)	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	(71)
Water heating gains (Table 5)	51.0642	49.7781	47.7927	44.0935	41.6539	39.1498	37.9204	39.4213	41.1090	43.8610	47.4366	50.6499	(72)
Total internal gains	484.3862	498.9896	477.2390	464.0109	440.1537	425.5708	409.3494	408.3005	420.5637	432.8447	457.8379	473.1300	(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
-------	------------	--------------------------------	-----------------------------------	------------------------------------	------------------------------	------------

Full SAP Calculation Printout



North	5.1500	10.6334	0.6300	0.7000	0.7700	16.7360 (74)
East	1.0300	19.6403	0.6300	0.7000	0.7700	6.1824 (76)
South	5.8000	46.7521	0.6300	0.7000	0.7700	82.8706 (78)
West	7.2500	19.6403	0.6300	0.7000	0.7700	43.5168 (80)

Solar gains	149.3058	264.9262	387.3427	516.2050	607.3893	614.7961	587.8957	518.7545	432.1570	299.8218	180.8450	126.4300 (83)
Total gains	633.6920	763.9158	864.5817	980.2159	1047.5430	1040.3669	997.2451	927.0550	852.7207	732.6665	638.6829	599.5600 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	33.0027	33.0880	33.1721	33.5730	33.6490	34.0077	34.0077	34.0750	33.8687	33.6490	33.4955	33.3365
alpha	3.2002	3.2059	3.2115	3.2382	3.2433	3.2672	3.2672	3.2717	3.2579	3.2433	3.2330	3.2224
util living area	0.9803	0.9641	0.9363	0.8716	0.7633	0.6059	0.4648	0.5123	0.7247	0.9047	0.9668	0.9833 (86)
MIT	18.8332	19.1484	19.5837	20.1430	20.5862	20.8629	20.9568	20.9402	20.7428	20.1467	19.3965	18.7859 (87)
Th 2	19.9022	19.9047	19.9072	19.9188	19.9210	19.9311	19.9311	19.9330	19.9272	19.9210	19.9166	19.9120 (88)
util rest of house	0.9763	0.9570	0.9233	0.8450	0.7141	0.5267	0.3620	0.4078	0.6533	0.8791	0.9590	0.9799 (89)
MIT 2	17.9421	18.2540	18.6812	19.2232	19.6248	19.8556	19.9154	19.9094	19.7694	19.2406	18.5108	17.9021 (90)
Living area fraction	fLA = Living area / (4) =											0.1868 (91)
MIT	18.1085	18.4211	18.8498	19.3950	19.8043	20.0437	20.1099	20.1019	19.9512	19.4099	18.6762	18.0672 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.1085	18.4211	18.8498	19.3950	19.8043	20.0437	20.1099	20.1019	19.9512	19.4099	18.6762	18.0672 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9672	0.9442	0.9074	0.8299	0.7082	0.5356	0.3799	0.4252	0.6550	0.8641	0.9469	0.9718 (94)
Useful gains	612.9001	721.3013	784.5376	813.4442	741.8489	557.2194	378.8317	394.1949	558.5666	633.1084	604.7509	582.6737 (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	1581.4663	1544.5528	1407.1777	1181.5602	910.3500	605.0334	390.1002	410.6367	652.9913	989.5994	1306.3013	1572.2885 (97)
Space heating kWh	720.6132	553.2250	463.2442	265.0435	125.3648	0.0000	0.0000	0.0000	0.0000	265.2293	505.1163	736.2735 (98a)
Space heating requirement - total per year (kWh/year)	3634.1099											
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	720.6132	553.2250	463.2442	265.0435	125.3648	0.0000	0.0000	0.0000	0.0000	265.2293	505.1163	736.2735 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	3634.1099											
Space heating per m ²	(98c) / (4) = 38.7845 (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	1044.7526	822.4648	843.0261	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8059	0.8673	0.8387	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	841.9911	713.3328	707.0774	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1166.3630	1118.3870	1038.7972	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	233.5477	301.3603	246.7995	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	f _C = 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	58.3869	75.3401	61.6999	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												195.4269 (107)
Energy for space heating												38.7845 (99)
Energy for space cooling												2.0857 (108)
Total												40.8702 (109)
Fabric Energy Efficiency (TFEE)												40.9 (109)

Full SAP Calculation Printout



Property Reference	Barnwood Bay DET Plot 223				Issued on Date	01/09/2023
Assessment Reference	Hampton Woods	Prop Type Ref	Plot 223			
Property	Plot 223, Hampton Woods, Peterborough, PE7					
SAP Rating	90 B	DER	11.12	TER	11.71	
Environmental	90 B	% DER < TER				5.04
CO ₂ Emissions (t/year)	0.95	DFEE	40.06	TFEE	40.87	
Compliance Check	See BREL	% DFEE < TFEE				1.99
% DPER < TPER	2.40	DPER	59.69	TPER	61.16	
Assessor Details	Mr. Ben Tunningley				Assessor ID	AU36-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	47.6000 (1b)	x 2.3000 (2b)	= 109.4800 (1b) -
First floor	46.1000 (1c)	x 2.5500 (2c)	= 117.5550 (1c) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	227.0350 (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)

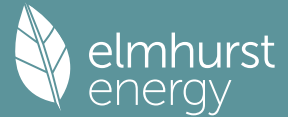
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0100 (17)
Infiltration rate	0.2005 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1855 (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	0.2365	0.2318	0.2272	0.2040	0.1994	0.1762	0.1762	0.1716	0.1855	0.1994	0.2086	0.2179 (22b)
Mechanical extract ventilation - decentralised												
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)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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
entrance			2.1000	0.9000	1.8900		(26)
rear/utility entrance			2.1000	1.1000	2.3100		(26a)
glazing (Uw = 1.30)			25.2000	1.2357	31.1407		(27)

Full SAP Calculation Printout



ground			46.1000	0.1200	5.5320	75.0000	3457.5000 (28a)
external wall	137.5400	29.4000	108.1400	0.2400	25.9536	60.0000	6488.3996 (29a)
cold	46.1000		46.1000	0.0700	3.2270	9.0000	414.9000 (30)
bay	1.1000		1.1000	0.1600	0.1760	9.0000	9.9000 (30)
Total net area of external elements Aum(A, m2)			230.8400				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	70.2293			(33)
stud			221.3000			9.0000	1991.7000 (32c)
internal			46.1000			18.0000	829.8000 (32d)
internal			46.1000			9.0000	414.9000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13607.0996 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 145.2199 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	18.4000	0.0500	0.9200
E2 Other lintels (including other steel lintels)	14.6000	0.0090	0.1314
E3 Sill	44.1000	0.0140	0.6174
E4 Jamb	29.2000	0.0550	1.6060
E5 Ground floor (normal)	27.6000	0.0000	0.0000
E6 Intermediate floor within a dwelling	16.4000	0.0460	0.7544
E10 Eaves (insulation at ceiling level)	11.2000	0.0520	0.5824
E12 Gable (insulation at ceiling level)	19.4000	0.0480	0.9312
E16 Corner (normal)	4.6000	-0.0970	-0.4462
E17 Corner (inverted - internal area greater than external area)			5.0966 (36)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			0.0000 (36a)
Point Thermal bridges			(33) + (36) + (36a) = 75.3259 (37)
Total fabric heat loss			

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.4608	37.4608	37.4608	37.4608	37.4608	37.4608	37.4608	37.4608	37.4608	37.4608	37.4608	37.4608	(38)
Heat transfer coeff	112.7867	112.7867	112.7867	112.7867	112.7867	112.7867	112.7867	112.7867	112.7867	112.7867	112.7867	112.7867	(39)
Average = Sum(39)m / 12 =												112.7867	
HLP	1.2037	1.2037	1.2037	1.2037	1.2037	1.2037	1.2037	1.2037	1.2037	1.2037	1.2037	1.2037	(40)
HLP (average)												1.2037	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6731 (42)
Hot water usage for mixer showers	69.0381	68.0006	66.4887	63.5961	61.4614	59.0808	57.7276	59.2280	60.8728	63.4288	66.3836	68.7736	(42a)
Hot water usage for baths	29.8119	29.3691	28.7456	27.5961	26.7353	25.7808	25.2652	25.8843	26.5584	27.5798	28.7530	29.7111	(42b)
Hot water usage for other uses	42.0048	40.4773	38.9499	37.4224	35.8950	34.3675	34.3675	35.8950	37.4224	38.9499	40.4773	42.0048	(42c)
Average daily hot water use (litres/day)												129.4773	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	140.8547	137.8470	134.1843	128.6146	124.0916	119.2291	117.3604	121.0073	124.8536	129.9585	135.6140	140.4894	(44)
Energy conte	223.0795	196.2923	206.2362	176.0669	167.0512	146.6060	141.9372	149.8324	153.9570	176.3524	193.2069	219.9725	(45)
Energy content (annual)										Total = Sum(45)m =		2150.5905	
Distribution loss (46)m = 0.15 x (45)m	33.4619	29.4439	30.9354	26.4100	25.0577	21.9909	21.2906	22.4749	23.0935	26.4529	28.9810	32.9959	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.2920	12.8964	14.2515	13.7354	14.1575	13.6647	14.0972	14.1162	13.6823	14.1798	13.7765	14.2845	(61)
Total heat required for water heating calculated for each month	237.3714	209.1887	220.4877	189.8023	181.2086	160.2707	156.0344	163.9485	167.6393	190.5322	206.9834	234.2570	(62)
WWHRS	-60.8004	-53.7723	-56.3073	-46.6247	-43.4525	-37.1826	-34.8528	-37.0624	-38.4706	-45.3526	-51.3789	-59.6744	(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	176.5711	155.4164	164.1804	143.1776	137.7561	123.0881	121.1816	126.8861	129.1687	145.1796	155.6045	174.5826	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1752.7928	(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	77.7469	68.4913	72.1364	61.9761	59.0839	52.1627	50.7184	53.3483	54.6113	62.1821	67.6854	76.7120	(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	133.6527	133.6527	133.6527	133.6527	133.6527	133.6527	133.6527	133.6527	133.6527	133.6527	133.6527	133.6527	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	123.9388	137.2180	123.9388	128.0701	123.9388	128.0701	123.9388	123.9388	128.0701	123.9388	128.0701	123.9388	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													

Full SAP Calculation Printout



	245.7226	248.2724	241.8469	228.1678	210.9004	194.6714	183.8295	181.2797	187.7051	201.3843	218.6517	234.8806 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3653	36.3653	36.3653	36.3653	36.3653	36.3653	36.3653	36.3653	36.3653	36.3653	36.3653	36.3653 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222 (71)
Water heating gains (Table 5)	104.4985	101.9216	96.9576	86.0779	79.4138	72.4482	68.1699	71.7047	75.8490	83.5781	94.0075	103.1075 (72)
Total internal gains	540.2557	553.5078	528.8391	508.4116	480.3488	458.2855	439.0340	440.0190	454.7201	474.9970	506.8252	528.0228 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
North	6.7500	10.6334	0.4600	0.0000	0.7700	25.4228 (74)
East	1.3500	19.6403	0.4600	0.0000	0.7700	9.3914 (76)
South	7.6000	46.7521	0.4600	0.0000	0.7700	125.8528 (78)
West	9.5000	19.6403	0.4600	0.0000	0.7700	66.0875 (80)

Solar gains	226.7546	402.3516	588.2731	783.9883	922.4810	933.7330	892.8764	787.8627	656.3365	455.3496	274.6542	192.0123 (83)
Total gains	767.0103	955.8594	1117.1121	1292.3999	1402.8298	1392.0185	1331.9104	1227.8817	1111.0566	930.3466	781.4793	720.0351 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	33.5124	33.5124	33.5124	33.5124	33.5124	33.5124	33.5124	33.5124	33.5124	33.5124	33.5124	33.5124
alpha	3.2342	3.2342	3.2342	3.2342	3.2342	3.2342	3.2342	3.2342	3.2342	3.2342	3.2342	3.2342
util living area	0.9668	0.9364	0.8846	0.7842	0.6437	0.4867	0.3628	0.4071	0.6152	0.8436	0.9443	0.9724 (86)
MIT	19.0743	19.4472	19.9087	20.4077	20.7539	20.9253	20.9781	20.9680	20.8404	20.3455	19.6008	18.9855 (87)
Th 2	19.9170	19.9170	19.9170	19.9170	19.9170	19.9170	19.9170	19.9170	19.9170	19.9170	19.9170	19.9170 (88)
util rest of house	0.9605	0.9248	0.8644	0.7486	0.5897	0.4142	0.2775	0.3173	0.5412	0.8081	0.9321	0.9670 (89)
MIT 2	17.6998	18.1650	18.7321	19.3218	19.7018	19.8671	19.9074	19.9019	19.7985	19.2699	18.3653	17.5880 (90)
Living area fraction									fLA = Living area / (4) =			0.1868 (91)
MIT	17.9565	18.4045	18.9518	19.5246	19.8983	20.0648	20.1074	20.1010	19.9931	19.4708	18.5960	17.8490 (92)
Temperature adjustment												-0.1500
adjusted MIT	17.8065	18.2545	18.8018	19.3746	19.7483	19.9148	19.9574	19.9510	19.8431	19.3208	18.4460	17.6990 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9429	0.9017	0.8390	0.7285	0.5807	0.4141	0.2808	0.3203	0.5357	0.7846	0.9098	0.9512 (94)
Useful gains	723.2192	861.9139	937.2968	941.4621	814.6046	576.4109	374.0064	393.2378	595.2253	729.9712	711.0155	684.8725 (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	1523.3531	1506.2082	1387.4836	1181.3972	907.7357	599.4354	378.6682	400.5051	647.7424	983.5916	1279.6815	1522.5095 (97)
Space heating kWh	595.2997	432.9658	334.9390	172.7533	69.2895	0.0000	0.0000	0.0000	0.0000	188.6936	409.4396	623.2019 (98a)
Space heating requirement - total per year (kWh/year)												2826.5823
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	595.2997	432.9658	334.9390	172.7533	69.2895	0.0000	0.0000	0.0000	0.0000	188.6936	409.4396	623.2019 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2826.5823
Space heating per m2										(98c) / (4) =		30.1663 (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 %)												89.0000 (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	595.2997	432.9658	334.9390	172.7533	69.2895	0.0000	0.0000	0.0000	0.0000	188.6936	409.4396	623.2019 (98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000 (210)
Space heating fuel (main heating system)	668.8760	486.4784	376.3360	194.1048	77.8534	0.0000	0.0000	0.0000	0.0000	212.0153	460.0445	700.2268 (211)
Space heating efficiency (main heating system 2)												

Full SAP Calculation Printout



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 (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	176.5711	155.4164	164.1804	143.1776	137.7561	123.0881	121.1816	126.8861	129.1687	145.1796	155.6045	174.5826 (64)
Efficiency of water heater	88.6053	88.5446	88.4335	88.2214	87.8616	87.3000	87.3000	87.3000	87.3000	88.2527	88.5253	87.3000 (216)
Fuel for water heating, kWh/month	199.2782	175.5234	185.6540	162.2934	156.7876	140.9944	138.8106	145.3449	147.9596	164.5044	175.7741	88.6223 (217)
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	10.4558	9.4439	10.4558	10.1185	10.4558	10.1185	10.4558	10.4558	10.1185	10.4558	10.1185	10.4558 (231)
Lighting	24.7578	19.8616	17.8832	13.1020	10.1204	8.2684	9.2321	12.0003	15.5872	20.4512	23.0996	25.4459 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-12.6548	-20.8419	-35.4040	-46.1861	-54.8195	-52.9933	-52.0249	-46.2582	-36.9507	-26.0191	-14.7695	-10.5287 (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	-3.0867	-7.6046	-18.2529	-32.3368	-47.2335	-49.2372	-48.0659	-37.9601	-24.3433	-11.8179	-4.3456	-2.3373 (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												3175.9352 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												87.3000
Water heating fuel used												1989.9206 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(MEVDecentralised, Database: total watage = 4.9570, total flow = 37.0000, SFP = 0.1340)												
mechanical ventilation fans (SFP = 0.1340)												37.1082 (230a)
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												123.1082 (231)
Electricity for lighting (calculated in Appendix L)												199.8097 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-696.0724 (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												4792.7013 (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	3175.9352	0.2100	666.9464 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1989.9206	0.2100	417.8833 (264)
Space and water heating			1084.8297 (265)
Pumps, fans and electric keep-hot	123.1082	0.1387	17.0766 (267)
Energy for lighting	199.8097	0.1443	28.8387 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-409.4507	0.1318	-53.9629
PV Unit electricity exported	-286.6217	0.1220	-34.9597
Total			-88.9226 (269)
Total CO2, kg/year			1041.8224 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.1200 (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	3175.9352	1.1300	3588.8068 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1989.9206	1.1300	2248.6103 (278)
Space and water heating			5837.4171 (279)
Pumps, fans and electric keep-hot	123.1082	1.5128	186.2381 (281)
Energy for lighting	199.8097	1.5338	306.4747 (282)
Energy saving/generation technologies			

Full SAP Calculation Printout



PV Unit electricity used in dwelling	-409.4507	1.4869	-608.8234
PV Unit electricity exported	-286.6217	0.4475	-128.2698
Total			-737.0932 (283)
Total Primary energy kWh/year			5593.0367 (286)
Dwelling Primary energy Rate (DPER)			59.6900 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	47.6000 (1b)	x 2.3000 (2b)	= 109.4800 (1b) -
First floor	46.1000 (1c)	x 2.5500 (2c)	= 117.5550 (1c) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	227.0350 (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	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1321 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3821 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3535 (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	0.4507	0.4418	0.4330	0.3888	0.3800	0.3358	0.3358	0.3270	0.3535	0.3800	0.3977	0.4153 (22b)
Effective ac	0.6016	0.5976	0.5937	0.5756	0.5722	0.5564	0.5564	0.5535	0.5625	0.5722	0.5791	0.5863 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1000	1.0000	2.1000		(26)
TER Semi-glazed door			2.1000	1.0000	2.1000		(26a)
TER Opening Type (Uw = 1.20)			19.2300	1.1450	22.0191		(27)
ground			46.1000	0.1300	5.9930		(28a)
external wall	137.5400	23.4300	114.1100	0.1800	20.5398		(29a)
cold	46.1000		46.1000	0.1100	5.0710		(30)
bay	1.1000		1.1000	0.1100	0.1210		(30)
Total net area of external elements Aum(A, m ²)			230.8400				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	57.9439	(33)

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

145.2199 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	18.4000	0.0500	0.9200
E3 Sill	14.6000	0.0500	0.7300
E4 Jamb	44.1000	0.0500	2.2050
E5 Ground floor (normal)	29.2000	0.1600	4.6720
E6 Intermediate floor within a dwelling	27.6000	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	16.4000	0.0600	0.9840
E12 Gable (insulation at ceiling level)	11.2000	0.0600	0.6720

Full SAP Calculation Printout



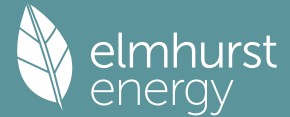
E16 Corner (normal)	19.4000	0.0900	1.7460									
E17 Corner (inverted - internal area greater than external area)	4.6000	-0.0900	-0.4140									
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				11.5150 (36)								
Point Thermal bridges				0.0000								
Total fabric heat loss		(33) + (36) + (36a) =		69.4589 (37)								
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 45.0697	Feb 44.7742	Mar 44.4846	Apr 43.1243	May 42.8698	Jun 41.6850	Jul 41.6850	Aug 41.4656	Sep 42.1414	Oct 42.8698	Nov 43.3847	Dec 43.9229 (38)
Heat transfer coeff	114.5285	114.2331	113.9435	112.5832	112.3287	111.1439	111.1439	110.9245	111.6003	112.3287	112.8435	113.3818 (39)
Average = Sum(39)m / 12 =												112.5820
HLP	Jan 1.2223	Feb 1.2191	Mar 1.2160	Apr 1.2015	May 1.1988	Jun 1.1862	Jul 1.1862	Aug 1.1838	Sep 1.1910	Oct 1.1988	Nov 1.2043	Dec 1.2101 (40)
HLP (average)												1.2015
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.6731 (42)
Hot water usage for mixer showers	69.0381	68.0006	66.4887	63.5961	61.4614	59.0808	57.7276	59.2280	60.8728	63.4288	66.3836	68.7736 (42a)
Hot water usage for baths	29.8119	29.3691	28.7456	27.5961	26.7353	25.7808	25.2652	25.8843	26.5584	27.5798	28.7530	29.7111 (42b)
Hot water usage for other uses	42.0048	40.4773	38.9499	37.4224	35.8950	34.3675	34.3675	35.8950	37.4224	38.9499	40.4773	42.0048 (42c)
Average daily hot water use (litres/day)												129.4773 (43)
Daily hot water use	Jan 140.8547	Feb 137.8470	Mar 134.1843	Apr 128.6146	May 124.0916	Jun 119.2291	Jul 117.3604	Aug 121.0073	Sep 124.8536	Oct 129.9585	Nov 135.6140	Dec 140.4894 (44)
Energy conte	223.0795	196.2923	206.2362	176.0669	167.0512	146.6060	141.9372	149.8324	153.9570	176.3524	193.2069	219.9725 (45)
Energy content (annual)										Total = Sum(45)m =		2150.5905
Distribution loss (46)m = 0.15 x (45)m	33.4619	29.4439	30.9354	26.4100	25.0577	21.9909	21.2906	22.4749	23.0935	26.4529	28.9810	32.9959 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	274.0384	242.3197	257.1951	225.3820	218.0101	195.9211	192.8961	200.7913	203.2721	227.3113	242.5220	270.9314 (62)
WWHRS	-31.5613	-27.9131	-29.2290	-24.2028	-22.5561	-19.3014	-18.0920	-19.2390	-19.9700	-23.5424	-26.6707	-30.9769 (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	242.4770	214.4066	227.9661	201.1792	195.4539	176.6197	174.8041	181.5522	183.3021	203.7689	215.8513	239.9545 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2457.3357 (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	86.9137	76.7741	81.3133	70.8710	68.2842	61.0753	59.9338	62.5590	63.5195	71.3769	76.5701	85.8806 (65)

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts	Jan 133.6527	Feb 133.6527	Mar 133.6527	Apr 133.6527	May 133.6527	Jun 133.6527	Jul 133.6527	Aug 133.6527	Sep 133.6527	Oct 133.6527	Nov 133.6527	Dec 133.6527 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	124.5036	137.8433	124.5036	128.6538	124.5036	128.6538	124.5036	124.5036	128.6538	124.5036	128.6538	124.5036 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	245.7226	248.2724	241.8469	228.1678	210.9004	194.6714	183.8295	181.2797	187.7051	201.3843	218.6517	234.8806 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3653	36.3653	36.3653	36.3653	36.3653	36.3653	36.3653	36.3653	36.3653	36.3653	36.3653	36.3653 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222 (71)
Water heating gains (Table 5)	116.8194	114.2471	109.2920	98.4320	91.7799	84.8268	80.5562	84.0847	88.2215	95.9367	106.3473	115.4309 (72)
Total internal gains	553.1414	566.4586	541.7384	521.3493	493.2797	471.2478	451.9852	452.9638	467.6762	487.9204	519.7486	540.9110 (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						

Full SAP Calculation Printout



North	5.1500	10.6334	0.6300	0.7000	0.7700	16.7360 (74)
East	1.0300	19.6403	0.6300	0.7000	0.7700	6.1824 (76)
South	5.8000	46.7521	0.6300	0.7000	0.7700	82.8706 (78)
West	7.2500	19.6403	0.6300	0.7000	0.7700	43.5168 (80)

Solar gains	149.3058	264.9262	387.3427	516.2050	607.3893	614.7961	587.8957	518.7545	432.1570	299.8218	180.8450	126.4300 (83)
Total gains	702.4472	831.3849	929.0811	1037.5544	1100.6690	1086.0439	1039.8809	971.7183	899.8332	787.7422	700.5936	667.3410 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	33.0027	33.0880	33.1721	33.5730	33.6490	34.0077	34.0077	34.0750	33.8687	33.6490	33.4955	33.3365
alpha	3.2002	3.2059	3.2115	3.2382	3.2433	3.2672	3.2672	3.2717	3.2579	3.2433	3.2330	3.2224
util living area	0.9740	0.9554	0.9244	0.8558	0.7440	0.5871	0.4482	0.4927	0.7025	0.8883	0.9577	0.9776 (86)
MIT	18.9388	19.2454	19.6666	20.1998	20.6188	20.8751	20.9611	20.9467	20.7666	20.2090	19.4868	18.8917 (87)
Th 2	19.9022	19.9047	19.9072	19.9188	19.9210	19.9311	19.9311	19.9330	19.9272	19.9210	19.9166	19.9120 (88)
util rest of house	0.9688	0.9468	0.9095	0.8272	0.6935	0.5085	0.3481	0.3907	0.6298	0.8596	0.9481	0.9731 (89)
MIT 2	17.5201	17.9075	18.4350	19.0913	19.5739	19.8436	19.9131	19.9063	19.7457	19.1196	18.2247	17.4667 (90)
Living area fraction	17.7851	18.1574	18.6650	19.2983	19.7690	20.0363	20.1088	20.1006	fLA = Living area / (4) =	19.3231	18.4604	0.1868 (91)
MIT	17.7851	18.1574	18.6650	19.2983	19.7690	20.0363	20.1088	20.1006	19.9364	19.3231	18.4604	17.7328 (92)
Temperature adjustment												0.0000
adjusted MIT	17.7851	18.1574	18.6650	19.2983	19.7690	20.0363	20.1088	20.1006	19.9364	19.3231	18.4604	17.7328 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9545	0.9283	0.8880	0.8079	0.6856	0.5168	0.3654	0.4075	0.6305	0.8400	0.9303	0.9602 (94)
Useful gains	670.5051	771.7657	825.0145	838.2636	754.5749	561.2239	379.9414	395.9830	567.3721	661.7203	651.7615	640.7715 (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	1544.4287	1514.4297	1386.1218	1170.6722	906.3841	604.2106	389.9868	410.4911	651.3450	979.8507	1281.9449	1534.3746 (97)
Space heating kWh	650.1992	499.0703	417.4638	239.3341	112.9460	0.0000	0.0000	0.0000	0.0000	236.6890	453.7320	664.8407 (98a)
Space heating requirement - total per year (kWh/year)												3274.2751
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	650.1992	499.0703	417.4638	239.3341	112.9460	0.0000	0.0000	0.0000	0.0000	236.6890	453.7320	664.8407 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3274.2751
Space heating per m2										(98c) / (4) =		34.9442 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (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	650.1992	499.0703	417.4638	239.3341	112.9460	0.0000	0.0000	0.0000	0.0000	236.6890	453.7320	664.8407 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	703.6788	540.1193	451.8007	259.0196	122.2360	0.0000	0.0000	0.0000	0.0000	256.1569	491.0520	719.5245 (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	242.4770	214.4066	227.9661	201.1792	195.4539	176.6197	174.8041	181.5522	183.3021	203.7689	215.8513	239.9545 (64)
Efficiency of water heater (217)m	86.3869	86.1280	85.6597	84.7546	83.2494	80.3000	80.3000	80.3000	80.3000	84.7032	85.9332	80.3000 (216)
Fuel for water heating, kWh/month	280.6872	248.9394	266.1298	237.3668	234.7812	219.9498	217.6888	226.0924	228.2716	240.5680	251.1851	277.5815 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	25.8694	20.7534	18.6861	13.6903	10.5747	8.6397	9.6466	12.5391	16.2870	21.3694	24.1367	26.5884 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-43.6324	-61.0594	-87.1255	-97.2134	-104.1842	-96.9868	-95.7451	-90.6693	-81.6613	-69.4200	-47.7896	-37.7727 (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	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-26.0634	-54.6584	-108.3387	-162.3033	-214.2286	-215.1422	-212.6499	-180.2594	-132.3761	-78.0770	-34.7658	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year												
Space heating fuel - main system 1											3543.5878	(211)
Space heating fuel - main system 2											0.0000	(213)
Space heating fuel - secondary											0.0000	(215)
Efficiency of water heater											80.3000	
Water heating fuel used											2929.2416	(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)											208.7809	(232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation											-2352.7492	(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											4414.8611	(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	3543.5878	0.2100	744.1534 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2929.2416	0.2100	615.1407 (264)
Space and water heating			1359.2942 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	208.7809	0.1443	30.1335 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-913.2596	0.1348	-123.0637
PV Unit electricity exported	-1439.4896	0.1260	-181.3286
Total			-304.3922 (269)
Total CO2, kg/year			1096.9647 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.7100 (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	3543.5878	1.1300	4004.2542 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2929.2416	1.1300	3310.0430 (278)
Space and water heating			7314.2973 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	208.7809	1.5338	320.2351 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-913.2596	1.4980	-1368.0906
PV Unit electricity exported	-1439.4896	0.4624	-665.6048
Total			-2033.6953 (283)
Total Primary energy kWh/year			5730.9378 (286)
Target Primary Energy Rate (TPER)			61.1600 (287)

Full SAP Calculation Printout



Property Reference	Barnwood Bay DET Plot 223				Issued on Date	01/09/2023
Assessment Reference	Hampton Woods	Prop Type Ref	Plot 223			
Property	Plot 223, Hampton Woods, Peterborough, PE7					
SAP Rating	90 B	DER	11.12	TER	11.71	
Environmental	90 B	% DER < TER				5.04
CO ₂ Emissions (t/year)	0.95	DFEE	40.06	TFEE	40.87	
Compliance Check	See BREL	% DFEE < TFEE				1.99
% DPER < TPER	2.40	DPER	59.69	TPER	61.16	
Assessor Details	Mr. Ben Tunningley				Assessor ID	AU36-0001
Client						

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	47.6000 (1b)	x 2.3000 (2b)	= 109.4800 (1b) -
First floor	46.1000 (1c)	x 2.5500 (2c)	= 117.5550 (1c) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	227.0350 (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	4.0100 (17)
Infiltration rate	0.2005 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1855 (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	0.2365	0.2318	0.2272	0.2040	0.1994	0.1762	0.1762	0.1716	0.1855	0.1994	0.2086	0.2179 (22b)
Mechanical extract ventilation - decentralised												
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)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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
entrance			2.1000	0.9000	1.8900		(26)
rear/utility entrance			2.1000	1.1000	2.3100		(26a)
glazing (Uw = 1.30)			25.2000	1.2357	31.1407		(27)

Page 2 of 17

Full SAP Calculation Printout



Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	53.7114	53.7114	53.7114	53.7114	53.7114	53.7114	53.7114	53.7114	53.7114	53.7114	53.7114	53.7114 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222 (71)
Water heating gains (Table 5)	104.4985	101.9216	96.9576	86.0779	79.4138	72.4482	68.1699	71.7047	75.8490	83.5781	94.0075	103.1075 (72)
Total internal gains	609.7062	607.7725	588.5266	552.2669	515.9252	479.9363	460.2622	463.1538	481.5799	517.6891	557.7962	592.9193 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W	
North					6.7500	10.6334	0.4600	0.0000			0.7700	25.4228 (74)	
East					1.3500	19.6403	0.4600	0.0000			0.7700	9.3914 (76)	
South					7.6000	46.7521	0.4600	0.0000			0.7700	125.8528 (78)	
West					9.5000	19.6403	0.4600	0.0000			0.7700	66.0875 (80)	
Solar gains	226.7546	402.3516	588.2731	783.9883	922.4810	933.7330	892.8764	787.8627	656.3365	455.3496	274.6542	192.0123	(83)
Total gains	836.4608	1010.1241	1176.7997	1336.2552	1438.4062	1413.6694	1353.1386	1251.0165	1137.9164	973.0387	832.4504	784.9317	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)											
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	33.5124	33.5124	33.5124	33.5124	33.5124	33.5124	33.5124	33.5124	33.5124	33.5124	33.5124	33.5124
alpha	3.2342	3.2342	3.2342	3.2342	3.2342	3.2342	3.2342	3.2342	3.2342	3.2342	3.2342	3.2342
util living area	0.9584	0.9274	0.8713	0.7718	0.6328	0.4804	0.3576	0.4003	0.6048	0.8296	0.9350	0.9653 (86)
MIT	19.1757	19.5176	19.9713	20.4378	20.7661	20.9281	20.9790	20.9695	20.8482	20.3833	19.6689	19.0825 (87)
Th 2	19.9170	19.9170	19.9170	19.9170	19.9170	19.9170	19.9170	19.9170	19.9170	19.9170	19.9170	19.9170 (88)
util rest of house	0.9507	0.9146	0.8495	0.7354	0.5788	0.4085	0.2733	0.3118	0.5310	0.7923	0.9212	0.9587 (89)
MIT 2	17.8264	18.2511	18.8059	19.3546	19.7132	19.8691	19.9078	19.9027	19.8049	19.3114	18.4484	17.7097 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.0784	18.4877	19.0235	19.5569	19.9099	20.0669	20.1079	20.1019	19.9997	19.5116	18.6764	17.9661 (92)
Temperature adjustment	-0.1500											
adjusted MIT	17.9284	18.3377	18.8735	19.4069	19.7599	19.9169	19.9579	19.9519	19.8497	19.3616	18.5264	17.8161 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9311	0.8906	0.8244	0.7161	0.5704	0.4085	0.2766	0.3147	0.5261	0.7697	0.8978	0.9408 (94)
Ext temp.	778.7918	899.5913	970.1057	956.8899	820.5226	577.5258	374.2684	393.7031	598.6253	748.9420	747.3719	738.4322 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Space heating kWh	1537.0987	1515.5902	1395.5689	1185.0357	909.0457	599.6742	378.7267	400.6081	648.4931	988.1945	1288.7405	1535.7097 (97)
Space heating requirement - total per year (kWh/year)	564.1803	413.9513	316.5447	164.2649	65.8612	0.0000	0.0000	0.0000	0.0000	178.0039	389.7854	593.1745 (98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98c)
Space heating kWh	564.1803	413.9513	316.5447	164.2649	65.8612	0.0000	0.0000	0.0000	0.0000	178.0039	389.7854	593.1745 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	(98c) / (4) =											
Space heating per m2	28.6635 (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 %)	89.0000 (206)											
Efficiency of main space heating system 2 (in %)	0.0000 (207)											
Efficiency of secondary/supplementary heating system, %	0.0000 (208)											
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating efficiency (main heating system 1)	564.1803	413.9513	316.5447	164.2649	65.8612	0.0000	0.0000	0.0000	0.0000	178.0039	389.7854	593.1745 (98)
Space heating fuel (main heating system)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000 (210)
Space heating efficiency (main heating system 2)	633.9105	465.1138	355.6682	184.5674	74.0013	0.0000	0.0000	0.0000	0.0000	200.0043	437.9611	666.4882 (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)

Full SAP Calculation Printout



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	176.5711	155.4164	164.1804	143.1776	137.7561	123.0881	121.1816	126.8861	129.1687	145.1796	155.6045	174.5826	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.5888	88.5294	88.4120	88.2001	87.8427	87.3000	87.3000	87.3000	87.3000	88.2282	88.5083	88.6076	(217)
Fuel for water heating, kWh/month	199.3154	175.5534	185.6992	162.3326	156.8213	140.9944	138.8106	145.3449	147.9596	164.5501	175.8079	197.0288	(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	10.4558	9.4439	10.4558	10.1185	10.4558	10.1185	10.4558	10.4558	10.1185	10.4558	10.1185	10.4558	(231)
Lighting	24.7578	19.8616	17.8832	13.1020	10.1204	8.2684	9.2321	12.0003	15.5872	20.4512	23.0996	25.4459	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-12.6548	-20.8419	-35.4040	-46.1861	-54.8195	-52.9933	-52.0249	-46.2582	-36.9507	-26.0191	-14.7695	-10.5287	(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)	-3.0867	-7.6046	-18.2529	-32.3368	-47.2335	-49.2372	-48.0659	-37.9601	-24.3433	-11.8179	-4.3456	-2.3373	(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												3017.7147	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												87.3000	
Water heating fuel used												1990.2181	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 4.9570, total flow = 37.0000, SFP = 0.1340)													
mechanical ventilation fans (SFP = 0.1340)												37.1082	(230a)
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												123.1082	(231)
Electricity for lighting (calculated in Appendix L)												199.8097	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-696.0724	(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												4634.7782	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3017.7147	3.6400	109.8448 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1990.2181	3.6400	72.4439 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	123.1082	16.4900	20.3005 (249)
Energy for lighting	199.8097	16.4900	32.9486 (250)
Additional standing charges			92.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-409.4507	16.4900	-67.5184
PV Unit electricity exported	-286.6217	5.5900	-16.0222
Total			-83.5406 (252)
Total energy cost			243.9973 (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] =	0.6333 (257)
SAP value		89.7342
SAP rating (Section 12)		90 (258)
SAP band		B

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

Full SAP Calculation Printout

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3017.7147	0.2100	633.7201 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1990.2181	0.2100	417.9458 (264)
Space and water heating			1051.6659 (265)
Pumps, fans and electric keep-hot	123.1082	0.1387	17.0766 (267)
Energy for lighting	199.8097	0.1443	28.8387 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-409.4507	0.1318	-53.9629
PV Unit electricity exported	-286.6217	0.1220	-34.9597
Total			-88.9226 (269)
Total CO2, kg/year			1008.6586 (272)
CO2 emissions per m2			10.7600 (273)
EI value			90.2552
EI rating			90 (274)
EI band			B

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)
Ground floor	47.6000 (1b)	x 2.3000 (2b)	= 109.4800 (1b) -
First floor	46.1000 (1c)	x 2.5500 (2c)	= 117.5550 (1c) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	227.0350 (5)

2. Ventilation rate

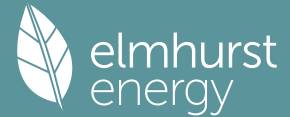
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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) =	Air changes per hour 0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0100 (17)
Infiltration rate	0.2005 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1855 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.8000	4.7000	4.7000	4.3000	4.3000	3.7000	3.8000	3.8000	3.9000	4.1000	4.2000	4.3000 (22)
Wind factor	1.2000	1.1750	1.1750	1.0750	1.0750	0.9250	0.9500	0.9500	0.9750	1.0250	1.0500	1.0750 (22a)
Adj infilt rate	0.2226	0.2179	0.2179	0.1994	0.1994	0.1716	0.1762	0.1762	0.1808	0.1901	0.1947	0.1994 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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
entrance			2.1000	0.9000	1.8900		(26)
rear/utility entrance			2.1000	1.1000	2.3100		(26a)

Full SAP Calculation Printout



glazing (Uw = 1.30)			25.2000	1.2357	31.1407			(27)
ground			46.1000	0.1200	5.5320	75.0000	3457.5000	(28a)
external wall	137.5400	29.4000	108.1400	0.2400	25.9536	60.0000	6488.3996	(29a)
cold	46.1000		46.1000	0.0700	3.2270	9.0000	414.9000	(30)
bay	1.1000		1.1000	0.1600	0.1760	9.0000	9.9000	(30)
Total net area of external elements Aum(A, m2)			230.8400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...	(30) + (32) =	70.2293			(33)
stud			221.3000			9.0000	1991.7000	(32c)
internal			46.1000			18.0000	829.8000	(32d)
internal			46.1000			9.0000	414.9000	(32e)

Heat capacity Cm = Sum(A x k) (28)...

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K (34)

145.2199 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	18.4000	0.0500	0.9200
E3 Sill	14.6000	0.0090	0.1314
E4 Jamb	44.1000	0.0140	0.6174
E5 Ground floor (normal)	29.2000	0.0550	1.6060
E6 Intermediate floor within a dwelling	27.6000	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	16.4000	0.0460	0.7544
E12 Gable (insulation at ceiling level)	11.2000	0.0520	0.5824
E16 Corner (normal)	19.4000	0.0480	0.9312
E17 Corner (inverted - internal area greater than external area)	4.6000	-0.0970	-0.4462
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			5.0966 (36)
Point Thermal bridges			0.0000 (36a) =
Total fabric heat loss			75.3259 (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)
Heat transfer coeff	37.4608	37.4608	37.4608	37.4608	37.4608	37.4608	37.4608	37.4608	37.4608	37.4608	37.4608	37.4608	
Average = Sum(39)m / 12 =	112.7867	112.7867	112.7867	112.7867	112.7867	112.7867	112.7867	112.7867	112.7867	112.7867	112.7867	112.7867	(39)
													112.7867
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.2037	1.2037	1.2037	1.2037	1.2037	1.2037	1.2037	1.2037	1.2037	1.2037	1.2037	1.2037	(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													2.6731 (42)
Hot water usage for mixer showers													
	69.0381	68.0006	66.4887	63.5961	61.4614	59.0808	57.7276	59.2280	60.8728	63.4288	66.3836	68.7736	(42a)
Hot water usage for baths													
	29.8119	29.3691	28.7456	27.5961	26.7353	25.7808	25.2652	25.8843	26.5584	27.5798	28.7530	29.7111	(42b)
Hot water usage for other uses													
	42.0048	40.4773	38.9499	37.4224	35.8950	34.3675	34.3675	35.8950	37.4224	38.9499	40.4773	42.0048	(42c)
Average daily hot water use (litres/day)													129.4773 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	140.8547	137.8470	134.1843	128.6146	124.0916	119.2291	117.3604	121.0073	124.8536	129.9585	135.6140	140.4894	(44)
Energy conte	223.0795	196.2923	206.2362	176.0669	167.0512	146.6060	141.9372	149.8324	153.9570	176.3524	193.2069	219.9725	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
	33.4619	29.4439	30.9354	26.4100	25.0577	21.9909	21.2906	22.4749	23.0935	26.4529	28.9810	32.9959	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.2920	12.8964	14.2515	13.7354	14.1575	13.6647	14.0972	14.1162	13.6823	14.1798	13.7765	14.2845	(61)
Total heat required for water heating calculated for each month													
	237.3714	209.1887	220.4877	189.8023	181.2086	160.2707	156.0344	163.9485	167.6393	190.5322	206.9834	234.2570	(62)
WWHRS	-60.8004	-53.7723	-56.3073	-46.6247	-43.4525	-37.1826	-34.8528	-37.0624	-38.4706	-45.3526	-51.3789	-59.6744	(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													
	176.5711	155.4164	164.1804	143.1776	137.7561	123.0881	121.1816	126.8861	129.1687	145.1796	155.6045	174.5826	(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													
	77.7469	68.4913	72.1364	61.9761	59.0839	52.1627	50.7184	53.3483	54.6113	62.1821	67.6854	76.7120	(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)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	28.2851	25.1226	20.4311	15.4676	11.5622	9.7613	10.5475	13.7100	18.4015	23.3650	27.2703	29.0713	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													

Full SAP Calculation Printout



Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	366.7501	370.5558	360.9655	340.5489	314.7767	290.5544	274.3724	270.5666	280.1569	300.5735	326.3458	350.5681 (68)
Pumps, fans	53.7114	53.7114	53.7114	53.7114	53.7114	53.7114	53.7114	53.7114	53.7114	53.7114	53.7114	53.7114 (69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Water heating gains (Table 5)	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222 (71)
Total internal gains	104.4985	101.9216	96.9576	86.0779	79.4138	72.4482	68.1699	71.7047	75.8490	83.5781	94.0075	103.1075 (72)
	609.7062	607.7725	588.5266	552.2669	515.9252	479.9363	460.2622	463.1538	481.5799	517.6891	557.7962	592.9193 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
North	6.7500	12.1136	0.4600	0.0000	0.7700	28.9617 (74)
East	1.3500	22.4868	0.4600	0.0000	0.7700	10.7525 (76)
South	7.6000	52.3697	0.4600	0.0000	0.7700	140.9751 (78)
West	9.5000	22.4868	0.4600	0.0000	0.7700	75.6659 (80)

Solar gains	256.3552	416.6552	609.1872	827.0591	949.1605	988.7649	929.4376	825.2480	703.4944	501.3847	309.9649	223.9253 (83)
Total gains	866.0615	1024.4277	1197.7138	1379.3261	1465.0856	1468.7012	1389.6998	1288.4018	1185.0743	1019.0738	867.7610	816.8447 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	33.5124	33.5124	33.5124	33.5124	33.5124	33.5124	33.5124	33.5124	33.5124	33.5124	33.5124	33.5124
alpha	3.2342	3.2342	3.2342	3.2342	3.2342	3.2342	3.2342	3.2342	3.2342	3.2342	3.2342	3.2342
util living area	0.9531	0.9227	0.8568	0.7433	0.5906	0.4136	0.2883	0.3100	0.5339	0.7939	0.9244	0.9603 (86)
MIT	19.2538	19.5699	20.0678	20.5226	20.8236	20.9592	20.9909	20.9887	20.9069	20.5003	19.7661	19.1656 (87)
Th 2	19.9170	19.9170	19.9170	19.9170	19.9170	19.9170	19.9170	19.9170	19.9170	19.9170	19.9170	19.9170 (88)
util rest of house	0.9444	0.9091	0.8325	0.7034	0.5326	0.3394	0.2033	0.2190	0.4536	0.7499	0.9085	0.9528 (89)
MIT 2	17.9244	18.3160	18.9222	19.4496	19.7708	19.8933	19.9142	19.9134	19.8558	19.4434	18.5681	17.8142 (90)
Living area fraction									fLA = Living area / (4) =			0.1868 (91)
MIT	18.1727	18.5502	19.1362	19.6500	19.9675	20.0924	20.1153	20.1143	20.0521	19.6408	18.7919	18.0666 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.0227	18.4002	18.9862	19.5000	19.8175	19.9424	19.9653	19.9643	19.9021	19.4908	18.6419	17.9166 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9237	0.8847	0.8078	0.6864	0.5269	0.3412	0.2072	0.2231	0.4524	0.7300	0.8842	0.9336 (94)
Useful gains	800.0234	906.3159	967.5319	946.7020	771.9616	501.1270	287.8937	287.4236	536.1555	743.9183	767.2504	762.5807 (95)
Ext temp.	4.5000	5.1000	7.0000	9.4000	12.4000	15.4000	17.4000	17.4000	14.9000	11.2000	7.4000	4.4000 (96)
Heat loss rate W	1525.1771	1500.0876	1351.8795	1139.1465	836.5908	512.3218	289.3272	289.2149	564.1690	935.0879	1267.9343	1524.4865 (97)
Space heating kWh	539.5144	399.0146	285.9547	138.5601	48.0841	0.0000	0.0000	0.0000	0.0000	142.2302	360.4924	566.8579 (98a)
Space heating requirement - total per year (kWh/year)												2480.7083
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	539.5144	399.0146	285.9547	138.5601	48.0841	0.0000	0.0000	0.0000	0.0000	142.2302	360.4924	566.8579 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2480.7083
Space heating per m2										(98c) / (4) =		26.4750 (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 %)												89.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	539.5144	399.0146	285.9547	138.5601	48.0841	0.0000	0.0000	0.0000	0.0000	142.2302	360.4924	566.8579 (98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000 (210)
Space heating fuel (main heating system)	606.1959	448.3310	321.2974	155.6855	54.0271	0.0000	0.0000	0.0000	0.0000	159.8092	405.0476	636.9190 (211)
Space heating efficiency (main heating system 2)												

Full SAP Calculation Printout



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 (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	176.5711	155.4164	164.1804	143.1776	137.7561	123.0881	121.1816	126.8861	129.1687	145.1796	155.6045	174.5826 (64)
Efficiency of water heater	88.5747	88.5168	88.3723	88.1279	87.7336	87.3000	87.3000	87.3000	87.3000	88.1331	88.4805	87.3000 (216)
Fuel for water heating, kWh/month	199.3471	175.5784	185.7826	162.4657	157.0164	140.9944	138.8106	145.3449	147.9596	164.7277	175.8630	88.5938 (217)
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	10.4558	9.4439	10.4558	10.1185	10.4558	10.1185	10.4558	10.4558	10.1185	10.4558	10.1185	10.4558 (231)
Lighting	24.7578	19.8616	17.8832	13.1020	10.1204	8.2684	9.2321	12.0003	15.5872	20.4512	23.0996	25.4459 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-14.2985	-21.7299	-36.7480	-48.3173	-56.1100	-55.1915	-53.6012	-48.0062	-39.2064	-28.4328	-16.6135	-12.2454 (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	-3.7737	-8.1670	-19.5172	-35.2507	-49.4973	-53.5435	-51.1078	-40.8662	-27.2265	-13.8230	-5.2918	-2.9917 (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												2787.3127 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												87.3000
Water heating fuel used												1990.9499 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(MEVDecentralised, Database: total watage = 4.9570, total flow = 37.0000, SFP = 0.1340)												
mechanical ventilation fans (SFP = 0.1340)												37.1082 (230a)
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												123.1082 (231)
Electricity for lighting (calculated in Appendix L)												199.8097 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-741.5571 (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												4359.6234 (238)

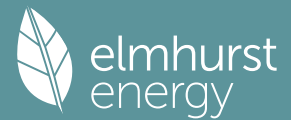
10a. Fuel costs - using BEDF prices (524)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2787.3127	4.8000	133.7910 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1990.9499	4.8000	95.5656 (247)
Energy for instantaneous electric shower(s)	0.0000	21.5100	0.0000 (247a)
Pumps, fans and electric keep-hot	123.1082	21.5100	26.4806 (249)
Energy for lighting	199.8097	21.5100	42.9791 (250)
Additional standing charges			98.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-430.5007	21.5100	-92.6007
PV Unit electricity exported	-311.0564	5.5900	-17.3881
Total			-109.9888 (252)
Total energy cost			286.8275 (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	2787.3127	0.2100	585.3357 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1990.9499	0.2100	418.0995 (264)
Space and water heating			1003.4351 (265)
Pumps, fans and electric keep-hot	123.1082	0.1387	17.0766 (267)
Energy for lighting	199.8097	0.1443	28.8387 (268)

Full SAP Calculation Printout



Energy saving/generation technologies			
PV Unit electricity used in dwelling	-430.5007	0.1321	-56.8499
PV Unit electricity exported	-311.0564	0.1223	-38.0496
Total			-94.8995 (269)
Total CO2, kg/year			954.4510 (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	2787.3127	1.1300	3149.6633 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1990.9499	1.1300	2249.7734 (278)
Space and water heating			5399.4367 (279)
Pumps, fans and electric keep-hot	123.1082	1.5128	186.2381 (281)
Energy for lighting	199.8097	1.5338	306.4747 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-430.5007	1.4879	-640.5437
PV Unit electricity exported	-311.0564	0.4488	-139.6138
Total			-780.1575 (283)
Total Primary energy kWh/year			5111.9920 (286)

SAP 10 EPC IMPROVEMENTS

Hampton Woods

Current energy efficiency rating: B 90
Current environmental impact rating: B 90

N Solar water heating SAP increase too small
U Solar photovoltaic panels Already installed
V2 Wind turbine Not applicable

Recommended measures: (none) SAP change Cost change CO2 change

Measures omitted - SAP change or cost saving too small:

N Solar water heating + 0.4 -£ 16 -134 kg (14.0%)

Recommended measures (none) Typical annual savings Energy Environmental efficiency impact

Total Savings £0 0.00 kg/m²

Potential energy efficiency rating: B 90
Potential environmental impact rating: B 90

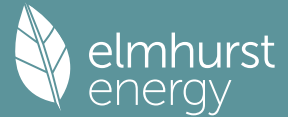
Fuel prices for cost data on this page from database revision number 524 TEST (01 Aug 2023)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, East Anglia):

	Current	Potential	Saving
Electricity	£69	£69	£0
Mains gas	£327	£327	£0
Space heating	£258	£258	£0
Water heating	£96	£96	£0
Lighting	£43	£43	£0
Generated (PV)	-£110	-£110	£0
Total cost of fuels	£286	£286	£0
Total cost of uses	£287	£287	£0
Delivered energy	47 kWh/m²	47 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.0 tonnes	1.0 tonnes	0.0 tonnes
CO2 emissions per m²	10 kg/m²	10 kg/m²	0 kg/m²
Primary energy	55 kWh/m²	55 kWh/m²	0 kWh/m²

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

Full SAP Calculation Printout



1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	47.6000 (1b)	x 2.3000 (2b)	= 109.4800 (1b) -
First floor	46.1000 (1c)	x 2.5500 (2c)	= 117.5550 (1c) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 227.0350 (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) =	Air changes per hour 0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0100 (17)
Infiltration rate	0.2005 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1855 (21)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 4.7000 (22)
Wind factor	Jan 1.2750 Feb 1.2500 Mar 1.2250 Apr 1.1000 May 1.0750 Jun 0.9500 Jul 0.9500 Aug 0.9250 Sep 1.0000 Oct 1.0750 Nov 1.1250 Dec 1.1750 (22a)
Adj infilt rate	Jan 0.2365 Feb 0.2318 Mar 0.2272 Apr 0.2040 May 0.1994 Jun 0.1762 Jul 0.1762 Aug 0.1716 Sep 0.1855 Oct 0.1994 Nov 0.2086 Dec 0.2179 (22b)
Mechanical extract ventilation - decentralised	
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)
Effective ac	Jan 0.5000 Feb 0.5000 Mar 0.5000 Apr 0.5000 May 0.5000 Jun 0.5000 Jul 0.5000 Aug 0.5000 Sep 0.5000 Oct 0.5000 Nov 0.5000 Dec 0.5000 (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
entrance			2.1000	0.9000	1.8900		(26)
rear/utility entrance			2.1000	1.1000	2.3100		(26a)
glazing (Uw = 1.30)			25.2000	1.2357	31.1407		(27)
ground			46.1000	0.1200	5.5320	75.0000	3457.5000 (28a)
external wall	137.5400	29.4000	108.1400	0.2400	25.9536	60.0000	6488.3996 (29a)
cold	46.1000		46.1000	0.0700	3.2270	9.0000	414.9000 (30)
bay	1.1000		1.1000	0.1600	0.1760	9.0000	9.9000 (30)
Total net area of external elements Aum(A, m ²)			230.8400				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 70.2293		(33)
stud			221.3000			9.0000	1991.7000 (32c)
internal			46.1000			18.0000	829.8000 (32d)
internal			46.1000			9.0000	414.9000 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 13607.0996 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							145.2199 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				18.4000	0.0500	0.9200	
E3 Sill				14.6000	0.0090	0.1314	
E4 Jamb				44.1000	0.0140	0.6174	
E5 Ground floor (normal)				29.2000	0.0550	1.6060	
E6 Intermediate floor within a dwelling				27.6000	0.0000	0.0000	
E10 Eaves (insulation at ceiling level)				16.4000	0.0460	0.7544	
E12 Gable (insulation at ceiling level)				11.2000	0.0520	0.5824	
E16 Corner (normal)				19.4000	0.0480	0.9312	
E17 Corner (inverted - internal area greater than external area)				4.6000	-0.0970	-0.4462	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.0966 (36)
Point Thermal bridges							(36a) = 0.0000
Total fabric heat loss							(33) + (36) + (36a) = 75.3259 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	Jan 37.4608 Feb 37.4608 Mar 37.4608 Apr 37.4608 May 37.4608 Jun 37.4608 Jul 37.4608 Aug 37.4608 Sep 37.4608 Oct 37.4608 Nov 37.4608 Dec 37.4608 (38)						
Heat transfer coeff	112.7867 112.7867 112.7867 112.7867 112.7867 112.7867 112.7867 112.7867 112.7867 112.7867 112.7867 112.7867 (39)						
Average = Sum(39)m / 12 =							112.7867

Full SAP Calculation Printout



	Jan 1.2037	Feb 1.2037	Mar 1.2037	Apr 1.2037	May 1.2037	Jun 1.2037	Jul 1.2037	Aug 1.2037	Sep 1.2037	Oct 1.2037	Nov 1.2037	Dec 1.2037 (40)
HLP HLP (average) Days in month	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6731 (42)
Hot water usage for mixer showers	69.0381	68.0006	66.4887	63.5961	61.4614	59.0808	57.7276	59.2280	60.8728	63.4288	66.3836	68.7736 (42a)
Hot water usage for baths	29.8119	29.3691	28.7456	27.5961	26.7353	25.7808	25.2652	25.8843	26.5584	27.5798	28.7530	29.7111 (42b)
Hot water usage for other uses	42.0048	40.4773	38.9499	37.4224	35.8950	34.3675	34.3675	35.8950	37.4224	38.9499	40.4773	42.0048 (42c)
Average daily hot water use (litres/day)												129.4773 (43)
Daily hot water use	140.8547	137.8470	134.1843	128.6146	124.0916	119.2291	117.3604	121.0073	124.8536	129.9585	135.6140	140.4894 (44)
Energy content (annual)	223.0795	196.2923	206.2362	176.0669	167.0512	146.6060	141.9372	149.8324	153.9570	176.3524	193.2069	219.9725 (45)
Distribution loss (46)m = 0.15 x (45)m	33.4619	29.4439	30.9354	26.4100	25.0577	21.9909	21.2906	22.4749	23.0935	26.4529	28.9810	32.9959 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	14.2920	12.8964	14.2515	13.7354	14.1575	13.6647	14.0972	14.1162	13.6823	14.1798	13.7765	14.2845 (61)
Total heat required for water heating calculated for each month	237.3714	209.1887	220.4877	189.8023	181.2086	160.2707	156.0344	163.9485	167.6393	190.5322	206.9834	234.2570 (62)
WWHRS	-60.8004	-53.7723	-56.3073	-46.6247	-43.4525	-37.1826	-34.8528	-37.0624	-38.4706	-45.3526	-51.3789	-59.6744 (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	176.5711	155.4164	164.1804	143.1776	137.7561	123.0881	121.1816	126.8861	129.1687	145.1796	155.6045	174.5826 (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	77.7469	68.4913	72.1364	61.9761	59.0839	52.1627	50.7184	53.3483	54.6113	62.1821	67.6854	76.7120 (65)

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

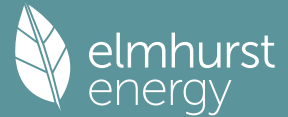
Metabolic gains (Table 5), Watts	160.3833	160.3833	160.3833	160.3833	160.3833	160.3833	160.3833	160.3833	160.3833	160.3833	160.3833	160.3833 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.2851	25.1226	20.4311	15.4676	11.5622	9.7613	10.5475	13.7100	18.4015	23.3650	27.2703	29.0713 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	366.7501	370.5558	360.9655	340.5489	314.7767	290.5544	274.3724	270.5666	280.1569	300.5735	326.3458	350.5681 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.7114	53.7114	53.7114	53.7114	53.7114	53.7114	53.7114	53.7114	53.7114	53.7114	53.7114	53.7114 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222 (71)
Water heating gains (Table 5)	104.4985	101.9216	96.9576	86.0779	79.4138	72.4482	68.1699	71.7047	75.8490	83.5781	94.0075	103.1075 (72)
Total internal gains	609.7062	607.7725	588.5266	552.2669	515.9252	479.9363	460.2622	463.1538	481.5799	517.6891	557.7962	592.9193 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W	
North					6.7500	10.6334	0.4600	0.0000			0.7700	25.4228 (74)	
East					1.3500	19.6403	0.4600	0.0000			0.7700	9.3914 (76)	
South					7.6000	46.7521	0.4600	0.0000			0.7700	125.8528 (78)	
West					9.5000	19.6403	0.4600	0.0000			0.7700	66.0875 (80)	
Solar gains	226.7546	402.3516	588.2731	783.9883	922.4810	933.7330	892.8764	787.8627	656.3365	455.3496	274.6542	192.0123	(83)
Total gains	836.4608	1010.1241	1176.7997	1336.2552	1438.4062	1413.6694	1353.1386	1251.0165	1137.9164	973.0387	832.4504	784.9317	(84)

7. Mean internal temperature (heating season)

Full SAP Calculation Printout



Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	33.5124	33.5124	33.5124	33.5124	33.5124	33.5124	33.5124	33.5124	33.5124	33.5124	33.5124	33.5124
alpha	3.2342	3.2342	3.2342	3.2342	3.2342	3.2342	3.2342	3.2342	3.2342	3.2342	3.2342	3.2342
util living area	0.9584	0.9274	0.8713	0.7718	0.6328	0.4804	0.3576	0.4003	0.6048	0.8296	0.9350	0.9653 (86)
MIT	19.1757	19.5176	19.9713	20.4378	20.7661	20.9281	20.9790	20.9695	20.8482	20.3833	19.6689	19.0825 (87)
Th 2	19.9170	19.9170	19.9170	19.9170	19.9170	19.9170	19.9170	19.9170	19.9170	19.9170	19.9170	19.9170 (88)
util rest of house	0.9507	0.9146	0.8495	0.7354	0.5788	0.4085	0.2733	0.3118	0.5310	0.7923	0.9212	0.9587 (89)
MIT 2	17.8264	18.2511	18.8059	19.3546	19.7132	19.8691	19.9078	19.9027	19.8049	19.3114	18.4484	17.7097 (90)
Living area fraction									fLA = Living area / (4) =			0.1868 (91)
MIT	18.0784	18.4877	19.0235	19.5569	19.9099	20.0669	20.1079	20.1019	19.9997	19.5116	18.6764	17.9661 (92)
Temperature adjustment												-0.1500
adjusted MIT	17.9284	18.3377	18.8735	19.4069	19.7599	19.9169	19.9579	19.9519	19.8497	19.3616	18.5264	17.8161 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9311	0.8906	0.8244	0.7161	0.5704	0.4085	0.2766	0.3147	0.5261	0.7697	0.8978	0.9408 (94)	
Useful gains	778.7918	899.5913	970.1057	956.8899	820.5226	577.5258	374.2684	393.7031	598.6253	748.9420	747.3719	738.4322 (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	1537.0987	1515.5902	1395.5689	1185.0357	909.0457	599.6742	378.7267	400.6081	648.4931	988.1945	1288.7405	1535.7097 (97)	
Space heating kWh	564.1803	413.9513	316.5447	164.2649	65.8612	0.0000	0.0000	0.0000	0.0000	178.0039	389.7854	593.1745 (98a)	
Space heating requirement - total per year (kWh/year)												2685.7660	
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	564.1803	413.9513	316.5447	164.2649	65.8612	0.0000	0.0000	0.0000	0.0000	178.0039	389.7854	593.1745 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												2685.7660	
Space heating per m2										(98c) / (4) =			28.6635 (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 %)												89.0000 (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	564.1803	413.9513	316.5447	164.2649	65.8612	0.0000	0.0000	0.0000	0.0000	178.0039	389.7854	593.1745 (98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000 (210)
Space heating fuel (main heating system)	633.9105	465.1138	355.6682	184.5674	74.0013	0.0000	0.0000	0.0000	0.0000	200.0043	437.9611	666.4882 (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	176.5711	155.4164	164.1804	143.1776	137.7561	123.0881	121.1816	126.8861	129.1687	145.1796	155.6045	174.5826 (64)
Efficiency of water heater	88.5888	88.5294	88.4120	88.2001	87.8427	87.3000	87.3000	87.3000	87.3000	88.2282	88.5083	87.3000 (216)
Fuel for water heating, kWh/month	199.3154	175.5534	185.6992	162.3326	156.8213	140.9944	138.8106	145.3449	147.9596	164.5501	175.8079	197.0288 (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	10.4558	9.4439	10.4558	10.1185	10.4558	10.1185	10.4558	10.4558	10.1185	10.4558	10.1185	10.4558 (231)
Lighting	24.7578	19.8616	17.8832	13.1020	10.1204	8.2684	9.2321	12.0003	15.5872	20.4512	23.0996	25.4459 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-12.6548	-20.8419	-35.4040	-46.1861	-54.8195	-52.9933	-52.0249	-46.2582	-36.9507	-26.0191	-14.7695	-10.5287 (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)	-3.0867	-7.6046	-18.2529	-32.3368	-47.2335	-49.2372	-48.0659	-37.9601	-24.3433	-11.8179	-4.3456	-2.3373 (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												

Full SAP Calculation Printout



Space heating fuel - main system 1	3017.7147 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	87.3000
Water heating fuel used	1990.2181 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(MEVDecentralised, Database: total watage = 4.9570, total flow = 37.0000, SFP = 0.1340)	
mechanical ventilation fans (SFP = 0.1340)	37.1082 (230a)
central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	123.1082 (231)
Electricity for lighting (calculated in Appendix L)	199.8097 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-696.0724 (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	4634.7782 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3017.7147	3.6400	109.8448 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1990.2181	3.6400	72.4439 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	123.1082	16.4900	20.3005 (249)
Energy for lighting	199.8097	16.4900	32.9486 (250)
Additional standing charges			92.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-409.4507	16.4900	-67.5184
PV Unit electricity exported	-286.6217	5.5900	-16.0222
Total			-83.5406 (252)
Total energy cost			243.9973 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] = 0.6333 (257)$
SAP value	89.7342
SAP rating (Section 12)	90 (258)
SAP band	B

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	3017.7147	0.2100	633.7201 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1990.2181	0.2100	417.9458 (264)
Space and water heating			1051.6659 (265)
Pumps, fans and electric keep-hot	123.1082	0.1387	17.0766 (267)
Energy for lighting	199.8097	0.1443	28.8387 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-409.4507	0.1318	-53.9629
PV Unit electricity exported	-286.6217	0.1220	-34.9597
Total			-88.9226 (269)
Total CO2, kg/year			1008.6586 (272)
CO2 emissions per m2			10.7600 (273)
EI value			90.2552
EI rating			90 (274)
EI band			B

Full SAP Calculation Printout



1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	47.6000 (1b)	x 2.3000 (2b)	= 109.4800 (1b) -
First floor	46.1000 (1c)	x 2.5500 (2c)	= 117.5550 (1c) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 227.0350 (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	4.0100 (17)
Infiltration rate	0.2005 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1855 (21)
Wind speed	Jan 4.8000 Feb 4.7000 Mar 4.7000 Apr 4.3000 May 4.3000 Jun 3.7000 Jul 3.8000 Aug 3.8000 Sep 3.9000 Oct 4.1000 Nov 4.2000 Dec 4.3000 (22)
Wind factor	Jan 1.2000 Feb 1.1750 Mar 1.1750 Apr 1.0750 May 1.0750 Jun 0.9250 Jul 0.9500 Aug 0.9500 Sep 0.9750 Oct 1.0250 Nov 1.0500 Dec 1.0750 (22a)
Adj infilt rate	0.2226 0.2179 0.2179 0.1994 0.1994 0.1716 0.1762 0.1762 0.1808 0.1901 0.1947 0.1994 (22b)
Mechanical extract ventilation - decentralised	
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)
Effective ac	0.5000 0.5000 0.5000 0.5000 0.5000 0.5000 0.5000 0.5000 0.5000 0.5000 0.5000 0.5000 (25)

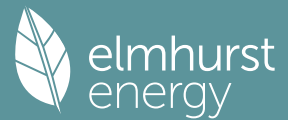
3. Heat losses and heat loss parameter

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
entrance			2.1000	0.9000	1.8900		(26)
rear/utility entrance			2.1000	1.1000	2.3100		(26a)
glazing (Uw = 1.30)			25.2000	1.2357	31.1407		(27)
ground			46.1000	0.1200	5.5320	75.0000	3457.5000 (28a)
external wall	137.5400	29.4000	108.1400	0.2400	25.9536	60.0000	6488.3996 (29a)
cold	46.1000		46.1000	0.0700	3.2270	9.0000	414.9000 (30)
bay	1.1000		1.1000	0.1600	0.1760	9.0000	9.9000 (30)
Total net area of external elements Aum(A, m ²)			230.8400				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	70.2293			(33)
stud			221.3000			9.0000	1991.7000 (32c)
internal			46.1000			18.0000	829.8000 (32d)
internal			46.1000			9.0000	414.9000 (32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	13607.0996	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		145.2199	(35)
List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	18.4000	0.0500	0.9200
E3 Sill	14.6000	0.0090	0.1314
E4 Jamb	44.1000	0.0140	0.6174
E5 Ground floor (normal)	29.2000	0.0550	1.6060
E6 Intermediate floor within a dwelling	27.6000	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	16.4000	0.0460	0.7544
E12 Gable (insulation at ceiling level)	11.2000	0.0520	0.5824
E16 Corner (normal)	19.4000	0.0480	0.9312
E17 Corner (inverted - internal area greater than external area)	4.6000	-0.0970	-0.4462
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			5.0966 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	75.3259 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 37.4608	Feb 37.4608	Mar 37.4608	Apr 37.4608	May 37.4608	Jun 37.4608	Jul 37.4608	Aug 37.4608	Sep 37.4608	Oct 37.4608	Nov 37.4608	Dec 37.4608 (38)
Heat transfer coeff	112.7867	112.7867	112.7867	112.7867	112.7867	112.7867	112.7867	112.7867	112.7867	112.7867	112.7867	112.7867 (39)

Full SAP Calculation Printout



Average = Sum(39)m / 12 =

112.7867

	Jan 1.2037	Feb 1.2037	Mar 1.2037	Apr 1.2037	May 1.2037	Jun 1.2037	Jul 1.2037	Aug 1.2037	Sep 1.2037	Oct 1.2037	Nov 1.2037	Dec 1.2037 (40)
HLP												1.2037
HLP (average)												1.2037
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6731 (42)
Hot water usage for mixer showers	69.0381	68.0006	66.4887	63.5961	61.4614	59.0808	57.7276	59.2280	60.8728	63.4288	66.3836	68.7736 (42a)
Hot water usage for baths	29.8119	29.3691	28.7456	27.5961	26.7353	25.7808	25.2652	25.8843	26.5584	27.5798	28.7530	29.7111 (42b)
Hot water usage for other uses	42.0048	40.4773	38.9499	37.4224	35.8950	34.3675	34.3675	35.8950	37.4224	38.9499	40.4773	42.0048 (42c)
Average daily hot water use (litres/day)												129.4773 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	140.8547	137.8470	134.1843	128.6146	124.0916	119.2291	117.3604	121.0073	124.8536	129.9585	135.6140	140.4894 (44)
Energy content (annual)	223.0795	196.2923	206.2362	176.0669	167.0512	146.6060	141.9372	149.8324	153.9570	176.3524	193.2069	219.9725 (45)
Distribution loss (46)m = 0.15 x (45)m	Total = Sum(45)m =											2150.5905
	33.4619	29.4439	30.9354	26.4100	25.0577	21.9909	21.2906	22.4749	23.0935	26.4529	28.9810	32.9959 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	14.2920	12.8964	14.2515	13.7354	14.1575	13.6647	14.0972	14.1162	13.6823	14.1798	13.7765	14.2845 (61)
Total heat required for water heating calculated for each month	237.3714	209.1887	220.4877	189.8023	181.2086	160.2707	156.0344	163.9485	167.6393	190.5322	206.9834	234.2570 (62)
WWHRS	-60.8004	-53.7723	-56.3073	-46.6247	-43.4525	-37.1826	-34.8528	-37.0624	-38.4706	-45.3526	-51.3789	-59.6744 (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	176.5711	155.4164	164.1804	143.1776	137.7561	123.0881	121.1816	126.8861	129.1687	145.1796	155.6045	174.5826 (64)
	Total per year (kWh/year) = Sum(64)m =											1752.7928 (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	77.7469	68.4913	72.1364	61.9761	59.0839	52.1627	50.7184	53.3483	54.6113	62.1821	67.6854	76.7120 (65)

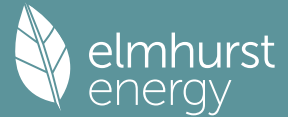
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	160.3833	160.3833	160.3833	160.3833	160.3833	160.3833	160.3833	160.3833	160.3833	160.3833	160.3833	160.3833 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.2851	25.1226	20.4311	15.4676	11.5622	9.7613	10.5475	13.7100	18.4015	23.3650	27.2703	29.0713 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	366.7501	370.5558	360.9655	340.5489	314.7767	290.5544	274.3724	270.5666	280.1569	300.5735	326.3458	350.5681 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.7114	53.7114	53.7114	53.7114	53.7114	53.7114	53.7114	53.7114	53.7114	53.7114	53.7114	53.7114 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222	-106.9222 (71)
Water heating gains (Table 5)	104.4985	101.9216	96.9576	86.0779	79.4138	72.4482	68.1699	71.7047	75.8490	83.5781	94.0075	103.1075 (72)
Total internal gains	609.7062	607.7725	588.5266	552.2669	515.9252	479.9363	460.2622	463.1538	481.5799	517.6891	557.7962	592.9193 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d		Gains W
North					6.7500	12.1136	0.4600	0.0000		0.7700		28.9617 (74)
East					1.3500	22.4868	0.4600	0.0000		0.7700		10.7525 (76)
South					7.6000	52.3697	0.4600	0.0000		0.7700		140.9751 (78)
West					9.5000	22.4868	0.4600	0.0000		0.7700		75.6659 (80)
Solar gains	256.3552	416.6552	609.1872	827.0591	949.1605	988.7649	929.4376	825.2480	703.4944	501.3847	309.9649	223.9253 (83)
Total gains	866.0615	1024.4277	1197.7138	1379.3261	1465.0856	1468.7012	1389.6998	1288.4018	1185.0743	1019.0738	867.7610	816.8447 (84)

Full SAP Calculation Printout



7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	33.5124	33.5124	33.5124	33.5124	33.5124	33.5124	33.5124	33.5124	33.5124	33.5124	33.5124	33.5124
alpha	3.2342	3.2342	3.2342	3.2342	3.2342	3.2342	3.2342	3.2342	3.2342	3.2342	3.2342	3.2342
util living area	0.9531	0.9227	0.8568	0.7433	0.5906	0.4136	0.2883	0.3100	0.5339	0.7939	0.9244	0.9603 (86)
MIT	19.2538	19.5699	20.0678	20.5226	20.8236	20.9592	20.9909	20.9887	20.9069	20.5003	19.7661	19.1656 (87)
Th 2	19.9170	19.9170	19.9170	19.9170	19.9170	19.9170	19.9170	19.9170	19.9170	19.9170	19.9170	19.9170 (88)
util rest of house	0.9444	0.9091	0.8325	0.7034	0.5326	0.3394	0.2033	0.2190	0.4536	0.7499	0.9085	0.9528 (89)
MIT 2	17.9244	18.3160	18.9222	19.4496	19.7708	19.8933	19.9142	19.9134	19.8558	19.4434	18.5681	17.8142 (90)
Living area fraction									fLA = Living area / (4) =			0.1868 (91)
MIT	18.1727	18.5502	19.1362	19.6500	19.9675	20.0924	20.1153	20.1143	20.0521	19.6408	18.7919	18.0666 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.0227	18.4002	18.9862	19.5000	19.8175	19.9424	19.9653	19.9643	19.9021	19.4908	18.6419	17.9166 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9237	0.8847	0.8078	0.6864	0.5269	0.3412	0.2072	0.2231	0.4524	0.7300	0.8842	0.9336 (94)
Useful gains	800.0234	906.3159	967.5319	946.7020	771.9616	501.1270	287.8937	287.4236	536.1555	743.9183	767.2504	762.5807 (95)
Ext temp.	4.5000	5.1000	7.0000	9.4000	12.4000	15.4000	17.4000	17.4000	14.9000	11.2000	7.4000	4.4000 (96)
Heat loss rate W	1525.1771	1500.0876	1351.8795	1139.1465	836.5908	512.3218	289.3272	289.2149	564.1690	935.0879	1267.9343	1524.4865 (97)
Space heating kwh	539.5144	399.0146	285.9547	138.5601	48.0841	0.0000	0.0000	0.0000	0.0000	142.2302	360.4924	566.8579 (98a)
Space heating requirement - total per year (kwh/year)												2480.7083
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	539.5144	399.0146	285.9547	138.5601	48.0841	0.0000	0.0000	0.0000	0.0000	142.2302	360.4924	566.8579 (98c)
Space heating requirement after solar contribution - total per year (kwh/year)												2480.7083
Space heating per m2										(98c) / (4) =		26.4750 (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 %)												89.0000 (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	539.5144	399.0146	285.9547	138.5601	48.0841	0.0000	0.0000	0.0000	0.0000	142.2302	360.4924	566.8579 (98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000 (210)
Space heating fuel (main heating system)	606.1959	448.3310	321.2974	155.6855	54.0271	0.0000	0.0000	0.0000	0.0000	159.8092	405.0476	636.9190 (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	176.5711	155.4164	164.1804	143.1776	137.7561	123.0881	121.1816	126.8861	129.1687	145.1796	155.6045	174.5826 (64)
Efficiency of water heater	88.5747	88.5168	88.3723	88.1279	87.7336	87.3000	87.3000	87.3000	87.3000	88.1331	88.4805	87.3000 (216)
Fuel for water heating, kwh/month	199.3471	175.5784	185.7826	162.4657	157.0164	140.9944	138.8106	145.3449	147.9596	164.7277	175.8630	197.0596 (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	10.4558	9.4439	10.4558	10.1185	10.4558	10.1185	10.4558	10.4558	10.1185	10.4558	10.1185	10.4558 (231)
Lighting	24.7578	19.8616	17.8832	13.1020	10.1204	8.2684	9.2321	12.0003	15.5872	20.4512	23.0996	25.4459 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-14.2985	-21.7299	-36.7480	-48.3173	-56.1100	-55.1915	-53.6012	-48.0062	-39.2064	-28.4328	-16.6135	-12.2454 (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)	-3.7737	-8.1670	-19.5172	-35.2507	-49.4973	-53.5435	-51.1078	-40.8662	-27.2265	-13.8230	-5.2918	-2.9917 (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)

Full SAP Calculation Printout



Annual totals kWh/year	
Space heating fuel - main system 1	2787.3127 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	87.3000
Water heating fuel used	1990.9499 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(MEVDecentralised, Database: total watage = 4.9570, total flow = 37.0000, SFP = 0.1340)	
mechanical ventilation fans (SFP = 0.1340)	37.1082 (230a)
central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	123.1082 (231)
Electricity for lighting (calculated in Appendix L)	199.8097 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-741.5571 (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	4359.6234 (238)

10a. Fuel costs - using BEDF prices (524)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2787.3127	4.8000	133.7910 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1990.9499	4.8000	95.5656 (247)
Energy for instantaneous electric shower(s)	0.0000	21.5100	0.0000 (247a)
Pumps, fans and electric keep-hot	123.1082	21.5100	26.4806 (249)
Energy for lighting	199.8097	21.5100	42.9791 (250)
Additional standing charges			98.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-430.5007	21.5100	-92.6007
PV Unit electricity exported	-311.0564	5.5900	-17.3881
Total			-109.9888 (252)
Total energy cost			286.8275 (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	2787.3127	0.2100	585.3357 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1990.9499	0.2100	418.0995 (264)
Space and water heating			1003.4351 (265)
Pumps, fans and electric keep-hot	123.1082	0.1387	17.0766 (267)
Energy for lighting	199.8097	0.1443	28.8387 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-430.5007	0.1321	-56.8499
PV Unit electricity exported	-311.0564	0.1223	-38.0496
Total			-94.8995 (269)
Total CO2, kg/year			954.4510 (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	2787.3127	1.1300	3149.6633 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1990.9499	1.1300	2249.7734 (278)
Space and water heating			5399.4367 (279)
Pumps, fans and electric keep-hot	123.1082	1.5128	186.2381 (281)
Energy for lighting	199.8097	1.5338	306.4747 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-430.5007	1.4879	-640.5437
PV Unit electricity exported	-311.0564	0.4488	-139.6138
Total			-780.1575 (283)
Total Primary energy kWh/year			5111.9920 (286)