

Full SAP Calculation Printout



Property Reference	MONTAGU-7283-24		Issued on Date	03/04/2024	
Assessment Reference	SEC1 ASHP Recog Const Details	Prop Type Ref	DS		
Property	Land West of No. 14, Victoria, Lostwithiel, Cornwall, PL22 0AX				
SAP Rating	98 A	DER	-0.37	TER	9.11
Environmental	100 A	% DER < TER			104.06
CO ₂ Emissions (t/year)	-0.13	DFEE	34.30	TFEE	38.53
Compliance Check	See BREL	% DFEE < TFEE			10.98
% DPER < TPER	85.65	DPER	6.84	TPER	47.66
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	72.8000 (1b)	x 2.5000 (2b)	= 182.0000 (1b) - (3b)
First floor	69.9200 (1c)	x 2.6500 (2c)	= 185.2880 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	142.7200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 367.2880 (5)

2. Ventilation rate

	Value	Reference
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	2.0000	(17)
Infiltration rate	0.1000	(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) =	0.0850 (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	0.1084	0.1063	0.1041	0.0935	0.0914	0.0808	0.0808	0.0786	0.0850	0.0914	0.0956	0.0999 (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	0.2034	0.2012	0.1991	0.1885	0.1864	0.1757	0.1757	0.1736	0.1800	0.1864	0.1906	0.1949 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Window (Uw = 1.20)			21.7400	1.1450	24.8931		(27)
Door			3.9900	1.2000	4.7880		(26a)
Floor 1 P/a 0.48			72.8000	0.1200	8.7360	75.0000	5460.0000 (28a)
External Wall 1 Stone	52.5200	12.2700	40.2500	0.1700	6.8425	9.0000	362.2500 (29a)
External Wall 2 Render	123.2200	13.4600	109.7600	0.1700	18.6592	9.0000	987.8400 (29a)
External Roof 1 Horz	72.8000		72.8000	0.1000	7.2800	9.0000	655.2000 (30)
Total net area of external elements Aum(A, m ²)			321.3400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	71.1988		(33)
Internal Wall 1 GF			122.6400			9.0000	1103.7600 (32c)
Internal Wall 2 FF			142.5600			9.0000	1283.0400 (32c)
Internal Floor 1			69.9200			18.0000	1258.5600 (32d)
Internal Ceiling 1			69.9200			9.0000	629.2800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	11739.9300 (34)

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Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 82.2585 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element			
E16 Corner (normal)	20.2000	0.0300	0.6060
E5 Ground floor (normal)	34.8000	0.0210	0.7308
E10 Eaves (insulation at ceiling level)	20.8000	0.0440	0.9152
E6 Intermediate floor within a dwelling	34.8000	0.0800	2.7840
E12 Gable (insulation at ceiling level)	14.0000	0.0510	0.7140
E2 Other lintels (including other steel lintels)	18.1000	0.0840	1.5204
E3 Sill	16.2000	0.0430	0.6966
E4 Jamb	36.0000	0.0340	1.2240

Thermal bridges (Sum(L x Psi) calculated using Appendix K)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 80.3898 (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	24.6501	24.3925	24.1350	22.8472	22.5896	21.3018	21.3018	21.0442	21.8169	22.5896	23.1047	23.6198 (38)
Average = Sum(39)m / 12 =	105.0399	104.7823	104.5248	103.2370	102.9794	101.6916	101.6916	101.4341	102.2067	102.9794	103.4945	104.0097 (39)
												103.1726

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7360	0.7342	0.7324	0.7234	0.7215	0.7125	0.7125	0.7107	0.7161	0.7215	0.7252	0.7288 (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	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 (42)
Hot water usage for baths	84.4572	83.2029	81.4365	78.1798	75.7411	73.0370	71.5764	73.3304	75.2402	78.1336	81.4575	84.1717 (42b)
Hot water usage for other uses	44.5551	42.9350	41.3148	39.6946	38.0744	36.4542	36.4542	38.0744	39.6946	41.3148	42.9350	44.5551 (42c)
Average daily hot water use (litres/day)												118.8098 (43)
Daily hot water use	129.0123	126.1378	122.7513	117.8743	113.8155	109.4912	108.0306	111.4048	114.9347	119.4484	124.3924	128.7268 (44)
Energy conte	204.3240	179.6186	188.6642	161.3641	153.2175	134.6323	130.6537	137.9424	141.7260	162.0903	177.2198	201.5551 (45)
Energy content (annual)												Total = Sum(45)m = 1973.0080
Distribution loss (46)m = 0.15 x (45)m	30.6486	26.9428	28.2996	24.2046	22.9826	20.1948	19.5981	20.6914	21.2589	24.3135	26.5830	30.2333 (46)
Water storage loss:												250.0000 (47)
Store volume												1.4000 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7560 (55)
Enter (49) or (54) in (55)												
Total storage loss	23.4360	21.1680	23.4360	22.6800	23.4360	22.6800	23.4360	23.4360	22.6800	23.4360	22.6800	23.4360 (56)
If cylinder contains dedicated solar storage												
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 (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 (61)
Total heat required for water heating calculated for each month	251.0224	221.7978	235.3626	206.5561	199.9159	179.8243	177.3521	184.6408	186.9180	208.7887	222.4118	248.2535 (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	251.0224	221.7978	235.3626	206.5561	199.9159	179.8243	177.3521	184.6408	186.9180	208.7887	222.4118	248.2535 (64)
Total per year (kWh/year)												2522.8440 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	105.2964	93.4665	100.0896	89.8072	88.3036	80.9188	80.8011	83.2246	83.2775	91.2538	95.0792	104.3758 (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	146.1046	146.1046	146.1046	146.1046	146.1046	146.1046	146.1046	146.1046	146.1046	146.1046	146.1046	146.1046 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	166.0780	183.8721	166.0780	171.6140	166.0780	171.6140	166.0780	166.0780	171.6140	166.0780	171.6140	166.0780 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	312.4840	315.7266	307.5553	290.1597	268.2008	247.5625	233.7749	230.5323	238.7036	256.0992	278.0581	298.6963 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6105	37.6105	37.6105	37.6105	37.6105	37.6105	37.6105	37.6105	37.6105	37.6105	37.6105	37.6105 (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)	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837 (71)
Water heating gains (Table 5)	141.5275	139.0871	134.5290	124.7322	118.6876	112.3873	108.6036	111.8610	115.6632	122.6529	132.0544	140.2900 (72)
Total internal gains	686.9208	705.5172	674.9937	653.3372	619.7977	598.3951	575.2879	575.3027	592.8121	611.6615	648.5579	671.8958 (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
Northeast	11.5700	11.2829	0.7600	0.7000	0.7700	48.1283 (75)
Southwest	10.1700	36.7938	0.7600	0.7000	0.7700	137.9561 (79)

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Solar gains	186.0844	332.9568	498.0285	688.2549	835.8667	858.3976	815.6951	701.2014	563.2160	379.4372	225.7975	157.3657 (83)
Total gains	873.0052	1038.4740	1173.0222	1341.5921	1455.6645	1456.7927	1390.9830	1276.5041	1156.0281	991.0987	874.3553	829.2614 (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	31.0462	31.1225	31.1992	31.5884	31.6674	32.0684	32.0684	32.1499	31.9068	31.6674	31.5098	31.3537	
alpha	3.0697	3.0748	3.0799	3.1059	3.1112	3.1379	3.1379	3.1433	3.1271	3.1112	3.1007	3.0902	
util living area	0.9374	0.8996	0.8417	0.7288	0.5834	0.4263	0.3154	0.3556	0.5517	0.7852	0.9038	0.9449 (86)	
Living	19.5625	19.8234	20.1439	20.5109	20.7452	20.8590	20.8895	20.8838	20.8045	20.4801	19.9696	19.5185	
Non living	18.5873	18.9150	19.3140	19.7646	20.0371	20.1667	20.1954	20.1927	20.1110	19.7384	19.1089	18.5368	
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	20.2646	19.8234	20.1439	20.5109	20.7452	20.8590	20.8895	20.8838	20.8045	20.4801	19.9696	19.7258 (87)	
Th 2	20.3092	20.3107	20.3123	20.3203	20.3218	20.3298	20.3298	20.3314	20.3266	20.3218	20.3187	20.3155 (88)	
util rest of house	0.9309	0.8899	0.8269	0.7056	0.5511	0.3861	0.2693	0.3068	0.5087	0.7606	0.8928	0.9392 (89)	
MIT 2	19.6227	18.9150	19.3140	19.7646	20.0371	20.1667	20.1954	20.1927	20.1110	19.7384	19.1089	18.8573 (90)	
Living area fraction	19.6983	19.0219	19.4117	19.8525	20.1204	20.2482	20.2771	20.2740	20.1926	19.8257	19.2102	18.9595 (92)	
MIT	19.6983	19.0219	19.4117	19.8525	20.1204	20.2482	20.2771	20.2740	20.1926	19.8257	19.2102	18.9595 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.6983	19.0219	19.4117	19.8525	20.1204	20.2482	20.2771	20.2740	20.1926	19.8257	19.2102	18.9595 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9245	0.8686	0.8050	0.6884	0.5411	0.3811	0.2656	0.3025	0.4997	0.7405	0.8717	0.9254 (94)
Useful gains	807.1286	901.9922	944.2931	923.5721	787.7305	555.2112	369.4780	386.2042	577.7006	733.9362	762.1591	767.4256 (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	1617.4329	1479.7302	1349.5938	1130.7020	867.1297	574.3738	373.9288	392.9576	622.7078	950.0600	1253.3390	1535.1323 (97)
Space heating kWh	602.8664	388.2399	301.5437	149.1335	59.0730	0.0000	0.0000	0.0000	0.0000	160.7961	353.6495	571.1739 (98a)
Space heating requirement - total per year (kWh/year)												2586.4759
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	602.8664	388.2399	301.5437	149.1335	59.0730	0.0000	0.0000	0.0000	0.0000	160.7961	353.6495	571.1739 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2586.4759
Space heating per m2												18.1227 (99)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												372.6696 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	602.8664	388.2399	301.5437	149.1335	59.0730	0.0000	0.0000	0.0000	0.0000	160.7961	353.6495	571.1739 (98)
Space heating efficiency (main heating system 1)	372.6696	372.6696	372.6696	372.6696	372.6696	0.0000	0.0000	0.0000	0.0000	372.6696	372.6696	372.6696 (210)
Space heating fuel (main heating system)	161.7697	104.1780	80.9145	40.0176	15.8513	0.0000	0.0000	0.0000	0.0000	43.1471	94.8962	153.2655 (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	251.0224	221.7978	235.3626	206.5561	199.9159	179.8243	177.3521	184.6408	186.9180	208.7887	222.4118	248.2535 (64)
Efficiency of water heater (217)m	200.1433	200.1433	200.1433	200.1433	200.1433	200.1433	200.1433	200.1433	200.1433	200.1433	200.1433	200.1433 (216)
Fuel for water heating, kWh/month	125.4213	110.8195	117.5970	103.2041	99.8864	89.8477	88.6125	92.2543	93.3921	104.3196	111.1263	124.0378 (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	31.8157	28.7368	31.8157	30.7894	31.8157	30.7894	31.8157	31.8157	30.7894	31.8157	30.7894	31.8157 (231)
Lighting	32.1096	25.7595	23.1936	16.9926	13.1256	10.7237	11.9736	15.5638	20.2158	26.5242	29.9590	33.0021 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-62.6355	-91.9198	-137.3367	-156.5779	-168.9022	-155.9500	-153.8938	-144.4166	-126.2244	-105.1114	-69.3488	-53.3907 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-26.6295	-61.1073	-132.3344	-215.0959	-297.0579	-304.4172	-299.4760	-247.5779	-173.9234	-93.1450	-37.3769	-20.7159 (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												694.0399 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												200.1433
Water heating fuel used												1260.5186 (219)

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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)	374.6044 (230a) 374.6044 (231)
Total electricity for the above, kWh/year	259.1432 (232)
Electricity for lighting (calculated in Appendix L)	
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-3334.5650 (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	-746.2589 (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	694.0399	0.1562	108.4114 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1260.5186	0.1409	177.6400 (264)
Space and water heating			286.0514 (265)
Pumps, fans and electric keep-hot	374.6044	0.1387	51.9622 (267)
Energy for lighting	259.1432	0.1443	37.4024 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1425.7078	0.1343	-191.4547
PV Unit electricity exported	-1908.8572	0.1239	-236.4465
Total			-427.9012 (269)
Total CO2, kg/year			-52.4852 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			-0.3700 (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	694.0399	1.5782	1095.3618 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1260.5186	1.5211	1917.3685 (278)
Space and water heating			3012.7303 (279)
Pumps, fans and electric keep-hot	374.6044	1.5128	566.7015 (281)
Energy for lighting	259.1432	1.5338	397.4825 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1425.7078	1.4963	-2133.2817
PV Unit electricity exported	-1908.8572	0.4546	-867.7543
Total			-3001.0360 (283)
Total Primary energy kWh/year			975.8783 (286)
Dwelling Primary energy Rate (DPER)			6.8400 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.8000 (1b)	x 2.5000 (2b)	= 182.0000 (1b) - (3b)
First floor	69.9200 (1c)	x 2.6500 (2c)	= 185.2880 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	142.7200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	367.2880 (5)

2. Ventilation rate

		m3 per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1089 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3589 (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) =	0.3051 (21)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
Effective ac	0.3890	0.3813	0.3737	0.3356	0.3280	0.2898	0.2898	0.2822	0.3051	0.3280	0.3432	0.3585	(22b)
	0.5756	0.5727	0.5698	0.5563	0.5538	0.5420	0.5420	0.5398	0.5465	0.5538	0.5589	0.5642	(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			3.9900	1.0000	3.9900		(26a)
TER Opening Type (Uw = 1.20)			21.7400	1.1450	24.8931		(27)
Floor 1 P/a 0.48			72.8000	0.1300	9.4640		(28a)
External Wall 1 Stone	52.5200	12.2700	40.2500	0.1800	7.2450		(29a)
External Wall 2 Render	123.2200	13.4600	109.7600	0.1800	19.7568		(29a)
External Roof 1 Horz	72.8000		72.8000	0.1100	8.0080		(30)
Total net area of external elements Aum(A, m2)			321.3400				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	73.3569	(33)

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

List of Thermal Bridges 82.2585 (35)

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	20.2000	0.0900	1.8180
E5 Ground floor (normal)	34.8000	0.1600	5.5680
E10 Eaves (insulation at ceiling level)	20.8000	0.0600	1.2480
E6 Intermediate floor within a dwelling	34.8000	0.0000	0.0000
E12 Gable (insulation at ceiling level)	14.0000	0.0600	0.8400
E2 Other lintels (including other steel lintels)	18.1000	0.0500	0.9050
E3 Sill	16.2000	0.0500	0.8100
E4 Jamb	36.0000	0.0500	1.8000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 12.9890 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 86.3459 (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	69.7713	69.4153	69.0663	67.4271	67.1204	65.6928	65.6928	65.4284	66.2427	67.1204	67.7408	68.3895	(38)
Average = Sum(39)m / 12 =	156.1172	155.7612	155.4122	153.7730	153.4664	152.0387	152.0387	151.7743	152.5886	153.4664	154.0868	154.7354	(39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0939	1.0914	1.0889	1.0774	1.0753	1.0653	1.0653	1.0634	1.0691	1.0753	1.0796	1.0842	(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													2.9221 (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	84.4572	83.2029	81.4365	78.1798	75.7411	73.0370	71.5764	73.3304	75.2402	78.1336	81.4575	84.1717	(42b)
Hot water usage for other uses	44.5551	42.9350	41.3148	39.6946	38.0744	36.4542	36.4542	38.0744	39.6946	41.3148	42.9350	44.5551	(42c)
Average daily hot water use (litres/day)													118.8098 (43)
Daily hot water use	129.0123	126.1378	122.7513	117.8743	113.8155	109.4912	108.0306	111.4048	114.9347	119.4484	124.3924	128.7268	(44)
Energy conte	204.3240	179.6186	188.6642	161.3641	153.2175	134.6323	130.6537	137.9424	141.7260	162.0903	177.2198	201.5551	(45)
Energy content (annual)													Total = Sum(45)m = 1973.0080
Distribution loss (46)m = 0.15 x (45)m	30.6486	26.9428	28.2996	24.2046	22.9826	20.1948	19.5981	20.6914	21.2589	24.3135	26.5830	30.2333	(46)
Water storage loss:													250.0000 (47)
Store volume													1.8903 (48)
a) If manufacturer declared loss factor is known (kWh/day):													0.5400 (49)
Temperature factor from Table 2b													1.0208 (55)
Enter (49) or (54) in (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	259.2308	229.2118	243.5710	214.4997	208.1243	187.7679	185.5605	192.8492	194.8616	216.9971	230.3554	256.4619	(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	259.2308	229.2118	243.5710	214.4997	208.1243	187.7679	185.5605	192.8492	194.8616	216.9971	230.3554	256.4619	(64)
12Total per year (kWh/year)													Total per year (kWh/year) = Sum(64)m = 2619.4912 (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	111.8632	99.3978	106.6563	96.1620	94.8703	87.2737	87.3678	89.7913	89.6324	97.8205	101.4341	110.9425	(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	146.1046	146.1046	146.1046	146.1046	146.1046	146.1046	146.1046	146.1046	146.1046	146.1046	146.1046	146.1046	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	166.0780	183.8721	166.0780	171.6140	166.0780	171.6140	166.0780	166.0780	171.6140	166.0780	171.6140	166.0780	(67)

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Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	312.4840	315.7266	307.5553	290.1597	268.2008	247.5625	233.7749	230.5323	238.7036	256.0992	278.0581	298.6963 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6105	37.6105	37.6105	37.6105	37.6105	37.6105	37.6105	37.6105	37.6105	37.6105	37.6105	37.6105 (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)	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837 (71)
Water heating gains (Table 5)	150.3537	147.9133	143.3552	133.5584	127.5138	121.2135	117.4298	120.6872	124.4894	131.4791	140.8807	149.1163 (72)
Total internal gains	698.7471	717.3434	686.8199	665.1634	631.6240	607.2213	584.1141	584.1289	601.6383	623.4877	660.3841	683.7220 (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						
Northeast	11.5700	11.2829	0.6300	0.7000	0.7700	39.8958 (75)						
Southwest	10.1700	36.7938	0.6300	0.7000	0.7700	114.3583 (79)						
Solar gains	154.2542	276.0037	412.8394	570.5271	692.8895	711.5664	676.1683	581.2591	466.8764	314.5334	187.1742	130.4478 (83)
Total gains	853.0012	993.3470	1099.6593	1235.6905	1324.5135	1318.7878	1260.2824	1165.3880	1068.5147	938.0212	847.5583	814.1698 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)											
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	20.8887	20.9365	20.9835	21.2072	21.2496	21.4491	21.4491	21.4865	21.3718	21.2496	21.1640	21.0753
alpha	2.3926	2.3958	2.3989	2.4138	2.4166	2.4299	2.4299	2.4324	2.4248	2.4166	2.4109	2.4050
util living area	0.9525	0.9314	0.8997	0.8339	0.7332	0.5951	0.4705	0.5156	0.7028	0.8637	0.9325	0.9571 (86)
MIT	18.0654	18.4097	18.9289	19.6335	20.2488	20.6888	20.8743	20.8390	20.5014	19.7055	18.7776	18.0120 (87)
Th 2	20.0058	20.0079	20.0099	20.0193	20.0211	20.0293	20.0293	20.0308	20.0261	20.0211	20.0175	20.0138 (88)
util rest of house	0.9464	0.9227	0.8865	0.8110	0.6943	0.5321	0.3839	0.4292	0.6469	0.8401	0.9225	0.9516 (89)
MIT 2	16.5550	16.9905	17.6452	18.5247	19.2656	19.7667	19.9494	19.9228	19.5748	18.6306	17.4673	16.4916 (90)
Living area fraction	16.7328	17.1575	17.7963	18.6552	19.3813	19.8753	20.0583	20.0306	19.6838	18.7572	17.6216	16.6706 (91)
Temperature adjustment	16.7328	17.1575	17.7963	18.6552	19.3813	19.8753	20.0583	20.0306	19.6838	18.7572	17.6216	16.6706 (92)
adjusted MIT	16.7328	17.1575	17.7963	18.6552	19.3813	19.8753	20.0583	20.0306	19.6838	18.7572	17.6216	16.6706 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9165	0.8875	0.8472	0.7720	0.6651	0.5212	0.3866	0.4292	0.6244	0.8009	0.8878	0.9234 (94)
Useful gains	781.7523	881.5938	931.6377	953.9700	880.9165	687.3507	487.2464	500.1688	667.2257	751.2904	752.4710	751.7937 (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	1940.9700	1909.2479	1755.5889	1500.0937	1178.8240	802.0467	525.7962	551.0343	852.0316	1251.8494	1621.2356	1929.6422 (97)
Space heating kWh	862.4580	690.5835	613.0197	393.2091	221.6431	0.0000	0.0000	0.0000	0.0000	372.4159	625.5104	876.3193 (98a)
Space heating requirement - total per year (kWh/year)	4655.1590											
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	862.4580	690.5835	613.0197	393.2091	221.6431	0.0000	0.0000	0.0000	0.0000	372.4159	625.5104	876.3193 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	4655.1590											
Space heating per m2	32.6174 (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	862.4580	690.5835	613.0197	393.2091	221.6431	0.0000	0.0000	0.0000	0.0000	372.4159	625.5104	876.3193 (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)	934.4073	748.1945	664.1600	426.0120	240.1334	0.0000	0.0000	0.0000	0.0000	403.4842	677.6928	949.4250 (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	259.2308	229.2118	243.5710	214.4997	208.1243	187.7679	185.5605	192.8492	194.8616	216.9971	230.3554	256.4619 (64)
Water heating requirement	259.2308	229.2118	243.5710	214.4997	208.1243	187.7679	185.5605	192.8492	194.8616	216.9971	230.3554	256.4619 (64)
Efficiency of water heater (217)m	86.5442	86.3725	86.0407	85.4004	84.2012	79.8000	79.8000	79.8000	79.8000	85.2599	86.1839	86.5890 (217)
Fuel for water heating, kWh/month	299.5356	265.3760	283.0881	251.1695	247.1751	235.2981	232.5319	241.6657	244.1875	254.5126	267.2837	296.1828 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	34.5077	27.6834	24.9258	18.2617	14.1059	11.5246	12.8679	16.7261	21.7256	28.5051	32.1965	35.4668 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												

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(233a)m	-63.5197	-87.2892	-122.2913	-133.8309	-141.1934	-130.5647	-128.8196	-123.0441	-112.5215	-97.9391	-68.9707	-55.1744	(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	-43.0738	-89.6908	-176.6540	-263.0769	-345.7909	-346.8091	-342.8435	-291.3175	-214.8298	-127.6446	-57.2904	-34.1425	(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												5043.5093	(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												3118.0064	(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)												278.4972	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-3598.3224	(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												4927.6904	(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	5043.5093	0.2100	1059.1369	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3118.0064	0.2100	654.7813	(264)
Space and water heating			1713.9183	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	278.4972	0.1443	40.1957	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1265.1585	0.1352	-171.0089	
PV Unit electricity exported	-2333.1639	0.1261	-294.3062	
Total			-465.3152	(269)
Total CO2, kg/year			1300.7281	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.1100	(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	5043.5093	1.1300	5699.1655	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3118.0064	1.1300	3523.3472	(278)
Space and water heating			9222.5127	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	278.4972	1.5338	427.1683	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1265.1585	1.4996	-1897.2196	
PV Unit electricity exported	-2333.1639	0.4630	-1080.3305	
Total			-2977.5501	(283)
Total Primary energy kWh/year			6802.2316	(286)
Target Primary Energy Rate (TPER)			47.6600	(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	72.8000 (1b)	x 2.5000 (2b)	= 182.0000 (1b) - (3b)	
First floor	69.9200 (1c)	x 2.6500 (2c)	= 185.2880 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	142.7200		(4)	
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	367.2880 (5)	

2. Ventilation rate

Number of open chimneys	0 * 80 =	0.0000 (6a)	m ³ per hour
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Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000	Air changes per hour / (5) =	0.1089 (8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			2.0000	(17)
Infiltration rate			0.2089	(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) =	0.1776 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
	0.2264	0.2220	0.2175	0.1953	0.1909	0.1687	0.1687	0.1643	0.1776	0.1909	0.1998	0.2086 (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	0.5256	0.5246	0.5237	0.5191	0.5182	0.5142	0.5142	0.5135	0.5158	0.5182	0.5200	0.5218 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Window (Uw = 1.20)			21.7400	1.1450	24.8931		(27)
Door			3.9900	1.2000	4.7880		(26a)
Floor 1 P/a 0.48			72.8000	0.1200	8.7360	75.0000	5460.0000 (28a)
External Wall 1 Stone	52.5200	12.2700	40.2500	0.1700	6.8425	9.0000	362.2500 (29a)
External Wall 2 Render	123.2200	13.4600	109.7600	0.1700	18.6592	9.0000	987.8400 (29a)
External Roof 1 Horz	72.8000		72.8000	0.1000	7.2800	9.0000	655.2000 (30)
Total net area of external elements Aum(A, m2)			321.3400				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	71.1988	(33)
Internal Wall 1 GF			122.6400			9.0000	1103.7600 (32c)
Internal Wall 2 FF			142.5600			9.0000	1283.0400 (32c)
Internal Floor 1			69.9200			18.0000	1258.5600 (32d)
Internal Ceiling 1			69.9200			9.0000	629.2800 (32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11739.9300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		82.2585 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	20.2000	0.0300	0.6060
E5 Ground floor (normal)	34.8000	0.0210	0.7308
E10 Eaves (insulation at ceiling level)	20.8000	0.0440	0.9152
E6 Intermediate floor within a dwelling	34.8000	0.0800	2.7840
E12 Gable (insulation at ceiling level)	14.0000	0.0510	0.7140
E2 Other lintels (including other steel lintels)	18.1000	0.0840	1.5204
E3 Sill	16.2000	0.0430	0.6966
E4 Jamb	36.0000	0.0340	1.2240

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		9.1910 (36)
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Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	80.3898 (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
	63.7089	63.5883	63.4700	62.9147	62.8108	62.3271	62.3271	62.2375	62.5134	62.8108	63.0210	63.2407 (38)
Heat transfer coeff	144.0987	143.9781	143.8599	143.3045	143.2006	142.7169	142.7169	142.6273	142.9032	143.2006	143.4108	143.6305 (39)
Average = Sum(39)m / 12 =												143.3040

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1.0097	1.0088	1.0080	1.0041	1.0034	1.0000	1.0000	0.9994	1.0013	1.0034	1.0048	1.0064 (40)
HLP (average)												1.0041
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9221 (42)
Hot water usage for mixer showers												0.0000 (42a)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hot water usage for baths												31.5007 (42b)
	31.6075	31.1381	30.4771	29.2582	28.3456	27.3336	26.7870	27.4434	28.1581	29.2410	30.4849	31.5007
Hot water usage for other uses												44.5551 (42c)
	44.5551	42.9350	41.3148	39.6946	38.0744	36.4542	36.4542	38.0744	39.6946	41.3148	42.9350	44.5551
Average daily hot water use (litres/day)												69.8098 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	76.1627	74.0731	71.7918	68.9528	66.4200	63.7878	63.2412	65.5178	67.8527	70.5557	73.4199	76.0558 (44)
Energy conte	120.6230	105.4790	110.3414	94.3930	89.4141	78.4346	76.4847	81.1247	83.6692	95.7435	104.6000	119.0850 (45)
Energy content (annual)										Total = Sum(45)m =		1159.3922
Distribution loss (46)m = 0.15 x (45)m												0.0000 (46)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water storage loss:												
Total storage loss												0.0000 (56)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
If cylinder contains dedicated solar storage												0.0000 (57)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Primary loss												0.0000 (59)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Combi loss												0.0000 (61)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total heat required for water heating calculated for each month												
	102.5296	89.6572	93.7902	80.2340	76.0020	66.6694	65.0120	68.9560	71.1188	81.3819	88.9100	101.2223 (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)

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Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	102.5296	89.6572	93.7902	80.2340	76.0020	66.6694	65.0120	68.9560	71.1188	81.3819	88.9100	101.2223	(64)
	Total per year (kWh/year) = Sum(64)m =											985.4833 (64)	
12Total per year (kWh/year)												985 (64)	
Electric shower(s)	58.6320	52.2416	57.0458	54.4381	55.4596	52.9031	54.6665	55.4596	54.4381	57.0458	55.9731	58.6320	(64a)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											666.9354 (64a)	
Heat gains from water heating, kWh/month	40.2904	35.4747	37.7090	33.6680	32.8654	29.8931	29.9196	31.1039	31.3892	34.6069	36.2208	39.9636	(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	
(66m)	146.1046	146.1046	146.1046	146.1046	146.1046	146.1046	146.1046	146.1046	146.1046	146.1046	146.1046	146.1046	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	166.0780	183.8721	166.0780	171.6140	166.0780	171.6140	166.0780	166.0780	171.6140	166.0780	171.6140	166.0780	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	312.4840	315.7266	307.5553	290.1597	268.2008	247.5625	233.7749	230.5323	238.7036	256.0992	278.0581	298.6963	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6105	37.6105	37.6105	37.6105	37.6105	37.6105	37.6105	37.6105	37.6105	37.6105	37.6105	37.6105	(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)	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	(71)
Water heating gains (Table 5)	54.1538	52.7897	50.6841	46.7612	44.1739	41.5182	40.2146	41.8063	43.5961	46.5147	50.3067	53.7145	(72)
Total internal gains	599.5471	619.2198	591.1488	575.3661	545.2841	527.5261	506.8989	505.2480	520.7450	535.5233	566.8101	585.3202	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data g or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W							
Northeast	11.5700	11.2829	0.7600	0.7000	0.7700	48.1283 (75)							
Southwest	10.1700	36.7938	0.7600	0.7000	0.7700	137.9561 (79)							
Solar gains	186.0844	332.9568	498.0285	688.2549	835.8667	858.3976	815.6951	701.2014	563.2160	379.4372	225.7975	157.3657	(83)
Total gains	785.6315	952.1766	1089.1773	1263.6211	1381.1508	1385.9237	1322.5940	1206.4494	1083.9610	914.9605	792.6075	742.6859	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area, nil,m (see Table 9a)	0.9586	0.9339	0.8959	0.8178	0.7026	0.5571	0.4337	0.4835	0.6814	0.8621	0.9384	0.9636	(86)
MIT	18.2031	18.5822	19.1208	19.8122	20.3872	20.7601	20.9078	20.8763	20.5800	19.8119	18.8820	18.1249	(87)
Th 2	20.0753	20.0760	20.0767	20.0799	20.0805	20.0834	20.0834	20.0839	20.0823	20.0805	20.0793	20.0780	(88)
util rest of house	0.9534	0.9258	0.8829	0.7946	0.6639	0.4976	0.3554	0.4037	0.6270	0.8392	0.9295	0.9590	(89)
MIT 2	17.4969	17.8703	18.3982	19.0660	19.6003	19.9255	20.0373	20.0186	19.7848	19.0802	18.1730	17.4214	(90)
Living area fraction	fLA = Living area / (4) =												0.1177 (91)
MIT	17.5800	17.9541	18.4833	19.1538	19.6929	20.0237	20.1397	20.1195	19.8784	19.1663	18.2565	17.5043	(92)
Temperature adjustment													0.0000
adjusted MIT	17.5800	17.9541	18.4833	19.1538	19.6929	20.0237	20.1397	20.1195	19.8784	19.1663	18.2565	17.5043	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation	0.9339	0.9014	0.8548	0.7674	0.6459	0.4935	0.3604	0.4070	0.6135	0.8113	0.9058	0.9410	(94)	
Useful gains	733.7237	858.3086	931.0539	969.6591	892.0341	683.8854	476.6951	490.9653	665.0470	742.2895	717.9781	698.8944	(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	1913.6362	1879.5035	1723.9151	1469.4159	1144.5941	774.0587	505.1815	530.5086	825.7502	1226.7045	1599.9606	1910.8970	(97)	
Space heating kWh	877.8549	686.2429	589.8887	359.8249	187.9046	0.0000	0.0000	0.0000	0.0000	360.4047	635.0274	901.7300	(98a)	
Space heating requirement - total per year (kWh/year)													4598.8782	
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	877.8549	686.2429	589.8887	359.8249	187.9046	0.0000	0.0000	0.0000	0.0000	360.4047	635.0274	901.7300	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)													4598.8782	
Space heating per m2													(98c) / (4) =	32.2231 (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	1341.5390	1056.1052	1083.9678	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7643	0.8228	0.7874	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1025.2785	868.9255	853.5185	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1542.7641	1472.1401	1339.7762	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	372.5896	448.7917	361.7758	0.0000	0.0000	0.0000	0.0000	(104)

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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	93.1474	112.1979	90.4439	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												295.7893 (107)
Energy for space heating												32.2231 (99)
Energy for space cooling												2.0725 (108)
Total												34.2956 (109)
Fabric Energy Efficiency (DFEE)												34.3 (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	72.8000 (1b)	x 2.5000 (2b)	= 182.0000 (1b) - (3b)
First floor	69.9200 (1c)	x 2.6500 (2c)	= 185.2880 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	142.7200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 367.2880 (5)

2. Ventilation rate

	m3 per hour											
Number of open chimneys	0 * 80 =											0.0000 (6a)
Number of open flues	0 * 20 =											0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =											0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =											0.0000 (6d)
Number of flues attached to other heater	0 * 35 =											0.0000 (6e)
Number of blocked chimneys	0 * 20 =											0.0000 (6f)
Number of intermittent extract fans	4 * 10 =											40.0000 (7a)
Number of passive vents	0 * 10 =											0.0000 (7b)
Number of flueless gas fires	0 * 40 =											0.0000 (7c)
Air changes per hour												
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =											0.1089 (8)
Pressure test	Yes											
Pressure Test Method	Blower Door											
Measured/design AP50												5.0000 (17)
Infiltration rate												0.3589 (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) =											0.3051 (21)
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3890	0.3813	0.3737	0.3356	0.3280	0.2898	0.2898	0.2822	0.3051	0.3280	0.3432	0.3585 (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	0.5756	0.5727	0.5698	0.5563	0.5538	0.5420	0.5420	0.5398	0.5465	0.5538	0.5589	0.5642 (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			3.9900	1.0000	3.9900		(26a)					
TER Opening Type (Uw = 1.20)			21.7400	1.1450	24.8931		(27)					
Floor 1 P/a 0.48			72.8000	0.1300	9.4640		(28a)					
External Wall 1 Stone	52.5200	12.2700	40.2500	0.1800	7.2450		(29a)					
External Wall 2 Render	123.2200	13.4600	109.7600	0.1800	19.7568		(29a)					
External Roof 1 Horz	72.8000		72.8000	0.1100	8.0080		(30)					
Total net area of external elements Aum(A, m2)			321.3400				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		73.3569		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								82.2585 (35)				
List of Thermal Bridges												
K1 Element			Length	Psi-value	Total							
E16 Corner (normal)			20.2000	0.0900	1.8180							
E5 Ground floor (normal)			34.8000	0.1600	5.5680							
E10 Eaves (insulation at ceiling level)			20.8000	0.0600	1.2480							
E6 Intermediate floor within a dwelling			34.8000	0.0000	0.0000							
E12 Gable (insulation at ceiling level)			14.0000	0.0600	0.8400							
E2 Other lintels (including other steel lintels)			18.1000	0.0500	0.9050							
E3 Sill			16.2000	0.0500	0.8100							
E4 Jamb			36.0000	0.0500	1.8000							
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								12.9890 (36)				
Point Thermal bridges								(36a) = 0.0000				
Total fabric heat loss								(33) + (36) + (36a) = 86.3459 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 69.7713	Feb 69.4153	Mar 69.0663	Apr 67.4271	May 67.1204	Jun 65.6928	Jul 65.6928	Aug 65.4284	Sep 66.2427	Oct 67.1204	Nov 67.7408	Dec 68.3895 (38)
Heat transfer coeff	156.1172	155.7612	155.4122	153.7730	153.4664	152.0387	152.0387	151.7743	152.5886	153.4664	154.0868	154.7354 (39)
Average = Sum(39)m / 12 =												153.7716

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0939	1.0914	1.0889	1.0774	1.0753	1.0653	1.0653	1.0634	1.0691	1.0753	1.0796	1.0842 (40)
HLP (average)												1.0774
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9221 (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	31.6075	31.1381	30.4771	29.2582	28.3456	27.3336	26.7870	27.4434	28.1581	29.2410	30.4849	31.5007 (42b)
Hot water usage for other uses	44.5551	42.9350	41.3148	39.6946	38.0744	36.4542	36.4542	38.0744	39.6946	41.3148	42.9350	44.5551 (42c)
Average daily hot water use (litres/day)												69.8098 (43)
Daily hot water use	76.1627	74.0731	71.7918	68.9528	66.4200	63.7878	63.2412	65.5178	67.8527	70.5557	73.4199	76.0558 (44)
Energy content	120.6230	105.4790	110.3414	94.3930	89.4141	78.4346	76.4847	81.1247	83.6692	95.7435	104.6000	119.0850 (45)
Energy content (annual)												Total = Sum(45)m = 1159.3922
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	102.5296	89.6572	93.7902	80.2340	76.0020	66.6694	65.0120	68.9560	71.1188	81.3819	88.9100	101.2223 (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	102.5296	89.6572	93.7902	80.2340	76.0020	66.6694	65.0120	68.9560	71.1188	81.3819	88.9100	101.2223 (64)
12Total per year (kWh/year)												Total per year (kWh/year) = Sum(64)m = 985.4833 (64)
Electric shower(s)	58.6320	52.2416	57.0458	54.4381	55.4596	52.9031	54.6665	55.4596	54.4381	57.0458	55.9731	58.6320 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												666.9354 (64a)
Heat gains from water heating, kWh/month	40.2904	35.4747	37.7090	33.6680	32.8654	29.8931	29.9196	31.1039	31.3892	34.6069	36.2208	39.9636 (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	146.1046	146.1046	146.1046	146.1046	146.1046	146.1046	146.1046	146.1046	146.1046	146.1046	146.1046	146.1046 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	166.0780	183.8721	166.0780	171.6140	166.0780	171.6140	166.0780	166.0780	171.6140	166.0780	171.6140	166.0780 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	312.4840	315.7266	307.5553	290.1597	268.2008	247.5625	233.7749	230.5323	238.7036	256.0992	278.0581	298.6963 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6105	37.6105	37.6105	37.6105	37.6105	37.6105	37.6105	37.6105	37.6105	37.6105	37.6105	37.6105 (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)	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837 (71)
Water heating gains (Table 5)	54.1538	52.7897	50.6841	46.7612	44.1739	41.5182	40.2146	41.8063	43.5961	46.5147	50.3067	53.7145 (72)
Total internal gains	599.5471	619.2198	591.1488	575.3661	545.2841	527.5261	506.8989	505.2480	520.7450	535.5233	566.8101	585.3202 (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						
Northeast	11.5700	11.2829	0.6300	0.7000	0.7700	39.8958 (75)						
Southwest	10.1700	36.7938	0.6300	0.7000	0.7700	114.3583 (79)						
Solar gains	154.2542	276.0037	412.8394	570.5271	692.8895	711.5664	581.2591	466.8764	314.5334	187.1742	130.4478 (83)	
Total gains	753.8013	895.2234	1003.9882	1145.8932	1238.1736	1239.0925	1183.0672	1086.5071	987.6214	850.0568	753.9843	715.7680 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	20.8887	20.9365	20.9835	21.2072	21.2496	21.4491	21.4491	21.4865	21.3718	21.2496	21.1640	21.0753
alpha	2.3926	2.3958	2.3989	2.4138	2.4166	2.4299	2.4299	2.4324	2.4248	2.4166	2.4109	2.4050
util living area	0.9629	0.9438	0.9148	0.8526	0.7557	0.6190	0.4938	0.5423	0.7303	0.8846	0.9462	0.9670 (86)
MIT	17.9238	18.2783	18.8128	19.5456	20.1903	20.6592	20.8599	20.8196	20.4524	19.6096	18.6511	17.8691 (87)
Th 2	20.0058	20.0079	20.0099	20.0193	20.0211	20.0293	20.0293	20.0308	20.0261	20.0211	20.0175	20.0138 (88)
util rest of house	0.9580	0.9364	0.9032	0.8315	0.7182	0.5559	0.4049	0.4541	0.6762	0.8636	0.9379	0.9626 (89)
MIT 2	17.1774	17.5284	18.0557	18.7733	19.3822	19.8033	19.9592	19.9353	19.6357	18.8487	17.9073	17.1283 (90)
Living area fraction												0.1177 (91)
MIT	17.2653	17.6167	18.1448	18.8642	19.4774	19.9041	20.0652	20.0394	19.7318	18.9383	17.9949	17.2155 (92)
Temperature adjustment												0.0000
adjusted MIT	17.2653	17.6167	18.1448	18.8642	19.4774	19.9041	20.0652	20.0394	19.7318	18.9383	17.9949	17.2155 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9388	0.9123	0.8748	0.8012	0.6942	0.5470	0.4084	0.4549	0.6573	0.8340	0.9144	0.9448	(94)
Useful gains	707.6626	816.7437	878.2594	918.1288	859.5752	677.7838	483.1967	494.2884	649.1985	708.9850	689.4797	676.2718	(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	2024.1041	1980.7620	1809.7477	1532.2300	1193.5628	806.4261	526.8480	552.3673	859.3509	1279.6463	1678.7570	2013.9525	(97)
Space heating kWh	979.4325	782.2203	693.0273	442.1528	248.4868	0.0000	0.0000	0.0000	0.0000	424.5720	712.2796	995.2345	(98a)
Space heating requirement - total per year (kWh/year)												5277.4057	
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	979.4325	782.2203	693.0273	442.1528	248.4868	0.0000	0.0000	0.0000	0.0000	424.5720	712.2796	995.2345	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5277.4057	
Space heating per m2												36.9773	(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	1429.1637	1125.0863	1153.4847	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6936	0.7599	0.7224	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	991.3096	854.9825	833.2915	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1371.1432	1309.0569	1199.5839	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	273.4802	337.8313	272.5215	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	68.3701	84.4578	68.1304	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												220.9583	(107)
Energy for space heating												36.9773	(99)
Energy for space cooling												1.5482	(108)
Total												38.5255	(109)
Fabric Energy Efficiency (TFEE)												38.5	(109)

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

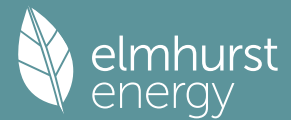
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	72.8000 (1b)	x 2.5000 (2b)	= 182.0000 (1b)	- (3b)
First floor	69.9200 (1c)	x 2.6500 (2c)	= 185.2880 (1c)	- (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	142.7200			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	367.2880	(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						0.0000 / (5) =	0.0000	(8)						
Pressure Test						Yes								
Pressure Test Method						Blower Door								
Measured/design AP50						2.0000		(17)						
Infiltration rate						0.1000		(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) =	0.0850	(21)						
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 infiltr rate	0.1084	0.1063	0.1041	0.0935	0.0914	0.0808	0.0808	0.0786	0.0850	0.0914	0.0956	0.0999	(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)	

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If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 81.0000 (23c)
 Effective ac 0.2034 0.2012 0.1991 0.1885 0.1864 0.1757 0.1757 0.1736 0.1800 0.1864 0.1906 0.1949 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Window (Uw = 1.20)			21.7400	1.1450	24.8931		(27)
Door			3.9900	1.2000	4.7880		(26a)
Floor 1 P/a 0.48			72.8000	0.1200	8.7360	75.0000	5460.0000 (28a)
External Wall 1 Stone	52.5200	12.2700	40.2500	0.1700	6.8425	9.0000	362.2500 (29a)
External Wall 2 Render	123.2200	13.4600	109.7600	0.1700	18.6592	9.0000	987.8400 (29a)
External Roof 1 Horz	72.8000		72.8000	0.1000	7.2800	9.0000	655.2000 (30)
Total net area of external elements Aum(A, m2)			321.3400				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 71.1988		(33)
Internal Wall 1 GF			122.6400			9.0000	1103.7600 (32c)
Internal Wall 2 FF			142.5600			9.0000	1283.0400 (32c)
Internal Floor 1			69.9200			18.0000	1258.5600 (32d)
Internal Ceiling 1			69.9200			9.0000	629.2800 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 11739.9300 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 82.2585 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	20.2000	0.0300	0.6060
E5 Ground floor (normal)	34.8000	0.0210	0.7308
E10 Eaves (insulation at ceiling level)	20.8000	0.0440	0.9152
E6 Intermediate floor within a dwelling	34.8000	0.0800	2.7840
E12 Gable (insulation at ceiling level)	14.0000	0.0510	0.7140
E2 Other lintels (including other steel lintels)	18.1000	0.0840	1.5204
E3 Sill	16.2000	0.0430	0.6966
E4 Jamb	36.0000	0.0340	1.2240

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.1910 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 80.3898 (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
24.6501	24.3925	24.1350	22.8472	22.5896	21.3018	21.3018	21.0442	21.8169	22.5896	23.1047	23.6198	(38)
Heat transfer coeff	105.0399	104.7823	104.5248	103.2370	102.9794	101.6916	101.6916	101.4341	102.2067	102.9794	103.4945	104.0097 (39)
Average = Sum(39)m / 12 =												103.1726

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.7360	0.7342	0.7324	0.7234	0.7215	0.7125	0.7125	0.7107	0.7161	0.7215	0.7252	0.7288	(40)
HLP (average)												0.7229
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9221 (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	84.4572	83.2029	81.4365	78.1798	75.7411	73.0370	71.5764	73.3304	75.2402	78.1336	81.4575	84.1717 (42b)
Hot water usage for other uses	44.5551	42.9350	41.3148	39.6946	38.0744	36.4542	36.4542	38.0744	39.6946	41.3148	42.9350	44.5551 (42c)
Average daily hot water use (litres/day)	118.8098 (43)											

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
129.0123	126.1378	122.7513	117.8743	113.8155	109.4912	108.0306	111.4048	114.9347	119.4484	124.3924	128.7268 (44)	
Energy conte	204.3240	179.6186	188.6642	161.3641	153.2175	134.6323	130.6537	137.9424	141.7260	162.0903	177.2198	201.5551 (45)
Energy content (annual)	Total = Sum(45)m = 1973.0080											

Distribution loss (46)m = 0.15 x (45)m
 30.6486 26.9428 28.2996 24.2046 22.9826 20.1948 19.5981 20.6914 21.2589 24.3135 26.5830 30.2333 (46)

Water storage loss:
 Store volume 250.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day):
 Temperature factor from Table 2b 1.4000 (48)
 Enter (49) or (54) in (55) 0.5400 (49)
 Total storage loss 0.7560 (55)

23.4360 21.1680 23.4360 22.6800 23.4360 22.6800 23.4360 23.4360 22.6800 23.4360 22.6800 23.4360 (56)

If cylinder contains dedicated solar storage
 23.4360 21.1680 23.4360 22.6800 23.4360 22.6800 23.4360 23.4360 22.6800 23.4360 22.6800 23.4360 (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
 251.0224 221.7978 235.3626 206.5561 199.9159 179.8243 177.3521 184.6408 186.9180 208.7887 222.4118 248.2535 (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
 251.0224 221.7978 235.3626 206.5561 199.9159 179.8243 177.3521 184.6408 186.9180 208.7887 222.4118 248.2535 (64)

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

Heat gains from water heating, kWh/month
 105.2964 93.4665 100.0896 89.8072 88.3036 80.9188 80.8011 83.2246 83.2775 91.2538 95.0792 104.3758 (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	175.3255	175.3255	175.3255	175.3255	175.3255	175.3255	175.3255	175.3255	175.3255	175.3255	175.3255	175.3255 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	36.6844	32.5828	26.4981	20.0608	14.9956	12.6600	13.6795	17.7812	23.8659	30.3032	35.3683	37.7040 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												

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Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	466.3940	471.2337	459.0378	433.0741	400.2997	369.4963	348.9178	344.0780	356.2740	382.2376	415.0121	445.8154 (68)
Pumps, fans	55.4546	55.4546	55.4546	55.4546	55.4546	55.4546	55.4546	55.4546	55.4546	55.4546	55.4546	55.4546 (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)	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837 (71)
Total internal gains	141.5275	139.0871	134.5290	124.7322	118.6876	112.3873	108.6036	111.8610	115.6632	122.6529	132.0544	140.2900 (72)
	758.5023	756.8000	733.9613	691.7635	647.8794	608.4400	585.0974	587.6167	609.6995	649.0902	696.3313	737.7059 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
Northeast	11.5700	11.2829	0.7600	0.7000	0.7700	48.1283 (75)						
Southwest	10.1700	36.7938	0.7600	0.7000	0.7700	137.9561 (79)						
Solar gains	186.0844	332.9568	498.0285	688.2549	835.8667	858.3976	815.6951	701.2014	563.2160	379.4372	225.7975	157.3657 (83)
Total gains	944.5867	1089.7568	1231.9898	1380.0184	1483.7461	1466.8376	1400.7925	1288.8181	1172.9155	1028.5274	922.1287	895.0716 (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	31.0462	31.1225	31.1992	31.5884	31.6674	32.0684	32.0684	32.1499	31.9068	31.6674	31.5098	31.3537
alpha	3.0697	3.0748	3.0799	3.1059	3.1112	3.1379	3.1379	3.1433	3.1271	3.1112	3.1007	3.0902
util living area	0.9249	0.8889	0.8267	0.7176	0.5752	0.4237	0.3133	0.3524	0.5456	0.7718	0.8922	0.9340 (86)
Living	19.6416	19.8727	20.1887	20.5288	20.7513	20.8597	20.8897	20.8843	20.8075	20.5025	20.0163	19.5937
Non living	18.6862	18.9759	19.3679	19.7852	20.0435	20.1674	20.1956	20.1930	20.1139	19.7642	19.1662	18.6311
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	20.3051	19.8727	20.1887	20.5288	20.7513	20.8597	20.8897	20.8843	20.8075	20.5025	20.0163	19.7904 (87)
Th 2	20.3092	20.3107	20.3123	20.3203	20.3218	20.3298	20.3298	20.3314	20.3266	20.3218	20.3187	20.3155 (88)
util rest of house	0.9175	0.8785	0.8111	0.6940	0.5431	0.3837	0.2675	0.3040	0.5027	0.7465	0.8803	0.9274 (89)
MIT 2	19.6621	18.9759	19.3679	19.7852	20.0435	20.1674	20.1956	20.1930	20.1139	19.7642	19.1662	18.9346 (90)
Living area fraction									fLA = Living area / (4) =			0.1177 (91)
MIT	19.7378	19.0814	19.4645	19.8727	20.1268	20.2489	20.2773	20.2744	20.1956	19.8511	19.2663	19.0353 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7378	19.0814	19.4645	19.8727	20.1268	20.2489	20.2773	20.2744	20.1956	19.8511	19.2663	19.0353 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9106	0.8568	0.7896	0.6774	0.5334	0.3788	0.2638	0.2998	0.4940	0.7270	0.8587	0.9125 (94)
Useful gains	860.1634	933.6648	972.7631	934.8762	791.4759	555.6074	369.5816	386.4134	579.4172	747.7765	791.8645	816.7869 (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	1621.5881	1485.9642	1355.1150	1132.7932	867.7890	574.4413	373.9468	392.9937	623.0084	952.6732	1259.1427	1543.0185 (97)
Space heating kWh	566.5000	371.1453	284.4698	142.5002	56.7770	0.0000	0.0000	0.0000	0.0000	152.4431	336.4403	540.3163 (98a)
Space heating requirement - total per year (kWh/year)												2450.5920
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	566.5000	371.1453	284.4698	142.5002	56.7770	0.0000	0.0000	0.0000	0.0000	152.4431	336.4403	540.3163 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2450.5920
Space heating per m ²										(98c) / (4) =		17.1706 (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 %)												372.6696 (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	566.5000	371.1453	284.4698	142.5002	56.7770	0.0000	0.0000	0.0000	0.0000	152.4431	336.4403	540.3163 (98)
Space heating efficiency (main heating system 1)	372.6696	372.6696	372.6696	372.6696	372.6696	0.0000	0.0000	0.0000	0.0000	372.6696	372.6696	372.6696 (210)
Space heating fuel (main heating system)	152.0113	99.5910	76.3330	38.2377	15.2352	0.0000	0.0000	0.0000	0.0000	40.9057	90.2784	144.9853 (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	251.0224	221.7978	235.3626	206.5561	199.9159	179.8243	177.3521	184.6408	186.9180	208.7887	222.4118	248.2535 (64)
Efficiency of water heater (217)m	200.1433	200.1433	200.1433	200.1433	200.1433	200.1433	200.1433	200.1433	200.1433	200.1433	200.1433	200.1433 (216)
Fuel for water heating, kWh/month	125.4213	110.8195	117.5970	103.2041	99.8864	89.8477	88.6125	92.2543	93.3921	104.3196	111.1263	124.0378 (219)
Space cooling fuel requirement												

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(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	0.0000	(221)
Pumps and Fa	31.8157	28.7368	31.8157	30.7894	31.8157	30.7894	31.8157	31.8157	30.7894	31.8157	30.7894	31.8157	31.8157	(231)
Lighting	32.1096	25.7595	23.1936	16.9926	13.1256	10.7237	11.9736	15.5638	20.2158	26.5242	29.9590	33.0021	33.0021	(232)
Electricity generated by PVs (Appendix M) (negative quantity)														
(233a)m	-62.4797	-91.7368	-136.9817	-156.3411	-168.7890	-155.9500	-153.8938	-144.4166	-126.2244	-104.9608	-69.2273	-53.2829	-53.2829	(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	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	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	-26.7853	-61.2903	-132.6895	-215.3326	-297.1711	-304.4172	-299.4760	-247.5779	-173.9234	-93.2955	-37.4984	-20.8237	-20.8237	(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													657.5776	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													200.1433	
Water heating fuel used													1260.5186	(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)													374.6044	(230a)
Total electricity for the above, kWh/year													374.6044	(231)
Electricity for lighting (calculated in Appendix L)													259.1432	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-3334.5650	(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													-782.7212	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	657.5776	16.4900	108.4346	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1260.5186	16.4900	207.8595	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	374.6044	16.4900	61.7723	(249)
Energy for lighting	259.1432	16.4900	42.7327	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1424.2842	16.4900	-234.8645	
PV Unit electricity exported	-1910.2808	5.5900	-106.7847	
Total			-341.6492	(252)
Total energy cost			79.1499	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)		0.1518	(257)
SAP value	$[(255) \times (256)] / [(4) + 45.0] =$	97.5395	
SAP rating (Section 12)		98	(258)
SAP band		A	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	657.5776	0.1562	102.6982	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1260.5186	0.1409	177.6400	(264)
Space and water heating			280.3383	(265)
Pumps, fans and electric keep-hot	374.6044	0.1387	51.9622	(267)
Energy for lighting	259.1432	0.1443	37.4024	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1424.2842	0.1343	-191.2406	
PV Unit electricity exported	-1910.2808	0.1239	-236.6873	
Total			-427.9279	(269)
Total CO2, kg/year			-58.2250	(272)
CO2 emissions per m2			-0.4100	(273)
EI value			100.4156	
EI rating			100	(274)
EI band			A	

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1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.8000 (1b)	x 2.5000 (2b)	= 182.0000 (1b) - (3b)
First floor	69.9200 (1c)	x 2.6500 (2c)	= 185.2880 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	142.7200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 367.2880 (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												2.0000 (17)	
Infiltration rate												0.1000 (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) =											0.0850 (21)	
Wind speed	Jan 5.6000	Feb 5.2000	Mar 5.1000	Apr 4.8000	May 4.7000	Jun 4.1000	Jul 4.2000	Aug 4.0000	Sep 4.3000	Oct 4.9000	Nov 4.9000	Dec 5.5000 (22)	
Wind factor	1.4000	1.3000	1.2750	1.2000	1.1750	1.0250	1.0500	1.0000	1.0750	1.2250	1.2250	1.3750 (22a)	
Adj infilt rate	0.1190	0.1105	0.1084	0.1020	0.0999	0.0871	0.0893	0.0850	0.0914	0.1041	0.1041	0.1169 (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	0.2140	0.2055	0.2034	0.1970	0.1949	0.1821	0.1842	0.1800	0.1864	0.1991	0.1991	0.2119 (25)	

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K					
Window (Uw = 1.20)			21.7400	1.1450	24.8931		(27)					
Door			3.9900	1.2000	4.7880		(26a)					
Floor 1 P/a 0.48			72.8000	0.1200	8.7360	75.0000	5460.0000 (28a)					
External Wall 1 Stone	52.5200	12.2700	40.2500	0.1700	6.8425	9.0000	362.2500 (29a)					
External Wall 2 Render	123.2200	13.4600	109.7600	0.1700	18.6592	9.0000	987.8400 (29a)					
External Roof 1 Horz	72.8000		72.8000	0.1000	7.2800	9.0000	655.2000 (30)					
Total net area of external elements Aum (A, m ²)			321.3400				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	71.1988		(33)					
Internal Wall 1 GF			122.6400			9.0000	1103.7600 (32c)					
Internal Wall 2 FF			142.5600			9.0000	1283.0400 (32c)					
Internal Floor 1			69.9200			18.0000	1258.5600 (32d)					
Internal Ceiling 1			69.9200			9.0000	629.2800 (32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	11739.9300 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							82.2585 (35)					
List of Thermal Bridges												
K1 Element				Length	Psi-value	Total						
E16 Corner (normal)				20.2000	0.0300	0.6060						
E5 Ground floor (normal)				34.8000	0.0210	0.7308						
E10 Eaves (insulation at ceiling level)				20.8000	0.0440	0.9152						
E6 Intermediate floor within a dwelling				34.8000	0.0800	2.7840						
E12 Gable (insulation at ceiling level)				14.0000	0.0510	0.7140						
E2 Other lintels (including other steel lintels)				18.1000	0.0840	1.5204						
E3 Sill				16.2000	0.0430	0.6966						
E4 Jamb				36.0000	0.0340	1.2240						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.1910 (36)					
Point Thermal bridges						(36a) =	0.0000					
Total fabric heat loss						(33) + (36) + (36a) =	80.3898 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 25.9379	Feb 24.9076	Mar 24.6501	Apr 23.8774	May 23.6198	Jun 22.0745	Jul 22.3320	Aug 21.8169	Sep 22.5896	Oct 24.1350	Nov 24.1350	Dec 25.6803 (38)
Heat transfer coeff	106.3277	105.2975	105.0399	104.2672	104.0097	102.4643	102.7219	102.2067	102.9794	104.5248	104.5248	106.0701 (39)
Average = Sum(39)m / 12 =												104.2028
HLP	Jan 0.7450	Feb 0.7378	Mar 0.7360	Apr 0.7306	May 0.7288	Jun 0.7179	Jul 0.7197	Aug 0.7161	Sep 0.7215	Oct 0.7324	Nov 0.7324	Dec 0.7432 (40)
HLP (average)												0.7301
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9221 (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)

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Hot water usage for baths	84.4572	83.2029	81.4365	78.1798	75.7411	73.0370	71.5764	73.3304	75.2402	78.1336	81.4575	84.1717 (42b)
Hot water usage for other uses	44.5551	42.9350	41.3148	39.6946	38.0744	36.4542	36.4542	38.0744	39.6946	41.3148	42.9350	44.5551 (42c)
Average daily hot water use (litres/day)												118.8098 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	129.0123	126.1378	122.7513	117.8743	113.8155	109.4912	108.0306	111.4048	114.9347	119.4484	124.3924	128.7268 (44)
Distribution loss (46)m = 0.15 x (45)m	204.3240	179.6186	188.6642	161.3641	153.2175	134.6323	130.6537	137.9424	141.7260	162.0903	177.2198	201.5551 (45)
Water storage loss:	30.6486	26.9428	28.2996	24.2046	22.9826	20.1948	19.5981	20.6914	21.2589	24.3135	26.5830	30.2333 (46)
Store volume												250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.4000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7560 (55)
Total storage loss	23.4360	21.1680	23.4360	22.6800	23.4360	22.6800	23.4360	23.4360	22.6800	23.4360	22.6800	23.4360 (56)
If cylinder contains dedicated solar storage	23.4360	21.1680	23.4360	22.6800	23.4360	22.6800	23.4360	23.4360	22.6800	23.4360	22.6800	23.4360 (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	251.0224	221.7978	235.3626	206.5561	199.9159	179.8243	177.3521	184.6408	186.9180	208.7887	222.4118	248.2535 (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	251.0224	221.7978	235.3626	206.5561	199.9159	179.8243	177.3521	184.6408	186.9180	208.7887	222.4118	248.2535 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower (s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	105.2964	93.4665	100.0896	89.8072	88.3036	80.9188	80.8011	83.2246	83.2775	91.2538	95.0792	104.3758 (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	175.3255	175.3255	175.3255	175.3255	175.3255	175.3255	175.3255	175.3255	175.3255	175.3255	175.3255	175.3255 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	36.6844	32.5828	26.4981	20.0608	14.9956	12.6600	13.6795	17.7812	23.8659	30.3032	35.3683	37.7040 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	466.3940	471.2337	459.0378	433.0741	400.2997	369.4963	348.9178	344.0780	356.2740	382.2376	415.0121	445.8154 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.4546	55.4546	55.4546	55.4546	55.4546	55.4546	55.4546	55.4546	55.4546	55.4546	55.4546	55.4546 (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)	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837 (71)
Water heating gains (Table 5)	141.5275	139.0871	134.5290	124.7322	118.6876	112.3873	108.6036	111.8610	115.6632	122.6529	132.0544	140.2900 (72)
Total internal gains	758.5023	756.8000	733.9613	691.7635	647.8794	608.4400	585.0974	587.6167	609.6995	649.0902	696.3313	737.7059 (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							
Northeast	11.5700	15.4493	0.7600	0.7000	0.7700	65.9001 (75)						
Southwest	10.1700	47.1180	0.7600	0.7000	0.7700	176.6660 (79)						
Solar gains	242.5662	368.2205	543.7515	767.5428	878.5226	971.9055	825.9121	772.9901	635.5135	427.1210	283.9006	211.3546 (83)
Total gains	1001.0685	1125.0206	1277.7129	1459.3063	1526.4020	1580.3455	1411.0095	1360.6068	1245.2130	1076.2112	980.2319	949.0605 (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	30.6702	30.9703	31.0462	31.2763	31.3537	31.8266	31.7468	31.9068	31.6674	31.1992	31.1992	30.7447
alpha	3.0447	3.0647	3.0697	3.0851	3.0902	3.1218	3.1165	3.1271	3.1112	3.0799	3.0799	3.0496
util living area	0.8951	0.8604	0.7921	0.6839	0.5620	0.4045	0.3473	0.3577	0.5109	0.7237	0.8484	0.9020 (86)
Living	19.8894	20.0567	20.3197	20.5826	20.7586	20.8630	20.8823	20.8813	20.8239	20.5937	20.2353	19.8826
Non living	18.9921	19.2031	19.5255	19.8420	20.0453	20.1652	20.1827	20.1853	20.1254	19.8631	19.4326	18.9860
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	20.4319	20.0567	20.3197	20.5826	20.7586	20.8630	20.8823	20.8813	20.8239	20.5937	20.2353	20.0389 (87)
Th 2	20.3012	20.3076	20.3092	20.3139	20.3155	20.3250	20.3234	20.3266	20.3218	20.3123	20.3123	20.3028 (88)
util rest of house	0.8843	0.8471	0.7734	0.6587	0.5295	0.3662	0.3020	0.3114	0.4677	0.6934	0.8314	0.8916 (89)
MIT 2	19.7793	19.2031	19.5255	19.8420	20.0453	20.1652	20.1827	20.1853	20.1254	19.8631	19.4326	19.2233 (90)
Living area fraction												0.1177 (91)
MIT	19.8561	19.3036	19.6190	19.9292	20.1292	20.2474	20.2651	20.2672	20.2077	19.9491	19.5271	19.3193 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8561	19.3036	19.6190	19.9292	20.1292	20.2474	20.2651	20.2672	20.2077	19.9491	19.5271	19.3193 (93)

8. Space heating requirement

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8768	0.8248	0.7529	0.6437	0.5203	0.3617	0.2981	0.3073	0.4602	0.6760	0.8092	0.8743	(94)
Useful gains	877.7003	927.9322	961.9688	939.2878	794.1257	571.6525	420.5575	418.1081	572.9981	727.4943	793.2348	829.8109	(95)
Ext temp.	5.9000	6.2000	7.5000	9.3000	11.8000	14.5000	16.1000	16.1000	14.3000	11.5000	8.6000	6.2000	(96)
Heat loss rate W	1483.9247	1379.7780	1272.9808	1108.2766	866.3224	588.8994	427.8437	425.9158	608.3665	883.1388	1142.1491	1391.5640	(97)
Space heating kWh	451.0310	303.6404	231.3930	121.6720	53.7143	0.0000	0.0000	0.0000	0.0000	115.7995	251.2183	417.9443	(98a)
Space heating requirement - total per year (kWh/year)												1946.4127	
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	451.0310	303.6404	231.3930	121.6720	53.7143	0.0000	0.0000	0.0000	0.0000	115.7995	251.2183	417.9443	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1946.4127	
Space heating per m2										(98c) / (4) =		13.6380	(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 %)													372.0224	(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	451.0310	303.6404	231.3930	121.6720	53.7143	0.0000	0.0000	0.0000	0.0000	115.7995	251.2183	417.9443	(98)		
Space heating efficiency (main heating system 1)	372.0224	372.0224	372.0224	372.0224	372.0224	0.0000	0.0000	0.0000	0.0000	372.0224	372.0224	372.0224	(210)		
Space heating fuel (main heating system)	121.2376	81.6188	62.1987	32.7056	14.4385	0.0000	0.0000	0.0000	0.0000	31.1270	67.5277	112.3438	(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	251.0224	221.7978	235.3626	206.5561	199.9159	179.8243	177.3521	184.6408	186.9180	208.7887	222.4118	248.2535	(64)		
Efficiency of water heater (217)m	200.0316	200.0316	200.0316	200.0316	200.0316	200.0316	200.0316	200.0316	200.0316	200.0316	200.0316	200.0316	(216)		
Fuel for water heating, kWh/month	125.4914	110.8814	117.6627	103.2618	99.9422	89.8979	88.6621	92.3058	93.4443	104.3779	111.1884	124.1072	(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	31.8157	28.7368	31.8157	30.7894	31.8157	30.7894	31.8157	30.7894	31.8157	30.7894	31.8157	31.8157	(231)		
Lighting	32.1096	25.7595	23.1936	16.9926	13.1256	10.7237	11.9736	15.5638	20.2158	26.5242	29.9590	33.0021	(232)		
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-78.0801	-99.3634	-144.8301	-165.2408	-172.3575	-164.1161	-154.4185	-151.2202	-135.3380	-114.0891	-83.0907	-68.5127	(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	-41.1211	-73.3504	-153.1034	-249.9723	-315.4331	-354.2206	-302.3498	-280.4337	-205.9295	-113.0301	-54.2567	-33.5175	(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													523.1977	(211)	
Space heating fuel - main system 2													0.0000	(213)	
Space heating fuel - secondary													0.0000	(215)	
Efficiency of water heater													200.0316		
Water heating fuel used													1261.2231	(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)														374.6044	(230a)
Total electricity for the above, kWh/year														374.6044	(231)
Electricity for lighting (calculated in Appendix L)														259.1432	(232)
Energy saving/generation technologies (Appendices M ,N and Q)															
PV generation														-3707.3754	(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														-1289.2071	(238)

10a. Fuel costs - using BEDF prices (538)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	523.1977	25.1600	131.6365	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1261.2231	25.1600	317.3237	(247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000	(247a)
Pumps, fans and electric keep-hot	374.6044	25.1600	94.2505	(249)
Energy for lighting	259.1432	25.1600	65.2004	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1530.6573	25.1600	-385.1134	
PV Unit electricity exported	-2176.7181	5.8100	-126.4673	
Total			-511.5807	(252)

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Total energy cost

96.8305 (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	523.1977	0.1561	81.6619 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1261.2231	0.1409	177.7393 (264)
Space and water heating			259.4012 (265)
Pumps, fans and electric keep-hot	374.6044	0.1387	51.9622 (267)
Energy for lighting	259.1432	0.1443	37.4024 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1530.6573	0.1350	-206.6775
PV Unit electricity exported	-2176.7181	0.1255	-273.1927
Total			-479.8702 (269)
Total CO2, kg/year			-131.1043 (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	523.1977	1.5778	825.5011 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1261.2231	1.5211	1918.4401 (278)
Space and water heating			2743.9412 (279)
Pumps, fans and electric keep-hot	374.6044	1.5128	566.7015 (281)
Energy for lighting	259.1432	1.5338	397.4825 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1530.6573	1.4990	-2294.5179
PV Unit electricity exported	-2176.7181	0.4607	-1002.8361
Total			-3297.3540 (283)
Total Primary energy kWh/year			410.7712 (286)

 SAP 10 EPC IMPROVEMENTS

SECI ASHP Recog Const Details

Current energy efficiency rating: A 98
 Current environmental impact rating: A 100

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

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.2	-£ 65	-38 kg (28.8%)

Recommended measures	Typical annual savings		Energy efficiency	Environmental impact
Solar water heating	£65	0.26 kg/m ²	A 99	A 101
Total Savings	£65	0.26 kg/m²		

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

Fuel prices for cost data on this page from database revision number 538 TEST (29 Feb 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	£608	£532	£77
Space heating	£226	£246	-£20
Water heating	£317	£220	£97
Lighting	£65	£65	£0
Generated (PV)	-£512	-£500	-£11
Total cost of fuels	£96	£32	£66
Total cost of uses	£96	£31	£66
Delivered energy	-9 kWh/m ²	-11 kWh/m ²	2 kWh/m ²
Carbon dioxide emissions	-0.1 tonnes	-0.2 tonnes	0.0 tonnes
CO2 emissions per m ²	-1 kg/m ²	-1 kg/m ²	0 kg/m ²
Primary energy	3 kWh/m ²	0 kWh/m ²	3 kWh/m ²

 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 Storey height Volume

Full SAP Calculation Printout



Ground floor		(m2)		(m)		(m3)
First floor		72.8000 (1b)	x	2.5000 (2b)	=	182.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	142.7200	69.9200 (1c)	x	2.6500 (2c)	=	185.2880 (1c) - (3c)
Dwelling volume						(4)
						(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 367.2880 (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													2.0000 (17)
Infiltration rate													0.1000 (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) =	0.0850 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(22)
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)
	0.1084	0.1063	0.1041	0.0935	0.0914	0.0808	0.0808	0.0786	0.0850	0.0914	0.0956	0.0999	(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	0.2034	0.2012	0.1991	0.1885	0.1864	0.1757	0.1757	0.1736	0.1800	0.1864	0.1906	0.1949	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
Window (Uw = 1.20)			21.7400	1.1450	24.8931		(27)						
Door			3.9900	1.2000	4.7880		(26a)						
Floor 1 P/a 0.48			72.8000	0.1200	8.7360	75.0000	5460.0000 (28a)						
External Wall 1 Stone	52.5200	12.2700	40.2500	0.1700	6.8425	9.0000	362.2500 (29a)						
External Wall 2 Render	123.2200	13.4600	109.7600	0.1700	18.6592	9.0000	987.8400 (29a)						
External Roof 1 Horz	72.8000		72.8000	0.1000	7.2800	9.0000	655.2000 (30)						
Total net area of external elements Aum(A, m2)			321.3400				(31)						
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	71.1988	(33)						
Internal Wall 1 GF			122.6400			9.0000	1103.7600 (32c)						
Internal Wall 2 FF			142.5600			9.0000	1283.0400 (32c)						
Internal Floor 1			69.9200			18.0000	1258.5600 (32d)						
Internal Ceiling 1			69.9200			9.0000	629.2800 (32e)						
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 11739.9300 (34)						
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							82.2585 (35)						
List of Thermal Bridges													
K1 Element				Length	Psi-value	Total							
E16 Corner (normal)				20.2000	0.0300	0.6060							
E5 Ground floor (normal)				34.8000	0.0210	0.7308							
E10 Eaves (insulation at ceiling level)				20.8000	0.0440	0.9152							
E6 Intermediate floor within a dwelling				34.8000	0.0800	2.7840							
E12 Gable (insulation at ceiling level)				14.0000	0.0510	0.7140							
E2 Other lintels (including other steel lintels)				18.1000	0.0840	1.5204							
E3 Sill				16.2000	0.0430	0.6966							
E4 Jamb				36.0000	0.0340	1.2240							
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.1910 (36)						
Point Thermal bridges							(36a) = 0.0000						
Total fabric heat loss							(33) + (36) + (36a) = 80.3898 (37)						
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(38)
Heat transfer coeff	24.6501	24.3925	24.1350	22.8472	22.5896	21.3018	21.3018	21.0442	21.8169	22.5896	23.1047	23.6198	(38)
Average = Sum(39)m / 12 =	105.0399	104.7823	104.5248	103.2370	102.9794	101.6916	101.6916	101.4341	102.2067	102.9794	103.4945	104.0097	(39)
													103.1726
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(40)
HLP (average)	0.7360	0.7342	0.7324	0.7234	0.7215	0.7125	0.7125	0.7107	0.7161	0.7215	0.7252	0.7288	(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													2.9221 (42)
Hot water usage for mixer showers													0.0000 (42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Hot water usage for other uses	84.4572	83.2029	81.4365	78.1798	75.7411	73.0370	71.5764	73.3304	75.2402	78.1336	81.4575	84.1717	(42b)
Average daily hot water use (litres/day)	44.5551	42.9350	41.3148	39.6946	38.0744	36.4542	36.4542	38.0744	39.6946	41.3148	42.9350	44.5551	(42c)
													118.8098 (43)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	129.0123	126.1378	122.7513	117.8743	113.8155	109.4912	108.0306	111.4048	114.9347	119.4484	124.3924	128.7268	(44)
Energy content (annual)	204.3240	179.6186	188.6642	161.3641	153.2175	134.6323	130.6537	137.9424	141.7260	162.0903	177.2198	201.5551	(45)
Distribution loss (46)m = 0.15 x (45)m	30.6486	26.9428	28.2996	24.2046	22.9826	20.1948	19.5981	20.6914	21.2589	24.3135	26.5830	30.2333	(46)
Water storage loss:													
Store volume													250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.4000 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.7560 (55)
Total storage loss	23.4360	21.1680	23.4360	22.6800	23.4360	22.6800	23.4360	23.4360	22.6800	23.4360	22.6800	23.4360	(56)
If cylinder contains dedicated solar storage	23.4360	21.1680	23.4360	22.6800	23.4360	22.6800	23.4360	23.4360	22.6800	23.4360	22.6800	23.4360	(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	251.0224	221.7978	233.9669	199.8025	187.1216	167.2175	164.3252	172.5444	181.5152	207.3930	222.4118	248.2535	(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													609.8963 (H24)
Heat delivered to space heating													0.0000 (H29)
Solar input													609.8963
Solar input	-0.0000	-16.2273	-57.7663	-78.8721	-102.1817	-93.9991	-93.2384	-81.9806	-57.0370	-28.5937	-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	251.0224	205.5705	176.2006	120.9303	84.9400	73.2184	71.0868	90.5637	124.4781	178.7992	222.4118	248.2535	(64)
													Total per year (kWh/year) = Sum(64)m = 1847.4754 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
													Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month	105.2964	93.4665	98.9730	84.4043	78.0681	70.8335	70.3795	73.5474	78.9552	90.1372	95.0792	104.3758	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	175.3255	175.3255	175.3255	175.3255	175.3255	175.3255	175.3255	175.3255	175.3255	175.3255	175.3255	175.3255	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	36.6844	32.5828	26.4981	20.0608	14.9956	12.6600	13.6795	17.7812	23.8659	30.3032	35.3683	37.7040	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	466.3940	471.2337	459.0378	433.0741	400.2997	369.4963	348.9178	344.0780	356.2740	382.2376	415.0121	445.8154	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.4546	55.4546	55.4546	55.4546	55.4546	55.4546	55.4546	55.4546	55.4546	55.4546	55.4546	55.4546	(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)	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	(71)
Water heating gains (Table 5)	141.5275	139.0871	133.0282	117.2282	104.9302	98.3798	94.5961	98.8541	109.6600	121.1521	132.0544	140.2900	(72)
Total internal gains	758.5023	756.8000	732.4605	684.2595	634.1220	594.4325	571.0899	574.6098	603.6963	647.5894	696.3313	737.7059	(73)

6. Solar gains

[Jan]		Area	Solar flux	g	FF	Access	Gains						
		m ²	Table 6a	Specific data	Specific data	factor	W						
			W/m ²	or Table 6b	or Table 6c	Table 6d							
Northeast		11.5700	11.2829	0.7600	0.7000	0.7700	48.1283 (75)						
Southwest		10.1700	36.7938	0.7600	0.7000	0.7700	137.9561 (79)						
Solar gains	186.0844	332.9568	498.0285	688.2549	835.8667	858.3976	815.6951	701.2014	563.2160	379.4372	225.7975	157.3657	(83)
Total gains	944.5867	1089.7568	1230.4890	1372.5144	1469.9888	1452.8301	1386.7850	1275.8112	1166.9123	1027.0266	922.1287	895.0716	(84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	31.0462	31.1225	31.1992	31.5884	31.6674	32.0684	32.0684	32.1499	31.9068	31.6674	31.5098	31.3537	
alpha	3.0697	3.0748	3.0799	3.1059	3.1112	3.1379	3.1379	3.1433	3.1271	3.1112	3.1007	3.0902	
util living area	0.9249	0.8889	0.8271	0.7197	0.5792	0.4273	0.3163	0.3557	0.5478	0.7724	0.8922	0.9340	(86)
Living	19.6416	19.8727	20.1876	20.5254	20.7483	20.8587	20.8893	20.8838	20.8065	20.5016	20.0163	19.5937	
Non living	18.6862	18.9759	19.3666	19.7813	20.0404	20.1664	20.1953	20.1926	20.1129	19.7632	19.1662	18.6311	
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	20.3051	19.8727	20.1876	20.5254	20.7483	20.8587	20.8893	20.8838	20.8065	20.5016	20.0163	19.7904	(87)
Th 2	20.3092	20.3107	20.3123	20.3203	20.3218	20.3298	20.3298	20.3314	20.3266	20.3218	20.3187	20.3155	(88)
util rest of house													
	0.9175	0.8785	0.8115	0.6963	0.5470	0.3871	0.2701	0.3070	0.5048	0.7470	0.8803	0.9274	(89)
MIT 2	19.6621	18.9759	19.3666	19.7813	20.0404	20.1664	20.1953	20.1926	20.1129	19.7632	19.1662	18.9346	(90)
Living area fraction													fLA = Living area / (4) = 0.1177 (91)

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MIT	19.7378	19.0814	19.4632	19.8689	20.1237	20.2479	20.2770	20.2740	20.1945	19.8501	19.2663	19.0353 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7378	19.0814	19.4632	19.8689	20.1237	20.2479	20.2770	20.2740	20.1945	19.8501	19.2663	19.0353 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9106	0.8568	0.7900	0.6796	0.5372	0.3820	0.2664	0.3027	0.4960	0.7276	0.8587	0.9125 (94)	
Useful gains	860.1634	933.6648	972.0597	932.7144	789.6637	555.0525	369.4329	386.1927	578.8147	747.2370	791.8645	816.7869 (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	1621.5881	1485.9642	1354.9789	1132.3940	867.4702	574.3468	373.9210	392.9556	622.9029	952.5716	1259.1427	1543.0185 (97)	
Space heating kWh	566.5000	371.1453	284.8919	143.7693	57.8881	0.0000	0.0000	0.0000	0.0000	152.7689	336.4403	540.3163 (98a)	
Space heating requirement - total per year (kWh/year)												2453.7200	
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	566.5000	371.1453	284.8919	143.7693	57.8881	0.0000	0.0000	0.0000	0.0000	152.7689	336.4403	540.3163 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												2453.7200	
Space heating per m2											(98c) / (4) =	17.1925 (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 %)													372.6696 (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	566.5000	371.1453	284.8919	143.7693	57.8881	0.0000	0.0000	0.0000	0.0000	152.7689	336.4403	540.3163 (98)	
Space heating efficiency (main heating system 1)	372.6696	372.6696	372.6696	372.6696	372.6696	0.0000	0.0000	0.0000	0.0000	372.6696	372.6696	372.6696 (210)	
Space heating fuel (main heating system)	152.0113	99.5910	76.4462	38.5782	15.5334	0.0000	0.0000	0.0000	0.0000	40.9931	90.2784	144.9853 (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	251.0224	205.5705	176.2006	120.9303	84.9400	73.2184	71.0868	90.5637	124.4781	178.7992	222.4118	248.2535 (64)	
Efficiency of water heater	200.1433	200.1433	200.1433	200.1433	200.1433	200.1433	200.1433	200.1433	200.1433	200.1433	200.1433	200.1433 (216)	
Fuel for water heating, kWh/month	125.4213	102.7116	88.0372	60.4219	42.4396	36.5830	35.5179	45.2494	62.1945	89.3356	111.1263	124.0378 (219)	
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)	
Pumps and Fa	38.6102	34.8738	38.6102	37.3647	38.6102	37.3647	38.6102	38.6102	37.3647	38.6102	37.3647	38.6102 (231)	
Lighting	32.1096	25.7595	23.1936	16.9926	13.1256	10.7237	11.9736	15.5638	20.2158	26.5242	29.9590	33.0021 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)	-62.5885	-91.6577	-135.1793	-151.3767	-159.0181	-145.6992	-143.7619	-136.8964	-122.8341	-104.4101	-69.3999	-53.3715 (233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)	
Electricity generated by PVs (Appendix M) (negative quantity)	-26.6765	-61.3695	-134.4918	-220.2970	-306.9420	-314.6679	-309.6078	-255.0981	-177.3138	-93.8463	-37.3257	-20.7351 (233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)	
Annual totals kWh/year													
Space heating fuel - main system 1													658.4170 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													200.1433
Water heating fuel used													923.0761 (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)													374.6044 (230a)
pump for solar water heating													80.0000 (230g)
Total electricity for the above, kWh/year													454.6044 (231)
Electricity for lighting (calculated in Appendix L)													259.1432 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-3334.5650 (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													-1039.3243 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	658.4170	16.4900	108.5730	(240)

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Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	923.0761	16.4900	152.2152 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	374.6044	16.4900	61.7723 (249)
Pump for solar water heating	80.0000	16.4900	13.1920 (249)
Energy for lighting	259.1432	16.4900	42.7327 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1376.1934	16.4900	-226.9343
PV Unit electricity exported	-1958.3716	5.5900	-109.4730
Total			-336.4073 (252)
Total energy cost			42.0779 (255)

 11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.0807 (257)
SAP value		98.6919
SAP rating (Section 12)		99 (258)
SAP band		A

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	658.4170	0.1562	102.8155 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	923.0761	0.1460	134.7256 (264)
Space and water heating			237.5410 (265)
Pumps, fans and electric keep-hot	454.6044	0.1387	63.0592 (267)
Energy for lighting	259.1432	0.1443	37.4024 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1376.1934	0.1347	-185.3252
PV Unit electricity exported	-1958.3716	0.1236	-242.1368
Total			-427.4620 (269)
Total CO2, kg/year			-89.4594 (272)
CO2 emissions per m2			-0.6300 (273)
EI value			100.6386
EI rating			101 (274)
EI band			A

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

 1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	72.8000 (1b)	x 2.5000 (2b)	= 182.0000 (1b) - (3b)
First floor	69.9200 (1c)	x 2.6500 (2c)	= 185.2880 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	142.7200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	367.2880 (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	2.0000	(17)
Infiltration rate	0.1000	(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) =	0.0850 (21)
Wind speed	Jan 5.6000 Feb 5.2000 Mar 5.1000 Apr 4.8000 May 4.7000 Jun 4.1000 Jul 4.2000 Aug 4.0000 Sep 4.3000 Oct 4.9000 Nov 4.9000 Dec 5.5000	(22)
Wind factor	1.4000 1.3000 1.2750 1.2000 1.1750 1.0250 1.0500 1.0000 1.0750 1.2250 1.2250 1.3750	(22a)
Adj infilt rate	0.1190 0.1105 0.1084 0.1020 0.0999 0.0871 0.0893 0.0850 0.0914 0.1041 0.1041 0.1169	(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)

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If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 81.0000 (23c)
 Effective ac 0.2140 0.2055 0.2034 0.1970 0.1949 0.1821 0.1842 0.1800 0.1864 0.1991 0.1991 0.2119 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Window (Uw = 1.20)			21.7400	1.1450	24.8931		(27)
Door			3.9900	1.2000	4.7880		(26a)
Floor 1 P/a 0.48			72.8000	0.1200	8.7360	75.0000	5460.0000 (28a)
External Wall 1 Stone	52.5200	12.2700	40.2500	0.1700	6.8425	9.0000	362.2500 (29a)
External Wall 2 Render	123.2200	13.4600	109.7600	0.1700	18.6592	9.0000	987.8400 (29a)
External Roof 1 Horz	72.8000		72.8000	0.1000	7.2800	9.0000	655.2000 (30)
Total net area of external elements Aum(A, m2)			321.3400				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 71.1988		(33)
Internal Wall 1 GF			122.6400			9.0000	1103.7600 (32c)
Internal Wall 2 FF			142.5600			9.0000	1283.0400 (32c)
Internal Floor 1			69.9200			18.0000	1258.5600 (32d)
Internal Ceiling 1			69.9200			9.0000	629.2800 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 11739.9300 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 82.2585 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	20.2000	0.0300	0.6060
E5 Ground floor (normal)	34.8000	0.0210	0.7308
E10 Eaves (insulation at ceiling level)	20.8000	0.0440	0.9152
E6 Intermediate floor within a dwelling	34.8000	0.0800	2.7840
E12 Gable (insulation at ceiling level)	14.0000	0.0510	0.7140
E2 Other lintels (including other steel lintels)	18.1000	0.0840	1.5204
E3 Sill	16.2000	0.0430	0.6966
E4 Jamb	36.0000	0.0340	1.2240

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.1910 (36)

Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 80.3898 (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	25.9379	24.9076	24.6501	23.8774	23.6198	22.0745	22.3320	21.8169	22.5896	24.1350	24.1350	25.6803 (38)
Average = Sum(39)m / 12 =	106.3277	105.2975	105.0399	104.2672	104.0097	102.4643	102.7219	102.2067	102.9794	104.5248	104.5248	106.0701 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7450	0.7378	0.7360	0.7306	0.7288	0.7179	0.7197	0.7161	0.7215	0.7324	0.7324	0.7432 (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													2.9221 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	84.4572	83.2029	81.4365	78.1798	75.7411	73.0370	71.5764	73.3304	75.2402	78.1336	81.4575	84.1717	84.1717 (42b)
Hot water usage for other uses	44.5551	42.9350	41.3148	39.6946	38.0744	36.4542	36.4542	38.0744	39.6946	41.3148	42.9350	44.5551	44.5551 (42c)
Average daily hot water use (litres/day)													118.8098 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	129.0123	126.1378	122.7513	117.8743	113.8155	109.4912	108.0306	111.4048	114.9347	119.4484	124.3924	128.7268 (44)
Energy content (annual)	204.3240	179.6186	188.6642	161.3641	153.2175	134.6323	130.6537	137.9424	141.7260	162.0903	177.2198	201.5551 (45)
Distribution loss (46)m = 0.15 x (45)m	30.6486	26.9428	28.2996	24.2046	22.9826	20.1948	19.5981	20.6914	21.2589	24.3135	26.5830	30.2333 (46)

Water storage loss: 250.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.4000 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7560 (55)

Total storage loss 23.4360 21.1680 23.4360 22.6800 23.4360 22.6800 23.4360 23.4360 22.6800 23.4360 22.6800 23.4360 23.4360 (56)

If cylinder contains dedicated solar storage 23.4360 21.1680 23.4360 22.6800 23.4360 22.6800 23.4360 23.4360 22.6800 23.4360 22.6800 23.4360 23.4360 (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 251.0224 221.7978 233.9669 199.8025 187.1216 167.2175 164.3252 172.5444 181.5152 207.3930 222.4118 248.2535 (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 704.8974 (H24)

Heat delivered to space heating 0.0000 (H29)

Solar input 704.8974

Solar input -6.9054 -24.1076 -67.7413 -90.5883 -107.1165 -106.1254 -93.1385 -91.0709 -68.4075 -39.2143 -10.4818 -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 244.1170 197.6902 166.2256 109.2142 80.0051 61.0921 71.1867 81.4735 113.1076 168.1786 211.9300 248.2535 (64)

Electric shower(s) Total per year (kWh/year) = Sum(64)m = 1752.4742 (64)

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0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												
Heat gains from water heating, kWh/month	105.2964	93.4665	98.9730	84.4043	78.0681	70.8335	70.3795	73.5474	78.9552	90.1372	95.0792	104.3758 (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
	175.3255	175.3255	175.3255	175.3255	175.3255	175.3255	175.3255	175.3255	175.3255	175.3255	175.3255	175.3255 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	36.6844	32.5828	26.4981	20.0608	14.9956	12.6600	13.6795	17.7812	23.8659	30.3032	35.3683	37.7040 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	466.3940	471.2337	459.0378	433.0741	400.2997	369.4963	348.9178	344.0780	356.2740	382.2376	415.0121	445.8154 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	55.4546	55.4546	55.4546	55.4546	55.4546	55.4546	55.4546	55.4546	55.4546	55.4546	55.4546	55.4546 (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)												
	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837	-116.8837 (71)
Water heating gains (Table 5)												
	141.5275	139.0871	133.0282	117.2282	104.9302	98.3798	94.5961	98.8541	109.6600	121.1521	132.0544	140.2900 (72)
Total internal gains												
	758.5023	756.8000	732.4605	684.2595	634.1220	594.4325	571.0899	574.6098	603.6963	647.5894	696.3313	737.7059 (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							
Northeast	11.5700	15.4493	0.7600	0.7000	0.7700	65.9001 (75)						
Southwest	10.1700	47.1180	0.7600	0.7000	0.7700	176.6660 (79)						
Solar gains	242.5662	368.2205	543.7515	767.5428	878.5226	971.9055	825.9121	772.9901	635.5135	427.1210	283.9006	211.3546 (83)
Total gains	1001.0685	1125.0206	1276.2121	1451.8023	1512.6447	1566.3380	1397.0020	1347.5998	1239.2098	1074.7104	980.2319	949.0605 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	30.6702	30.9703	31.0462	31.2763	31.3537	31.8266	31.7468	31.9068	31.6674	31.1992	31.1992	30.7447
util living area	3.0447	3.0647	3.0697	3.0851	3.0902	3.1218	3.1165	3.1271	3.1112	3.0799	3.0799	3.0496
	0.8951	0.8604	0.7925	0.6861	0.5659	0.4078	0.3506	0.3609	0.5129	0.7243	0.8484	0.9020 (86)
Living	19.8894	20.0567	20.3187	20.5797	20.7559	20.8622	20.8818	20.8808	20.8230	20.5930	20.2353	19.8826
Non living	18.9921	19.2031	19.5244	19.8387	20.0424	20.1644	20.1823	20.1849	20.1246	19.8623	19.4326	18.9860
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	20.4319	20.0567	20.3187	20.5797	20.7559	20.8622	20.8818	20.8808	20.8230	20.5930	20.2353	20.0389 (87)
Th 2	20.3012	20.3076	20.3092	20.3139	20.3155	20.3250	20.3234	20.3266	20.3218	20.3123	20.3123	20.3028 (88)
util rest of house	0.8843	0.8471	0.7738	0.6609	0.5333	0.3692	0.3049	0.3143	0.4696	0.6940	0.8314	0.8916 (89)
MIT 2	19.7793	19.2031	19.5244	19.8387	20.0424	20.1644	20.1823	20.1849	20.1246	19.8623	19.4326	19.2233 (90)
Living area fraction										FLA = Living area / (4) = 0.1177 (91)		
MIT	19.8561	19.3036	19.6179	19.9259	20.1264	20.2466	20.2647	20.2668	20.2068	19.9483	19.5271	19.3193 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8561	19.3036	19.6179	19.9259	20.1264	20.2466	20.2647	20.2668	20.2068	19.9483	19.5271	19.3193 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.8768	0.8248	0.7533	0.6457	0.5239	0.3647	0.3009	0.3101	0.4620	0.6765	0.8092	0.8743 (94)
Useful gains	877.7003	927.9322	961.3616	937.4439	792.4439	571.1769	420.3193	417.8634	572.5221	727.0632	793.2348	829.8109 (95)
Ext temp.	5.9000	6.2000	7.5000	9.3000	11.8000	14.5000	16.1000	16.1000	14.3000	11.5000	8.6000	6.2000 (96)
Heat loss rate W	1483.9247	1379.7780	1272.8642	1107.9379	866.0257	588.8183	427.8025	425.8736	608.2834	883.0581	1142.1491	1391.5640 (97)
Space heating kWh	451.0310	303.6404	231.7580	122.7557	54.7448	0.0000	0.0000	0.0000	0.0000	116.0602	251.2183	417.9443 (98a)
Space heating requirement - total per year (kWh/year)												
Solar heating kWh	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												
Space heating kWh	451.0310	303.6404	231.7580	122.7557	54.7448	0.0000	0.0000	0.0000	0.0000	116.0602	251.2183	417.9443 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												
Space heating per m2												1949.1526 (98c) / (4) = 13.6572 (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 %)												372.0224 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	451.0310	303.6404	231.7580	122.7557	54.7448	0.0000	0.0000	0.0000	0.0000	116.0602	251.2183	417.9443 (98)
Space heating efficiency (main heating system 1)	372.0224	372.0224	372.0224	372.0224	372.0224	0.0000	0.0000	0.0000	0.0000	372.0224	372.0224	372.0224 (210)
Space heating fuel (main heating system)												

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Space heating efficiency (main heating system 2)	121.2376	81.6188	62.2968	32.9969	14.7155	0.0000	0.0000	0.0000	0.0000	31.1971	67.5277	112.3438	(211)
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	(212)
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	(213)
Water heating requirement	244.1170	197.6902	166.2256	109.2142	80.0051	61.0921	71.1867	81.4735	113.1076	168.1786	211.9300	248.2535	(64)
Efficiency of water heater (217)m	200.0316	200.0316	200.0316	200.0316	200.0316	200.0316	200.0316	200.0316	200.0316	200.0316	200.0316	200.0316	(216)
Fuel for water heating, kWh/month	122.0393	98.8295	83.0997	54.5985	39.9962	30.5412	35.5877	40.7303	56.5449	84.0761	105.9483	124.1072	(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	38.6102	34.8738	38.6102	37.3647	38.6102	37.3647	38.6102	38.6102	37.3647	38.6102	37.3647	38.6102	(231)
Lighting	32.1096	25.7595	23.1936	16.9926	13.1256	10.7237	11.9736	15.5638	20.2158	26.5242	29.9590	33.0021	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-78.1633	-99.0756	-142.2798	-158.6280	-161.5842	-151.0940	-144.2211	-141.9689	-130.5274	-112.9863	-83.1419	-68.6571	(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	-41.0379	-73.6382	-155.6537	-256.5851	-326.2064	-367.2427	-312.5471	-289.6850	-210.7402	-114.1329	-54.2055	-33.3731	(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												523.9342	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												200.0316	(216)
Water heating fuel used												876.0989	(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)												374.6044	(230a)
pump for solar water heating												80.0000	(230g)
Total electricity for the above, kWh/year												454.6044	(231)
Electricity for lighting (calculated in Appendix L)												259.1432	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-3707.3754	(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												-1593.5948	(238)

10a. Fuel costs - using BEDF prices (538)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost E/year	
Space heating - main system 1	523.9342	25.1600	131.8218	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	876.0989	25.1600	220.4265	(247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000	(247a)
Pumps, fans and electric keep-hot	374.6044	25.1600	94.2505	(249)
Pump for solar water heating	80.0000	25.1600	20.1280	(249)
Energy for lighting	259.1432	25.1600	65.2004	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1472.3275	25.1600	-370.4376	
PV Unit electricity exported	-2235.0479	5.8100	-129.8563	
Total			-500.2939	(252)
Total energy cost			31.5333	(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	523.9342	0.1561	81.7647	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	876.0989	0.1464	128.2439	(264)
Space and water heating			210.0086	(265)
Pumps, fans and electric keep-hot	454.6044	0.1387	63.0592	(267)
Energy for lighting	259.1432	0.1443	37.4024	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1472.3275	0.1355	-199.4508	
PV Unit electricity exported	-2235.0479	0.1252	-279.9020	
Total			-479.3528	(269)
Total CO2, kg/year			-168.8826	(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	523.9342	1.5777	826.6180	(275)
Total CO2 associated with community systems			0.0000	(473)

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Water heating (other fuel)	876.0989	1.5415	1350.5126 (278)
Space and water heating			2177.1305 (279)
Pumps, fans and electric keep-hot	454.6044	1.5128	687.7255 (281)
Energy for lighting	259.1432	1.5338	397.4825 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1472.3275	1.5007	-2209.5231
PV Unit electricity exported	-2235.0479	0.4597	-1027.4390
Total			-3236.9621 (283)
Total Primary energy kWh/year			25.3764 (286)