

Full SAP Calculation Printout



Property Reference	KNIGHTLEY-7041-23 RH		Issued on Date	05/02/2024	
Assessment Reference	SEC1 - ASHP ROI	Prop Type Ref	DS		
Property	Bedevire, (Right Hand), Bodinnick Road, St Tudy, Bodmin, Cornwall, PL30 3NX				
SAP Rating	101 A	DER	-1.46	TER	9.74
Environmental	102 A	% DER < TER			114.99
CO ₂ Emissions (t/year)	-0.35	DFEE	40.48	TFEE	48.40
Compliance Check	See BREL	% DFEE < TFEE			16.38
% DPER < TPER	98.11	DPER	0.97	TPER	51.63
Assessor Details	Mr. Stuart Thomas			Assessor ID	V220-0003
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	103.9300 (1b)	2.9000 (2b)	301.3970 (1b) - (3b)
First floor	61.2500 (1c)	2.7000 (2c)	165.3750 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	165.1800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	466.7720 (5)

2. Ventilation rate

	m3 per hour											
Number of open chimneys	0 * 80 =											0.0000 (6a)
Number of open flues	0 * 20 =											0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =											0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =											0.0000 (6d)
Number of flues attached to other heater	0 * 35 =											0.0000 (6e)
Number of blocked chimneys	0 * 20 =											0.0000 (6f)
Number of intermittent extract fans	0 * 10 =											0.0000 (7a)
Number of passive vents	0 * 10 =											0.0000 (7b)
Number of flueless gas fires	0 * 40 =											0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =											0.0000 (8)
Pressure test	Yes											
Pressure Test Method	Blower Door											
Measured/design AP50	0.9500											(17)
Infiltration rate	0.0475											(18)
Number of sides sheltered	2											(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =											0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =											0.0404 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Balanced mechanical ventilation with heat recovery	0.0515	0.0505	0.0495	0.0444	0.0434	0.0384	0.0384	0.0373	0.0404	0.0434	0.0454	0.0474 (22b)
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												81.0000 (23c)
Effective ac	0.1465	0.1455	0.1445	0.1394	0.1384	0.1334	0.1334	0.1323	0.1354	0.1384	0.1404	0.1424 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K	
Window (Uw = 0.90)			30.3000	0.8687	26.3224		(27)	
Door			2.1000	0.9000	1.8900		(26a)	
16-18			6.0000	1.2357	7.4144		(27a)	
19			2.0000	1.2357	2.4715		(27a)	
Floor 1 P/a 0.35			103.9300	0.1200	12.4716	110.0000	11432.3000 (28a)	
External Wall 1 Render	111.9700	24.0200	87.9500	0.1500	13.1925	9.0000	791.5500 (29a)	
External Wall 3 "attic"	15.9000		15.9000	0.0900	1.4310	9.0000	143.1000 (29a)	
External Wall 2 Dormers	83.0400	8.3800	74.6600	0.1600	11.9456	9.0000	671.9400 (29a)	
External Roof 1 sloping	59.0600	6.0000	53.0600	0.1300	6.8978	9.0000	477.5400 (30)	
External Roof 3 "attic"	32.7800		32.7800	0.0861	2.8232	9.0000	295.0200 (30)	
External Roof 2 Flat	22.1300	2.0000	20.1300	0.1500	3.0195	9.0000	181.1700 (30)	
Total net area of external elements Aum(A, m ²)	428.8100						(31)	
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	89.8795		(33)	
Party Wall 1				32.6200	0.0000	0.0000	20.0000	652.4000 (32)

Full SAP Calculation Printout



Internal Wall 1 GF	168.5800	9.0000	1517.2200 (32c)
Internal Wall 2 FF	135.0400	9.0000	1215.3600 (32c)
Internal Floor 1	61.2500	18.0000	1102.5000 (32d)
Internal Ceiling 1	61.2500	9.0000	551.2500 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 19031.3500 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 115.2158 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E6 Corner (normal)	21.0700	0.0300	0.6321
E5 Ground floor (normal)	35.9500	0.0210	0.7550
E11 Eaves (insulation at rafter level)	23.0400	0.0390	0.8986
R4 Ridge (vaulted ceiling)	19.9000	0.1200	2.3880
E13 Gable (insulation at rafter level)	24.4900	0.0240	0.5878
E6 Intermediate floor within a dwelling	17.5100	0.0800	1.4008
R7 Flat ceiling (inverted)	18.3500	0.1200	2.2020
E14 Flat roof	11.1800	0.0460	0.5143
E17 Corner (inverted - internal area greater than external area)	5.3000	-0.0150	-0.0795
P1 Party wall - Ground floor	6.9000	0.1490	1.0281
P2 Party wall - Intermediate floor within a dwelling	6.9000	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	8.7000	0.0810	0.7047
E18 Party wall between dwellings	8.7900	0.0395	0.3472
E2 Other lintels (including other steel lintels)	27.0400	0.0840	2.2714
E3 Sill	26.0400	0.0430	1.1197
E4 Jamb	37.3200	0.0340	1.2689
R1 Head of roof window	2.5000	0.2400	0.6000
R2 Sill of roof window	2.5000	0.2400	0.6000
R3 Jamb of roof window	1.6000	0.2400	0.3840
R11 Upstands or kerbs of rooflights	18.0000	0.2400	4.3200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 21.9429 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 111.8224 (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	22.5627	22.4072	22.2518	21.4744	21.3189	20.5415	20.5415	20.3860	20.8525	21.3189	21.6298	21.9408 (38)
Average = Sum(39)m / 12 =	134.3851	134.2296	134.0742	133.2968	133.1413	132.3639	132.3639	132.2084	132.6749	133.1413	133.4522	133.7632 (39)
												133.2579

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8136	0.8126	0.8117	0.8070	0.8060	0.8013	0.8013	0.8004	0.8032	0.8060	0.8079	0.8098 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	0.8067
												31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9561 (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 85.1167 83.8526 82.0725 78.7903 76.3326 73.6074 72.1354 73.9030 75.8277 78.7437 82.0936 84.8289 (42b)

Hot water usage for other uses 44.9031 43.2702 41.6374 40.0046 38.3717 36.7389 36.7389 38.3717 40.0046 41.6374 43.2702 44.9031 (42c)

Average daily hot water use (litres/day) 119.7376 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	130.0198	127.1228	123.7099	118.7948	114.7043	110.3462	108.8742	112.2747	115.8323	120.3811	125.3638	129.7320 (44)
Energy content (annual)	205.9195	181.0212	190.1375	162.6242	154.4140	135.6836	131.6740	139.0196	142.8328	163.3561	178.6037	203.1290 (45)
Distribution loss (46)m = 0.15 x (45)m	30.8879	27.1532	28.5206	24.3936	23.1621	20.3525	19.7511	20.8529	21.4249	24.5034	26.7906	30.4693 (46)
Water storage loss:												250.0000 (47)
Store volume												1.6000 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.8640 (55)
Enter (49) or (54) in (55)												
Total storage loss	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840 (56)
If cylinder contains dedicated solar storage	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	255.9659	226.2244	240.1839	211.0562	204.4604	184.1156	181.7204	189.0660	191.2648	213.4025	227.0357	253.1754 (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)
FV 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	255.9659	226.2244	240.1839	211.0562	204.4604	184.1156	181.7204	189.0660	191.2648	213.4025	227.0357	253.1754 (64)
12Total per year (kWh/year)												2577.6710 (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	2578 (64)
Total Energy used by instantaneous electric shower (s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	108.5054	96.3521	103.2578	92.8181	91.3798	83.8604	83.8187	86.2611	86.2375	94.3530	98.1313	107.5775 (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
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	147.8033	147.8033	147.8033	147.8033	147.8033	147.8033	147.8033	147.8033	147.8033	147.8033	147.8033	147.8033 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	169.8651	188.0649	169.8651	175.5273	169.8651	175.5273	169.8651	169.8651	175.5273	169.8651	175.5273	169.8651 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	336.6009	340.0937	331.2918	312.5536	288.9000	266.6689	251.8172	248.3243	257.1262	275.8645	299.5181	321.7492 (68)
Pumps, fans	37.7803	37.7803	37.7803	37.7803	37.7803	37.7803	37.7803	37.7803	37.7803	37.7803	37.7803	37.7803 (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)	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426 (71)

Full SAP Calculation Printout



Total internal gains	145.8405	143.3811	138.7874	128.9141	122.8223	116.4728	112.6596	115.9424	119.7743	126.8186	136.2935	144.5934 (72)
	719.6475	738.8808	707.2853	684.3360	648.9284	626.0100	601.6829	601.4728	619.7688	639.8891	678.6799	703.5487 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
East	9.8000	19.6403	0.6800	0.7000	0.7700	63.4912 (76)						
South	1.9200	46.7521	0.6800	0.7000	0.7700	29.6103 (78)						
West	18.5800	19.6403	0.6800	0.7000	0.7700	120.3741 (80)						
North	6.0000	26.0000	0.7600	0.7000	1.0000	74.6928 (82)						
Horizontal	2.0000	26.0000	0.7600	0.7000	1.0000	24.8976 (82)						
Solar gains	313.0660	615.0152	1021.8322	1508.2708	1866.9248	1919.8985	1824.1796	1554.1299	1193.9421	731.9019	390.7599	257.2263 (83)
Total gains	1032.7135	1353.8960	1729.1176	2192.6068	2515.8532	2545.9085	2425.8625	2155.6027	1813.7109	1371.7910	1069.4398	960.7750 (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	39.3383	39.3839	39.4296	39.6595	39.7058	39.9390	39.9390	39.9860	39.8454	39.7058	39.6133	39.5212
alpha	3.6226	3.6256	3.6286	3.6440	3.6471	3.6626	3.6626	3.6657	3.6564	3.6471	3.6409	3.6347
util living area	0.9666	0.9225	0.8274	0.6520	0.4726	0.3288	0.2391	0.2802	0.4833	0.7885	0.9382	0.9734 (86)
Living	19.7316	20.0485	20.4271	20.7409	20.8686	20.9062	20.9136	20.9119	20.8787	20.6269	20.1049	19.6675
Non living	18.7322	19.1290	19.5913	19.9585	20.0964	20.1369	20.1429	20.1427	20.1120	19.8411	19.2079	18.6537
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.3511	20.0485	20.4271	20.7409	20.8686	20.9062	20.9136	20.9119	20.8787	20.6269	20.1049	19.8539 (87)
Th 2	20.2416	20.2424	20.2432	20.2473	20.2481	20.2522	20.2522	20.2530	20.2505	20.2481	20.2465	20.2448 (88)
util rest of house	0.9619	0.9126	0.8081	0.6225	0.4383	0.2915	0.1988	0.2354	0.4362	0.7583	0.9284	0.9695 (89)
MIT 2	19.6399	19.1290	19.5913	19.9585	20.0964	20.1369	20.1429	20.1427	20.1120	19.8411	19.2079	18.9405 (90)
Living area fraction	FLA = Living area / (4) = 0.3200 (91)											
MIT	19.8674	19.4232	19.8587	20.2088	20.3435	20.3830	20.3895	20.3888	20.3573	20.0925	19.4949	19.2327 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.8674	19.4232	19.8587	20.2088	20.3435	20.3830	20.3895	20.3888	20.3573	20.0925	19.4949	19.2327 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9592	0.9000	0.7975	0.6210	0.4427	0.2981	0.2063	0.2436	0.4431	0.7516	0.9168	0.9632 (94)
Useful gains	990.5683	1218.5266	1379.0259	1361.5690	1113.7980	758.8760	500.3500	525.0624	803.6413	1030.9791	980.4341	925.3751 (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	2092.0320	1949.4412	1791.0576	1507.4291	1150.8003	765.4621	501.5885	527.3500	830.1888	1263.8484	1654.1301	2010.8257 (97)
Space heating kWh	819.4890	491.1746	306.5515	105.0192	27.5297	0.0000	0.0000	0.0000	0.0000	173.2548	485.0611	807.5752 (98a)
Space heating requirement - total per year (kWh/year)	3215.6551											
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	819.4890	491.1746	306.5515	105.0192	27.5297	0.0000	0.0000	0.0000	0.0000	173.2548	485.0611	807.5752 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	3215.6551											
Space heating per m2	(98c) / (4) = 19.4676 (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 %)	362.6070 (206)											
Efficiency of main space heating system 2 (in %)	0.0000 (207)											
Efficiency of secondary/supplementary heating system, %	65.0000 (208)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	819.4890	491.1746	306.5515	105.0192	27.5297	0.0000	0.0000	0.0000	0.0000	173.2548	485.0611	807.5752 (98)
Space heating efficiency (main heating system 1)	362.6070	362.6070	362.6070	362.6070	362.6070	0.0000	0.0000	0.0000	0.0000	362.6070	362.6070	362.6070 (210)
Space heating fuel (main heating system)	225.9992	135.4565	84.5410	28.9623	7.5922	0.0000	0.0000	0.0000	0.0000	47.7803	133.7705	222.7136 (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	255.9659	226.2244	240.1839	211.0562	204.4604	184.1156	181.7204	189.0660	191.2648	213.4025	227.0357	253.1754 (64)
Efficiency of water heater (217)m	197.8978	197.8978	197.8978	197.8978	197.8978	197.8978	197.8978	197.8978	197.8978	197.8978	197.8978	197.8978 (216)
Fuel for water heating, kWh/month	129.3425	114.3137	121.3676	106.6490	103.3161	93.0357	91.8253	95.5372	96.6482	107.8347	114.7237	127.9324 (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	40.4334	36.5204	40.4334	39.1290	40.4334	39.1290	40.4334	40.4334	39.1290	40.4334	39.1290	40.4334 (231)
Lighting	32.8418	26.3469	23.7225	17.3801	13.4249	10.9683	12.2466	15.9187	20.6768	27.1290	30.6422	33.7546 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												

Full SAP Calculation Printout



(233a)m	-97.6214	-134.7089	-187.2536	-199.8649	-208.5825	-192.1309	-189.8611	-181.5866	-164.5070	-146.8214	-105.2372	-84.3878	(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	-52.6381	-116.0310	-239.7851	-372.4512	-498.4658	-503.0102	-496.0935	-417.7353	-304.8823	-173.7162	-72.9922	-41.3538	(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												886.8155	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												197.8978	
Water heating fuel used												1302.5261	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.8360)													
mechanical ventilation fans (SFP = 0.8360)												476.0701	(230a)
Total electricity for the above, kWh/year												476.0701	(231)
Electricity for lighting (calculated in Appendix L)												265.0525	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-5181.7182	(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												-2251.2540	(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	886.8155	0.1574	139.5892 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1302.5261	0.1409	183.5207 (264)
Space and water heating			323.1099 (265)
Pumps, fans and electric keep-hot	476.0701	0.1387	66.0368 (267)
Energy for lighting	265.0525	0.1443	38.2553 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1892.5634	0.1355	-256.3807
PV Unit electricity exported	-3289.1548	0.1251	-411.4138
Total			-667.7945 (269)
Total CO2, kg/year			-240.3925 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			-1.4600 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	886.8155	1.5826	1403.5036 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1302.5261	1.5210	1981.1187 (278)
Space and water heating			3384.6223 (279)
Pumps, fans and electric keep-hot	476.0701	1.5128	720.1988 (281)
Energy for lighting	265.0525	1.5338	406.5463 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1892.5634	1.5007	-2840.2043
PV Unit electricity exported	-3289.1548	0.4591	-1510.1186
Total			-4350.3228 (283)
Total Primary energy kWh/year			161.0446 (286)
Dwelling Primary energy Rate (DPER)			0.9700 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	103.9300 (1b)	x 2.9000 (2b)	= 301.3970 (1b) - (3b)
First floor	61.2500 (1c)	x 2.7000 (2c)	= 165.3750 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	165.1800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 466.7720 (5)

2. Ventilation rate

m3 per hour

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Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 40.0000 / (5) = 0.0857 (8)

Pressure test Yes

Pressure Test Method Blower Door

Measured/design AP50 5.0000 (17)

Infiltration rate 0.3357 (18)

Number of sides sheltered 2 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)

Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.2853 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750
Adj infilt rate												
Effective ac	0.3638	0.3567	0.3495	0.3139	0.3067	0.2711	0.2711	0.2639	0.2853	0.3067	0.3210	0.3353
	0.5662	0.5636	0.5611	0.5493	0.5470	0.5367	0.5367	0.5348	0.5407	0.5470	0.5515	0.5562

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Semi-glazed door			2.1000	1.0000	2.1000		(26a)
TER Opening Type (Uw = 1.20)			30.3000	1.1450	34.6947		(27)
19			2.0000	1.5918	3.1835		(27a)
16-18			6.0000	2.0221	12.1324		(27a)
Floor 1 P/a 0.35			103.9300	0.1300	13.5109		(28a)
External Wall 1 Render	111.9700	24.0200	87.9500	0.1800	15.8310		(29a)
External Wall 3 "attic"	15.9000		15.9000	0.1800	2.8620		(29a)
External Wall 2 Dormers	83.0400	8.3800	74.6600	0.1800	13.4388		(29a)
External Roof 1 sloping	59.0600	6.0000	53.0600	0.1100	5.8366		(30)
External Roof 3 "attic"	32.7800		32.7800	0.1100	3.6058		(30)
External Roof 2 Flat	22.1300	2.0000	20.1300	0.1100	2.2143		(30)
Total net area of external elements Aum(A, m2)			428.8100				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	109.4099	(33)
Party Wall 1			32.6200	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 115.2158 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	21.0700	0.0900	1.8963
E5 Ground floor (normal)	35.9500	0.1600	5.7520
E11 Eaves (insulation at rafter level)	23.0400	0.0400	0.9216
R4 Ridge (vaulted ceiling)	19.9000	0.0800	1.5920
E13 Gable (insulation at rafter level)	24.4900	0.0800	1.9592
E6 Intermediate floor within a dwelling	17.5100	0.0000	0.0000
R7 Flat ceiling (inverted)	18.3500	0.0400	0.7340
E14 Flat roof	11.1800	0.0800	0.8944
E17 Corner (inverted - internal area greater than external area)	5.3000	-0.0900	-0.4770
P1 Party wall - Ground floor	6.9000	0.0800	0.5520
P2 Party wall - Intermediate floor within a dwelling	6.9000	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	8.7000	0.0800	0.6960
E18 Party wall between dwellings	8.7900	0.0600	0.5274
E2 Other lintels (including other steel lintels)	27.0400	0.0500	1.3520
E3 Sill	26.0400	0.0500	1.3020
E4 Jamb	37.3200	0.0500	1.8660
R1 Head of roof window	2.5000	0.0800	0.2000
R2 Sill of roof window	2.5000	0.0600	0.1500
R3 Jamb of roof window	1.6000	0.0800	0.1280
R11 Upstands or kerbs of rooflights	18.0000	0.0800	1.4400

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 21.4859 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 130.8958 (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
	87.2112	86.8154	86.4274	84.6049	84.2640	82.6767	82.6767	82.3827	83.2881	84.2640	84.9537	85.6749
Heat transfer coeff	218.1070	217.7112	217.3232	215.5008	215.1598	213.5725	213.5725	213.2786	214.1839	215.1598	215.8496	216.5707
Average = Sum(39)m / 12 =												215.4991

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1.3204	1.3180	1.3157	1.3046	1.3026	1.2930	1.2930	1.2912	1.2967	1.3026	1.3068	1.3111
HLP (average)												1.3046
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9561 (42)
Hot water usage for mixer showers													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths													
85.1167	83.8526	82.0725	78.7903	76.3326	73.6074	72.1354	73.9030	75.8277	78.7437	82.0936	84.8289	84.8289	(42b)
Hot water usage for other uses													
44.9031	43.2702	41.6374	40.0046	38.3717	36.7389	36.7389	38.3717	40.0046	41.6374	43.2702	44.9031	44.9031	(42c)
Average daily hot water use (litres/day)													119.7376 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	130.0198	127.1228	123.7099	118.7948	114.7043	110.3462	108.8742	112.2747	115.8323	120.3811	125.3638	129.7320	
Energy conte	205.9195	181.0212	190.1375	162.6242	154.4140	135.6836	131.6740	139.0196	142.8328	163.3561	178.6037	203.1290	
Energy content (annual)													Total = Sum(45)m = 1988.4150

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Distribution loss (46)m = 0.15 x (45)m	30.8879	27.1532	28.5206	24.3936	23.1621	20.3525	19.7511	20.8529	21.4249	24.5034	26.7906	30.4693 (46)
Water storage loss:												
Store volume												250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8903 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0208 (55)
Total storage loss												
	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444 (56)
If cylinder contains dedicated solar storage												
	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month												
	260.8263	230.6144	245.0443	215.7598	209.3208	188.8192	186.5807	193.9264	195.9684	218.2629	231.7393	258.0358 (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												
	260.8263	230.6144	245.0443	215.7598	209.3208	188.8192	186.5807	193.9264	195.9684	218.2629	231.7393	258.0358 (64)
12Total per year (kWh/year)												2634.8982 (64)
Electric shower(s)												2635 (64)
	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												
	112.3937	99.8641	107.1461	96.5810	95.2681	87.6233	87.7070	90.1494	90.0004	98.2413	101.8942	111.4658 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	147.8033	147.8033	147.8033	147.8033	147.8033	147.8033	147.8033	147.8033	147.8033	147.8033	147.8033	147.8033 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	169.7765	187.9668	169.7765	175.4357	169.7765	175.4357	169.7765	169.7765	175.4357	169.7765	175.4357	169.7765 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	336.6009	340.0937	331.2918	312.5536	288.9000	266.6689	251.8172	248.3243	257.1262	275.8645	299.5181	321.7492 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	37.7803	37.7803	37.7803	37.7803	37.7803	37.7803	37.7803	37.7803	37.7803	37.7803	37.7803	37.7803 (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)												
	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426 (71)
Water heating gains (Table 5)												
	151.0668	148.6073	144.0136	134.1403	128.0485	121.6990	117.8858	121.1686	125.0005	132.0448	141.5197	149.8197 (72)
Total internal gains	727.7851	747.0089	715.4230	692.4706	657.0660	631.1446	606.8205	606.6104	624.9035	648.0267	686.8145	711.6863 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
East	9.8000	19.6403	0.6300	0.7000	0.7700	58.8227 (76)						
South	1.9200	46.7521	0.6300	0.7000	0.7700	27.4330 (78)						
West	18.5800	19.6403	0.6300	0.7000	0.7700	111.5231 (80)						
Horizontal	2.0000	26.0000	0.6300	0.7000	1.0000	20.6388 (82)						
North	6.0000	26.0000	0.6300	0.7000	1.0000	61.9164 (82)						
Solar gains	280.3341	549.6216	910.8364	1341.3356	1657.9287	1704.0189	1619.4473	1381.2078	1063.1937	653.4311	349.7003	230.4680 (83)
Total gains	1008.1192	1296.6306	1626.2594	2033.8062	2314.9947	2335.1635	2226.2677	1987.8182	1688.0971	1301.4578	1036.5149	942.1543 (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	24.2380	24.2821	24.3255	24.5312	24.5700	24.7527	24.7527	24.7868	24.6820	24.5700	24.4915	24.4100
alpha	2.6159	2.6188	2.6217	2.6354	2.6380	2.6502	2.6502	2.6525	2.6455	2.6380	2.6328	2.6273
util living area	0.9746	0.9521	0.9060	0.8078	0.6704	0.5170	0.3962	0.4520	0.6759	0.8836	0.9593	0.9786 (86)
MIT	18.1461	18.5619	19.1972	19.9601	20.5157	20.8272	20.9376	20.9106	20.6359	19.8267	18.8387	18.0771 (87)
Th 2	19.8249	19.8267	19.8286	19.8372	19.8388	19.8463	19.8463	19.8477	19.8434	19.8388	19.8355	19.8321 (88)
util rest of house	0.9701	0.9438	0.8898	0.7760	0.6181	0.4416	0.3016	0.3528	0.6037	0.8563	0.9508	0.9747 (89)
MIT 2	16.5093	17.0353	17.8300	18.7599	19.3955	19.7223	19.8158	19.8005	19.5508	18.6297	17.3975	16.4258 (90)
Living area fraction									FLA = Living area / (4) =			0.3200 (91)
MIT	17.0330	17.5237	18.2674	19.1439	19.7539	20.0758	20.1747	20.1556	19.8979	19.0127	17.8587	16.9541 (92)
Temperature adjustment												0.0000
adjusted MIT	17.0330	17.5237	18.2674	19.1439	19.7539	20.0758	20.1747	20.1556	19.8979	19.0127	17.8587	16.9541 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9538	0.9209	0.8621	0.7539	0.6139	0.4573	0.3294	0.3806	0.6075	0.8316	0.9301	0.9602 (94)
Useful gains	961.5918	1194.0959	1402.0387	1533.3615	1421.2722	1067.9460	733.4392	756.4749	1025.4510	1082.2737	964.0225	904.6127 (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	2777.1584	2748.3310	2557.3346	2207.5645	1732.8818	1169.4808	763.4615	800.9987	1241.8262	1810.0746	2322.2503	2762.1687 (97)
Space heating kWh	1350.7815	1044.4460	859.5402	485.4262	231.8375	0.0000	0.0000	0.0000	0.0000	541.4839	977.9240	1382.0216 (98a)
Space heating requirement - total per year (kWh/year)												6873.4609
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

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Space heating kWh	1350.7815	1044.4460	859.5402	485.4262	231.8375	0.0000	0.0000	0.0000	0.0000	541.4839	977.9240	1382.0216	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6873.4609	
Space heating per m2												41.6119	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													92.3000	(206)
Efficiency of main space heating system 2 (in %)													0.0000	(207)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1350.7815	1044.4460	859.5402	485.4262	231.8375	0.0000	0.0000	0.0000	0.0000	541.4839	977.9240	1382.0216	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	1463.4686	1131.5775	931.2462	525.9222	251.1782	0.0000	0.0000	0.0000	0.0000	586.6564	1059.5059	1497.3149	(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	260.8263	230.6144	245.0443	215.7598	209.3208	188.8192	186.5807	193.9264	195.9684	218.2629	231.7393	258.0358	(64)	
Efficiency of water heater (217)m	87.2082	87.0248	86.6325	85.8217	84.2894	79.8000	79.8000	79.8000	79.8000	86.0131	86.9220	87.2518	(216)	
Fuel for water heating, kWh/month	299.0846	264.9984	282.8550	251.4048	248.3357	236.6155	233.8105	243.0155	245.5744	253.7553	266.6062	295.7370	(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	7.0685	7.3041	7.0685	7.3041	7.0685	(231)	
Lighting	35.2762	28.2999	25.4809	18.6684	14.4200	11.7813	13.1544	17.0986	22.2094	29.1399	32.9135	36.2566	(232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-83.4745	-111.3150	-151.3971	-160.6875	-165.5094	-151.6077	-149.4859	-144.6354	-135.3556	-122.2968	-89.3607	-72.9167	(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	-68.6995	-141.3435	-275.3800	-405.9419	-529.7142	-529.8958	-523.8649	-446.9114	-331.9745	-199.7487	-90.8909	-54.5929	(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													7446.8699	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													79.8000	
Water heating fuel used													3121.7929	(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)													284.6992	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-5137.0006	(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													5802.3613	(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	7446.8699	0.2100	1563.8427	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3121.7929	0.2100	655.5765	(264)
Space and water heating			2219.4192	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	284.6992	0.1443	41.0909	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1538.0424	0.1358	-208.9157	
PV Unit electricity exported	-3598.9583	0.1264	-455.0793	
Total			-663.9950	(269)
Total CO2, kg/year			1608.4443	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.7400	(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	7446.8699	1.1300	8414.9630	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3121.7929	1.1300	3527.6260	(278)
Space and water heating			11942.5890	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)

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Energy for lighting	284.6992	1.5338	436.6811 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1538.0424	1.5021	-2310.2647
PV Unit electricity exported	-3598.9583	0.4642	-1670.5398
Total			-3980.8045 (283)
Total Primary energy kWh/year			8528.5664 (286)
Target Primary Energy Rate (TPER)			51.6300 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	103.9300 (1b)	x 2.9000 (2b)	= 301.3970 (1b) - (3b)
First floor	61.2500 (1c)	x 2.7000 (2c)	= 165.3750 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	165.1800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 466.7720 (5)

2. Ventilation rate

	m ³ per hour											
Number of open chimneys	0 * 80 =											0.0000 (6a)
Number of open flues	0 * 20 =											0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =											0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =											0.0000 (6d)
Number of flues attached to other heater	0 * 35 =											0.0000 (6e)
Number of blocked chimneys	0 * 20 =											0.0000 (6f)
Number of intermittent extract fans	4 * 10 =											40.0000 (7a)
Number of passive vents	0 * 10 =											0.0000 (7b)
Number of flueless gas fires	0 * 40 =											0.0000 (7c)
												Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =											0.0857 (8)
Pressure test												Yes
Pressure Test Method												Blower Door
Measured/design AP50												0.9500 (17)
Infiltration rate												0.1332 (18)
Number of sides sheltered												2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =											0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =											0.1132 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Effective ac	0.1444	0.1415	0.1387	0.1245	0.1217	0.1076	0.1076	0.1047	0.1132	0.1217	0.1274	0.1330 (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	0.5104	0.5100	0.5096	0.5078	0.5074	0.5058	0.5058	0.5055	0.5064	0.5074	0.5081	0.5088 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Window (Uw = 0.90)			30.3000	0.8687	26.3224		(27)
Door			2.1000	0.9000	1.8900		(26a)
16-18			6.0000	1.2357	7.4144		(27a)
19			2.0000	1.2357	2.4715		(27a)
Floor 1 P/a 0.35			103.9300	0.1200	12.4716	110.0000	11432.3000 (28a)
External Wall 1 Render	111.9700	24.0200	87.9500	0.1500	13.1925	9.0000	791.5500 (29a)
External Wall 3 "attic"	15.9000		15.9000	0.0900	1.4310	9.0000	143.1000 (29a)
External Wall 2 Dormers	83.0400	8.3800	74.6600	0.1600	11.9456	9.0000	671.9400 (29a)
External Roof 1 sloping	59.0600	6.0000	53.0600	0.1300	6.8978	9.0000	477.5400 (30)
External Roof 3 "attic"	32.7800		32.7800	0.0861	2.8232	9.0000	295.0200 (30)
External Roof 2 Flat	22.1300	2.0000	20.1300	0.1500	3.0195	9.0000	181.1700 (30)
Total net area of external elements Aum(A, m ²)			428.8100				
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	89.8795			
Party Wall 1			32.6200	0.0000	0.0000	20.0000	652.4000 (32)
Internal Wall 1 GF			168.5800			9.0000	1517.2200 (32c)
Internal Wall 2 FF			135.0400			9.0000	1215.3600 (32c)
Internal Floor 1			61.2500			18.0000	1102.5000 (32d)
Internal Ceiling 1			61.2500			9.0000	551.2500 (32e)
Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =	19031.3500 (34)			
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K				115.2158 (35)			

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	21.0700	0.0300	0.6321
E5 Ground floor (normal)	35.9500	0.0210	0.7550
E11 Eaves (insulation at rafter level)	23.0400	0.0390	0.8986
R4 Ridge (vaulted ceiling)	19.9000	0.1200	2.3880
E13 Gable (insulation at rafter level)	24.4900	0.0240	0.5878
E6 Intermediate floor within a dwelling	17.5100	0.0800	1.4008
R7 Flat ceiling (inverted)	18.3500	0.1200	2.2020
E14 Flat roof	11.1800	0.0460	0.5143
E17 Corner (inverted - internal area greater than external area)	5.3000	-0.0150	-0.0795

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P1 Party wall - Ground floor	6.9000	0.1490	1.0281
P2 Party wall - Intermediate floor within a dwelling	6.9000	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	8.7000	0.0810	0.7047
E18 Party wall between dwellings	8.7900	0.0395	0.3472
E2 Other lintels (including other steel lintels)	27.0400	0.0840	2.2714
E3 Sill	26.0400	0.0430	1.1197
E4 Jamb	37.3200	0.0340	1.2689
R1 Head of roof window	2.5000	0.2400	0.6000
R2 Sill of roof window	2.5000	0.2400	0.6000
R3 Jamb of roof window	1.6000	0.2400	0.3840
R11 Upstands or kerbs of rooflights	18.0000	0.2400	4.3200
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			21.9429 (36)
Point Thermal bridges			0.0000 (36a) =
Total fabric heat loss			(33) + (36) + (36a) = 111.8224 (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	78.6222	78.5599	78.4988	78.2119	78.1582	77.9083	77.9083	77.8620	78.0046	78.1582	78.2668	78.3803 (38)
Average = Sum(39)m / 12 =	190.4446	190.3823	190.3212	190.0343	189.9806	189.7307	189.7307	189.6844	189.8270	189.9806	190.0892	190.2027 (39)
												190.0340

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1530	1.1526	1.1522	1.1505	1.1501	1.1486	1.1486	1.1483	1.1492	1.1501	1.1508	1.1515 (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												2.9561 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	31.8525	31.3794	30.7133	29.4850	28.5653	27.5454	26.9946	27.6561	28.3763	29.4676	30.7212	31.7448 (42b)
Hot water usage for other uses	44.9031	43.2702	41.6374	40.0046	38.3717	36.7389	36.7389	38.3717	40.0046	41.6374	43.2702	44.9031 (42c)
Average daily hot water use (litres/day)												70.3532 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	76.7555	74.6497	72.3507	69.4895	66.9370	64.2843	63.7335	66.0278	68.3809	71.1050	73.9914	76.6479 (44)
Energy content (annual)	121.5620	106.3001	111.2003	95.1277	90.1100	79.0451	77.0801	81.7562	84.3205	96.4888	105.4143	120.0120 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Total heat required for water heating calculated for each month	103.3277	90.3551	94.5202	80.8586	76.5935	67.1883	65.5181	69.4928	71.6724	82.0155	89.6022	102.0102 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	103.3277	90.3551	94.5202	80.8586	76.5935	67.1883	65.5181	69.4928	71.6724	82.0155	89.6022	102.0102 (64)
12Total per year (kWh/year)												993.1546 (64)
Electric shower(s)	59.0882	52.6480	57.4897	54.8617	55.8911	53.3147	55.0919	55.8911	54.8617	57.4897	56.4086	59.0882 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												672.1245 (64a)
Heat gains from water heating, kWh/month	40.6040	35.7508	38.0025	33.9301	33.1212	30.1258	30.1525	31.3460	31.6335	34.8763	36.5027	40.2746 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	147.8033	147.8033	147.8033	147.8033	147.8033	147.8033	147.8033	147.8033	147.8033	147.8033	147.8033	147.8033 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	169.8651	188.0649	169.8651	175.5273	169.8651	175.5273	169.8651	169.8651	175.5273	169.8651	175.5273	169.8651 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	336.6009	340.0937	331.2918	312.5536	288.9000	266.6689	251.8172	248.3243	257.1262	275.8645	299.5181	321.7492 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.7803	37.7803	37.7803	37.7803	37.7803	37.7803	37.7803	37.7803	37.7803	37.7803	37.7803	37.7803 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426 (71)
Water heating gains (Table 5)	54.5752	53.2006	51.0786	47.1251	44.5177	41.8413	40.5275	42.1317	43.9354	46.8767	50.6982	54.1325 (72)
Total internal gains	628.3822	648.7003	619.5765	602.5470	570.6238	551.3785	529.5508	527.6621	543.9300	559.9473	593.0845	613.0878 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
East	9.8000	19.6403	0.6800	0.7000	0.7700	63.4912 (76)						
South	1.9200	46.7521	0.6800	0.7000	0.7700	29.6103 (78)						
West	18.5800	19.6403	0.6800	0.7000	0.7700	120.3741 (80)						
North	6.0000	26.0000	0.7600	0.7000	1.0000	74.6928 (82)						
Horizontal	2.0000	26.0000	0.7600	0.7000	1.0000	24.8976 (82)						
Solar gains	313.0660	615.0152	1021.8322	1508.2708	1866.9248	1919.8985	1824.1796	1554.1299	1193.9421	731.9019	390.7599	257.2263 (83)

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Total gains 941.4482 1263.7155 1641.4088 2110.8178 2437.5486 2471.2770 2353.7305 2081.7920 1737.8721 1291.8492 983.8445 870.3141 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
 Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	27.7587	27.7677	27.7767	27.8186	27.8265	27.8631	27.8631	27.8699	27.8490	27.8265	27.8106	27.7940
alpha	2.8506	2.8512	2.8518	2.8546	2.8551	2.8575	2.8575	2.8580	2.8566	2.8551	2.8540	2.8529
util living area	0.9779	0.9514	0.8935	0.7714	0.6129	0.4563	0.3426	0.3981	0.6290	0.8723	0.9617	0.9821 (86)
MIT	18.4465	18.8948	19.5386	20.2410	20.6914	20.9019	20.9679	20.9505	20.7549	20.0399	19.0822	18.3539 (87)
Th 2	19.9578	19.9581	19.9584	19.9598	19.9601	19.9613	19.9613	19.9615	19.9608	19.9601	19.9596	19.9590 (88)
util rest of house	0.9741	0.9435	0.8769	0.7390	0.5639	0.3918	0.2662	0.3156	0.5617	0.8449	0.9541	0.9790 (89)
MIT 2	17.6246	18.0658	18.6901	19.3470	19.7400	19.9059	19.9486	19.9406	19.8066	19.1834	18.2570	17.5337 (90)
Living area fraction	fLA = Living area / (4) = 0.3200 (91)											
MIT	17.8876	18.3310	18.9616	19.6330	20.0444	20.2246	20.2747	20.2637	20.1100	19.4574	18.5210	17.7961 (92)
Temperature adjustment	0.0000											
adjusted MIT	17.8876	18.3310	18.9616	19.6330	20.0444	20.2246	20.2747	20.2637	20.1100	19.4574	18.5210	17.7961 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9636	0.9274	0.8577	0.7277	0.5681	0.4086	0.2897	0.3403	0.5720	0.8291	0.9400	0.9699 (94)
Useful gains	907.2038	1171.9497	1407.8982	1536.1181	1384.8289	1009.8859	681.9046	708.4166	994.1396	1071.0910	924.8509	844.0860 (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	2587.6795	2557.0279	2371.7064	2039.6439	1585.2709	1067.1591	697.2119	732.8826	1140.8574	1682.7409	2171.0095	2586.0158 (97)
Space heating kWh	1250.2739	930.7725	717.0732	362.5386	149.1288	0.0000	0.0000	0.0000	0.0000	455.0675	897.2342	1295.9958 (98a)
Space heating requirement - total per year (kWh/year)	6058.0846											
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	1250.2739	930.7725	717.0732	362.5386	149.1288	0.0000	0.0000	0.0000	0.0000	455.0675	897.2342	1295.9958 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	6058.0846											
Space heating per m2	(98c) / (4) = 36.6757 (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	1783.4688	1404.0073	1441.6018	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8685	0.9098	0.8787	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1548.9480	1277.3340	1266.7411	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	2684.2300	2557.1808	2263.4385	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	817.4030	952.2060	741.5429	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fc = cooled area / (4) = 1.0000 (105)											
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	204.3508	238.0515	185.3857	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement	627.7880 (107)											
Energy for space heating	36.6757 (99)											
Energy for space cooling	3.8006 (108)											
Total	40.4763 (109)											
Fabric Energy Efficiency (DFEE)	40.5 (109)											

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	103.9300 (1b)	x 2.9000 (2b)	= 301.3970 (1b) - (3b)
First floor	61.2500 (1c)	x 2.7000 (2c)	= 165.3750 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	165.1800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	466.7720 (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)

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Number of intermittent extract fans 4 * 10 = 40.0000 (7a)
 Number of passive vents 0 * 10 = 0.0000 (7b)
 Number of flueless gas fires 0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 40.0000 / (5) = 0.0857 (8)
 Pressure test Yes
 Pressure Test Method Blower Door
 Measured/design AP50 5.0000 (17)
 Infiltration rate 0.3357 (18)
 Number of sides sheltered 2 (19)
 Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
 Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.2853 (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	0.3638	0.3567	0.3495	0.3139	0.3067	0.2711	0.2711	0.2639	0.2853	0.3067	0.3210	0.3353 (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	0.5662	0.5636	0.5611	0.5493	0.5470	0.5367	0.5367	0.5348	0.5407	0.5470	0.5515	0.5562 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Semi-glazed door			2.1000	1.0000	2.1000		(26a)
TER Opening Type (Uw = 1.20)			30.3000	1.1450	34.6947		(27)
19			2.0000	1.5918	3.1835		(27a)
16-18			6.0000	2.0221	12.1324		(27a)
Floor 1 P/a 0.35			103.9300	0.1300	13.5109		(28a)
External Wall 1 Render	111.9700	24.0200	87.9500	0.1800	15.8310		(29a)
External Wall 3 "attic"	15.9000		15.9000	0.1800	2.8620		(29a)
External Wall 2 Dormers	83.0400	8.3800	74.6600	0.1800	13.4388		(29a)
External Roof 1 sloping	59.0600	6.0000	53.0600	0.1100	5.8366		(30)
External Roof 3 "attic"	32.7800		32.7800	0.1100	3.6058		(30)
External Roof 2 Flat	22.1300	2.0000	20.1300	0.1100	2.2143		(30)
Total net area of external elements Aum(A, m2)			428.8100				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 109.4099		(33)
Party Wall 1			32.6200	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 115.2158 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	21.0700	0.0900	1.8963
E5 Ground floor (normal)	35.9500	0.1600	5.7520
E11 Eaves (insulation at rafter level)	23.0400	0.0400	0.9216
R4 Ridge (vaulted ceiling)	19.9000	0.0800	1.5920
E13 Gable (insulation at rafter level)	24.4900	0.0800	1.9592
E6 Intermediate floor within a dwelling	17.5100	0.0000	0.0000
R7 Flat ceiling (inverted)	18.3500	0.0400	0.7340
E14 Flat roof	11.1800	0.0800	0.8944
E17 Corner (inverted - internal area greater than external area)	5.3000	-0.0900	-0.4770
P1 Party wall - Ground floor	6.9000	0.0800	0.5520
P2 Party wall - Intermediate floor within a dwelling	6.9000	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	8.7000	0.0800	0.6960
E18 Party wall between dwellings	8.7900	0.0600	0.5274
E2 Other lintels (including other steel lintels)	27.0400	0.0500	1.3520
E3 Sill	26.0400	0.0500	1.3020
E4 Jamb	37.3200	0.0500	1.8660
R1 Head of roof window	2.5000	0.0800	0.2000
R2 Sill of roof window	2.5000	0.0600	0.1500
R3 Jamb of roof window	1.6000	0.0800	0.1280
R11 Upstands or kerbs of rooflights	18.0000	0.0800	1.4400

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 21.4859 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 130.8958 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)
 (38)m Jan 87.2112 Feb 86.8154 Mar 86.4274 Apr 84.6049 May 84.2640 Jun 82.6767 Jul 82.6767 Aug 82.3827 Sep 83.2881 Oct 84.2640 Nov 84.9537 Dec 85.6749 (38)
 Heat transfer coeff 218.1070 217.7112 217.3232 215.5008 215.1598 213.5725 213.5725 213.2786 214.1839 215.1598 215.8496 216.5707 (39)
 Average = Sum(39)m / 12 = 215.4991

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3204	1.3180	1.3157	1.3046	1.3026	1.2930	1.2930	1.2912	1.2967	1.3026	1.3068	1.3111 (40)
HLP (average)												1.3046
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.9561 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	31.8525	31.3794	30.7133	29.4850	28.5653	27.5454	26.9946	27.6561	28.3763	29.4676	30.7212	31.7448 (42b)
Hot water usage for other uses	44.9031	43.2702	41.6374	40.0046	38.3717	36.7389	36.7389	38.3717	40.0046	41.6374	43.2702	44.9031 (42c)
Average daily hot water use (litres/day)												70.3532 (43)
Daily hot water use	76.7555	74.6497	72.3507	69.4895	66.9370	64.2843	63.7335	66.0278	68.3809	71.1050	73.9914	76.6479 (44)
Energy conte	121.5620	106.3001	111.2003	95.1277	90.1100	79.0451	77.0801	81.7562	84.3205	96.4888	105.4143	120.0120 (45)
Energy content (annual)												Total = Sum(45)m = 1168.4171
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

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If cylinder contains dedicated solar storage												
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Total heat required for water heating calculated for each month												
WWHRS	103.3277	90.3551	94.5202	80.8586	76.5935	67.1883	65.5181	69.4928	71.6724	82.0155	89.6022	102.0102 (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												
	103.3277	90.3551	94.5202	80.8586	76.5935	67.1883	65.5181	69.4928	71.6724	82.0155	89.6022	102.0102 (64)
Total per year (kWh/year) = Sum(64)m =											993 (64)	
12Total per year (kWh/year)												
Electric shower(s)											59.0882 (64a)	
	59.0882	52.6480	57.4897	54.8617	55.8911	53.3147	55.0919	55.8911	54.8617	57.4897	56.4086	672.1245 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											672.1245 (64a)	
Heat gains from water heating, kWh/month												
	40.6040	35.7508	38.0025	33.9301	33.1212	30.1258	30.1525	31.3460	31.6335	34.8763	36.5027	40.2746 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	147.8033	147.8033	147.8033	147.8033	147.8033	147.8033	147.8033	147.8033	147.8033	147.8033	147.8033	147.8033 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	169.7765	187.9668	169.7765	175.4357	169.7765	175.4357	169.7765	169.7765	175.4357	169.7765	175.4357	169.7765 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	336.6009	340.0937	331.2918	312.5536	288.9000	266.6689	251.8172	248.3243	257.1262	275.8645	299.5181	321.7492 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	37.7803	37.7803	37.7803	37.7803	37.7803	37.7803	37.7803	37.7803	37.7803	37.7803	37.7803	37.7803 (69)
Pumps, fans												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426 (71)
Water heating gains (Table 5)												
	54.5752	53.2006	51.0786	47.1251	44.5177	41.8413	40.5275	42.1317	43.9354	46.8767	50.6982	54.1325 (72)
Total internal gains												
	628.2936	648.6021	619.4879	602.4554	570.5352	551.2870	529.4622	527.5735	543.8384	559.8587	592.9930	612.9992 (73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	Specific data	Specific data	factor	W						
		W/m2	or Table 6b	or Table 6c	Table 6d							
East	9.8000	19.6403	0.6300	0.7000	0.7700	58.8227 (76)						
South	1.9200	46.7521	0.6300	0.7000	0.7700	27.4330 (78)						
West	18.5800	19.6403	0.6300	0.7000	0.7700	111.5231 (80)						
Horizontal	2.0000	26.0000	0.6300	0.7000	1.0000	20.6388 (82)						
North	6.0000	26.0000	0.6300	0.7000	1.0000	61.9164 (82)						
Solar gains	280.3341	549.6216	910.8364	1341.3356	1657.9287	1704.0189	1619.4473	1381.2078	1063.1937	653.4311	349.7003	230.4680 (83)
Total gains	908.6277	1198.2238	1530.3244	1943.7910	2228.4639	2255.3059	2148.9095	1908.7813	1607.0321	1213.2897	942.6933	843.4672 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	24.2380	24.2821	24.3255	24.5312	24.5700	24.7527	24.7527	24.7868	24.6820	24.5700	24.4915	24.4100
alpha	2.6159	2.6188	2.6217	2.6354	2.6380	2.6502	2.6502	2.6525	2.6455	2.6380	2.6328	2.6273
util living area	0.9800	0.9596	0.9165	0.8212	0.6850	0.5306	0.4084	0.4671	0.6946	0.8979	0.9670	0.9834 (86)
MIT	18.0472	18.4709	19.1210	19.9096	20.4882	20.8159	20.9328	20.9032	20.6093	19.7613	18.7495	17.9776 (87)
Th 2	19.8249	19.8267	19.8286	19.8372	19.8388	19.8463	19.8463	19.8477	19.8434	19.8388	19.8355	19.8321 (88)
util rest of house	0.9764	0.9524	0.9017	0.7906	0.6332	0.4544	0.3116	0.3658	0.6233	0.8730	0.9599	0.9804 (89)
MIT 2	17.1436	17.5627	18.1989	18.9529	19.4719	19.7427	19.8206	19.8075	19.5965	18.8370	17.8487	17.0792 (90)
Living area fraction	17.4327	17.8533	18.4939	19.2590	19.7971	20.0861	20.1764	20.1581	19.9205	19.1328	18.1370	17.3666 (92)
MIT	17.4327	17.8533	18.4939	19.2590	19.7971	20.0861	20.1764	20.1581	19.9205	19.1328	18.1370	17.3666 (92)
Temperature adjustment												0.0000
adjusted MIT	17.4327	17.8533	18.4939	19.2590	19.7971	20.0861	20.1764	20.1581	19.9205	19.1328	18.1370	17.3666 (93)

8. Space heating requirement

Utilisation	0.9656	0.9360	0.8804	0.7730	0.6312	0.4711	0.3403	0.3945	0.6286	0.8539	0.9455	0.9710 (94)
Useful gains	877.3536	1121.5074	1347.3164	1502.5751	1406.5223	1062.4086	731.3363	752.9335	1010.1237	1036.0368	891.3104	818.9676 (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	2864.3354	2820.0817	2606.5533	2232.3794	1742.1698	1171.6797	763.8308	801.5184	1246.6610	1835.9062	2382.3232	2851.5072 (97)
Space heating kWh	1478.3145	1141.4419	936.8723	525.4591	249.7217	0.0000	0.0000	0.0000	0.0000	595.1028	1073.5292	1512.2094 (98a)
Space heating requirement - total per year (kWh/year)												7512.6509
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	1478.3145	1141.4419	936.8723	525.4591	249.7217	0.0000	0.0000	0.0000	0.0000	595.1028	1073.5292	1512.2094 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												7512.6509
Space heating per m2												(98c) / (4) = 45.4816 (99)

8c. Space cooling requirement

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Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W												
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	2007.5817	1580.4366	1620.9172	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.7943	0.8492	0.8093	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1594.6703	1342.0570	1311.7499	0.0000	0.0000	0.0000	0.0000 (102)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	2454.0191	2338.7817	2078.6780	0.0000	0.0000	0.0000	0.0000 (103)
Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	618.7311	741.5632	570.5945	0.0000	0.0000	0.0000	0.0000 (104)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	fC = cooled area / (4) =			1.0000 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	154.6828	185.3908	142.6486	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling requirement	0.0000	0.0000	0.0000	0.0000	0.0000	154.6828	185.3908	142.6486	0.0000	0.0000	0.0000	0.0000 (107)
Energy for space heating												482.7222 (107)
Energy for space cooling												45.4816 (99)
Total												2.9224 (108)
Fabric Energy Efficiency (TFEE)												48.4040 (109)
												48.4 (109)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	103.9300 (1b)	x 2.9000 (2b)	= 301.3970 (1b) - (3b)
First floor	61.2500 (1c)	x 2.7000 (2c)	= 165.3750 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	165.1800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	466.7720 (5)

2. Ventilation rate

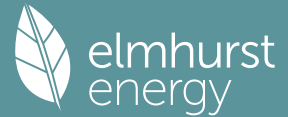
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked 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	0.9500	(17)
Infiltration rate	0.0475	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.0404 (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	0.0515	0.0505	0.0495	0.0444	0.0434	0.0384	0.0384	0.0373	0.0404	0.0434	0.0454	0.0474 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												81.0000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.1465	0.1455	0.1445	0.1394	0.1384	0.1334	0.1334	0.1323	0.1354	0.1384	0.1404	0.1424 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Window (Uw = 0.90)			30.3000	0.8687	26.3224		(27)
Door			2.1000	0.9000	1.8900		(26a)
16-18			6.0000	1.2357	7.4144		(27a)
19			2.0000	1.2357	2.4715		(27a)
Floor 1 P/a 0.35			103.9300	0.1200	12.4716	110.0000	11432.3000 (28a)
External Wall 1 Render	111.9700	24.0200	87.9500	0.1500	13.1925	9.0000	791.5500 (29a)
External Wall 3 "attic"	15.9000		15.9000	0.0900	1.4310	9.0000	143.1000 (29a)
External Wall 2 Dormers	83.0400	8.3800	74.6600	0.1600	11.9456	9.0000	671.9400 (29a)
External Roof 1 sloping	59.0600	6.0000	53.0600	0.1300	6.8978	9.0000	477.5400 (30)
External Roof 3 "attic"	32.7800		32.7800	0.0861	2.8232	9.0000	295.0200 (30)
External Roof 2 Flat	22.1300	2.0000	20.1300	0.1500	3.0195	9.0000	181.1700 (30)
Total net area of external elements Aum(A, m2)			428.8100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	89.8795		(33)
Party Wall 1			32.6200	0.0000	0.0000	20.0000	652.4000 (32)
Internal Wall 1 GF			168.5800			9.0000	1517.2200 (32c)
Internal Wall 2 FF			135.0400			9.0000	1215.3600 (32c)

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Internal Floor 1 61.2500 18.0000 1102.5000 (32d)
 Internal Ceiling 1 61.2500 9.0000 551.2500 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 19031.3500 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 115.2158 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	21.0700	0.0300	0.6321
E5 Ground floor (normal)	35.9500	0.0210	0.7550
E11 Eaves (insulation at rafter level)	23.0400	0.0390	0.8986
R4 Ridge (vaulted ceiling)	19.9000	0.1200	2.3880
E13 Gable (insulation at rafter level)	24.4900	0.0240	0.5878
E6 Intermediate floor within a dwelling	17.5100	0.0800	1.4008
R7 Flat ceiling (inverted)	18.3500	0.1200	2.2020
E14 Flat roof	11.1800	0.0460	0.5143
E17 Corner (inverted - internal area greater than external area)	5.3000	-0.0150	-0.0795
P1 Party wall - Ground floor	6.9000	0.1490	1.0281
P2 Party wall - Intermediate floor within a dwelling	6.9000	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	8.7000	0.0810	0.7047
E18 Party wall between dwellings	8.7900	0.0395	0.3472
E2 Other lintels (including other steel lintels)	27.0400	0.0840	2.2714
E3 Sill	26.0400	0.0430	1.1197
E4 Jamb	37.3200	0.0340	1.2689
R1 Head of roof window	2.5000	0.2400	0.6000
R2 Sill of roof window	2.5000	0.2400	0.6000
R3 Jamb of roof window	1.6000	0.2400	0.3840
R11 Upstands or kerbs of rooflights	18.0000	0.2400	4.3200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 21.9429 (36)

Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 111.8224 (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	22.5627	22.4072	22.2518	21.4744	21.3189	20.5415	20.5415	20.3860	20.8525	21.3189	21.6298	21.9408 (38)
Average = Sum(39)m / 12 =	134.3851	134.2296	134.0742	133.2968	133.1413	132.3639	132.3639	132.2084	132.6749	133.1413	133.4522	133.7632 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8136	0.8126	0.8117	0.8070	0.8060	0.8013	0.8013	0.8004	0.8032	0.8060	0.8079	0.8098 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	0.8067

4. Water heating energy requirements (kWh/year)

Assumed occupancy	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	85.1167	83.8526	82.0725	78.7903	76.3326	73.6074	72.1354	73.9030	75.8277	78.7437	82.0936	84.8289 (42b)
Hot water usage for other uses	44.9031	43.2702	41.6374	40.0046	38.3717	36.7389	36.7389	38.3717	40.0046	41.6374	43.2702	44.9031 (42c)
Average daily hot water use (litres/day)	130.0198	127.1228	123.7099	118.7948	114.7043	110.3462	108.8742	112.2747	115.8323	120.3811	125.3638	129.7320 (44)
Daily hot water use	205.9195	181.0212	190.1375	162.6242	154.4140	135.6836	131.6740	139.0196	142.8328	163.3561	178.6037	203.1290 (45)
Energy content (annual)	30.8879	27.1532	28.5206	24.3936	23.1621	20.3525	19.7511	20.8529	21.4249	24.5034	26.7906	30.4693 (46)
Distribution loss (46)m = 0.15 x (45)m	4.6332	4.0730	4.2781	3.6590	3.4743	3.0529	2.9627	3.1280	3.2137	3.6755	4.0186	4.5631 (47)
Water storage loss:												250.0000 (48)
Store volume												1.6000 (49)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (50)
Temperature factor from Table 2b												0.8640 (55)
Enter (49) or (54) in (55)												
Total storage loss	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840 (56)
If cylinder contains dedicated solar storage	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	255.9659	226.2244	240.1839	211.0562	204.4604	184.1156	181.7204	189.0660	191.2648	213.4025	227.0357	253.1754 (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	255.9659	226.2244	240.1839	211.0562	204.4604	184.1156	181.7204	189.0660	191.2648	213.4025	227.0357	253.1754 (64)
Total per year (kWh/year) = Sum(64)m =												2577.6710 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	108.5054	96.3521	103.2578	92.8181	91.3798	83.8604	83.8187	86.2611	86.2375	94.3530	98.1313	107.5775 (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	177.3640	177.3640	177.3640	177.3640	177.3640	177.3640	177.3640	177.3640	177.3640	177.3640	177.3640	177.3640 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	37.5209	33.3257	27.1023	20.5182	15.3376	12.9486	13.9915	18.1866	24.4101	30.9942	36.1748	38.5637 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	502.3894	507.6026	494.4654	466.4980	431.1940	398.0133	375.8466	370.6333	383.7705	411.7380	447.0419	480.2226 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.6925	55.6925	55.6925	55.6925	55.6925	55.6925	55.6925	55.6925	55.6925	55.6925	55.6925	55.6925 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426 (71)
Water heating gains (Table 5)	145.8405	143.3811	138.7874	128.9141	122.8223	116.4728	112.6596	115.9424	119.7743	126.8186	136.2935	144.5934 (72)
Total internal gains	800.5646	799.1233	775.1689	730.7440	684.1677	642.2485	617.3114	619.5761	642.7687	684.3645	734.3240	778.1936 (73)

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6. Solar gains

[Jan]		Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g Specific data or Table 6c	FF	Access factor Table 6d	Gains W				
East		9.8000	19.6403	0.6800	0.7000	0.7700	63.4912 (76)					
South		1.9200	46.7521	0.6800	0.7000	0.7700	29.6103 (78)					
West		18.5800	19.6403	0.6800	0.7000	0.7700	120.3741 (80)					
North		6.0000	26.0000	0.7600	0.7000	1.0000	74.6928 (82)					
Horizontal		2.0000	26.0000	0.7600	0.7000	1.0000	24.8976 (82)					
Solar gains	313.0660	615.0152	1021.8322	1508.2708	1866.9248	1919.8985	1824.1796	1554.1299	1193.9421	731.9019	390.7599	257.2263 (83)
Total gains	1113.6306	1414.1385	1797.0012	2239.0148	2551.0925	2562.1470	2441.4910	2173.7060	1836.7108	1416.2664	1125.0839	1035.4199 (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	39.3383	39.3839	39.4296	39.6595	39.7058	39.9390	39.9390	39.9860	39.8454	39.7058	39.6133	39.5212	
alpha	3.6226	3.6256	3.6286	3.6440	3.6471	3.6626	3.6626	3.6657	3.6564	3.6471	3.6409	3.6347	
util living area	0.9586	0.9136	0.8137	0.6424	0.4668	0.3268	0.2376	0.2779	0.4780	0.7759	0.9293	0.9668 (86)	
Living	19.7974	20.0893	20.4571	20.7493	20.8705	20.9064	20.9136	20.9120	20.8800	20.6433	20.1451	19.7302	
Non living	18.8148	19.1790	19.6265	19.9675	20.0981	20.1370	20.1429	20.1427	20.1131	19.8593	19.2573	18.7327	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.3848	20.0893	20.4571	20.7493	20.8705	20.9064	20.9136	20.9120	20.8800	20.6433	20.1451	19.9078 (87)	
Th 2	20.2416	20.2424	20.2432	20.2473	20.2481	20.2522	20.2522	20.2530	20.2505	20.2481	20.2465	20.2448 (88)	
util rest of house	0.9528	0.9027	0.7937	0.6129	0.4328	0.2897	0.1976	0.2335	0.4313	0.7450	0.9185	0.9621 (89)	
MIT 2	19.6728	19.1790	19.6265	19.9675	20.0981	20.1370	20.1429	20.1427	20.1131	19.8593	19.2573	19.0052 (90)	
Living area fraction	19.9006	19.4702	19.8922	20.2176	20.3452	20.3832	20.3895	20.3889	20.3585	20.1101	19.5414	0.3200 (91)	
MIT	19.9006	19.4702	19.8922	20.2176	20.3452	20.3832	20.3895	20.3889	20.3585	20.1101	19.5414	19.2940 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.9006	19.4702	19.8922	20.2176	20.3452	20.3832	20.3895	20.3889	20.3585	20.1101	19.5414	19.2940 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9499	0.8900	0.7836	0.6117	0.4373	0.2962	0.2049	0.2416	0.4381	0.7389	0.9065	0.9550 (94)
Useful gains	1057.8597	1258.5527	1408.1970	1369.6573	1115.4857	759.0317	500.3813	525.1361	804.7447	1046.4294	1019.8515	988.7809 (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	2096.4877	1955.7583	1795.5512	1508.6010	1151.0356	765.4838	501.5931	527.3607	830.3443	1266.1886	1660.3318	2019.0200 (97)
Space heating kWh	772.7392	468.5222	288.1916	100.0395	26.4492	0.0000	0.0000	0.0000	0.0000	163.5009	461.1458	766.4979 (98a)
Space heating requirement - total per year (kWh/year)												3047.0862
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	772.7392	468.5222	288.1916	100.0395	26.4492	0.0000	0.0000	0.0000	0.0000	163.5009	461.1458	766.4979 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3047.0862
Space heating per m2										(98c) / (4) =		18.4471 (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 %)													362.6070 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													65.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	772.7392	468.5222	288.1916	100.0395	26.4492	0.0000	0.0000	0.0000	0.0000	163.5009	461.1458	766.4979 (98)	
Space heating efficiency (main heating system 1)	362.6070	362.6070	362.6070	362.6070	362.6070	0.0000	0.0000	0.0000	0.0000	362.6070	362.6070	362.6070 (210)	
Space heating fuel (main heating system)	213.1065	129.2094	79.4777	27.5889	7.2942	0.0000	0.0000	0.0000	0.0000	45.0904	127.1751	211.3853 (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	255.9659	226.2244	240.1839	211.0562	204.4604	184.1156	181.7204	189.0660	191.2648	213.4025	227.0357	253.1754 (64)	
Efficiency of water heater (217)m	197.8978	197.8978	197.8978	197.8978	197.8978	197.8978	197.8978	197.8978	197.8978	197.8978	197.8978	197.8978 (216)	
Fuel for water heating, kWh/month	129.3425	114.3137	121.3676	106.6490	103.3161	93.0357	91.8253	95.5372	96.6482	107.8347	114.7237	127.9324 (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	40.4334	36.5204	40.4334	39.1290	40.4334	39.1290	40.4334	40.4334	39.1290	40.4334	39.1290	40.4334 (231)	
Lighting	32.8418	26.3469	23.7225	17.3801	13.4249	10.9683	12.2466	15.9187	20.6768	27.1290	30.6422	33.7546 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-97.2802	-134.3083	-186.6428	-199.5944	-208.5056	-192.1309	-189.8611	-181.5866	-164.5070	-146.5332	-104.9516	-84.1422 (233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)	

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Electricity generated by hydro-electric generators (Appendix M) (negative quantity)														
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)														
(233b)m	-52.9793	-116.4316	-240.3959	-372.7217	-498.5427	-503.0102	-496.0935	-417.7353	-304.8823	-174.0044	-73.2778	-41.5993		(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	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	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	0.0000	(235d)
Annual totals kWh/year														
Space heating fuel - main system 1													840.3274	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													197.8978	
Water heating fuel used													1302.5261	(219)
Space cooling fuel													0.0000	(221)
Electricity for pumps and fans:														
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.8360)														
mechanical ventilation fans (SFP = 0.8360)													476.0701	(230a)
Total electricity for the above, kWh/year													476.0701	(231)
Electricity for lighting (calculated in Appendix L)													265.0525	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-5181.7182	(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													-2297.7421	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	840.3274	16.4900	138.5700	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1302.5261	16.4900	214.7866	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	476.0701	16.4900	78.5040	(249)
Energy for lighting	265.0525	16.4900	43.7072	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1890.0440	16.4900	-311.6683	
PV Unit electricity exported	-3291.6742	5.5900	-184.0046	
Total			-495.6728	(252)
Total energy cost			-20.1052	(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] =	-0.0344	(257)
SAP value		100.5582	
SAP rating (Section 12)		101	(258)
SAP band		A	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	840.3274	0.1574	132.2695	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1302.5261	0.1409	183.5207	(264)
Space and water heating			315.7902	(265)
Pumps, fans and electric keep-hot	476.0701	0.1387	66.0368	(267)
Energy for lighting	265.0525	0.1443	38.2553	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1890.0440	0.1354	-255.9963	
PV Unit electricity exported	-3291.6742	0.1251	-411.8514	
Total			-667.8478	(269)
Total CO2, kg/year			-247.7655	(272)
CO2 emissions per m2			-1.5000	(273)
EI value			101.5796	
EI rating			102	(274)
EI band			A	

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

1. Overall dwelling characteristics

Area (m2)	Storey height (m)	Volume (m3)
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Ground floor		103.9300 (1b)	x	2.9000 (2b)	=	301.3970 (1b) - (3b)
First floor		61.2500 (1c)	x	2.7000 (2c)	=	165.3750 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	165.1800					(4)
Dwelling volume					(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	466.7720 (5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		0 * 10 =	0.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			0.9500 (17)
Infiltration rate			0.0475 (18)
Number of sides sheltered			2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.0404 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.8000	5.5000	5.4000	4.9000	4.8000	4.2000	4.2000	4.1000	4.4000	5.0000	5.1000	5.6000 (22)
Wind factor	1.4500	1.3750	1.3500	1.2250	1.2000	1.0500	1.0500	1.0250	1.1000	1.2500	1.2750	1.4000 (22a)
Adj infilt rate	0.0585	0.0555	0.0545	0.0495	0.0485	0.0424	0.0424	0.0414	0.0444	0.0505	0.0515	0.0565 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												81.0000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.1535	0.1505	0.1495	0.1445	0.1434	0.1374	0.1374	0.1364	0.1394	0.1455	0.1465	0.1515 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Window (Uw = 0.90)			30.3000	0.8687	26.3224		(27)
Door			2.1000	0.9000	1.8900		(26a)
16-18			6.0000	1.2357	7.4144		(27a)
19			2.0000	1.2357	2.4715		(27a)
Floor 1 P/a 0.35			103.9300	0.1200	12.4716	110.0000	11432.3000 (28a)
External Wall 1 Render	111.9700	24.0200	87.9500	0.1500	13.1925	9.0000	791.5500 (29a)
External Wall 3 "attic"	15.9000		15.9000	0.0900	1.4310	9.0000	143.1000 (29a)
External Wall 2 Dormers	83.0400	8.3800	74.6600	0.1600	11.9456	9.0000	671.9400 (29a)
External Roof 1 sloping	59.0600	6.0000	53.0600	0.1300	6.8978	9.0000	477.5400 (30)
External Roof 3 "attic"	32.7800		32.7800	0.0861	2.8232	9.0000	295.0200 (30)
External Roof 2 Flat	22.1300	2.0000	20.1300	0.1500	3.0195	9.0000	181.1700 (30)
Total net area of external elements Aum(A, m2)			428.8100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	89.8795		(33)
Party Wall 1			32.6200	0.0000	0.0000	20.0000	652.4000 (32)
Internal Wall 1 GF			168.5800			9.0000	1517.2200 (32c)
Internal Wall 2 FF			135.0400			9.0000	1215.3600 (32c)
Internal Floor 1			61.2500			18.0000	1102.5000 (32d)
Internal Ceiling 1			61.2500			9.0000	551.2500 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 19031.3500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							115.2158 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element			
E16 Corner (normal)	21.0700	0.0300	0.6321
E5 Ground floor (normal)	35.9500	0.0210	0.7550
E11 Eaves (insulation at rafter level)	23.0400	0.0390	0.8986
R4 Ridge (vaulted ceiling)	19.9000	0.1200	2.3880
E13 Gable (insulation at rafter level)	24.4900	0.0240	0.5878
E6 Intermediate floor within a dwelling	17.5100	0.0800	1.4008
R7 Flat ceiling (inverted)	18.3500	0.1200	2.2020
E14 Flat roof	11.1800	0.0460	0.5143
E17 Corner (inverted - internal area greater than external area)	5.3000	-0.0150	-0.0795
P1 Party wall - Ground floor	6.9000	0.1490	1.0281
P2 Party wall - Intermediate floor within a dwelling	6.9000	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	8.7000	0.0810	0.7047
E18 Party wall between dwellings	8.7900	0.0395	0.3472
E2 Other lintels (including other steel lintels)	27.0400	0.0840	2.2714
E3 Sill	26.0400	0.0430	1.1197
E4 Jamb	37.3200	0.0340	1.2689
R1 Head of roof window	2.5000	0.2400	0.6000
R2 Sill of roof window	2.5000	0.2400	0.6000
R3 Jamb of roof window	1.6000	0.2400	0.3840
R11 Upstands or kerbs of rooflights	18.0000	0.2400	4.3200
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			21.9429 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 111.8224 (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	23.6511	23.1846	23.0292	22.2518	22.0963	21.1634	21.1634	21.0079	21.4744	22.4072	22.5627	23.3401 (38)
Heat transfer coeff	135.4735	135.0070	134.8516	134.0742	133.9187	132.9858	132.9858	132.8303	133.2968	134.2296	134.3851	135.1625 (39)
Average = Sum(39)m / 12 =												134.1001
HLP	0.8202	0.8173	0.8164	0.8117	0.8107	0.8051	0.8051	0.8042	0.8070	0.8126	0.8136	0.8183 (40)
HLP (average)												0.8118

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Days in mont 31 28 31 30 31 30 31 31 30 31 30 31

4. Water heating energy requirements (kWh/year)													
Assumed occupancy												2.9561 (42)	
Hot water usage for mixer showers												0.0000 (42a)	
Hot water usage for baths												84.8289 (42b)	
Hot water usage for other uses												44.9031 (42c)	
Average daily hot water use (litres/day)												119.7376 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	130.0198	127.1228	123.7099	118.7948	114.7043	110.3462	108.8742	112.2747	115.8323	120.3811	125.3638	129.7320 (44)	
Energy conte	205.9195	181.0212	190.1375	162.6242	154.4140	135.6836	131.6740	139.0196	142.8328	163.3561	178.6037	203.1290 (45)	
Energy content (annual)	Total = Sum(45)m =											1988.4150	
Distribution loss (46)m = 0.15 x (45)m													
	30.8879	27.1532	28.5206	24.3936	23.1621	20.3525	19.7511	20.8529	21.4249	24.5034	26.7906	30.4693 (46)	
Water storage loss:													
Store volume													250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.6000 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8640 (55)
Total storage loss													
	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840 (56)	
If cylinder contains dedicated solar storage													
	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840 (57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)	
Total heat required for water heating calculated for each month													
	255.9659	226.2244	240.1839	211.0562	204.4604	184.1156	181.7204	189.0660	191.2648	213.4025	227.0357	253.1754 (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	255.9659	226.2244	240.1839	211.0562	204.4604	184.1156	181.7204	189.0660	191.2648	213.4025	227.0357	253.1754 (64)	
	Total per year (kWh/year) = Sum(64)m =											2577.6710 (64)	
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)	
	Total Energy used by instantaneous electric shower (s) (kWh/year) = Sum(64a)m =											0.0000 (64a)	
Heat gains from water heating, kWh/month	108.5054	96.3521	103.2578	92.8181	91.3798	83.8604	83.8187	86.2611	86.2375	94.3530	98.1313	107.5775 (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	177.3640	177.3640	177.3640	177.3640	177.3640	177.3640	177.3640	177.3640	177.3640	177.3640	177.3640	177.3640 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	37.5209	33.3257	27.1023	20.5182	15.3376	12.9486	13.9915	18.1866	24.4101	30.9942	36.1748	38.5637 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	502.3894	507.6026	494.4654	466.4980	431.1940	398.0133	375.8466	370.6333	383.7705	411.7380	447.0419	480.2226 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.6925	55.6925	55.6925	55.6925	55.6925	55.6925	55.6925	55.6925	55.6925	55.6925	55.6925	55.6925 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426 (71)
Water heating gains (Table 5)	145.8405	143.3811	138.7874	128.9141	122.8223	116.4728	112.6596	115.9424	119.7743	126.8186	136.2935	144.5934 (72)
Total internal gains	800.5646	799.1233	775.1689	730.7440	684.1677	642.2485	617.3114	619.5761	642.7687	684.3645	734.3240	778.1936 (73)

6. Solar gains												
[Jan]			Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d					Gains W
East			9.8000	26.5726	0.6800	0.7000	0.7700					85.9016 (76)
South			1.9200	59.2009	0.6800	0.7000	0.7700					37.4947 (78)
West			18.5800	26.5726	0.6800	0.7000	0.7700					162.8623 (80)
North			6.0000	36.0000	0.7600	0.7000	1.0000					103.4208 (82)
Horizontal			2.0000	36.0000	0.7600	0.7000	1.0000					34.4736 (82)
Solar gains	424.1530	703.5369	1131.0934	1698.5796	1955.8667	2152.6367	1828.0698	1703.7967	1350.5905	838.2808	498.4965	359.3800 (83)
Total gains	1224.7176	1502.6602	1906.2623	2429.3237	2640.0344	2794.8853	2445.3812	2323.3728	1993.3591	1522.6453	1232.8205	1137.5736 (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	39.0223	39.1571	39.2023	39.4296	39.4753	39.7523	39.7523	39.7988	39.6595	39.3839	39.3383	39.1121
alpha	3.6015	3.6105	3.6135	3.6286	3.6317	3.6502	3.6502	3.6533	3.6440	3.6256	3.6226	3.6075
util living area	0.9336	0.8842	0.7737	0.6034	0.4593	0.3245	0.2808	0.2893	0.4462	0.7188	0.8880	0.9424 (86)
Living	20.0211	20.2414	20.5485	20.7791	20.8712	20.9054	20.9108	20.9105	20.8865	20.7178	20.3466	19.9959
Non living	19.0918	19.3637	19.7309	19.9955	20.0945	20.1326	20.1375	20.1382	20.1153	19.9373	19.5017	19.0627
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.4992	20.2414	20.5485	20.7791	20.8712	20.9054	20.9108	20.9105	20.8865	20.7178	20.3466	20.1364 (87)
Th 2	20.2359	20.2383	20.2391	20.2432	20.2440	20.2489	20.2489	20.2497	20.2473	20.2424	20.2416	20.2375 (88)

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util rest of house	0.9243	0.8698	0.7506	0.5737	0.4259	0.2902	0.2409	0.2475	0.4014	0.6827	0.8710	0.9339 (89)
MIT 2	19.7798	19.3637	19.7309	19.9955	20.0945	20.1326	20.1375	20.1382	20.1153	19.9373	19.5017	19.2744 (90)
Living area fraction									fLA = Living area / (4) =			0.3200 (91)
MIT	20.0100	19.6445	19.9925	20.2462	20.3430	20.3798	20.3849	20.3853	20.3620	20.1870	19.7720	19.5502 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0100	19.6445	19.9925	20.2462	20.3430	20.3798	20.3849	20.3853	20.3620	20.1870	19.7720	19.5502 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9213	0.8572	0.7426	0.5738	0.4303	0.2962	0.2482	0.2551	0.4084	0.6799	0.8590	0.9249 (94)	
Useful gains	1128.3035	1288.1101	1415.5119	1393.9768	1136.0390	827.9804	606.8471	592.7061	814.0055	1035.3060	1058.9676	1052.1569 (95)	
Ext temp.	5.6000	5.9000	7.2000	9.0000	11.6000	14.1000	15.8000	15.9000	14.1000	11.3000	8.4000	5.9000 (96)	
Heat loss rate W	1952.1690	1855.6042	1725.0878	1507.8288	1170.8539	835.1297	609.7275	595.7822	834.7061	1192.9032	1528.2321	1844.9956 (97)	
Space heating kWh	612.9560	381.3560	230.3245	81.9734	25.9023	0.0000	0.0000	0.0000	0.0000	117.2523	337.8705	589.8720 (98a)	
Space heating requirement - total per year (kWh/year)												2377.5069	
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	612.9560	381.3560	230.3245	81.9734	25.9023	0.0000	0.0000	0.0000	0.0000	117.2523	337.8705	589.8720 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												2377.5069	
Space heating per m2												14.3934 (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 %)													363.9446 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													65.0000 (208)
Space heating requirement	612.9560	381.3560	230.3245	81.9734	25.9023	0.0000	0.0000	0.0000	0.0000	117.2523	337.8705	589.8720 (98)	
Space heating efficiency (main heating system 1)	363.9446	363.9446	363.9446	363.9446	363.9446	0.0000	0.0000	0.0000	0.0000	363.9446	363.9446	363.9446 (210)	
Space heating fuel (main heating system)	168.4201	104.7841	63.2856	22.5236	7.1171	0.0000	0.0000	0.0000	0.0000	32.2171	92.8357	162.0774 (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	255.9659	226.2244	240.1839	211.0562	204.4604	184.1156	181.7204	189.0660	191.2648	213.4025	227.0357	253.1754 (64)	
Efficiency of water heater (217)m	197.9512	197.9512	197.9512	197.9512	197.9512	197.9512	197.9512	197.9512	197.9512	197.9512	197.9512	197.9512 (217)	
Fuel for water heating, kWh/month	129.3076	114.2829	121.3349	106.6203	103.2883	93.0106	91.8006	95.5114	96.6222	107.8056	114.6928	127.8979 (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	40.4334	36.5204	40.4334	39.1290	40.4334	39.1290	40.4334	40.4334	39.1290	40.4334	39.1290	40.4334 (231)	
Lighting	32.8418	26.3469	23.7225	17.3801	13.4249	10.9683	12.2466	15.9187	20.6768	27.1290	30.6422	33.7546 (232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-118.6189	-142.9831	-193.4886	-208.1426	-211.3844	-198.9410	-189.4874	-187.1983	-172.5989	-155.1610	-120.7760	-105.4448 (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	-80.1947	-137.5367	-270.5733	-428.0524	-522.8768	-575.0573	-492.6285	-462.5693	-349.7694	-204.3173	-101.3388	-66.0886 (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													653.2606 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													197.9512
Water heating fuel used													1302.1748 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.8360)													
mechanical ventilation fans (SFP = 0.8360)													476.0701 (230a)
Total electricity for the above, kWh/year													476.0701 (231)
Electricity for lighting (calculated in Appendix L)													265.0525 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-5695.2282 (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													-2998.6702 (238)

10a. Fuel costs - using BEDF prices (536)

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	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	653.2606	25.1600	164.3604 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1302.1748	25.1600	327.6272 (247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000 (247a)
Pumps, fans and electric keep-hot	476.0701	25.1600	119.7792 (249)
Energy for lighting	265.0525	25.1600	66.6872 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2004.2251	25.1600	-504.2630
PV Unit electricity exported	-3691.0031	5.8100	-214.4473
Total			-718.7103 (252)
Total energy cost			-40.2563 (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	653.2606	0.1575	102.8793 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1302.1748	0.1409	183.4712 (264)
Space and water heating			286.3505 (265)
Pumps, fans and electric keep-hot	476.0701	0.1387	66.0368 (267)
Energy for lighting	265.0525	0.1443	38.2553 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2004.2251	0.1362	-272.9389
PV Unit electricity exported	-3691.0031	0.1269	-468.2566
Total			-741.1955 (269)
Total CO2, kg/year			-350.5530 (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	653.2606	1.5829	1034.0707 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1302.1748	1.5210	1980.5844 (278)
Space and water heating			3014.6551 (279)
Pumps, fans and electric keep-hot	476.0701	1.5128	720.1988 (281)
Energy for lighting	265.0525	1.5338	406.5463 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2004.2251	1.5034	-3013.0994
PV Unit electricity exported	-3691.0031	0.4658	-1719.1080
Total			-4732.2074 (283)
Total Primary energy kWh/year			-590.8071 (286)

SAP 10 EPC IMPROVEMENTS

SEC1 - ASHP ROI

Current energy efficiency rating: A 101
 Current environmental impact rating: A 102

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

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.0	-£ 61	-38 kg (10.8%)

Recommended measures	Typical annual savings		Energy efficiency	Environmental impact
Solar water heating	£61	0.23 kg/m ²	A 102	A 102
Total Savings	£61	0.23 kg/m²		

Potential energy efficiency rating: A 102
 Potential environmental impact rating: A 102

Fuel prices for cost data on this page from database revision number 536 TEST (31 Jan 2024)
 Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current	Potential	Saving
Electricity	£678	£602	£77
Space heating	£284	£304	-£20
Water heating	£328	£231	£97
Lighting	£67	£67	£0
Generated (PV)	-£719	-£703	-£16
Total cost of fuels	-£41	-£101	£61
Total cost of uses	-£40	-£101	£61
Delivered energy	-18 kWh/m ²	-20 kWh/m ²	2 kWh/m ²
Carbon dioxide emissions	-0.4 tonnes	-0.4 tonnes	0.0 tonnes
CO2 emissions per m ²	-2 kg/m ²	-2 kg/m ²	0 kg/m ²
Primary energy	-4 kWh/m ²	-6 kWh/m ²	2 kWh/m ²

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	103.9300 (1b)	x 2.9000 (2b)	= 301.3970 (1b) - (3b)
First floor	61.2500 (1c)	x 2.7000 (2c)	= 165.3750 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	165.1800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 466.7720 (5)

2. Ventilation rate

	m3 per hour												
Number of open chimneys	0 * 80 =											0.0000 (6a)	
Number of open flues	0 * 20 =											0.0000 (6b)	
Number of chimneys / flues attached to closed fire	0 * 10 =											0.0000 (6c)	
Number of flues attached to solid fuel boiler	0 * 20 =											0.0000 (6d)	
Number of flues attached to other heater	0 * 35 =											0.0000 (6e)	
Number of blocked chimneys	0 * 20 =											0.0000 (6f)	
Number of intermittent extract fans	0 * 10 =											0.0000 (7a)	
Number of passive vents	0 * 10 =											0.0000 (7b)	
Number of flueless gas fires	0 * 40 =											0.0000 (7c)	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =												0.0000 / (5) =	0.0000 (8)
Pressure test												Yes	
Pressure Test Method												Blower Door	
Measured/design AP50												0.9500 (17)	
Infiltration rate												0.0475 (18)	
Number of sides sheltered												2 (19)	
Shelter factor	(20) = 1 - [0.075 x (19)] =											0.8500 (20)	
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =											0.0404 (21)	
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)	
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)	
Balanced mechanical ventilation with heat recovery	0.0515	0.0505	0.0495	0.0444	0.0434	0.0384	0.0384	0.0373	0.0404	0.0434	0.0454	0.0474 (22b)	
If mechanical ventilation												0.5000 (23a)	
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)	
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												81.0000 (23c)	
Effective ac	0.1465	0.1455	0.1445	0.1394	0.1384	0.1334	0.1334	0.1323	0.1354	0.1384	0.1404	0.1424 (25)	

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Window (Uw = 0.90)			30.3000	0.8687	26.3224		(27)
Door			2.1000	0.9000	1.8900		(26a)
16-18			6.0000	1.2357	7.4144		(27a)
19			2.0000	1.2357	2.4715		(27a)
Floor 1 P/a 0.35			103.9300	0.1200	12.4716	110.0000	11432.3000 (28a)
External Wall 1 Render	111.9700	24.0200	87.9500	0.1500	13.1925	9.0000	791.5500 (29a)
External Wall 3 "attic"	15.9000		15.9000	0.0900	1.4310	9.0000	143.1000 (29a)
External Wall 2 Dormers	83.0400	8.3800	74.6600	0.1600	11.9456	9.0000	671.9400 (29a)
External Roof 1 sloping	59.0600	6.0000	53.0600	0.1300	6.8978	9.0000	477.5400 (30)
External Roof 3 "attic"	32.7800		32.7800	0.0861	2.8232	9.0000	295.0200 (30)
External Roof 2 Flat	22.1300	2.0000	20.1300	0.1500	3.0195	9.0000	181.1700 (30)
Total net area of external elements Aum(A, m2)			428.8100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	89.8795		(33)
Party Wall 1			32.6200	0.0000	0.0000	20.0000	652.4000 (32)
Internal Wall 1 GF			168.5800			9.0000	1517.2200 (32c)
Internal Wall 2 FF			135.0400			9.0000	1215.3600 (32c)
Internal Floor 1			61.2500			18.0000	1102.5000 (32d)
Internal Ceiling 1			61.2500			9.0000	551.2500 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	19031.3500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							115.2158 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element			
E16 Corner (normal)	21.0700	0.0300	0.6321
E5 Ground floor (normal)	35.9500	0.0210	0.7550
E11 Eaves (insulation at rafter level)	23.0400	0.0390	0.8986
R4 Ridge (vaulted ceiling)	19.9000	0.1200	2.3880
E13 Gable (insulation at rafter level)	24.4900	0.0240	0.5878
E6 Intermediate floor within a dwelling	17.5100	0.0800	1.4008
R7 Flat ceiling (inverted)	18.3500	0.1200	2.2020
E14 Flat roof	11.1800	0.0460	0.5143
E17 Corner (inverted - internal area greater than external area)	5.3000	-0.0150	-0.0795
P1 Party wall - Ground floor	6.9000	0.1490	1.0281
P2 Party wall - Intermediate floor within a dwelling	6.9000	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	8.7000	0.0810	0.7047
E18 Party wall between dwellings	8.7900	0.0395	0.3472
E2 Other lintels (including other steel lintels)	27.0400	0.0840	2.2714
E3 Sill	26.0400	0.0430	1.1197
E4 Jamb	37.3200	0.0340	1.2689
R1 Head of roof window	2.5000	0.2400	0.6000
R2 Sill of roof window	2.5000	0.2400	0.6000
R3 Jamb of roof window	1.6000	0.2400	0.3840

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R11 Upstands or kerbs of rooflights 18.0000 0.2400 4.3200
 Thermal bridges (Sum(L x Psi) calculated using Appendix K) 21.9429 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 111.8224 (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 22.5627 22.4072 22.2518 21.4744 21.3189 20.5415 20.5415 20.3860 20.8525 21.3189 21.6298 21.9408 (38)
 Average = Sum(39)m / 12 = 134.3851 134.2296 134.0742 133.2968 133.1413 132.3639 132.3639 132.2084 132.6749 133.1413 133.4522 133.7632 (39)
 134.3851 134.2296 134.0742 133.2968 133.1413 132.3639 132.3639 132.2084 132.6749 133.1413 133.4522 133.7632 (39)
 133.2579

HLP Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 HLP (average) 0.8136 0.8126 0.8117 0.8070 0.8060 0.8013 0.8013 0.8004 0.8032 0.8060 0.8079 0.8098 (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 2.9561 (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 85.1167 83.8526 82.0725 78.7903 76.3326 73.6074 72.1354 73.9030 75.8277 78.7437 82.0936 84.8289 (42b)
 Hot water usage for other uses 44.9031 43.2702 41.6374 40.0046 38.3717 36.7389 36.7389 38.3717 40.0046 41.6374 43.2702 44.9031 (42c)
 Average daily hot water use (litres/day) 119.7376 (43)
 Daily hot water use
 Energy conte 130.0198 127.1228 123.7099 118.7948 114.7043 110.3462 108.8742 112.2747 115.8323 120.3811 125.3638 129.7320 (44)
 Energy content (annual) 205.9195 181.0212 190.1375 162.6242 154.4140 135.6836 131.6740 139.0196 142.8328 163.3561 178.6037 203.1290 (45)
 Distribution loss (46)m = 0.15 x (45)m Total = Sum(45)m = 1988.4150
 30.8879 27.1532 28.5206 24.3936 23.1621 20.3525 19.7511 20.8529 21.4249 24.5034 26.7906 30.4693 (46)
 Water storage loss:
 Store volume 250.0000 (47)
 a) If manufacturer declared loss factor is known (kWh/day): 1.6000 (48)
 Temperature factor from Table 2b 0.5400 (49)
 Enter (49) or (54) in (55) 0.8640 (55)
 Total storage loss
 26.7840 24.1920 26.7840 25.9200 26.7840 25.9200 26.7840 26.7840 25.9200 26.7840 25.9200 26.7840 (56)
 If cylinder contains dedicated solar storage
 Primary loss 26.7840 24.1920 26.7840 25.9200 26.7840 25.9200 26.7840 26.7840 25.9200 26.7840 25.9200 26.7840 (57)
 23.2624 21.0112 21.8667 15.7584 10.4681 9.9053 10.2355 11.1660 17.1091 21.8667 22.5120 23.2624 (59)
 Combi loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (61)
 Total heat required for water heating calculated for each month
 255.9659 226.2244 238.7881 204.3026 191.6661 171.5089 168.6934 176.9695 185.8619 212.0067 227.0357 253.1754 (62)
 WWHRS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63a)
 PV diverter -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 (63b)
 Aperture area of solar collector 3.0000 (H1)
 Zero-loss collector efficiency 0.8000 (H2)
 Collector linear heat loss coefficient 1.8000 (H3)
 Collector 2nd order heat loss coefficient 0.0000 (H4)
 Collector loop efficiency 0.9000 (H5)
 Incidence angle modifier 1.0000 (H6)
 Overshading factor 0.8000 (H8)
 Overall heat loss coefficient of system 6.5000 (H10)
 Heat loss coefficient of collector loop 3.9667 (H11)
 Dedicated solar storage volume 75.0000 (H12)
 Effective solar volume 75.0000 (H14)
 Reference volume 225.0000 (H15)
 Storage tank correction coefficient 1.3161 (H16)
 Heat delivered to hot water 613.5576 (H24)
 Heat delivered to space heating 0.0000 (H29)
 Solar input 613.5576
 Solar input -0.0000 -16.2223 -57.9212 -79.2478 -102.9217 -94.7638 -94.0503 -82.5413 -57.2718 -28.6174 -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
 255.9659 210.0021 180.8670 125.0547 88.7444 76.7451 74.6431 94.4283 128.5901 183.3893 227.0357 253.1754 (64)
 Total per year (kWh/year) = Sum(64)m = 1898.6410 (64)
 Electric shower(s)
 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)
 Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
 Heat gains from water heating, kWh/month
 108.5054 96.3521 102.1412 87.4153 81.1443 73.7750 73.3972 76.5840 81.9152 93.2364 98.1313 107.5775 (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
 Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 37.5209 33.3257 27.1023 20.5182 15.3376 12.9486 13.9915 18.1866 24.4101 30.9942 36.1748 38.5637 (67)
 Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 502.3894 507.6026 494.4654 466.4980 431.1940 398.0133 375.8466 370.6333 383.7705 411.7380 447.0419 480.2226 (68)
 Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 55.6925 55.6925 55.6925 55.6925 55.6925 55.6925 55.6925 55.6925 55.6925 55.6925 55.6925 55.6925 (69)
 Pumps, fans 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (70)
 Losses e.g. evaporation (negative values) (Table 5)
 -118.2426 -118.2426 -118.2426 -118.2426 -118.2426 -118.2426 -118.2426 -118.2426 -118.2426 -118.2426 -118.2426 -118.2426 (71)
 Water heating gains (Table 5)
 145.8405 143.3811 137.2866 121.4101 109.0649 102.4653 98.6521 102.9355 113.7711 125.3178 136.2935 144.5934 (72)
 Total internal gains
 800.5646 799.1233 773.6681 723.2400 670.4104 628.2411 603.3039 606.5692 636.7655 682.8637 734.3240 778.1936 (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

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East	9.8000	19.6403	0.6800	0.7000	0.7700	63.4912 (76)
South	1.9200	46.7521	0.6800	0.7000	0.7700	29.6103 (78)
West	18.5800	19.6403	0.6800	0.7000	0.7700	120.3741 (80)
North	6.0000	26.0000	0.7600	0.7000	1.0000	74.6928 (82)
Horizontal	2.0000	26.0000	0.7600	0.7000	1.0000	24.8976 (82)

Solar gains	313.0660	615.0152	1021.8322	1508.2708	1866.9248	1919.8985	1824.1796	1554.1299	1193.9421	731.9019	390.7599	257.2263 (83)
Total gains	1113.6306	1414.1385	1795.5004	2231.5108	2537.3351	2548.1396	2427.4836	2160.6991	1830.7076	1414.7656	1125.0839	1035.4199 (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	39.3383	39.3839	39.4296	39.6595	39.7058	39.9390	39.9390	39.9860	39.8454	39.7058	39.6133	39.5212
alpha	3.6226	3.6256	3.6286	3.6440	3.6471	3.6626	3.6626	3.6657	3.6564	3.6471	3.6409	3.6347
util living area	0.9586	0.9136	0.8140	0.6439	0.4691	0.3285	0.2389	0.2795	0.4794	0.7763	0.9293	0.9668 (86)
Living	19.7974	20.0893	20.4564	20.7479	20.8697	20.9062	20.9136	20.9119	20.8796	20.6428	20.1451	19.7302
Non living	18.8148	19.1790	19.6257	19.9661	20.0974	20.1369	20.1429	20.1427	20.1129	19.8587	19.2573	18.7327
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.3848	20.0893	20.4564	20.7479	20.8697	20.9062	20.9136	20.9119	20.8796	20.6428	20.1451	19.9078 (87)
Th 2	20.2416	20.2424	20.2432	20.2473	20.2481	20.2522	20.2522	20.2530	20.2505	20.2481	20.2465	20.2448 (88)
util rest of house	0.9528	0.9027	0.7940	0.6145	0.4349	0.2913	0.1987	0.2349	0.4326	0.7454	0.9185	0.9621 (89)
MIT 2	19.6728	19.1790	19.6257	19.9661	20.0974	20.1369	20.1429	20.1427	20.1129	19.8587	19.2573	19.0052 (90)
Living area fraction									FLA = Living area / (4) =			0.3200 (91)
MIT	19.9006	19.4702	19.8915	20.2162	20.3445	20.3830	20.3895	20.3888	20.3582	20.1095	19.5414	19.2940 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9006	19.4702	19.8915	20.2162	20.3445	20.3830	20.3895	20.3888	20.3582	20.1095	19.5414	19.2940 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9499	0.8900	0.7839	0.6132	0.4394	0.2978	0.2061	0.2430	0.4394	0.7393	0.9065	0.9550 (94)
Useful gains	1057.8597	1258.5527	1407.5714	1368.3798	1114.8366	758.8976	500.3533	525.0834	804.4614	1045.9232	1019.8515	988.7809 (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	2096.4877	1955.7583	1795.4551	1508.4162	1150.9451	765.4651	501.5890	527.3530	830.3044	1266.1121	1660.3318	2019.0200 (97)
Space heating kWh	772.7392	468.5222	288.5854	100.8262	26.8647	0.0000	0.0000	0.0000	0.0000	163.8206	461.1458	766.4979 (98a)
Space heating requirement - total per year (kWh/year)												3049.0020
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	772.7392	468.5222	288.5854	100.8262	26.8647	0.0000	0.0000	0.0000	0.0000	163.8206	461.1458	766.4979 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3049.0020
Space heating per m2										(98c) / (4) =		18.4587 (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 %)	362.6070 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	65.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	772.7392	468.5222	288.5854	100.8262	26.8647	0.0000	0.0000	0.0000	0.0000	163.8206	461.1458	766.4979 (98)
Space heating efficiency (main heating system 1)	362.6070	362.6070	362.6070	362.6070	362.6070	0.0000	0.0000	0.0000	0.0000	362.6070	362.6070	362.6070 (210)
Space heating fuel (main heating system)	213.1065	129.2094	79.5863	27.8059	7.4088	0.0000	0.0000	0.0000	0.0000	45.1785	127.1751	211.3853 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)

Water heating	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Water heating requirement	255.9659	210.0021	180.8670	125.0547	88.7444	76.7451	74.6431	94.4283	128.5901	183.3893	227.0357	253.1754 (64)
Efficiency of water heater (217)m	197.8978	197.8978	197.8978	197.8978	197.8978	197.8978	197.8978	197.8978	197.8978	197.8978	197.8978	197.8978 (216)
Fuel for water heating, kWh/month	129.3425	106.1164	91.3941	63.1915	44.8435	38.7802	37.7180	47.7157	64.9780	92.6687	114.7237	127.9324 (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	47.2279	42.6574	47.2279	45.7044	47.2279	45.7044	47.2279	47.2279	45.7044	47.2279	45.7044	47.2279 (231)
Lighting	32.8418	26.3469	23.7225	17.3801	13.4249	10.9683	12.2466	15.9187	20.6768	27.1290	30.6422	33.7546 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-97.4609	-134.1752	-183.7930	-192.1173	-194.5581	-178.0451	-175.9067	-170.9607	-159.4644	-145.6358	-105.2364	-84.2900 (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	-52.7986	-116.5647	-243.2458	-380.1989	-512.4902	-517.0960	-510.0479	-428.3613	-309.9249	-174.9019	-72.9931	-41.4515 (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)

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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												840.8558	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												197.8978	
Water heating fuel used												959.4046	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.8360)													
mechanical ventilation fans (SFP = 0.8360)												476.0701	(230a)
pump for solar water heating												80.0000	(230g)
Total electricity for the above, kWh/year												556.0701	(231)
Electricity for lighting (calculated in Appendix L)												265.0525	(232)

Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-5181.7182	(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												-2560.3352	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	840.8558	16.4900	138.6571	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	959.4046	16.4900	158.2058	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	476.0701	16.4900	78.5040	(249)
Pump for solar water heating	80.0000	16.4900	13.1920	(249)
Energy for lighting	265.0525	16.4900	43.7072	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1821.6434	16.4900	-300.3890	
PV Unit electricity exported	-3360.0748	5.5900	-187.8282	
Total			-488.2172	(252)
Total energy cost			-55.9511	(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] =	-0.0958	(257)
SAP value			101.5535	
SAP rating (Section 12)			102	(258)
SAP band			A	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	840.8558	0.1574	132.3443	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	959.4046	0.1458	139.8915	(264)
Space and water heating			272.2358	(265)
Pumps, fans and electric keep-hot	556.0701	0.1387	77.1338	(267)
Energy for lighting	265.0525	0.1443	38.2553	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1821.6434	0.1359	-247.5586	
PV Unit electricity exported	-3360.0748	0.1249	-419.6497	
Total			-667.2083	(269)
Total CO2, kg/year			-279.5835	(272)
CO2 emissions per m2			-1.6900	(273)
EI value			101.7825	
EI rating			102	(274)
EI band			A	

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	103.9300 (1b)	x 2.9000 (2b)	= 301.3970	(1b) - (3b)
First floor	61.2500 (1c)	x 2.7000 (2c)	= 165.3750	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	165.1800			(4)
Dwelling volume		(3a) + (3b) + (3c) + (3d) + (3e) ... (3n) =	466.7720	(5)

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2. Ventilation rate

												m3 per hour		
Number of open chimneys												0 * 80 =	0.0000 (6a)	
Number of open flues												0 * 20 =	0.0000 (6b)	
Number of chimneys / flues attached to closed fire												0 * 10 =	0.0000 (6c)	
Number of flues attached to solid fuel boiler												0 * 20 =	0.0000 (6d)	
Number of flues attached to other heater												0 * 35 =	0.0000 (6e)	
Number of blocked chimneys												0 * 20 =	0.0000 (6f)	
Number of intermittent extract fans												0 * 10 =	0.0000 (7a)	
Number of passive vents												0 * 10 =	0.0000 (7b)	
Number of flueless gas fires												0 * 40 =	0.0000 (7c)	
												Air changes per hour		
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											0.0000 / (5) =	0.0000 (8)	
Pressure test												Yes		
Pressure Test Method												Blower Door		
Measured/design AP50												0.9500 (17)		
Infiltration rate												0.0475 (18)		
Number of sides sheltered												2 (19)		
Shelter factor												(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor												(21) = (18) x (20) =		0.0404 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	5.8000	5.5000	5.4000	4.9000	4.8000	4.2000	4.2000	4.1000	4.4000	5.0000	5.1000	5.6000	(22)	
Wind factor	1.4500	1.3750	1.3500	1.2250	1.2000	1.0500	1.0500	1.0250	1.1000	1.2500	1.2750	1.4000	(22a)	
Adj infilt rate	0.0585	0.0555	0.0545	0.0495	0.0485	0.0424	0.0424	0.0414	0.0444	0.0505	0.0515	0.0565	(22b)	
Balanced mechanical ventilation with heat recovery														
If mechanical ventilation													0.5000 (23a)	
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													0.5000 (23b)	
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													81.0000 (23c)	
Effective ac	0.1535	0.1505	0.1495	0.1445	0.1434	0.1374	0.1374	0.1364	0.1394	0.1455	0.1465	0.1515	(25)	

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
Window (Uw = 0.90)			30.3000	0.8687	26.3224			(27)					
Door			2.1000	0.9000	1.8900			(26a)					
16-18			6.0000	1.2357	7.4144			(27a)					
19			2.0000	1.2357	2.4715			(27a)					
Floor 1 P/a 0.35			103.9300	0.1200	12.4716	110.0000	11432.3000	(28a)					
External Wall 1 Render	111.9700	24.0200	87.9500	0.1500	13.1925	9.0000	791.5500	(29a)					
External Wall 3 "attic"	15.9000		15.9000	0.0900	1.4310	9.0000	143.1000	(29a)					
External Wall 2 Dormers	83.0400	8.3800	74.6600	0.1600	11.9456	9.0000	671.9400	(29a)					
External Roof 1 sloping	59.0600	6.0000	53.0600	0.1300	6.8978	9.0000	477.5400	(30)					
External Roof 3 "attic"	32.7800		32.7800	0.0861	2.8232	9.0000	295.0200	(30)					
External Roof 2 Flat	22.1300	2.0000	20.1300	0.1500	3.0195	9.0000	181.1700	(30)					
Total net area of external elements Aum(A, m2)			428.8100					(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	89.8795		(33)					
Party Wall 1			32.6200	0.0000	0.0000	20.0000	652.4000	(32)					
Internal Wall 1 GF			168.5800			9.0000	1517.2200	(32c)					
Internal Wall 2 FF			135.0400			9.0000	1215.3600	(32c)					
Internal Floor 1			61.2500			18.0000	1102.5000	(32d)					
Internal Ceiling 1			61.2500			9.0000	551.2500	(32e)					
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) =	19031.3500 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								115.2158 (35)					
List of Thermal Bridges													
K1 Element					Length	Psi-value	Total						
E16 Corner (normal)					21.0700	0.0300	0.6321						
E5 Ground floor (normal)					35.9500	0.0210	0.7550						
E11 Eaves (insulation at rafter level)					23.0400	0.0390	0.8986						
R4 Ridge (vaulted ceiling)					19.9000	0.1200	2.3880						
E13 Gable (insulation at rafter level)					24.4900	0.0240	0.5878						
E6 Intermediate floor within a dwelling					17.5100	0.0800	1.4008						
R7 Flat ceiling (inverted)					18.3500	0.1200	2.2020						
E14 Flat roof					11.1800	0.0460	0.5143						
E17 Corner (inverted - internal area greater than external area)					5.3000	-0.0150	-0.0795						
P1 Party wall - Ground floor					6.9000	0.1490	1.0281						
P2 Party wall - Intermediate floor within a dwelling					6.9000	0.0000	0.0000						
P5 Party wall - Roof (insulation at rafter level)					8.7000	0.0810	0.7047						
E18 Party wall between dwellings					8.7900	0.0395	0.3472						
E2 Other lintels (including other steel lintels)					27.0400	0.0840	2.2714						
E3 Sill					26.0400	0.0430	1.1197						
E4 Jamb					37.3200	0.0340	1.2689						
R1 Head of roof window					2.5000	0.2400	0.6000						
R2 Sill of roof window					2.5000	0.2400	0.6000						
R3 Jamb of roof window					1.6000	0.2400	0.3840						
R11 Upstands or kerbs of rooflights					18.0000	0.2400	4.3200						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							21.9429	(36)					
Point Thermal bridges							(36a) =	0.0000					
Total fabric heat loss							(33) + (36) + (36a) =	111.8224 (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	
	23.6511	23.1846	23.0292	22.2518	22.0963	21.1634	21.1634	21.0079	21.4744	22.4072	22.5627	23.3401	(38)
Heat transfer coeff	135.4735	135.0070	134.8516	134.0742	133.9187	132.9858	132.9858	132.8303	133.2968	134.2296	134.3851	135.1625	(39)
Average = Sum(39)m / 12 =													134.1001
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.8202	0.8173	0.8164	0.8117	0.8107	0.8051	0.8051	0.8042	0.8070	0.8126	0.8136	0.8183	(40)
HLP (average)													0.8118
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

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Assumed occupancy												2.9561 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths	85.1167	83.8526	82.0725	78.7903	76.3326	73.6074	72.1354	73.9030	75.8277	78.7437	82.0936	84.8289 (42b)
Hot water usage for other uses	44.9031	43.2702	41.6374	40.0046	38.3717	36.7389	36.7389	38.3717	40.0046	41.6374	43.2702	44.9031 (42c)
Average daily hot water use (litres/day)												119.7376 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	130.0198	127.1228	123.7099	118.7948	114.7043	110.3462	108.8742	112.2747	115.8323	120.3811	125.3638	129.7320 (44)
Distribution loss (46)m = 0.15 x (45)m	205.9195	181.0212	190.1375	162.6242	154.4140	135.6836	131.6740	139.0196	142.8328	163.3561	178.6037	203.1290 (45)
Water storage loss:												1988.4150
Store volume												250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8640 (55)
Total storage loss	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840 (56)
If cylinder contains dedicated solar storage	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840 (57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	255.9659	226.2244	238.7881	204.3026	191.6661	171.5089	168.6934	176.9695	185.8619	212.0067	227.0357	253.1754 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.8000 (H2)
Collector linear heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0000 (H4)
Collector loop efficiency												0.9000 (H5)
Incidence angle modifier												1.0000 (H6)
Overshading factor												0.8000 (H8)
Overall heat loss coefficient of system												6.5000 (H10)
Heat loss coefficient of collector loop												3.9667 (H11)
Dedicated solar storage volume												75.0000 (H12)
Effective solar volume												75.0000 (H14)
Reference volume												225.0000 (H15)
Storage tank correction coefficient												1.3161 (H16)
Heat delivered to hot water												698.2693 (H24)
Heat delivered to space heating												0.0000 (H29)
Solar input												698.2693
Solar input	-6.5550	-23.8532	-66.7616	-90.8119	-107.1842	-105.7549	-92.5814	-90.3966	-67.1729	-38.1285	-9.0690	-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 (63a)
Output from w/h	249.4109	202.3712	172.0266	113.4906	84.4819	65.7540	76.1120	86.5729	118.6889	173.8782	217.9667	253.1754 (64)
Electric shower(s)												1813.9294 (64)
Heat gains from water heating, kWh/month	108.5054	96.3521	102.1412	87.4153	81.1443	73.7750	73.3972	76.5840	81.9152	93.2364	98.1313	107.5775 (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	177.3640	177.3640	177.3640	177.3640	177.3640	177.3640	177.3640	177.3640	177.3640	177.3640	177.3640	177.3640 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	37.5209	33.3257	27.1023	20.5182	15.3376	12.9486	13.9915	18.1866	24.4101	30.9942	36.1748	38.5637 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	502.3894	507.6026	494.4654	466.4980	431.1940	398.0133	375.8466	370.6333	383.7705	411.7380	447.0419	480.2226 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.6925	55.6925	55.6925	55.6925	55.6925	55.6925	55.6925	55.6925	55.6925	55.6925	55.6925	55.6925 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426	-118.2426 (71)
Water heating gains (Table 5)	145.8405	143.3811	137.2866	121.4101	109.0649	102.4653	98.6521	102.9355	113.7711	125.3178	136.2935	144.5934 (72)
Total internal gains	800.5646	799.1233	773.6681	723.2400	670.4104	628.2411	603.3039	606.5692	636.7655	682.8637	734.3240	778.1936 (73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
	m2	Table 6a	Specific data	Specific data	factor	W
		W/m2	or Table 6b	or Table 6c	Table 6d	
East	9.8000	26.5726	0.6800	0.7000	0.7700	85.9016 (76)
South	1.9200	59.2009	0.6800	0.7000	0.7700	37.4947 (78)
West	18.5800	26.5726	0.6800	0.7000	0.7700	162.8623 (80)
North	6.0000	36.0000	0.7600	0.7000	1.0000	103.4208 (82)
Horizontal	2.0000	36.0000	0.7600	0.7000	1.0000	34.4736 (82)
Solar gains	424.1530	703.5369	1131.0934	1698.5796	1955.8667	2152.6367
Total gains	1224.7176	1502.6602	1904.7615	2421.8197	2626.2770	2780.8778

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	39.0223	39.1571	39.2023	39.4296	39.4753	39.7523	39.7523	39.7988	39.6595	39.3839	39.3383	39.1121
alpha	3.6015	3.6105	3.6135	3.6286	3.6317	3.6502	3.6502	3.6533	3.6440	3.6256	3.6226	3.6075
util living area	0.9336	0.8842	0.7740	0.6048	0.4615	0.3261	0.2823	0.2909	0.4474	0.7192	0.8880	0.9424 (86)

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Living	20.0211	20.2414	20.5479	20.7781	20.8705	20.9053	20.9107	20.9104	20.8862	20.7174	20.3466	19.9959
Non living	19.0918	19.3637	19.7303	19.9944	20.0939	20.1324	20.1374	20.1381	20.1151	19.9369	19.5017	19.0627
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.4992	20.2414	20.5479	20.7781	20.8705	20.9053	20.9107	20.9104	20.8862	20.7174	20.3466	20.1364 (87)
Th 2	20.2359	20.2383	20.2391	20.2432	20.2440	20.2489	20.2489	20.2497	20.2473	20.2424	20.2416	20.2375 (88)
util rest of house	0.9243	0.8698	0.7509	0.5751	0.4279	0.2917	0.2423	0.2489	0.4026	0.6832	0.8710	0.9339 (89)
MIT 2	19.7798	19.3637	19.7303	19.9944	20.0939	20.1324	20.1374	20.1381	20.1151	19.9369	19.5017	19.2744 (90)
Living area fraction									FLA = Living area / (4) =			0.3200 (91)
MIT	20.0100	19.6445	19.9919	20.2451	20.3424	20.3797	20.3848	20.3852	20.3618	20.1866	19.7720	19.5502 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0100	19.6445	19.9919	20.2451	20.3424	20.3797	20.3848	20.3852	20.3618	20.1866	19.7720	19.5502 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9213	0.8572	0.7429	0.5752	0.4323	0.2977	0.2496	0.2565	0.4095	0.6804	0.8590	0.9249 (94)
Useful gains	1128.3035	1288.1101	1414.9934	1392.9647	1135.4239	827.8449	606.7825	592.6390	813.7897	1034.9286	1058.9676	1052.1569 (95)
Ext temp.	5.6000	5.9000	7.2000	9.0000	11.6000	14.1000	15.8000	15.9000	14.1000	11.3000	8.4000	5.9000 (96)
Heat loss rate W	1952.1690	1855.6042	1725.0088	1507.6834	1170.7679	835.1109	609.7182	595.7726	834.6757	1192.8468	1528.2321	1844.9956 (97)
Space heating kWh	612.9560	381.3560	230.6515	82.5974	26.2959	0.0000	0.0000	0.0000	0.0000	117.4912	337.8705	589.8720 (98a)
Space heating requirement - total per year (kWh/year)												2379.0904
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	612.9560	381.3560	230.6515	82.5974	26.2959	0.0000	0.0000	0.0000	0.0000	117.4912	337.8705	589.8720 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2379.0904
Space heating per m2										(98c) / (4) =		14.4030 (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 %)													363.9446 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													65.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	612.9560	381.3560	230.6515	82.5974	26.2959	0.0000	0.0000	0.0000	0.0000	117.4912	337.8705	589.8720 (98)	
Space heating efficiency (main heating system 1)	363.9446	363.9446	363.9446	363.9446	363.9446	0.0000	0.0000	0.0000	0.0000	363.9446	363.9446	363.9446 (210)	
Space heating fuel (main heating system)	168.4201	104.7841	63.3754	22.6951	7.2252	0.0000	0.0000	0.0000	0.0000	32.2827	92.8357	162.0774 (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	249.4109	202.3712	172.0266	113.4906	84.4819	65.7540	76.1120	86.5729	118.6889	173.8782	217.9667	253.1754 (64)	
Efficiency of water heater (217)m	197.9512	197.9512	197.9512	197.9512	197.9512	197.9512	197.9512	197.9512	197.9512	197.9512	197.9512	197.9512 (216)	
Fuel for water heating, kWh/month	125.9962	102.2329	86.9035	57.3326	42.6781	33.2173	38.4499	43.7345	59.9587	87.8389	110.1113	127.8979 (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	47.2279	42.6574	47.2279	45.7044	47.2279	45.7044	47.2279	47.2279	45.7044	47.2279	45.7044	47.2279 (231)	
Lighting	32.8418	26.3469	23.7225	17.3801	13.4249	10.9683	12.2466	15.9187	20.6768	27.1290	30.6422	33.7546 (232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-118.7613	-142.5257	-189.6499	-198.4126	-196.3403	-181.6858	-175.8304	-174.6447	-165.8680	-153.4997	-120.8972	-105.6841 (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	-80.0523	-137.9941	-274.4120	-437.7824	-537.9209	-592.3124	-506.2855	-475.1228	-356.5004	-205.9785	-101.2176	-65.8493 (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													653.6957 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													197.9512
Water heating fuel used													916.3517 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.8360)													
mechanical ventilation fans (SFP = 0.8360)													476.0701 (230a)
pump for solar water heating													80.0000 (230g)
Total electricity for the above, kWh/year													556.0701 (231)
Electricity for lighting (calculated in Appendix L)													265.0525 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-5695.2282 (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													

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Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	-3304.0582	(238)

 10a. Fuel costs - using BEDF prices (536)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	653.6957	25.1600	164.4698 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	916.3517	25.1600	230.5541 (247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000 (247a)
Pumps, fans and electric keep-hot	476.0701	25.1600	119.7792 (249)
Pump for solar water heating	80.0000	25.1600	20.1280 (249)
Energy for lighting	265.0525	25.1600	66.6872 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1923.7998	25.1600	-484.0280
PV Unit electricity exported	-3771.4284	5.8100	-219.1200
Total			-703.1480 (252)
Total energy cost			-101.5297 (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	653.6957	0.1575	102.9407 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	916.3517	0.1461	133.9104 (264)
Space and water heating			236.8512 (265)
Pumps, fans and electric keep-hot	556.0701	0.1387	77.1338 (267)
Energy for lighting	265.0525	0.1443	38.2553 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1923.7998	0.1367	-262.9421
PV Unit electricity exported	-3771.4284	0.1266	-477.5717
Total			-740.5138 (269)
Total CO2, kg/year			-388.2736 (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	653.6957	1.5829	1034.7334 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	916.3517	1.5406	1411.7175 (278)
Space and water heating			2446.4509 (279)
Pumps, fans and electric keep-hot	556.0701	1.5128	841.2228 (281)
Energy for lighting	265.0525	1.5338	406.5463 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1923.7998	1.5052	-2895.7840
PV Unit electricity exported	-3771.4284	0.4649	-1753.2769
Total			-4649.0609 (283)
Total Primary energy kWh/year			-954.8408 (286)