Full SAP Calculation Printout

Property Reference	4907-P635-7667-Coppice_Det	**Issued on Date**	22/04/2025
Assessment Reference	Plot XX	**Prop Type Ref**	Coppice Detached (AS)
Property	Plot XX, Coppice Detached (AS)		

SAP Rating	85 B	**DER**	3.53	**TER**	11.23
Environmental	97 A	**% DER < TER**			68.57
CO_2 Emissions (t/year)	0.31	**DFEE**	36.63	**TFEE**	38.72
Compliance Check	See BREL	**% DFEE < TFEE**			5.41
% DPER < TPER	37.05	**DPER**	36.95	**TPER**	58.69

Assessor Details	Mr. Mitchell Bennellick	**Assessor ID**	P635-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	46.4800 (1b)	x	2.3900 (2b)	=	111.0872	(1b) - (3b)
First floor	46.4800 (1c)	x	2.6100 (2c)	=	121.3128	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	92.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	232.4000	(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		4.5000	(17)
Infiltration rate		0.2250	(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) =	0.1913	(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	0.2438	0.2391	0.2343	0.2104	0.2056	0.1817	0.1817	0.1769	0.1913	0.2056	0.2152	0.2247	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1300	1.1000	2.3430			(26)
Windows			9.3500	1.1450	10.7061			(27)
French Doors			3.7800	1.1450	4.3282			(27)
Jetfloor 150/150 Grey			46.4800	0.1100	5.1128	75.0000	3486.0000	(28a)
External Wall - 150mm FF AAC	139.9500	15.2600	124.6900	0.1800	22.4442	60.0000	7481.3999	(29a)
500mm Mineral Wool	46.4800		46.4800	0.0900	4.1832	9.0000	418.3200	(30)
Total net area of external elements Aum(A, m2)			232.9100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		49.1176			(33)
Main dwelling								
GF - Masonry			15.9200			75.0000	1194.0000	(32c)
GF - Timber			67.1100			9.0000	603.9900	(32c)
1F - Timber			111.8900			9.0000	1007.0100	(32c)
Internal Floor			46.4800			18.0000	836.6400	(32d)
Internal Ceiling			46.4800			9.0000	418.3200	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15445.6799 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 166.1540 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.3000	0.0670	0.4221
E2 Other lintels (including other steel lintels)	1.4620	0.0670	0.0980
E1 Steel lintel with perforated steel base plate	2.8100	0.1770	0.4974
E3 Sill	7.3100	0.0380	0.2778
E4 Jamb	4.2000	0.0410	0.1722
E4 Jamb	19.9500	0.0410	0.8179
E5 Ground floor (normal)	10.8500	0.0520	0.5642
E5 Ground floor (normal)	17.1400	0.0450	0.7713
E6 Intermediate floor within a dwelling	27.9900	0.0010	0.0280
E10 Eaves (insulation at ceiling level)	8.3800	0.0530	0.4441
E12 Gable (insulation at ceiling level)	19.6100	0.0770	1.5100
E16 Corner (normal)	20.0000	0.0410	0.8200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.4230 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 55.5405 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	38.3460	38.3460	38.3460	38.3460	38.3460	38.3460	38.3460	38.3460	38.3460	38.3460	38.3460	38.3460	(38)
Heat transfer coeff	93.8865	93.8865	93.8865	93.8865	93.8865	93.8865	93.8865	93.8865	93.8865	93.8865	93.8865	93.8865	(39)
Average = Sum(39)m / 12 =												93.8865	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0100	1.0100	1.0100	1.0100	1.0100	1.0100	1.0100	1.0100	1.0100	1.0100	1.0100	1.0100	(40)
HLP (average)												1.0100	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6641 (42)
Hot water usage for mixer showers

68.8881	67.8528	66.3443	63.4579	61.3278	58.9524	57.6022	59.0993	60.7405	63.2910	66.2394	68.6241	(42a)

Hot water usage for baths

29.7474	29.3056	28.6834	27.5363	26.6774	25.7250	25.2105	25.8283	26.5009	27.5201	28.6908	29.6468	(42b)

Hot water usage for other uses

41.9131	40.3890	38.8649	37.3408	35.8167	34.2926	34.2926	35.8167	37.3408	38.8649	40.3890	41.9131	(42c)

Average daily hot water use (litres/day) 129.1958 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	140.5486	137.5474	133.8926	128.3350	123.8219	118.9699	117.1053	120.7443	124.5822	129.6760	135.3192	140.1840	(44)
Energy conte	222.5946	195.8657	205.7879	175.6842	166.6880	146.2874	141.6287	149.5067	153.6223	175.9690	192.7870	219.4943	(45)
Energy content (annual)										Total = Sum(45)m =		2145.9157	
Distribution loss (46)m = 0.15 x (45)m	33.3892	29.3798	30.8682	26.3526	25.0032	21.9431	21.2443	22.4260	23.0433	26.3954	28.9180	32.9242	(46)

Water storage loss:
Store volume 180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.1800 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.6372 (55)
Total storage loss

19.7532	17.8416	19.7532	19.1160	19.7532	19.1160	19.7532	19.7532	19.1160	19.7532	19.1160	19.7532	(56)

If cylinder contains dedicated solar storage

19.7532	17.8416	19.7532	19.1160	19.7532	19.1160	19.7532	19.7532	19.1160	19.7532	19.1160	19.7532	(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

265.6102	234.7185	248.8035	217.3122	209.7036	187.9154	184.6443	192.5223	195.2503	218.9846	234.4150	262.5099	(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													
265.6102	234.7185	248.8035	217.3122	209.7036	187.9154	184.6443	192.5223	195.2503	218.9846	234.4150	262.5099	(64)
								Total per year (kWh/year) = Sum(64)m =			2652.3897	(64)
12Total per year (kWh/year)											2652	(64)	
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)	
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											0.0000	(64a)	

Heat gains from water heating, kWh/month

108.4252	96.2076	102.8370	91.7174	89.8363	81.9430	81.5040	84.1234	84.3818	92.9222	97.4041	107.3943	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.0646	147.3215	133.0646	137.5001	133.0646	137.5001	133.0646	133.0646	137.5001	133.0646	137.5001	133.0646	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	244.4192	246.9555	240.5641	226.9575	209.7817	193.6388	182.8544	180.3181	186.7095	200.3161	217.4919	233.6348	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3205	36.3205	36.3205	36.3205	36.3205	36.3205	36.3205	36.3205	36.3205	36.3205	36.3205	36.3205	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	(71)
Water heating gains (Table 5)	145.7328	143.1660	138.2217	127.3853	120.7477	113.8097	109.5484	113.0691	117.1970	124.8954	135.2834	144.3472	(72)
Total internal gains	586.1782	600.4047	574.8120	554.8045	526.5556	507.9102	488.4290	489.4135	504.3682	521.2377	553.2370	574.0082	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W

North	3.1100	10.6334	0.3100	0.0000	0.7700	7.8938	(74)
South	5.5300	46.7521	0.3100	0.0000	0.7700	61.7132	(78)
West	0.7100	19.6403	0.3100	0.0000	0.7700	3.3286	(80)
North	3.7800	10.6334	0.3500	0.0000	0.7700	10.8323	(74)

Solar gains	83.7679	143.3683	200.2792	258.8266	302.3771	306.4044	292.7668	258.8441	220.0753	159.3394	100.4026	71.6742	(83)
Total gains	669.9461	743.7730	775.0912	813.6312	828.9327	814.3146	781.1959	748.2576	724.4435	680.5772	653.6397	645.6824	(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	45.6984	45.6984	45.6984	45.6984	45.6984	45.6984	45.6984	45.6984	45.6984	45.6984	45.6984	45.6984	
alpha	4.0466	4.0466	4.0466	4.0466	4.0466	4.0466	4.0466	4.0466	4.0466	4.0466	4.0466	4.0466	
util living area	0.9814	0.9704	0.9532	0.9097	0.8221	0.6658	0.5091	0.5490	0.7547	0.9161	0.9686	0.9839	(86)
Living	19.5200	19.7160	19.9880	20.3565	20.6884	20.9046	20.9750	20.9657	20.8357	20.4263	19.9078	19.4687	
Non living	18.7320	18.9248	19.1913	19.5453	19.8481	20.0219	20.0659	20.0616	19.9742	19.6166	19.1159	18.6813	
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	20.2429	19.7160	19.9880	20.3565	20.6884	20.9046	20.9750	20.9657	20.8357	20.4263	19.9078	19.6829	(87)
Th 2	20.0750	20.0750	20.0750	20.0750	20.0750	20.0750	20.0750	20.0750	20.0750	20.0750	20.0750	20.0750	(88)
util rest of house	0.9775	0.9642	0.9430	0.8890	0.7801	0.5911	0.4104	0.4501	0.6887	0.8927	0.9610	0.9805	(89)
MIT 2	19.3880	18.9248	19.1913	19.5453	19.8481	20.0219	20.0659	20.0616	19.9742	19.6166	19.1159	18.8763	(90)
Living area fraction									fLA = Living area / (4) =			0.1479	(91)
MIT	19.5144	19.0418	19.3092	19.6653	19.9724	20.1525	20.2004	20.1953	20.1016	19.7364	19.2330	18.9956	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5144	19.0418	19.3092	19.6653	19.9724	20.1525	20.2004	20.1953	20.1016	19.7364	19.2330	18.9956	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9746	0.9554	0.9326	0.8782	0.7749	0.5978	0.4243	0.4635	0.6908	0.8824	0.9521	0.9754	(94)
Useful gains	652.9573	710.6379	722.8136	714.4981	642.3466	486.8147	331.4649	346.8321	500.4483	600.5740	622.3114	629.7840	(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	1428.4287	1327.7259	1202.6083	1010.7143	776.6626	521.3042	338.0258	356.3295	563.4695	857.7821	1139.1245	1389.1043	(97)
Space heating kWh	576.9507	414.6831	356.9672	213.2756	99.9311	0.0000	0.0000	0.0000	0.0000	191.3628	372.1054	564.9343	(98a)
Space heating requirement - total per year (kWh/year)												2790.2104	
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	576.9507	414.6831	356.9672	213.2756	99.9311	0.0000	0.0000	0.0000	0.0000	191.3628	372.1054	564.9343	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2790.2104	
Space heating per m2											(98c) / (4) =	30.0152	(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 %)	262.7707 (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	576.9507	414.6831	356.9672	213.2756	99.9311	0.0000	0.0000	0.0000	0.0000	191.3628	372.1054	564.9343	(98)
Space heating efficiency (main heating system 1)	262.7707	262.7707	262.7707	262.7707	262.7707	0.0000	0.0000	0.0000	0.0000	262.7707	262.7707	262.7707	(210)
Space heating fuel (main heating system)	219.5644	157.8118	135.8474	81.1642	38.0298	0.0000	0.0000	0.0000	0.0000	72.8250	141.6084	214.9914	(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	265.6102	234.7185	248.8035	217.3122	209.7036	187.9154	184.6443	192.5223	195.2503	218.9846	234.4150	262.5099	(64)
Efficiency of water heater												290.4902	(216)
(217)m	290.4902	290.4902	290.4902	290.4902	290.4902	290.4902	290.4902	290.4902	290.4902	290.4902	290.4902	290.4902	(217)
Fuel for water heating, kWh/month	91.4351	80.8008	85.6495	74.8088	72.1896	64.6890	63.5630	66.2749	67.2141	75.3845	80.6963	90.3679	(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	2.2154	2.0010	2.2154	2.1439	2.2154	2.1439	2.2154	2.2154	2.1439	2.2154	2.1439	2.2154	(231)
Lighting	26.9814	21.6454	19.4893	14.2787	11.0293	9.0110	10.0613	13.0780	16.9871	22.2880	25.1742	27.7312	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)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	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1061.8424	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	290.4902	
Water heating fuel used	913.0736	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.4040, total flow = 37.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	26.0846	(230a)
Total electricity for the above, kWh/year	26.0846	(231)
Electricity for lighting (calculated in Appendix L)	217.7550	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(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	2218.7555	(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	1061.8424	0.1552	164.7806	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	913.0736	0.1410	128.7716	(264)
Space and water heating			293.5522	(265)
Pumps, fans and electric keep-hot	26.0846	0.1387	3.6183	(267)
Energy for lighting	217.7550	0.1443	31.4288	(268)
Total CO2, kg/year			328.5992	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.5300	(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	1061.8424	1.5745	1671.8775	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	913.0736	1.5215	1389.2302	(278)
Space and water heating			3061.1078	(279)
Pumps, fans and electric keep-hot	26.0846	1.5128	39.4607	(281)
Energy for lighting	217.7550	1.5338	333.9998	(282)
Total Primary energy kWh/year			3434.5683	(286)
Dwelling Primary energy Rate (DPER)			36.9500	(287)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	46.4800	(1b) x	2.3900	(2b) =	111.0872	(1b) - (3b)
First floor	46.4800	(1c) x	2.6100	(2c) =	121.3128	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	92.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		232.4000	(5)

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2. Ventilation rate

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		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	3 * 10 =	30.0000	(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) =	30.0000 / (5) =	0.1291	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3791	(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) =	0.3222	(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													
	0.4108	0.4028	0.3947	0.3544	0.3464	0.3061	0.3061	0.2981	0.3222	0.3464	0.3625	0.3786	(22b)
Effective ac	0.5844	0.5811	0.5779	0.5628	0.5600	0.5469	0.5469	0.5444	0.5519	0.5600	0.5657	0.5717	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.1300	1.0000	2.1300			(26)
TER Opening Type			13.1300	1.1450	15.0344			(27)
Jetfloor 150/150 Grey			46.4800	0.1300	6.0424			(28a)
External Wall - 150mm FF AAC	139.9500	15.2600	124.6900	0.1800	22.4442			(29a)
500mm Mineral Wool	46.4800		46.4800	0.1100	5.1128			(30)
Total net area of external elements Aum(A, m2)			232.9100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		50.7638			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 166.1540 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	6.3000	0.0500	0.3150	
E2 Other lintels (including other steel lintels)	1.4620	0.0500	0.0731	
E1 Steel lintel with perforated steel base plate	2.8100	0.0500	0.1405	
E3 Sill	7.3100	0.0500	0.3655	
E4 Jamb	4.2000	0.0500	0.2100	
E4 Jamb	19.9500	0.0500	0.9975	
E5 Ground floor (normal)	10.8500	0.1600	1.7360	
E5 Ground floor (normal)	17.1400	0.1600	2.7424	
E6 Intermediate floor within a dwelling	27.9900	0.0000	0.0000	
E10 Eaves (insulation at ceiling level)	8.3800	0.0600	0.5028	
E12 Gable (insulation at ceiling level)	19.6100	0.0600	1.1766	
E16 Corner (normal)	20.0000	0.0900	1.8000	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.0594 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 60.8232 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	44.8183	44.5670	44.3206	43.1635	42.9470	41.9392	41.9392	41.7526	42.3274	42.9470	43.3850	43.8428	(38)
Heat transfer coeff	105.6414	105.3901	105.1438	103.9867	103.7702	102.7624	102.7624	102.5757	103.1506	103.7702	104.2081	104.6660	(39)

Average = Sum(39)m / 12 = 103.9856

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1364	1.1337	1.1311	1.1186	1.1163	1.1054	1.1054	1.1034	1.1096	1.1163	1.1210	1.1259	(40)
HLP (average)												1.1186	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6641 (42)

Hot water usage for mixer showers

68.8881	67.8528	66.3443	63.4579	61.3278	58.9524	57.6022	59.0993	60.7405	63.2910	66.2394	68.6241	(42a)

Hot water usage for baths

29.7474	29.3056	28.6834	27.5363	26.6774	25.7250	25.2105	25.8283	26.5009	27.5201	28.6908	29.6468	(42b)

Hot water usage for other uses

41.9131	40.3890	38.8649	37.3408	35.8167	34.2926	34.2926	35.8167	37.3408	38.8649	40.3890	41.9131	(42c)

Average daily hot water use (litres/day) 129.1958 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	140.5486	137.5474	133.8926	128.3350	123.8219	118.9699	117.1053	120.7443	124.5822	129.6760	135.3192	140.1840	(44)
Energy conte	222.5946	195.8657	205.7879	175.6842	166.6880	146.2874	141.6287	149.5067	153.6223	175.9690	192.7870	219.4943	(45)

Energy content (annual) Total = Sum(45)m = 2145.9157

Distribution loss (46)m = 0.15 x (45)m

33.3892	29.3798	30.8682	26.3526	25.0032	21.9431	21.2443	22.4260	23.0433	26.3954	28.9180	32.9242	(46)

Water storage loss:

Store volume 180.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.5520 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.8381 (55)

Total storage loss

25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(56)

If cylinder contains dedicated solar storage

25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(57)
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)
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)

Primary loss

Combi loss

Total heat required for water heating calculated for each month

271.8372	240.3429	255.0306	223.3384	215.9307	193.9416	190.8713	198.7493	201.2765	225.2117	240.4411	268.7370	(62)
-31.4928	-27.8524	-29.1655	-24.1502	-22.5071	-19.2595	-18.0527	-19.1972	-19.9266	-23.4913	-26.6127	-30.9096	(63a)
-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)
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)
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)

WWHRS

PV diverter

Solar input

FGHRS

Output from w/h

240.3445	212.4905	225.8651	199.1882	193.4236	174.6821	172.8186	179.5521	181.3499	201.7205	213.8284	237.8275	(64)

Total per year (kWh/year) = Sum(64)m = 2433.0909 (64)

12Total per year (kWh/year) 2433 (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

113.4068	100.7071	107.8186	96.5384	94.8179	86.7639	86.4857	89.1051	89.2028	97.9038	102.2250	112.3760	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	132.0045	146.1478	132.0045	136.4047	132.0045	136.4047	132.0045	132.0045	136.4047	132.0045	136.4047	132.0045	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
244.4192 246.9555 240.5641 226.9575 209.7817 193.6388 182.8544 180.3181 186.7095 200.3161 217.4919 233.6348 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
36.3205 36.3205 36.3205 36.3205 36.3205 36.3205 36.3205 36.3205 36.3205 36.3205 36.3205 36.3205 (69)
Pumps, fans 3.0000 3.0000 3.0000 3.0000 3.0000 0.0000 0.0000 0.0000 0.0000 3.0000 3.0000 3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
-106.5643 -106.5643 -106.5643 -106.5643 -106.5643 -106.5643 -106.5643 -106.5643 -106.5643 -106.5643 -106.5643 -106.5643 (71)
Water heating gains (Table 5)
152.4285 149.8618 144.9175 134.0810 127.4434 120.5054 116.2442 119.7649 123.8928 131.5912 141.9792 151.0430 (72)
Total internal gains
594.8138 608.9268 583.4477 563.4048 535.1912 513.5105 494.0647 495.0491 509.9685 529.8734 561.8374 582.6439 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	6.8900	10.6334	0.6300	0.7000	0.7700	22.3905	(74)
South	5.5300	46.7521	0.6300	0.7000	0.7700	79.0129	(78)
West	0.7100	19.6403	0.6300	0.7000	0.7700	4.2616	(80)

Solar gains 105.6650 180.5287 251.2749 323.1140 376.0031 380.3738 363.7047 322.5727 275.5789 200.4002 126.5925 90.4447 (83)
Total gains 700.4788 789.4554 834.7226 886.5189 911.1943 893.8843 857.7694 817.6218 785.5474 730.2736 688.4298 673.0886 (84)

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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	40.6135	40.7103	40.8057	41.2598	41.3459	41.7513	41.7513	41.8273	41.5942	41.3459	41.1721	40.9920	
alpha	3.7076	3.7140	3.7204	3.7507	3.7564	3.7834	3.7834	3.7885	3.7729	3.7564	3.7448	3.7328	
util living area	0.9801	0.9679	0.9489	0.9020	0.8118	0.6566	0.5039	0.5443	0.7498	0.9117	0.9667	0.9827	(86)
MIT	19.3032	19.5306	19.8451	20.2747	20.6434	20.8878	20.9684	20.9575	20.8055	20.3457	19.7624	19.2683	(87)
Th 2	19.9712	19.9734	19.9755	19.9857	19.9876	19.9964	19.9964	19.9980	19.9930	19.9876	19.9837	19.9797	(88)
util rest of house	0.9758	0.9611	0.9375	0.8790	0.7663	0.5773	0.3987	0.4390	0.6796	0.8863	0.9583	0.9789	(89)
MIT 2	18.0074	18.2957	18.6922	19.2277	19.6592	19.9180	19.9822	19.9773	19.8424	19.3238	18.5988	17.9688	(90)
Living area fraction										fLA = Living area / (4) =		0.1479	(91)
MIT	18.1991	18.4783	18.8628	19.3825	19.8048	20.0614	20.1280	20.1223	19.9849	19.4749	18.7709	18.1611	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1991	18.4783	18.8628	19.3825	19.8048	20.0614	20.1280	20.1223	19.9849	19.4749	18.7709	18.1611	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9653	0.9476	0.9214	0.8625	0.7570	0.5828	0.4131	0.4527	0.6790	0.8704	0.9448	0.9693	(94)
Useful gains	676.1750	748.0878	769.1252	764.5974	689.7921	520.9897	354.3670	370.1418	533.3492	635.6203	650.4112	652.4571	(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	1468.3170	1431.0200	1299.8662	1090.0436	841.0330	561.2303	362.5498	381.8161	607.0290	920.9537	1216.2009	1461.2481	(97)
Space heating kWh	589.3537	458.9304	394.8714	234.3213	112.5232	0.0000	0.0000	0.0000	0.0000	212.2881	407.3686	601.7405	(98a)
Space heating requirement - total per year (kWh/year)												3011.3972	
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	589.3537	458.9304	394.8714	234.3213	112.5232	0.0000	0.0000	0.0000	0.0000	212.2881	407.3686	601.7405	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3011.3972	
Space heating per m2											(98c) / (4) =	32.3945	(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	589.3537	458.9304	394.8714	234.3213	112.5232	0.0000	0.0000	0.0000	0.0000	212.2881	407.3686	601.7405	(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)	638.5197	497.2161	427.8129	253.8692	121.9103	0.0000	0.0000	0.0000	0.0000	229.9979	441.3528	651.9399	(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	240.3445	212.4905	225.8651	199.1882	193.4236	174.6821	172.8186	179.5521	181.3499	201.7205	213.8284	237.8275	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.9907	85.7397	85.2995	84.4250	82.8898	79.8000	79.8000	79.8000	79.8000	84.1745	85.4815	86.0508	(217)
Fuel for water heating, kWh/month	279.5007	247.8321	264.7906	235.9351	233.3504	218.8999	216.5647	225.0026	227.2556	239.6456	250.1459	276.3802	(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	27.4279	22.0037	19.8119	14.5150	11.2118	9.1602	10.2278	13.2945	17.2682	22.6569	25.5909	28.1902	(232)

Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-42.8506	-60.0795	-85.8750	-95.9765	-102.9816	-95.9102	-94.7017	-89.6466	-80.6568	-68.4149	-46.9832	-37.0840 (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	-25.2053	-52.9155	-104.9900	-157.4339	-207.9392	-208.8746	-206.4370	-174.9074	-128.3445	-75.6115	-33.6297	-19.9414 (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	3262.6188	(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	2915.3033	(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)	221.3591	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2297.3904	(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	4187.8908	(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	3262.6188	0.2100	685.1500	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2915.3033	0.2100	612.2137	(264)
Space and water heating			1297.3637	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	221.3591	0.1443	31.9490	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-901.1605	0.1347	-121.3997	
PV Unit electricity exported	-1396.2300	0.1259	-175.8424	
Total			-297.2421	(269)
Total CO2, kg/year			1043.9998	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.2300	(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	3262.6188	1.1300	3686.7593	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2915.3033	1.1300	3294.2928	(278)
Space and water heating			6981.0521	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	221.3591	1.5338	339.5280	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-901.1605	1.4979	-1349.8397	
PV Unit electricity exported	-1396.2300	0.4623	-645.4652	
Total			-1995.3049	(283)
Total Primary energy kWh/year			5455.3760	(286)
Target Primary Energy Rate (TPER)			58.6900	(287)

Full SAP Calculation Printout

Property Reference	4907-P635-7667-Coppice_Det	**Issued on Date**	22/04/2025
Assessment Reference	Plot XX	**Prop Type Ref**	Coppice Detached (AS)
Property	Plot XX, Coppice Detached (AS)		

SAP Rating	85 B	**DER**	3.53	**TER**	11.23
Environmental	97 A	**% DER < TER**			68.57
CO_2 Emissions (t/year)	0.31	**DFEE**	36.63	**TFEE**	38.72
Compliance Check	See BREL	**% DFEE < TFEE**			5.41
% DPER < TPER	37.05	**DPER**	36.95	**TPER**	58.69

Assessor Details	Mr. Mitchell Bennellick	**Assessor ID**	P635-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	46.4800 (1b)	x	2.3900 (2b)	=	111.0872	(1b) - (3b)
First floor	46.4800 (1c)	x	2.6100 (2c)	=	121.3128	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	92.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	232.4000	(5)

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2. Ventilation rate

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		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	3 * 10 =	30.0000	(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) =	30.0000 / (5) =	0.1291	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.5000	(17)
Infiltration rate		0.3541	(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) =	0.3010	(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	0.3837	0.3762	0.3687	0.3311	0.3235	0.2859	0.2859	0.2784	0.3010	0.3235	0.3386	0.3536	(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	0.5736	0.5708	0.5680	0.5548	0.5523	0.5409	0.5409	0.5388	0.5453	0.5523	0.5573	0.5625	(25)

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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	
Main dwelling								
Front Door			2.1300	1.1000	2.3430			(26)
Windows			9.3500	1.1450	10.7061			(27)
French Doors			3.7800	1.1450	4.3282			(27)
Jetfloor 150/150 Grey			46.4800	0.1100	5.1128	75.0000	3486.0000	(28a)
External Wall - 150mm FF AAC	139.9500	15.2600	124.6900	0.1800	22.4442	60.0000	7481.3999	(29a)
500mm Mineral Wool	46.4800		46.4800	0.0900	4.1832	9.0000	418.3200	(30)
Total net area of external elements Aum(A, m2)			232.9100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	49.1176			(33)
Main dwelling								
GF - Masonry			15.9200			75.0000	1194.0000	(32c)
GF - Timber			67.1100			9.0000	603.9900	(32c)
1F - Timber			111.8900			9.0000	1007.0100	(32c)
Internal Floor			46.4800			18.0000	836.6400	(32d)
Internal Ceiling			46.4800			9.0000	418.3200	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15445.6799 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		166.1540 (35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E2	Other lintels (including other steel lintels)	6.3000	0.0670	0.4221
E2	Other lintels (including other steel lintels)	1.4620	0.0670	0.0980
E1	Steel lintel with perforated steel base plate	2.8100	0.1770	0.4974
E3	Sill	7.3100	0.0380	0.2778
E4	Jamb	4.2000	0.0410	0.1722
E4	Jamb	19.9500	0.0410	0.8179
E5	Ground floor (normal)	10.8500	0.0520	0.5642
E5	Ground floor (normal)	17.1400	0.0450	0.7713
E6	Intermediate floor within a dwelling	27.9900	0.0010	0.0280
E10	Eaves (insulation at ceiling level)	8.3800	0.0530	0.4441
E12	Gable (insulation at ceiling level)	19.6100	0.0770	1.5100
E16	Corner (normal)	20.0000	0.0410	0.8200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.4230 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 55.5405 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	43.9928	43.7735	43.5586	42.5491	42.3602	41.4809	41.4809	41.3181	41.8196	42.3602	42.7423	43.1417	(38)
Heat transfer coeff	99.5333	99.3140	99.0991	98.0896	97.9007	97.0214	97.0214	96.8586	97.3601	97.9007	98.2828	98.6822	(39)

Average = Sum(39)m / 12 = 98.0887

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0707	1.0684	1.0660	1.0552	1.0531	1.0437	1.0437	1.0419	1.0473	1.0531	1.0573	1.0616	(40)
HLP (average)												1.0552	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6641 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.7474	29.3056	28.6834	27.5363	26.6774	25.7250	25.2105	25.8283	26.5009	27.5201	28.6908	29.6468	(42b)

Hot water usage for other uses

41.9131	40.3890	38.8649	37.3408	35.8167	34.2926	34.2926	35.8167	37.3408	38.8649	40.3890	41.9131	(42c)

Average daily hot water use (litres/day) 65.6833 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	71.6605	69.6946	67.5483	64.8771	62.4941	60.0175	59.5031	61.6450	63.8417	66.3850	69.0798	71.5599	(44)
Energy conte	113.4927	99.2441	103.8193	88.8135	84.1290	73.7985	71.9638	76.3293	78.7232	90.0838	98.4168	112.0455	(45)

Energy content (annual) Total = Sum(45)m = 1090.8597

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

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

96.4688	84.3575	88.2464	75.4915	71.5097	62.7288	61.1692	64.8799	66.9147	76.5712	83.6543	95.2387	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

96.4688	84.3575	88.2464	75.4915	71.5097	62.7288	61.1692	64.8799	66.9147	76.5712	83.6543	95.2387	(64)

Total per year (kWh/year) = Sum(64)m = 927.2307 (64)

12Total per year (kWh/year) 927 (64)

Electric shower(s)

55.1679	49.1550	53.6754	51.2218	52.1829	49.7775	51.4367	52.1829	51.2218	53.6754	52.6661	55.1679	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 627.5313 (64a)

Heat gains from water heating, kWh/month

37.9092	33.3781	35.4804	31.6783	30.9232	28.1266	28.1515	29.2657	29.5341	32.5617	34.0801	37.6016	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.0646	147.3215	133.0646	137.5001	133.0646	137.5001	133.0646	133.0646	137.5001	133.0646	137.5001	133.0646	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	244.4192	246.9555	240.5641	226.9575	209.7817	193.6388	182.8544	180.3181	186.7095	200.3161	217.4919	233.6348	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3205	36.3205	36.3205	36.3205	36.3205	36.3205	36.3205	36.3205	36.3205	36.3205	36.3205	36.3205	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	(71)
Water heating gains (Table 5)	50.9532	49.6698	47.6888	43.9977	41.5634	39.0647	37.8380	39.3356	41.0196	43.7657	47.3335	50.5398	(72)
Total internal gains	491.3986	506.9085	484.2791	471.4169	447.3713	433.1652	416.7187	415.6800	428.1909	440.1080	465.2871	480.2008	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	3.1100	10.6334	0.3100	0.0000	0.7700	7.8938	(74)
South	5.5300	46.7521	0.3100	0.0000	0.7700	61.7132	(78)
West	0.7100	19.6403	0.3100	0.0000	0.7700	3.3286	(80)
North	3.7800	10.6334	0.3500	0.0000	0.7700	10.8323	(74)

Solar gains	83.7679	143.3683	200.2792	258.8266	302.3771	306.4044	292.7668	258.8441	220.0753	159.3394	100.4026	71.6742	(83)
Total gains	575.1665	650.2768	684.5583	730.2436	749.7484	739.5696	709.4855	674.5241	648.2662	599.4474	565.6898	551.8750	(84)

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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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.1059	43.2010	43.2947	43.7403	43.8247	44.2218	44.2218	44.2962	44.0680	43.8247	43.6543	43.4776	
alpha	3.8737	3.8801	3.8863	3.9160	3.9216	3.9481	3.9481	3.9531	3.9379	3.9216	3.9103	3.8985	
util living area	0.9892	0.9817	0.9699	0.9368	0.8661	0.7230	0.5666	0.6106	0.8114	0.9444	0.9811	0.9908	(86)
MIT	19.2501	19.4615	19.7612	20.1920	20.5802	20.8610	20.9599	20.9457	20.7653	20.2732	19.6972	19.2174	(87)
Th 2	20.0248	20.0268	20.0287	20.0376	20.0393	20.0471	20.0471	20.0485	20.0441	20.0393	20.0359	20.0324	(88)
util rest of house	0.9868	0.9776	0.9627	0.9206	0.8293	0.6478	0.4583	0.5037	0.7499	0.9270	0.9762	0.9887	(89)
MIT 2	18.4281	18.6388	18.9363	19.3623	19.7263	19.9675	20.0321	20.0266	19.8950	19.4469	18.8808	18.4012	(90)
Living area fraction									fLA = Living area / (4) =			0.1479	(91)
MIT	18.5497	18.7605	19.0583	19.4850	19.8526	20.0997	20.1693	20.1625	20.0238	19.5691	19.0016	18.5219	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5497	18.7605	19.0583	19.4850	19.8526	20.0997	20.1693	20.1625	20.0238	19.5691	19.0016	18.5219	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9818	0.9705	0.9534	0.9091	0.8209	0.6524	0.4729	0.5174	0.7484	0.9162	0.9690	0.9843	(94)
Useful gains	564.6741	631.0891	652.6592	663.8783	615.5042	482.4648	335.5485	349.0078	485.1789	549.2007	548.1395	543.1846	(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	1418.3150	1376.5438	1244.5150	1038.2790	798.1437	533.5839	346.3009	364.4326	576.7375	878.0831	1169.7196	1413.3180	(97)
Space heating kWh	635.1088	500.9455	440.3408	269.5686	135.8838	0.0000	0.0000	0.0000	0.0000	244.6885	447.5377	647.3793	(98a)
Space heating requirement - total per year (kWh/year)												3321.4530	
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	635.1088	500.9455	440.3408	269.5686	135.8838	0.0000	0.0000	0.0000	0.0000	244.6885	447.5377	647.3793	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3321.4530	
Space heating per m2											(98c) / (4) =	35.7299	(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	912.0014	717.9586	736.1254	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7452	0.8260	0.7971	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	679.6469	593.0317	586.7736	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	804.7863	772.4612	734.2954	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	90.1004	133.4956	109.7562	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	22.5251	33.3739	27.4391	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												83.3381	(107)
Energy for space heating												35.7299	(99)
Energy for space cooling												0.8965	(108)
Total												36.6264	(109)
Fabric Energy Efficiency (DFEE)												36.6	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	46.4800	(1b)	x 2.3900	(2b) =	111.0872	(1b) - (3b)
First floor	46.4800	(1c)	x 2.6100	(2c) =	121.3128	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	92.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		232.4000	(5)

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2. Ventilation rate

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		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	3 * 10 =	30.0000 (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) =	30.0000 / (5) =	0.1291	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3791	(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) =	0.3222	(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	0.4108	0.4028	0.3947	0.3544	0.3464	0.3061	0.3061	0.2981	0.3222	0.3464	0.3625	0.3786	(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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5844	0.5811	0.5779	0.5628	0.5600	0.5469	0.5469	0.5444	0.5519	0.5600	0.5657	0.5717	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.1300	1.0000	2.1300			(26)
TER Opening Type			13.1300	1.1450	15.0344			(27)
Jetfloor 150/150 Grey			46.4800	0.1300	6.0424			(28a)
External Wall - 150mm FF AAC	139.9500	15.2600	124.6900	0.1800	22.4442			(29a)
500mm Mineral Wool	46.4800		46.4800	0.1100	5.1128			(30)
Total net area of external elements Aum(A, m2)			232.9100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		50.7638			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	166.1540	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.3000	0.0500	0.3150
E2 Other lintels (including other steel lintels)	1.4620	0.0500	0.0731
E1 Steel lintel with perforated steel base plate	2.8100	0.0500	0.1405
E3 Sill	7.3100	0.0500	0.3655
E4 Jamb	4.2000	0.0500	0.2100
E4 Jamb	19.9500	0.0500	0.9975
E5 Ground floor (normal)	10.8500	0.1600	1.7360
E5 Ground floor (normal)	17.1400	0.1600	2.7424
E6 Intermediate floor within a dwelling	27.9900	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	8.3800	0.0600	0.5028
E12 Gable (insulation at ceiling level)	19.6100	0.0600	1.1766
E16 Corner (normal)	20.0000	0.0900	1.8000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	10.0594	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 60.8232	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	44.8183	44.5670	44.3206	43.1635	42.9470	41.9392	41.9392	41.7526	42.3274	42.9470	43.3850	43.8428	(38)
Heat transfer coeff	105.6414	105.3901	105.1438	103.9867	103.7702	102.7624	102.7624	102.5757	103.1506	103.7702	104.2081	104.6660	(39)
Average = Sum(39)m / 12 =												103.9856	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1364	1.1337	1.1311	1.1186	1.1163	1.1054	1.1054	1.1034	1.1096	1.1163	1.1210	1.1259	(40)
HLP (average)												1.1186	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6641 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.7474	29.3056	28.6834	27.5363	26.6774	25.7250	25.2105	25.8283	26.5009	27.5201	28.6908	29.6468	(42b)

Hot water usage for other uses

41.9131	40.3890	38.8649	37.3408	35.8167	34.2926	34.2926	35.8167	37.3408	38.8649	40.3890	41.9131	(42c)

Average daily hot water use (litres/day)	65.6833 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	71.6605	69.6946	67.5483	64.8771	62.4941	60.0175	59.5031	61.6450	63.8417	66.3850	69.0798	71.5599	(44)
Energy conte	113.4927	99.2441	103.8193	88.8135	84.1290	73.7985	71.9638	76.3293	78.7232	90.0838	98.4168	112.0455	(45)
Energy content (annual)										Total = Sum(45)m =		1090.8597	
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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	96.4688	84.3575	88.2464	75.4915	71.5097	62.7288	61.1692	64.8799	66.9147	76.5712	83.6543	95.2387	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	96.4688	84.3575	88.2464	75.4915	71.5097	62.7288	61.1692	64.8799	66.9147	76.5712	83.6543	95.2387	(64)
										Total per year (kWh/year) = Sum(64)m =		927.2307	(64)

12Total per year (kWh/year) 927 (64)
Electric shower(s)

	55.1679	49.1550	53.6754	51.2218	52.1829	49.7775	51.4367	52.1829	51.2218	53.6754	52.6661	55.1679 (64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 627.5313 (64a)
Heat gains from water heating, kWh/month

	37.9092	33.3781	35.4804	31.6783	30.9232	28.1266	28.1515	29.2657	29.5341	32.5617	34.0801	37.6016 (65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	132.0045	146.1478	132.0045	136.4047	132.0045	136.4047	132.0045	132.0045	136.4047	132.0045	136.4047	132.0045	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	244.4192	246.9555	240.5641	226.9575	209.7817	193.6388	182.8544	180.3181	186.7095	200.3161	217.4919	233.6348	(68)

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

	36.3205	36.3205	36.3205	36.3205	36.3205	36.3205	36.3205	36.3205	36.3205	36.3205	36.3205	36.3205	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	(71)

Water heating gains (Table 5)

	50.9532	49.6698	47.6888	43.9977	41.5634	39.0647	37.8380	39.3356	41.0196	43.7657	47.3335	50.5398	(72)

Total internal gains

	490.3385	505.7348	483.2190	470.3215	446.3112	432.0698	415.6585	414.6199	427.0954	439.0479	464.1917	479.1407	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	6.8900	10.6334	0.6300	0.7000	0.7700	22.3905	(74)
South	5.5300	46.7521	0.6300	0.7000	0.7700	79.0129	(78)
West	0.7100	19.6403	0.6300	0.7000	0.7700	4.2616	(80)

Solar gains	105.6650	180.5287	251.2749	323.1140	376.0031	380.3738	363.7047	322.5727	275.5789	200.4002	126.5925	90.4447	(83)
Total gains	596.0034	686.2635	734.4939	793.4355	822.3143	812.4435	779.3632	737.1925	702.6743	639.4481	590.7841	569.5855	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	40.6135	40.7103	40.8057	41.2598	41.3459	41.7513	41.7513	41.8273	41.5942	41.3459	41.1721	40.9920	
alpha	3.7076	3.7140	3.7204	3.7507	3.7564	3.7834	3.7834	3.7885	3.7729	3.7564	3.7448	3.7328	
util living area	0.9881	0.9791	0.9646	0.9262	0.8479	0.7005	0.5466	0.5919	0.7955	0.9378	0.9791	0.9899	(86)
MIT	19.1495	19.3852	19.7134	20.1723	20.5762	20.8595	20.9585	20.9436	20.7579	20.2412	19.6248	19.1142	(87)
Th 2	19.9712	19.9734	19.9755	19.9857	19.9876	19.9964	19.9964	19.9980	19.9930	19.9876	19.9837	19.9797	(88)
util rest of house	0.9854	0.9744	0.9562	0.9075	0.8071	0.6217	0.4357	0.4818	0.7298	0.9183	0.9736	0.9876	(89)
MIT 2	18.2893	18.5240	18.8490	19.3014	19.6769	19.9179	19.9814	19.9759	19.8423	19.3752	18.7708	18.2605	(90)
Living area fraction									fLA = Living area / (4) =			0.1479	(91)
MIT	18.4165	18.6514	18.9769	19.4302	19.8099	20.0572	20.1260	20.1191	19.9777	19.5033	18.8971	18.3868	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4165	18.6514	18.9769	19.4302	19.8099	20.0572	20.1260	20.1191	19.9777	19.5033	18.8971	18.3868	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9797	0.9662	0.9456	0.8950	0.7988	0.6269	0.4508	0.4960	0.7286	0.9065	0.9655	0.9826	(94)
Useful gains	583.9056	663.0850	694.5513	710.1268	656.8610	509.3263	351.3624	365.6368	511.9976	579.6461	570.4224	559.6593	(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	1491.2875	1449.2609	1311.8664	1094.9988	841.5650	560.7926	362.3358	381.4869	606.2906	923.8985	1229.3535	1484.8716	(97)
Space heating kWh	675.0922	528.3102	459.2824	277.1079	137.4197	0.0000	0.0000	0.0000	0.0000	256.1238	474.4304	688.3580	(98a)
Space heating requirement - total per year (kWh/year)												3496.1246	
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	675.0922	528.3102	459.2824	277.1079	137.4197	0.0000	0.0000	0.0000	0.0000	256.1238	474.4304	688.3580	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3496.1246	
Space heating per m2											(98c) / (4) =	37.6089	(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	965.9664	760.4416	779.5757	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7579	0.8347	0.8054	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	732.1455	634.7460	627.8699	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	891.1514	855.2754	808.6531	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	114.4842	164.0739	134.5026	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	28.6211	41.0185	33.6257	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement											103.2652 (107)
Energy for space heating											37.6089 (99)
Energy for space cooling											1.1109 (108)
Total											38.7198 (109)
Fabric Energy Efficiency (TFEE)											38.7 (109)

Full SAP Calculation Printout

Property Reference	4907-P635-7667-Coppice_Det	**Issued on Date**	22/04/2025
Assessment Reference	Plot XX	**Prop Type Ref**	Coppice Detached (AS)
Property	Plot XX, Coppice Detached (AS)		

SAP Rating	85 B	**DER**	3.53	**TER**	11.23
Environmental	97 A	**% DER < TER**			68.57
CO_2 Emissions (t/year)	0.31	**DFEE**	36.63	**TFEE**	38.72
Compliance Check	See BREL	**% DFEE < TFEE**			5.41
% DPER < TPER	37.05	**DPER**	36.95	**TPER**	58.69

Assessor Details	Mr. Mitchell Bennellick	**Assessor ID**	P635-0001
Client			

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

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	46.4800 (1b)	x	2.3900 (2b)	=	111.0872	(1b) - (3b)
First floor	46.4800 (1c)	x	2.6100 (2c)	=	121.3128	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	92.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	232.4000	(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		4.5000	(17)
Infiltration rate		0.2250	(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) =	0.1913	(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	0.2438	0.2391	0.2343	0.2104	0.2056	0.1817	0.1817	0.1769	0.1913	0.2056	0.2152	0.2247	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1300	1.1000	2.3430			(26)
Windows			9.3500	1.1450	10.7061			(27)
French Doors			3.7800	1.1450	4.3282			(27)
Jetfloor 150/150 Grey			46.4800	0.1100	5.1128	75.0000	3486.0000	(28a)
External Wall - 150mm FF AAC	139.9500	15.2600	124.6900	0.1800	22.4442	60.0000	7481.3999	(29a)
500mm Mineral Wool	46.4800		46.4800	0.0900	4.1832	9.0000	418.3200	(30)
Total net area of external elements Aum(A, m2)			232.9100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		49.1176			(33)
Main dwelling								
GF - Masonry			15.9200			75.0000	1194.0000	(32c)
GF - Timber			67.1100			9.0000	603.9900	(32c)
1F - Timber			111.8900			9.0000	1007.0100	(32c)
Internal Floor			46.4800			18.0000	836.6400	(32d)
Internal Ceiling			46.4800			9.0000	418.3200	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15445.6799 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 166.1540 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.3000	0.0670	0.4221
E2 Other lintels (including other steel lintels)	1.4620	0.0670	0.0980
E1 Steel lintel with perforated steel base plate	2.8100	0.1770	0.4974
E3 Sill	7.3100	0.0380	0.2778
E4 Jamb	4.2000	0.0410	0.1722
E4 Jamb	19.9500	0.0410	0.8179
E5 Ground floor (normal)	10.8500	0.0520	0.5642
E5 Ground floor (normal)	17.1400	0.0450	0.7713
E6 Intermediate floor within a dwelling	27.9900	0.0010	0.0280
E10 Eaves (insulation at ceiling level)	8.3800	0.0530	0.4441
E12 Gable (insulation at ceiling level)	19.6100	0.0770	1.5100
E16 Corner (normal)	20.0000	0.0410	0.8200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.4230 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 55.5405 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	38.3460	38.3460	38.3460	38.3460	38.3460	38.3460	38.3460	38.3460	38.3460	38.3460	38.3460	38.3460	(38)
Heat transfer coeff	93.8865	93.8865	93.8865	93.8865	93.8865	93.8865	93.8865	93.8865	93.8865	93.8865	93.8865	93.8865	(39)
Average = Sum(39)m / 12 =												93.8865	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0100	1.0100	1.0100	1.0100	1.0100	1.0100	1.0100	1.0100	1.0100	1.0100	1.0100	1.0100	(40)
HLP (average)												1.0100	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6641 (42)
Hot water usage for mixer showers

68.8881	67.8528	66.3443	63.4579	61.3278	58.9524	57.6022	59.0993	60.7405	63.2910	66.2394	68.6241	(42a)

Hot water usage for baths

29.7474	29.3056	28.6834	27.5363	26.6774	25.7250	25.2105	25.8283	26.5009	27.5201	28.6908	29.6468	(42b)

Hot water usage for other uses

41.9131	40.3890	38.8649	37.3408	35.8167	34.2926	34.2926	35.8167	37.3408	38.8649	40.3890	41.9131	(42c)

Average daily hot water use (litres/day) 129.1958 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	140.5486	137.5474	133.8926	128.3350	123.8219	118.9699	117.1053	120.7443	124.5822	129.6760	135.3192	140.1840	(44)
Energy conte	222.5946	195.8657	205.7879	175.6842	166.6880	146.2874	141.6287	149.5067	153.6223	175.9690	192.7870	219.4943	(45)
Energy content (annual)										Total = Sum(45)m =		2145.9157	
Distribution loss (46)m = 0.15 x (45)m	33.3892	29.3798	30.8682	26.3526	25.0032	21.9431	21.2443	22.4260	23.0433	26.3954	28.9180	32.9242	(46)

Water storage loss:
Store volume 180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.1800 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.6372 (55)
Total storage loss

19.7532	17.8416	19.7532	19.1160	19.7532	19.1160	19.7532	19.7532	19.1160	19.7532	19.1160	19.7532	(56)

If cylinder contains dedicated solar storage

19.7532	17.8416	19.7532	19.1160	19.7532	19.1160	19.7532	19.7532	19.1160	19.7532	19.1160	19.7532	(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

265.6102	234.7185	248.8035	217.3122	209.7036	187.9154	184.6443	192.5223	195.2503	218.9846	234.4150	262.5099	(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													
265.6102	234.7185	248.8035	217.3122	209.7036	187.9154	184.6443	192.5223	195.2503	218.9846	234.4150	262.5099	(64)
								Total per year (kWh/year) = Sum(64)m =			2652.3897	(64)
12Total per year (kWh/year)											2652	(64)	
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)	
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											0.0000	(64a)	

Heat gains from water heating, kWh/month

108.4252	96.2076	102.8370	91.7174	89.8363	81.9430	81.5040	84.1234	84.3818	92.9222	97.4041	107.3943	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.0646	147.3215	133.0646	137.5001	133.0646	137.5001	133.0646	133.0646	137.5001	133.0646	137.5001	133.0646	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	244.4192	246.9555	240.5641	226.9575	209.7817	193.6388	182.8544	180.3181	186.7095	200.3161	217.4919	233.6348	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3205	36.3205	36.3205	36.3205	36.3205	36.3205	36.3205	36.3205	36.3205	36.3205	36.3205	36.3205	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	(71)
Water heating gains (Table 5)	145.7328	143.1660	138.2217	127.3853	120.7477	113.8097	109.5484	113.0691	117.1970	124.8954	135.2834	144.3472	(72)
Total internal gains	586.1782	600.4047	574.8120	554.8045	526.5556	507.9102	488.4290	489.4135	504.3682	521.2377	553.2370	574.0082	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W

North	3.1100	10.6334	0.3100	0.0000	0.7700	7.8938	(74)
South	5.5300	46.7521	0.3100	0.0000	0.7700	61.7132	(78)
West	0.7100	19.6403	0.3100	0.0000	0.7700	3.3286	(80)
North	3.7800	10.6334	0.3500	0.0000	0.7700	10.8323	(74)

Solar gains	83.7679	143.3683	200.2792	258.8266	302.3771	306.4044	292.7668	258.8441	220.0753	159.3394	100.4026	71.6742	(83)
Total gains	669.9461	743.7730	775.0912	813.6312	828.9327	814.3146	781.1959	748.2576	724.4435	680.5772	653.6397	645.6824	(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	45.6984	45.6984	45.6984	45.6984	45.6984	45.6984	45.6984	45.6984	45.6984	45.6984	45.6984	45.6984	
alpha	4.0466	4.0466	4.0466	4.0466	4.0466	4.0466	4.0466	4.0466	4.0466	4.0466	4.0466	4.0466	
util living area	0.9814	0.9704	0.9532	0.9097	0.8221	0.6658	0.5091	0.5490	0.7547	0.9161	0.9686	0.9839	(86)
Living	19.5200	19.7160	19.9880	20.3565	20.6884	20.9046	20.9750	20.9657	20.8357	20.4263	19.9078	19.4687	
Non living	18.7320	18.9248	19.1913	19.5453	19.8481	20.0219	20.0659	20.0616	19.9742	19.6166	19.1159	18.6813	
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	20.2429	19.7160	19.9880	20.3565	20.6884	20.9046	20.9750	20.9657	20.8357	20.4263	19.9078	19.6829	(87)
Th 2	20.0750	20.0750	20.0750	20.0750	20.0750	20.0750	20.0750	20.0750	20.0750	20.0750	20.0750	20.0750	(88)
util rest of house	0.9775	0.9642	0.9430	0.8890	0.7801	0.5911	0.4104	0.4501	0.6887	0.8927	0.9610	0.9805	(89)
MIT 2	19.3880	18.9248	19.1913	19.5453	19.8481	20.0219	20.0659	20.0616	19.9742	19.6166	19.1159	18.8763	(90)
Living area fraction									fLA = Living area / (4) =			0.1479	(91)
MIT	19.5144	19.0418	19.3092	19.6653	19.9724	20.1525	20.2004	20.1953	20.1016	19.7364	19.2330	18.9956	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5144	19.0418	19.3092	19.6653	19.9724	20.1525	20.2004	20.1953	20.1016	19.7364	19.2330	18.9956	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9746	0.9554	0.9326	0.8782	0.7749	0.5978	0.4243	0.4635	0.6908	0.8824	0.9521	0.9754	(94)
Useful gains	652.9573	710.6379	722.8136	714.4981	642.3466	486.8147	331.4649	346.8321	500.4483	600.5740	622.3114	629.7840	(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	1428.4287	1327.7259	1202.6083	1010.7143	776.6626	521.3042	338.0258	356.3295	563.4695	857.7821	1139.1245	1389.1043	(97)
Space heating kWh	576.9507	414.6831	356.9672	213.2756	99.9311	0.0000	0.0000	0.0000	0.0000	191.3628	372.1054	564.9343	(98a)
Space heating requirement - total per year (kWh/year)												2790.2104	
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	576.9507	414.6831	356.9672	213.2756	99.9311	0.0000	0.0000	0.0000	0.0000	191.3628	372.1054	564.9343	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2790.2104	
Space heating per m2											(98c) / (4) =	30.0152	(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 %)	262.7707 (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	576.9507	414.6831	356.9672	213.2756	99.9311	0.0000	0.0000	0.0000	0.0000	191.3628	372.1054	564.9343	(98)
Space heating efficiency (main heating system 1)	262.7707	262.7707	262.7707	262.7707	262.7707	0.0000	0.0000	0.0000	0.0000	262.7707	262.7707	262.7707	(210)
Space heating fuel (main heating system)	219.5644	157.8118	135.8474	81.1642	38.0298	0.0000	0.0000	0.0000	0.0000	72.8250	141.6084	214.9914	(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	265.6102	234.7185	248.8035	217.3122	209.7036	187.9154	184.6443	192.5223	195.2503	218.9846	234.4150	262.5099	(64)
Efficiency of water heater												290.4902	(216)
(217)m	290.4902	290.4902	290.4902	290.4902	290.4902	290.4902	290.4902	290.4902	290.4902	290.4902	290.4902	290.4902	(217)
Fuel for water heating, kWh/month	91.4351	80.8008	85.6495	74.8088	72.1896	64.6890	63.5630	66.2749	67.2141	75.3845	80.6963	90.3679	(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	2.2154	2.0010	2.2154	2.1439	2.2154	2.1439	2.2154	2.2154	2.1439	2.2154	2.1439	2.2154	(231)
Lighting	26.9814	21.6454	19.4893	14.2787	11.0293	9.0110	10.0613	13.0780	16.9871	22.2880	25.1742	27.7312	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)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	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1061.8424	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	290.4902	
Water heating fuel used	913.0736	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.4040, total flow = 37.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	26.0846	(230a)
Total electricity for the above, kWh/year	26.0846	(231)
Electricity for lighting (calculated in Appendix L)	217.7550	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(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	2218.7555	(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	1061.8424	0.1552	164.7806	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	913.0736	0.1410	128.7716	(264)
Space and water heating			293.5522	(265)
Pumps, fans and electric keep-hot	26.0846	0.1387	3.6183	(267)
Energy for lighting	217.7550	0.1443	31.4288	(268)
Total CO2, kg/year			328.5992	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.5300	(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	1061.8424	1.5745	1671.8775	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	913.0736	1.5215	1389.2302	(278)
Space and water heating			3061.1078	(279)
Pumps, fans and electric keep-hot	26.0846	1.5128	39.4607	(281)
Energy for lighting	217.7550	1.5338	333.9998	(282)
Total Primary energy kWh/year			3434.5683	(286)
Dwelling Primary energy Rate (DPER)			36.9500	(287)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	46.4800	(1b) x	2.3900	(2b) =	111.0872	(1b) - (3b)
First floor	46.4800	(1c) x	2.6100	(2c) =	121.3128	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	92.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		232.4000	(5)

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2. Ventilation rate

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		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	3 * 10 =	30.0000	(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) =	30.0000 / (5) =	0.1291	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3791	(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) =	0.3222	(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													
	0.4108	0.4028	0.3947	0.3544	0.3464	0.3061	0.3061	0.2981	0.3222	0.3464	0.3625	0.3786	(22b)
Effective ac	0.5844	0.5811	0.5779	0.5628	0.5600	0.5469	0.5469	0.5444	0.5519	0.5600	0.5657	0.5717	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.1300	1.0000	2.1300			(26)
TER Opening Type			13.1300	1.1450	15.0344			(27)
Jetfloor 150/150 Grey			46.4800	0.1300	6.0424			(28a)
External Wall - 150mm FF AAC	139.9500	15.2600	124.6900	0.1800	22.4442			(29a)
500mm Mineral Wool	46.4800		46.4800	0.1100	5.1128			(30)
Total net area of external elements Aum(A, m2)			232.9100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		50.7638			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 166.1540 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	6.3000	0.0500	0.3150	
E2 Other lintels (including other steel lintels)	1.4620	0.0500	0.0731	
E1 Steel lintel with perforated steel base plate	2.8100	0.0500	0.1405	
E3 Sill	7.3100	0.0500	0.3655	
E4 Jamb	4.2000	0.0500	0.2100	
E4 Jamb	19.9500	0.0500	0.9975	
E5 Ground floor (normal)	10.8500	0.1600	1.7360	
E5 Ground floor (normal)	17.1400	0.1600	2.7424	
E6 Intermediate floor within a dwelling	27.9900	0.0000	0.0000	
E10 Eaves (insulation at ceiling level)	8.3800	0.0600	0.5028	
E12 Gable (insulation at ceiling level)	19.6100	0.0600	1.1766	
E16 Corner (normal)	20.0000	0.0900	1.8000	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.0594 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 60.8232 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	44.8183	44.5670	44.3206	43.1635	42.9470	41.9392	41.9392	41.7526	42.3274	42.9470	43.3850	43.8428	(38)
Heat transfer coeff	105.6414	105.3901	105.1438	103.9867	103.7702	102.7624	102.7624	102.5757	103.1506	103.7702	104.2081	104.6660	(39)

Average = Sum(39)m / 12 = 103.9856

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1364	1.1337	1.1311	1.1186	1.1163	1.1054	1.1054	1.1034	1.1096	1.1163	1.1210	1.1259	(40)
HLP (average)												1.1186	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6641 (42)

Hot water usage for mixer showers

68.8881	67.8528	66.3443	63.4579	61.3278	58.9524	57.6022	59.0993	60.7405	63.2910	66.2394	68.6241	(42a)

Hot water usage for baths

29.7474	29.3056	28.6834	27.5363	26.6774	25.7250	25.2105	25.8283	26.5009	27.5201	28.6908	29.6468	(42b)

Hot water usage for other uses

41.9131	40.3890	38.8649	37.3408	35.8167	34.2926	34.2926	35.8167	37.3408	38.8649	40.3890	41.9131	(42c)

Average daily hot water use (litres/day) 129.1958 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	140.5486	137.5474	133.8926	128.3350	123.8219	118.9699	117.1053	120.7443	124.5822	129.6760	135.3192	140.1840	(44)
Energy conte	222.5946	195.8657	205.7879	175.6842	166.6880	146.2874	141.6287	149.5067	153.6223	175.9690	192.7870	219.4943	(45)

Energy content (annual) Total = Sum(45)m = 2145.9157

Distribution loss (46)m = 0.15 x (45)m

33.3892	29.3798	30.8682	26.3526	25.0032	21.9431	21.2443	22.4260	23.0433	26.3954	28.9180	32.9242	(46)

Water storage loss:

Store volume 180.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.5520 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.8381 (55)

Total storage loss

25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(56)

If cylinder contains dedicated solar storage

25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(57)
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)
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)

Primary loss

Combi loss

Total heat required for water heating calculated for each month

271.8372	240.3429	255.0306	223.3384	215.9307	193.9416	190.8713	198.7493	201.2765	225.2117	240.4411	268.7370	(62)
-31.4928	-27.8524	-29.1655	-24.1502	-22.5071	-19.2595	-18.0527	-19.1972	-19.9266	-23.4913	-26.6127	-30.9096	(63a)
-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)
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)
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)

WWHRS

PV diverter

Solar input

FGHRS

Output from w/h

240.3445	212.4905	225.8651	199.1882	193.4236	174.6821	172.8186	179.5521	181.3499	201.7205	213.8284	237.8275	(64)

Total per year (kWh/year) = Sum(64)m = 2433.0909 (64)

12Total per year (kWh/year) 2433 (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

113.4068	100.7071	107.8186	96.5384	94.8179	86.7639	86.4857	89.1051	89.2028	97.9038	102.2250	112.3760	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	132.0045	146.1478	132.0045	136.4047	132.0045	136.4047	132.0045	132.0045	136.4047	132.0045	136.4047	132.0045	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
244.4192 246.9555 240.5641 226.9575 209.7817 193.6388 182.8544 180.3181 186.7095 200.3161 217.4919 233.6348 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
36.3205 36.3205 36.3205 36.3205 36.3205 36.3205 36.3205 36.3205 36.3205 36.3205 36.3205 36.3205 (69)
Pumps, fans 3.0000 3.0000 3.0000 3.0000 3.0000 0.0000 0.0000 0.0000 0.0000 3.0000 3.0000 3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
-106.5643 -106.5643 -106.5643 -106.5643 -106.5643 -106.5643 -106.5643 -106.5643 -106.5643 -106.5643 -106.5643 -106.5643 (71)
Water heating gains (Table 5)
152.4285 149.8618 144.9175 134.0810 127.4434 120.5054 116.2442 119.7649 123.8928 131.5912 141.9792 151.0430 (72)
Total internal gains
594.8138 608.9268 583.4477 563.4048 535.1912 513.5105 494.0647 495.0491 509.9685 529.8734 561.8374 582.6439 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	6.8900	10.6334	0.6300	0.7000	0.7700	22.3905	(74)
South	5.5300	46.7521	0.6300	0.7000	0.7700	79.0129	(78)
West	0.7100	19.6403	0.6300	0.7000	0.7700	4.2616	(80)

Solar gains 105.6650 180.5287 251.2749 323.1140 376.0031 380.3738 363.7047 322.5727 275.5789 200.4002 126.5925 90.4447 (83)
Total gains 700.4788 789.4554 834.7226 886.5189 911.1943 893.8843 857.7694 817.6218 785.5474 730.2736 688.4298 673.0886 (84)

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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	40.6135	40.7103	40.8057	41.2598	41.3459	41.7513	41.7513	41.8273	41.5942	41.3459	41.1721	40.9920	
alpha	3.7076	3.7140	3.7204	3.7507	3.7564	3.7834	3.7834	3.7885	3.7729	3.7564	3.7448	3.7328	
util living area	0.9801	0.9679	0.9489	0.9020	0.8118	0.6566	0.5039	0.5443	0.7498	0.9117	0.9667	0.9827	(86)
MIT	19.3032	19.5306	19.8451	20.2747	20.6434	20.8878	20.9684	20.9575	20.8055	20.3457	19.7624	19.2683	(87)
Th 2	19.9712	19.9734	19.9755	19.9857	19.9876	19.9964	19.9964	19.9980	19.9930	19.9876	19.9837	19.9797	(88)
util rest of house	0.9758	0.9611	0.9375	0.8790	0.7663	0.5773	0.3987	0.4390	0.6796	0.8863	0.9583	0.9789	(89)
MIT 2	18.0074	18.2957	18.6922	19.2277	19.6592	19.9180	19.9822	19.9773	19.8424	19.3238	18.5988	17.9688	(90)
Living area fraction										fLA = Living area / (4) =		0.1479	(91)
MIT	18.1991	18.4783	18.8628	19.3825	19.8048	20.0614	20.1280	20.1223	19.9849	19.4749	18.7709	18.1611	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1991	18.4783	18.8628	19.3825	19.8048	20.0614	20.1280	20.1223	19.9849	19.4749	18.7709	18.1611	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9653	0.9476	0.9214	0.8625	0.7570	0.5828	0.4131	0.4527	0.6790	0.8704	0.9448	0.9693	(94)
Useful gains	676.1750	748.0878	769.1252	764.5974	689.7921	520.9897	354.3670	370.1418	533.3492	635.6203	650.4112	652.4571	(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	1468.3170	1431.0200	1299.8662	1090.0436	841.0330	561.2303	362.5498	381.8161	607.0290	920.9537	1216.2009	1461.2481	(97)
Space heating kWh	589.3537	458.9304	394.8714	234.3213	112.5232	0.0000	0.0000	0.0000	0.0000	212.2881	407.3686	601.7405	(98a)
Space heating requirement - total per year (kWh/year)												3011.3972	
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	589.3537	458.9304	394.8714	234.3213	112.5232	0.0000	0.0000	0.0000	0.0000	212.2881	407.3686	601.7405	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3011.3972	
Space heating per m2											(98c) / (4) =	32.3945	(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	589.3537	458.9304	394.8714	234.3213	112.5232	0.0000	0.0000	0.0000	0.0000	212.2881	407.3686	601.7405	(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)	638.5197	497.2161	427.8129	253.8692	121.9103	0.0000	0.0000	0.0000	0.0000	229.9979	441.3528	651.9399	(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	240.3445	212.4905	225.8651	199.1882	193.4236	174.6821	172.8186	179.5521	181.3499	201.7205	213.8284	237.8275	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.9907	85.7397	85.2995	84.4250	82.8898	79.8000	79.8000	79.8000	79.8000	84.1745	85.4815	86.0508	(217)
Fuel for water heating, kWh/month	279.5007	247.8321	264.7906	235.9351	233.3504	218.8999	216.5647	225.0026	227.2556	239.6456	250.1459	276.3802	(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	27.4279	22.0037	19.8119	14.5150	11.2118	9.1602	10.2278	13.2945	17.2682	22.6569	25.5909	28.1902	(232)

Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-42.8506	-60.0795	-85.8750	-95.9765	-102.9816	-95.9102	-94.7017	-89.6466	-80.6568	-68.4149	-46.9832	-37.0840 (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	-25.2053	-52.9155	-104.9900	-157.4339	-207.9392	-208.8746	-206.4370	-174.9074	-128.3445	-75.6115	-33.6297	-19.9414 (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	3262.6188	(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	2915.3033	(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)	221.3591	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2297.3904	(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	4187.8908	(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	3262.6188	0.2100	685.1500	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2915.3033	0.2100	612.2137	(264)
Space and water heating			1297.3637	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	221.3591	0.1443	31.9490	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-901.1605	0.1347	-121.3997	
PV Unit electricity exported	-1396.2300	0.1259	-175.8424	
Total			-297.2421	(269)
Total CO2, kg/year			1043.9998	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.2300	(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	3262.6188	1.1300	3686.7593	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2915.3033	1.1300	3294.2928	(278)
Space and water heating			6981.0521	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	221.3591	1.5338	339.5280	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-901.1605	1.4979	-1349.8397	
PV Unit electricity exported	-1396.2300	0.4623	-645.4652	
Total			-1995.3049	(283)
Total Primary energy kWh/year			5455.3760	(286)
Target Primary Energy Rate (TPER)			58.6900	(287)

Full SAP Calculation Printout

Property Reference	4907-P635-7667-Coppice_Det	**Issued on Date**	22/04/2025
Assessment Reference	Plot XX	**Prop Type Ref**	Coppice Detached (AS)
Property	Plot XX, Coppice Detached (AS)		

SAP Rating	85 B	**DER**	3.53	**TER**	11.23
Environmental	97 A	**% DER < TER**			68.57
CO_2 Emissions (t/year)	0.31	**DFEE**	36.63	**TFEE**	38.72
Compliance Check	See BREL	**% DFEE < TFEE**			5.41
% DPER < TPER	37.05	**DPER**	36.95	**TPER**	58.69

Assessor Details	Mr. Mitchell Bennellick	**Assessor ID**	P635-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	46.4800 (1b)	x	2.3900 (2b)	=	111.0872	(1b) - (3b)
First floor	46.4800 (1c)	x	2.6100 (2c)	=	121.3128	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	92.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	232.4000	(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		4.5000	(17)
Infiltration rate		0.2250	(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) =	0.1913	(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	0.2438	0.2391	0.2343	0.2104	0.2056	0.1817	0.1817	0.1769	0.1913	0.2056	0.2152	0.2247	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1300	1.1000	2.3430			(26)
Windows			9.3500	1.1450	10.7061			(27)
French Doors			3.7800	1.1450	4.3282			(27)
Jetfloor 150/150 Grey			46.4800	0.1100	5.1128	75.0000	3486.0000	(28a)
External Wall - 150mm FF AAC	139.9500	15.2600	124.6900	0.1800	22.4442	60.0000	7481.3999	(29a)
500mm Mineral Wool	46.4800		46.4800	0.0900	4.1832	9.0000	418.3200	(30)
Total net area of external elements Aum(A, m2)			232.9100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		49.1176			(33)
Main dwelling								
GF - Masonry			15.9200			75.0000	1194.0000	(32c)
GF - Timber			67.1100			9.0000	603.9900	(32c)
1F - Timber			111.8900			9.0000	1007.0100	(32c)
Internal Floor			46.4800			18.0000	836.6400	(32d)
Internal Ceiling			46.4800			9.0000	418.3200	(32e)

Heat capacity Cm = Sum(A x k)												(28)...(30) + (32) + (32a)...(32e) =	15445.6799 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K													166.1540 (35)
List of Thermal Bridges													
K1 Element												Length	Psi-value	Total
E2 Other lintels (including other steel lintels)												6.3000	0.0670	0.4221
E2 Other lintels (including other steel lintels)												1.4620	0.0670	0.0980
E1 Steel lintel with perforated steel base plate												2.8100	0.1770	0.4974
E3 Sill												7.3100	0.0380	0.2778
E4 Jamb												4.2000	0.0410	0.1722
E4 Jamb												19.9500	0.0410	0.8179
E5 Ground floor (normal)												10.8500	0.0520	0.5642
E5 Ground floor (normal)												17.1400	0.0450	0.7713
E6 Intermediate floor within a dwelling												27.9900	0.0010	0.0280
E10 Eaves (insulation at ceiling level)												8.3800	0.0530	0.4441
E12 Gable (insulation at ceiling level)												19.6100	0.0770	1.5100
E16 Corner (normal)												20.0000	0.0410	0.8200
Thermal bridges (Sum(L x Psi) calculated using Appendix K)														6.4230 (36)
Point Thermal bridges													(36a) =	0.0000
Total fabric heat loss												(33) + (36) + (36a) =		55.5405 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	38.3460	38.3460	38.3460	38.3460	38.3460	38.3460	38.3460	38.3460	38.3460	38.3460	38.3460	38.3460	(38)
Heat transfer coeff	93.8865	93.8865	93.8865	93.8865	93.8865	93.8865	93.8865	93.8865	93.8865	93.8865	93.8865	93.8865	(39)
Average = Sum(39)m / 12 =												93.8865	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0100	1.0100	1.0100	1.0100	1.0100	1.0100	1.0100	1.0100	1.0100	1.0100	1.0100	1.0100	(40)
HLP (average)												1.0100	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6641 (42)
Hot water usage for mixer showers	68.8881	67.8528	66.3443	63.4579	61.3278	58.9524	57.6022	59.0993	60.7405	63.2910	66.2394	68.6241	(42a)
Hot water usage for baths	29.7474	29.3056	28.6834	27.5363	26.6774	25.7250	25.2105	25.8283	26.5009	27.5201	28.6908	29.6468	(42b)
Hot water usage for other uses	41.9131	40.3890	38.8649	37.3408	35.8167	34.2926	34.2926	35.8167	37.3408	38.8649	40.3890	41.9131	(42c)
Average daily hot water use (litres/day)												129.1958	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	140.5486	137.5474	133.8926	128.3350	123.8219	118.9699	117.1053	120.7443	124.5822	129.6760	135.3192	140.1840	(44)
Energy conte	222.5946	195.8657	205.7879	175.6842	166.6880	146.2874	141.6287	149.5067	153.6223	175.9690	192.7870	219.4943	(45)
Energy content (annual)											Total = Sum(45)m =	2145.9157	
Distribution loss (46)m = 0.15 x (45)m	33.3892	29.3798	30.8682	26.3526	25.0032	21.9431	21.2443	22.4260	23.0433	26.3954	28.9180	32.9242	(46)
Water storage loss:													
Store volume												180.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.1800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.6372	(55)
Total storage loss	19.7532	17.8416	19.7532	19.1160	19.7532	19.1160	19.7532	19.7532	19.1160	19.7532	19.1160	19.7532	(56)
If cylinder contains dedicated solar storage	19.7532	17.8416	19.7532	19.1160	19.7532	19.1160	19.7532	19.7532	19.1160	19.7532	19.1160	19.7532	(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	265.6102	234.7185	248.8035	217.3122	209.7036	187.9154	184.6443	192.5223	195.2503	218.9846	234.4150	262.5099	(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	265.6102	234.7185	248.8035	217.3122	209.7036	187.9154	184.6443	192.5223	195.2503	218.9846	234.4150	262.5099	(64)
										Total per year (kWh/year) = Sum(64)m =		2652.3897	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	108.4252	96.2076	102.8370	91.7174	89.8363	81.9430	81.5040	84.1234	84.3818	92.9222	97.4041	107.3943	(65)

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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	159.8464	159.8464	159.8464	159.8464	159.8464	159.8464	159.8464	159.8464	159.8464	159.8464	159.8464	159.8464	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.8255	27.3789	22.2660	16.8568	12.6007	10.6380	11.4947	14.9413	20.0542	25.4634	29.7196	31.6822	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	364.8048	368.5903	359.0509	338.7426	313.1070	289.0132	272.9170	269.1315	278.6709	298.9792	324.6148	348.7086	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.6487	53.6487	53.6487	53.6487	53.6487	53.6487	53.6487	53.6487	53.6487	53.6487	53.6487	53.6487	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	(71)
Water heating gains (Table 5)	145.7328	143.1660	138.2217	127.3853	120.7477	113.8097	109.5484	113.0691	117.1970	124.8954	135.2834	144.3472	(72)
Total internal gains	648.2939	646.0661	626.4695	589.9156	553.3862	520.3918	500.8911	504.0729	522.8530	556.2689	596.5487	631.6689	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W

North				3.1100	10.6334	0.3100	0.0000	0.7700				7.8938	(74)
South				5.5300	46.7521	0.3100	0.0000	0.7700				61.7132	(78)
West				0.7100	19.6403	0.3100	0.0000	0.7700				3.3286	(80)
North				3.7800	10.6334	0.3500	0.0000	0.7700				10.8323	(74)
Solar gains	83.7679	143.3683	200.2792	258.8266	302.3771	306.4044	292.7668	258.8441	220.0753	159.3394	100.4026	71.6742	(83)
Total gains	732.0618	789.4345	826.7487	848.7422	855.7633	826.7961	793.6579	762.9169	742.9283	715.6084	696.9513	703.3431	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	45.6984	45.6984	45.6984	45.6984	45.6984	45.6984	45.6984	45.6984	45.6984	45.6984	45.6984	45.6984	
alpha	4.0466	4.0466	4.0466	4.0466	4.0466	4.0466	4.0466	4.0466	4.0466	4.0466	4.0466	4.0466	
util living area	0.9750	0.9642	0.9432	0.8991	0.8098	0.6585	0.5020	0.5400	0.7435	0.9040	0.9616	0.9785	(86)
Living	19.6115	19.7801	20.0546	20.3938	20.7072	20.9083	20.9762	20.9677	20.8448	20.4644	19.9680	19.5547	
Non living	18.8217	18.9870	19.2548	19.5791	19.8632	20.0242	20.0664	20.0624	19.9805	19.6507	19.1739	18.7659	
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	20.2897	19.7801	20.0546	20.3938	20.7072	20.9083	20.9762	20.9677	20.8448	20.4644	19.9680	19.7569	(87)
Th 2	20.0750	20.0750	20.0750	20.0750	20.0750	20.0750	20.0750	20.0750	20.0750	20.0750	20.0750	20.0750	(88)
util rest of house	0.9699	0.9569	0.9313	0.8767	0.7665	0.5839	0.4044	0.4421	0.6768	0.8784	0.9525	0.9741	(89)
MIT 2	19.4339	18.9870	19.2548	19.5791	19.8632	20.0242	20.0664	20.0624	19.9805	19.6507	19.1739	18.9490	(90)
Living area fraction									fLA = Living area / (4) =			0.1479	(91)
MIT	19.5604	19.1043	19.3731	19.6996	19.9880	20.1550	20.2010	20.1963	20.1083	19.7711	19.2913	19.0685	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5604	19.1043	19.3731	19.6996	19.9880	20.1550	20.2010	20.1963	20.1083	19.7711	19.2913	19.0685	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9666	0.9474	0.9203	0.8661	0.7620	0.5908	0.4181	0.4555	0.6794	0.8684	0.9428	0.9680	(94)
Useful gains	707.5856	747.8873	760.8634	735.0819	652.0948	488.4669	331.8560	347.4999	504.7571	621.4043	657.0759	680.8533	(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	1432.7499	1333.5926	1208.6120	1013.9332	778.1323	521.5392	338.0809	356.4235	564.0995	861.0413	1144.6028	1395.9541	(97)
Space heating kWh	539.5223	393.5939	333.1250	200.7729	93.7719	0.0000	0.0000	0.0000	0.0000	178.2899	351.0193	532.0350	(98a)
Space heating requirement - total per year (kWh/year)												2622.1301	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	539.5223	393.5939	333.1250	200.7729	93.7719	0.0000	0.0000	0.0000	0.0000	178.2899	351.0193	532.0350	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2622.1301	
Space heating per m2											(98c) / (4) =	28.2071	(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 %)												262.7707	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	539.5223	393.5939	333.1250	200.7729	93.7719	0.0000	0.0000	0.0000	0.0000	178.2899	351.0193	532.0350	(98)
Space heating efficiency (main heating system 1)	262.7707	262.7707	262.7707	262.7707	262.7707	0.0000	0.0000	0.0000	0.0000	262.7707	262.7707	262.7707	(210)
Space heating fuel (main heating system)	205.3206	149.7861	126.7740	76.4061	35.6858	0.0000	0.0000	0.0000	0.0000	67.8500	133.5839	202.4712	(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	265.6102	234.7185	248.8035	217.3122	209.7036	187.9154	184.6443	192.5223	195.2503	218.9846	234.4150	262.5099	(64)
Efficiency of water heater												290.4902	(216)
(217)m	290.4902	290.4902	290.4902	290.4902	290.4902	290.4902	290.4902	290.4902	290.4902	290.4902	290.4902	290.4902	(217)
Fuel for water heating, kWh/month	91.4351	80.8008	85.6495	74.8088	72.1896	64.6890	63.5630	66.2749	67.2141	75.3845	80.6963	90.3679	(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	2.2154	2.0010	2.2154	2.1439	2.2154	2.1439	2.2154	2.2154	2.1439	2.2154	2.1439	2.2154	(231)
Lighting	26.9814	21.6454	19.4893	14.2787	11.0293	9.0110	10.0613	13.0780	16.9871	22.2880	25.1742	27.7312	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)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	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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	997.8778	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	290.4902	
Water heating fuel used	913.0736	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.4040, total flow = 37.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	26.0846	(230a)
Total electricity for the above, kWh/year	26.0846	(231)
Electricity for lighting (calculated in Appendix L)	217.7550	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(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	2154.7909	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	997.8778	16.4900	164.5501	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	913.0736	16.4900	150.5658	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	26.0846	16.4900	4.3013	(249)
Energy for lighting	217.7550	16.4900	35.9078	(250)
Additional standing charges			0.0000	(251)
Total energy cost			355.3250	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.9272	(257)
SAP value		84.9700	
SAP rating (Section 12)		85	(258)
SAP band		B	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	997.8778	0.1552	154.8676	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	913.0736	0.1410	128.7716	(264)
Space and water heating			283.6392	(265)
Pumps, fans and electric keep-hot	26.0846	0.1387	3.6183	(267)
Energy for lighting	217.7550	0.1443	31.4288	(268)
Total CO2, kg/year			318.6863	(272)
CO2 emissions per m2			3.4300	(273)
EI value			96.9046	
EI rating			97	(274)
EI band			A	

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	46.4800	(1b) x	2.3900	(2b) =	111.0872	(1b) - (3b)
First floor	46.4800	(1c) x	2.6100	(2c) =	121.3128	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	92.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		232.4000	(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		4.5000 (17)
Infiltration rate		0.2250 (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) =	0.1913 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.9000	4.6000	4.7000	4.3000	4.3000	3.8000	3.8000	3.7000	3.8000	4.3000	4.3000	4.6000	(22)
Wind factor	1.2250	1.1500	1.1750	1.0750	1.0750	0.9500	0.9500	0.9250	0.9500	1.0750	1.0750	1.1500	(22a)
Adj infilt rate	0.2343	0.2199	0.2247	0.2056	0.2056	0.1817	0.1817	0.1769	0.1817	0.2056	0.2056	0.2199	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Front Door			2.1300	1.1000	2.3430			(26)
Windows			9.3500	1.1450	10.7061			(27)
French Doors			3.7800	1.1450	4.3282			(27)
Jetfloor 150/150 Grey			46.4800	0.1100	5.1128	75.0000	3486.0000	(28a)
External Wall - 150mm FF AAC	139.9500	15.2600	124.6900	0.1800	22.4442	60.0000	7481.3999	(29a)
500mm Mineral Wool	46.4800		46.4800	0.0900	4.1832	9.0000	418.3200	(30)
Total net area of external elements Aum(A, m2)			232.9100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	49.1176			(33)
Main dwelling								
GF - Masonry			15.9200			75.0000	1194.0000	(32c)
GF - Timber			67.1100			9.0000	603.9900	(32c)
1F - Timber			111.8900			9.0000	1007.0100	(32c)
Internal Floor			46.4800			18.0000	836.6400	(32d)
Internal Ceiling			46.4800			9.0000	418.3200	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15445.6799 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		166.1540 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.3000	0.0670	0.4221
E2 Other lintels (including other steel lintels)	1.4620	0.0670	0.0980
E1 Steel lintel with perforated steel base plate	2.8100	0.1770	0.4974
E3 Sill	7.3100	0.0380	0.2778
E4 Jamb	4.2000	0.0410	0.1722
E4 Jamb	19.9500	0.0410	0.8179
E5 Ground floor (normal)	10.8500	0.0520	0.5642
E5 Ground floor (normal)	17.1400	0.0450	0.7713
E6 Intermediate floor within a dwelling	27.9900	0.0010	0.0280
E10 Eaves (insulation at ceiling level)	8.3800	0.0530	0.4441
E12 Gable (insulation at ceiling level)	19.6100	0.0770	1.5100
E16 Corner (normal)	20.0000	0.0410	0.8200

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.4230 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	55.5405 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	38.3460	38.3460	38.3460	38.3460	38.3460	38.3460	38.3460	38.3460	38.3460	38.3460	38.3460	38.3460	(38)
Heat transfer coeff	93.8865	93.8865	93.8865	93.8865	93.8865	93.8865	93.8865	93.8865	93.8865	93.8865	93.8865	93.8865	(39)
Average = Sum(39)m / 12 =												93.8865	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0100	1.0100	1.0100	1.0100	1.0100	1.0100	1.0100	1.0100	1.0100	1.0100	1.0100	1.0100	(40)
HLP (average)												1.0100	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.6641 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
68.8881	67.8528	66.3443	63.4579	61.3278	58.9524	57.6022	59.0993	60.7405	63.2910	66.2394	68.6241	(42a)

Hot water usage for baths

29.7474	29.3056	28.6834	27.5363	26.6774	25.7250	25.2105	25.8283	26.5009	27.5201	28.6908	29.6468	(42b)

Hot water usage for other uses

41.9131	40.3890	38.8649	37.3408	35.8167	34.2926	34.2926	35.8167	37.3408	38.8649	40.3890	41.9131	(42c)

Average daily hot water use (litres/day)		129.1958 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	140.5486	137.5474	133.8926	128.3350	123.8219	118.9699	117.1053	120.7443	124.5822	129.6760	135.3192	140.1840	(44)
Energy conte	222.5946	195.8657	205.7879	175.6842	166.6880	146.2874	141.6287	149.5067	153.6223	175.9690	192.7870	219.4943	(45)
Energy content (annual)										Total = Sum(45)m =		2145.9157	
Distribution loss (46)m = 0.15 x (45)m													
	33.3892	29.3798	30.8682	26.3526	25.0032	21.9431	21.2443	22.4260	23.0433	26.3954	28.9180	32.9242	(46)

Water storage loss:		
Store volume		180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):		1.1800 (48)
Temperature factor from Table 2b		0.5400 (49)
Enter (49) or (54) in (55)		0.6372 (55)

Total storage loss

19.7532	17.8416	19.7532	19.1160	19.7532	19.1160	19.7532	19.7532	19.1160	19.7532	19.1160	19.7532	(56)

If cylinder contains dedicated solar storage

19.7532	17.8416	19.7532	19.1160	19.7532	19.1160	19.7532	19.7532	19.1160	19.7532	19.1160	19.7532	(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

	265.6102	234.7185	248.8035	217.3122	209.7036	187.9154	184.6443	192.5223	195.2503	218.9846	234.4150	262.5099	(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	265.6102	234.7185	248.8035	217.3122	209.7036	187.9154	184.6443	192.5223	195.2503	218.9846	234.4150	262.5099	(64)

Total per year (kWh/year) = Sum(64)m = 2652.3897 (64)

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

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month	108.4252	96.2076	102.8370	91.7174	89.8363	81.9430	81.5040	84.1234	84.3818	92.9222	97.4041	107.3943	(65)

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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	159.8464	159.8464	159.8464	159.8464	159.8464	159.8464	159.8464	159.8464	159.8464	159.8464	159.8464	159.8464	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.8255	27.3789	22.2660	16.8568	12.6007	10.6380	11.4947	14.9413	20.0542	25.4634	29.7196	31.6822	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	364.8048	368.5903	359.0509	338.7426	313.1070	289.0132	272.9170	269.1315	278.6709	298.9792	324.6148	348.7086	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.6487	53.6487	53.6487	53.6487	53.6487	53.6487	53.6487	53.6487	53.6487	53.6487	53.6487	53.6487	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	(71)
Water heating gains (Table 5)	145.7328	143.1660	138.2217	127.3853	120.7477	113.8097	109.5484	113.0691	117.1970	124.8954	135.2834	144.3472	(72)
Total internal gains	648.2939	646.0661	626.4695	589.9156	553.3862	520.3918	500.8911	504.0729	522.8530	556.2689	596.5487	631.6689	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	3.1100	12.7650	0.3100	0.0000	0.7700	9.4762	(74)
South	5.5300	54.2217	0.3100	0.0000	0.7700	71.5733	(78)
West	0.7100	23.8018	0.3100	0.0000	0.7700	4.0339	(80)
North	3.7800	12.7650	0.3500	0.0000	0.7700	13.0039	(74)

Solar gains	98.0872	149.4529	210.8474	281.1786	312.1504	342.8552	315.4282	282.8744	240.7129	170.9019	11.5846	81.1528	(83)
Total gains	746.3811	795.5190	837.3169	871.0942	865.5367	863.2469	816.3193	786.9472	763.5659	727.1708	608.1333	712.8217	(84)

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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	45.6984	45.6984	45.6984	45.6984	45.6984	45.6984	45.6984	45.6984	45.6984	45.6984	45.6984	45.6984	
alpha	4.0466	4.0466	4.0466	4.0466	4.0466	4.0466	4.0466	4.0466	4.0466	4.0466	4.0466	4.0466	
util living area	0.9700	0.9603	0.9348	0.8826	0.7828	0.6070	0.4797	0.4956	0.7107	0.8865	0.9706	0.9742	(86)
Living	19.7197	19.8457	20.1356	20.4641	20.7583	20.9360	20.9802	20.9778	20.8748	20.5370	19.9449	19.6716	
Non living	18.9284	19.0513	19.3330	19.6439	19.9062	20.0421	20.0681	20.0672	20.0022	19.7173	19.1536	18.8815	
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	20.3451	19.8457	20.1356	20.4641	20.7583	20.9360	20.9802	20.9778	20.8748	20.5370	19.9449	19.8574	(87)
Th 2	20.0750	20.0750	20.0750	20.0750	20.0750	20.0750	20.0750	20.0750	20.0750	20.0750	20.0750	20.0750	(88)
util rest of house	0.9638	0.9522	0.9209	0.8569	0.7342	0.5285	0.3830	0.3965	0.6391	0.8561	0.9630	0.9687	(89)
MIT 2	19.4885	19.0513	19.3330	19.6439	19.9062	20.0421	20.0681	20.0672	20.0022	19.7173	19.1536	19.0485	(90)

Living area fraction fLA = Living area / (4) = 0.1479 (91)

MIT	19.6152	19.1688	19.4517	19.7652	20.0322	20.1743	20.2030	20.2019	20.1312	19.8385	19.2706	19.1681	(92)

Temperature adjustment 0.0000

adjusted MIT	19.6152	19.1688	19.4517	19.7652	20.0322	20.1743	20.2030	20.2019	20.1312	19.8385	19.2706	19.1681	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9602	0.9422	0.9097	0.8470	0.7317	0.5373	0.3968	0.4106	0.6438	0.8471	0.9543	0.9620	(94)
Useful gains	716.6457	749.5527	761.7248	737.7783	633.3515	463.8489	323.8775	323.1110	491.5813	615.9502	580.3704	685.7338	(95)
Ext temp.	4.9000	5.3000	7.0000	9.3000	12.2000	15.0000	16.7000	16.7000	14.4000	11.1000	7.8000	4.9000	(96)
Heat loss rate W	1381.5549	1302.0967	1169.0493	982.5430	735.3404	485.7959	328.8884	328.7801	538.0852	820.4291	1076.9366	1339.5837	(97)
Space heating kWh	494.6924	371.3095	303.0495	176.2306	75.8797	0.0000	0.0000	0.0000	0.0000	152.1323	357.5276	486.4643	(98a)

Space heating requirement - total per year (kWh/year) 2417.2860

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	494.6924	371.3095	303.0495	176.2306	75.8797	0.0000	0.0000	0.0000	0.0000	152.1323	357.5276	486.4643	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 2417.2860

Space heating per m2 (98c) / (4) = 26.0035 (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 %)												262.7707	(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													
	494.6924	371.3095	303.0495	176.2306	75.8797	0.0000	0.0000	0.0000	0.0000	152.1323	357.5276	486.4643	(98)
Space heating efficiency (main heating system 1)													
	262.7707	262.7707	262.7707	262.7707	262.7707	0.0000	0.0000	0.0000	0.0000	262.7707	262.7707	262.7707	(210)
Space heating fuel (main heating system)													
	188.2601	141.3055	115.3285	67.0663	28.8768	0.0000	0.0000	0.0000	0.0000	57.8955	136.0607	185.1289	(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													
	265.6102	234.7185	248.8035	217.3122	209.7036	187.9154	184.6443	192.5223	195.2503	218.9846	234.4150	262.5099	(64)
Efficiency of water heater												290.4902	(216)
(217)m	290.4902	290.4902	290.4902	290.4902	290.4902	290.4902	290.4902	290.4902	290.4902	290.4902	290.4902	290.4902	(217)
Fuel for water heating, kWh/month													
	91.4351	80.8008	85.6495	74.8088	72.1896	64.6890	63.5630	66.2749	67.2141	75.3845	80.6963	90.3679	(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	2.2154	2.0010	2.2154	2.1439	2.2154	2.1439	2.2154	2.2154	2.1439	2.2154	2.1439	2.2154	(231)
Lighting	26.9814	21.6454	19.4893	14.2787	11.0293	9.0110	10.0613	13.0780	16.9871	22.2880	25.1742	27.7312	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)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	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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												919.9223	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												290.4902	
Water heating fuel used												913.0736	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.4040, total flow = 37.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												26.0846	(230a)
Total electricity for the above, kWh/year												26.0846	(231)
Electricity for lighting (calculated in Appendix L)												217.7550	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(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												2076.8354	(238)

10a. Fuel costs - using BEDF prices (568)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	919.9223	26.0600	239.7318	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	913.0736	26.0600	237.9470	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	26.0846	26.0600	6.7976	(249)
Energy for lighting	217.7550	26.0600	56.7469	(250)
Additional standing charges			0.0000	(251)
Total energy cost			541.2233	(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	919.9223	0.1554	142.9377	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	913.0736	0.1410	128.7716	(264)
Space and water heating			271.7093	(265)
Pumps, fans and electric keep-hot	26.0846	0.1387	3.6183	(267)
Energy for lighting	217.7550	0.1443	31.4288	(268)
Total CO2, kg/year			306.7563	(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	919.9223	1.5752	1449.0828	(275)
Total CO2 associated with community systems			0.0000	(473)

Water heating (other fuel)	913.0736	1.5215	1389.2302	(278)
Space and water heating			2838.3131	(279)
Pumps, fans and electric keep-hot	26.0846	1.5128	39.4607	(281)
Energy for lighting	217.7550	1.5338	333.9998	(282)
Total Primary energy kWh/year			3211.7736	(286)

SAP 10 EPC IMPROVEMENTS

Plot XX

Current energy efficiency rating: B 85
Current environmental impact rating: A 97

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

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.1	-£ 46	-22 kg (7.1%)
U Solar photovoltaic panels	+ 5.9	-£ 221	-114 kg (40.0%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£46	0.23 kg/m²	B 86	A 97
Solar photovoltaic panels	£221	1.23 kg/m²	A 92	A 98
Total Savings	£268	1.46 kg/m²		

Potential energy efficiency rating: A 92
Potential environmental impact rating: A 98

Fuel prices for cost data on this page from database revision number 568 TEST (31 Mar 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Severn Valley):

	Current	Potential	Saving
Electricity	£541	£495	£46
Space heating	£247	£268	-£21
Water heating	£238	£170	£68
Lighting	£57	£57	£0
Generated (PV)	-£0	-£221	£221
Total cost of fuels	£541	£274	£267
Total cost of uses	£542	£274	£268
Delivered energy	22 kWh/m²	11 kWh/m²	11 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.2 tonnes	0.1 tonnes
CO2 emissions per m²	3 kg/m²	2 kg/m²	1 kg/m²
Primary energy	35 kWh/m²	18 kWh/m²	16 kWh/m²

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	46.4800 (1b)	x	2.3900 (2b)	=	111.0872	(1b) - (3b)
First floor	46.4800 (1c)	x	2.6100 (2c)	=	121.3128	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	92.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	232.4000	(5)

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2. Ventilation rate

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		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		4.5000	(17)
Infiltration rate		0.2250	(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) =	0.1913	(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													
	0.2438	0.2391	0.2343	0.2104	0.2056	0.1817	0.1817	0.1769	0.1913	0.2056	0.2152	0.2247	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Front Door			2.1300	1.1000	2.3430			(26)
Windows			9.3500	1.1450	10.7061			(27)
French Doors			3.7800	1.1450	4.3282			(27)
Jetfloor 150/150 Grey			46.4800	0.1100	5.1128	75.0000	3486.0000	(28a)
External Wall - 150mm FF AAC	139.9500	15.2600	124.6900	0.1800	22.4442	60.0000	7481.3999	(29a)
500mm Mineral Wool	46.4800		46.4800	0.0900	4.1832	9.0000	418.3200	(30)
Total net area of external elements Aum(A, m2)			232.9100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	49.1176			(33)
Main dwelling								
GF - Masonry			15.9200			75.0000	1194.0000	(32c)
GF - Timber			67.1100			9.0000	603.9900	(32c)
1F - Timber			111.8900			9.0000	1007.0100	(32c)
Internal Floor			46.4800			18.0000	836.6400	(32d)
Internal Ceiling			46.4800			9.0000	418.3200	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 15445.6799	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	166.1540	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.3000	0.0670	0.4221
E2 Other lintels (including other steel lintels)	1.4620	0.0670	0.0980
E1 Steel lintel with perforated steel base plate	2.8100	0.1770	0.4974
E3 Sill	7.3100	0.0380	0.2778
E4 Jamb	4.2000	0.0410	0.1722
E4 Jamb	19.9500	0.0410	0.8179
E5 Ground floor (normal)	10.8500	0.0520	0.5642
E5 Ground floor (normal)	17.1400	0.0450	0.7713
E6 Intermediate floor within a dwelling	27.9900	0.0010	0.0280
E10 Eaves (insulation at ceiling level)	8.3800	0.0530	0.4441
E12 Gable (insulation at ceiling level)	19.6100	0.0770	1.5100
E16 Corner (normal)	20.0000	0.0410	0.8200

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	6.4230	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	55.5405	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	38.3460	38.3460	38.3460	38.3460	38.3460	38.3460	38.3460	38.3460	38.3460	38.3460	38.3460	38.3460	(38)
Heat transfer coeff													
	93.8865	93.8865	93.8865	93.8865	93.8865	93.8865	93.8865	93.8865	93.8865	93.8865	93.8865	93.8865	(39)
Average = Sum(39)m / 12 =												93.8865	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0100	1.0100	1.0100	1.0100	1.0100	1.0100	1.0100	1.0100	1.0100	1.0100	1.0100	1.0100	(40)
HLP (average)												1.0100	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6641	(42)

Hot water usage for mixer showers

68.8881	67.8528	66.3443	63.4579	61.3278	58.9524	57.6022	59.0993	60.7405	63.2910	66.2394	68.6241	(42a)

Hot water usage for baths

29.7474	29.3056	28.6834	27.5363	26.6774	25.7250	25.2105	25.8283	26.5009	27.5201	28.6908	29.6468	(42b)

Hot water usage for other uses

41.9131	40.3890	38.8649	37.3408	35.8167	34.2926	34.2926	35.8167	37.3408	38.8649	40.3890	41.9131	(42c)

Average daily hot water use (litres/day)	129.1958	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	140.5486	137.5474	133.8926	128.3350	123.8219	118.9699	117.1053	120.7443	124.5822	129.6760	135.3192	140.1840	(44)
Energy conte	222.5946	195.8657	205.7879	175.6842	166.6880	146.2874	141.6287	149.5067	153.6223	175.9690	192.7870	219.4943	(45)
Energy content (annual)										Total = Sum(45)m =		2145.9157	
Distribution loss (46)m = 0.15 x (45)m													
	33.3892	29.3798	30.8682	26.3526	25.0032	21.9431	21.2443	22.4260	23.0433	26.3954	28.9180	32.9242	(46)

Water storage loss:		
Store volume	180.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.1800	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.6372	(55)

Total storage loss

19.7532	17.8416	19.7532	19.1160	19.7532	19.1160	19.7532	19.7532	19.1160	19.7532	19.1160	19.7532	(56)

If cylinder contains dedicated solar storage

19.7532	17.8416	19.7532	19.1160	19.7532	19.1160	19.7532	19.7532	19.1160	19.7532	19.1160	19.7532	(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

265.6102	234.7185	247.4078	210.5586	196.9093	175.3087	171.6173	180.4258	189.8475	217.5889	234.4150	262.5099	(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												616.9565	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												616.9565	
Solar input	-0.0000	-16.2134	-58.1842	-79.7461	-103.7385	-95.4140	-94.5741	-82.9625	-57.4787	-28.6450	-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													
	265.6102	218.5050	189.2236	130.8125	93.1708	79.8946	77.0432	97.4633	132.3688	188.9439	234.4150	262.5099	(64)
									Total per year (kWh/year) = Sum(64)m =			1969.9608	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month													
	108.4252	96.2076	101.7204	86.3145	79.6008	71.8576	71.0825	74.4463	80.0595	91.8056	97.4041	107.3943	(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	159.8464	159.8464	159.8464	159.8464	159.8464	159.8464	159.8464	159.8464	159.8464	159.8464	159.8464	159.8464	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.8255	27.3789	22.2660	16.8568	12.6007	10.6380	11.4947	14.9413	20.0542	25.4634	29.7196	31.6822	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	364.8048	368.5903	359.0509	338.7426	313.1070	289.0132	272.9170	269.1315	278.6709	298.9792	324.6148	348.7086	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.6487	53.6487	53.6487	53.6487	53.6487	53.6487	53.6487	53.6487	53.6487	53.6487	53.6487	53.6487	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	(71)
Water heating gains (Table 5)													
	145.7328	143.1660	136.7209	119.8813	106.9903	99.8022	95.5409	100.0622	111.1938	123.3946	135.2834	144.3472	(72)
Total internal gains													
	648.2939	646.0661	624.9687	582.4116	539.6289	506.3843	486.8836	491.0659	516.8498	554.7681	596.5487	631.6689	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	3.1100	10.6334	0.3100	0.0000	0.7700	7.8938	(74)
South	5.5300	46.7521	0.3100	0.0000	0.7700	61.7132	(78)
West	0.7100	19.6403	0.3100	0.0000	0.7700	3.3286	(80)
North	3.7800	10.6334	0.3500	0.0000	0.7700	10.8323	(74)

Solar gains	83.7679	143.3683	200.2792	258.8266	302.3771	306.4044	292.7668	258.8441	220.0753	159.3394	100.4026	71.6742	(83)
Total gains	732.0618	789.4345	825.2479	841.2382	842.0060	812.7886	779.6504	749.9100	736.9251	714.1076	696.9513	703.3431	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	45.6984	45.6984	45.6984	45.6984	45.6984	45.6984	45.6984	45.6984	45.6984	45.6984	45.6984	45.6984	
alpha	4.0466	4.0466	4.0466	4.0466	4.0466	4.0466	4.0466	4.0466	4.0466	4.0466	4.0466	4.0466	
util living area													
	0.9750	0.9642	0.9435	0.9014	0.8161	0.6667	0.5100	0.5480	0.7471	0.9046	0.9616	0.9785	(86)
Living	19.6115	19.7801	20.0527	20.3860	20.6977	20.9041	20.9748	20.9660	20.8419	20.4628	19.9680	19.5547	
Non living	18.8217	18.9870	19.2530	19.5720	19.8556	20.0216	20.0658	20.0617	19.9785	19.6493	19.1739	18.7659	
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	20.2897	19.7801	20.0527	20.3860	20.6977	20.9041	20.9748	20.9660	20.8419	20.4628	19.9680	19.7569	(87)
Th 2	20.0750	20.0750	20.0750	20.0750	20.0750	20.0750	20.0750	20.0750	20.0750	20.0750	20.0750	20.0750	(88)
util rest of house													
	0.9699	0.9569	0.9317	0.8793	0.7735	0.5920	0.4112	0.4491	0.6806	0.8790	0.9525	0.9741	(89)
MIT 2	19.4339	18.9870	19.2530	19.5720	19.8556	20.0216	20.0658	20.0617	19.9785	19.6493	19.1739	18.9490	(90)
Living area fraction									fLA = Living area / (4) =			0.1479	(91)
MIT	19.5604	19.1043	19.3713	19.6924	19.9801	20.1522	20.2003	20.1954	20.1062	19.7696	19.2913	19.0685	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5604	19.1043	19.3713	19.6924	19.9801	20.1522	20.2003	20.1954	20.1062	19.7696	19.2913	19.0685	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9666	0.9474	0.9207	0.8687	0.7686	0.5987	0.4251	0.4626	0.6831	0.8690	0.9428	0.9680	(94)
Useful gains	707.5856	747.8873	759.7851	730.7726	647.1745	486.6072	331.4146	346.9098	503.3884	620.5376	657.0759	680.8533	(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													
	1432.7499	1333.5926	1208.4419	1013.2602	777.3914	521.2746	338.0187	356.3404	563.8997	860.9059	1144.6028	1395.9541	(97)
Space heating kWh													
	539.5223	393.5939	333.8007	203.3911	96.8814	0.0000	0.0000	0.0000	0.0000	178.8340	351.0193	532.0350	(98a)
Space heating requirement - total per year (kWh/year)												2629.0776	
Solar heating kWh													
	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	539.5223	393.5939	333.8007	203.3911	96.8814	0.0000	0.0000	0.0000	0.0000	178.8340	351.0193	532.0350	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2629.0776	
Space heating per m2											(98c) / (4) =	28.2818	(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 %)												262.7707	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	539.5223	393.5939	333.8007	203.3911	96.8814	0.0000	0.0000	0.0000	0.0000	178.8340	351.0193	532.0350	(98)
Space heating efficiency (main heating system 1)													
	262.7707	262.7707	262.7707	262.7707	262.7707	0.0000	0.0000	0.0000	0.0000	262.7707	262.7707	262.7707	(210)
Space heating fuel (main heating system)													
	205.3206	149.7861	127.0312	77.4025	36.8692	0.0000	0.0000	0.0000	0.0000	68.0571	133.5839	202.4712	(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													
	265.6102	218.5050	189.2236	130.8125	93.1708	79.8946	77.0432	97.4633	132.3688	188.9439	234.4150	262.5099	(64)
Efficiency of water heater												290.4902	(216)
(217)m	290.4902	290.4902	290.4902	290.4902	290.4902	290.4902	290.4902	290.4902	290.4902	290.4902	290.4902	290.4902	(217)
Fuel for water heating, kWh/month													
	91.4351	75.2194	65.1394	45.0316	32.0736	27.5034	26.5218	33.5513	45.5674	65.0431	80.6963	90.3679	(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	9.0099	8.1380	9.0099	8.7193	9.0099	8.7193	9.0099	9.0099	8.7193	9.0099	8.7193	9.0099	(231)
Lighting	26.9814	21.6454	19.4893	14.2787	11.0293	9.0110	10.0613	13.0780	16.9871	22.2880	25.1742	27.7312	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-37.7236	-55.7965	-83.1730	-94.9636	-100.5549	-89.7437	-88.4743	-83.3482	-73.8935	-63.5229	-42.0292	-32.2505	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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												1000.5217	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												290.4902	
Water heating fuel used												678.1504	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.4040, total flow = 37.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												26.0846	(230a)
pump for solar water heating												80.0000	(230g)
Total electricity for the above, kWh/year												106.0846	(231)
Electricity for lighting (calculated in Appendix L)												217.7550	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-845.4737	(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												1157.0379	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1000.5217	16.4900	164.9860	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	678.1504	16.4900	111.8270	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	26.0846	16.4900	4.3013	(249)
Pump for solar water heating	80.0000	16.4900	13.1920	(249)
Energy for lighting	217.7550	16.4900	35.9078	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-845.4737	16.4900	-139.4186	
PV Unit electricity exported	0.0000	5.5900	0.0000	
Total			-139.4186	(252)
Total energy cost			190.7956	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.4979	(257)
SAP value		91.9295	
SAP rating (Section 12)		92	(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	1000.5217	0.1552	155.2338	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	678.1504	0.1458	98.9009	(264)
Space and water heating			254.1347	(265)
Pumps, fans and electric keep-hot	106.0846	0.1387	14.7152	(267)
Energy for lighting	217.7550	0.1443	31.4288	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-845.4737	0.1346	-113.8371	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-113.8371	(269)
Total CO2, kg/year			186.4416	(272)
CO2 emissions per m2			2.0100	(273)
EI value			98.1891	
EI rating			98	(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)	
Main dwelling						
Ground floor	46.4800	(1b) x	2.3900	(2b) =	111.0872	(1b) - (3b)
First floor	46.4800	(1c) x	2.6100	(2c) =	121.3128	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	92.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		232.4000	(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		4.5000 (17)
Infiltration rate		0.2250 (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) =	0.1913 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.9000	4.6000	4.7000	4.3000	4.3000	3.8000	3.8000	3.7000	3.8000	4.3000	4.3000	4.6000	(22)
Wind factor	1.2250	1.1500	1.1750	1.0750	1.0750	0.9500	0.9500	0.9250	0.9500	1.0750	1.0750	1.1500	(22a)
Adj infilt rate	0.2343	0.2199	0.2247	0.2056	0.2056	0.1817	0.1817	0.1769	0.1817	0.2056	0.2056	0.2199	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1300	1.1000	2.3430			(26)
Windows			9.3500	1.1450	10.7061			(27)
French Doors			3.7800	1.1450	4.3282			(27)
Jetfloor 150/150 Grey			46.4800	0.1100	5.1128	75.0000	3486.0000	(28a)
External Wall - 150mm FF AAC	139.9500	15.2600	124.6900	0.1800	22.4442	60.0000	7481.3999	(29a)
500mm Mineral Wool	46.4800		46.4800	0.0900	4.1832	9.0000	418.3200	(30)
Total net area of external elements Aum(A, m2)			232.9100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		49.1176			(33)
Main dwelling								
GF - Masonry			15.9200			75.0000	1194.0000	(32c)
GF - Timber			67.1100			9.0000	603.9900	(32c)
1F - Timber			111.8900			9.0000	1007.0100	(32c)
Internal Floor			46.4800			18.0000	836.6400	(32d)
Internal Ceiling			46.4800			9.0000	418.3200	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		15445.6799	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							166.1540	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.3000	0.0670	0.4221
E2 Other lintels (including other steel lintels)	1.4620	0.0670	0.0980
E1 Steel lintel with perforated steel base plate	2.8100	0.1770	0.4974
E3 Sill	7.3100	0.0380	0.2778
E4 Jamb	4.2000	0.0410	0.1722
E4 Jamb	19.9500	0.0410	0.8179
E5 Ground floor (normal)	10.8500	0.0520	0.5642
E5 Ground floor (normal)	17.1400	0.0450	0.7713
E6 Intermediate floor within a dwelling	27.9900	0.0010	0.0280
E10 Eaves (insulation at ceiling level)	8.3800	0.0530	0.4441
E12 Gable (insulation at ceiling level)	19.6100	0.0770	1.5100
E16 Corner (normal)	20.0000	0.0410	0.8200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.4230 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 55.5405 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	38.3460	38.3460	38.3460	38.3460	38.3460	38.3460	38.3460	38.3460	38.3460	38.3460	38.3460	38.3460	(38)
Heat transfer coeff	93.8865	93.8865	93.8865	93.8865	93.8865	93.8865	93.8865	93.8865	93.8865	93.8865	93.8865	93.8865	(39)

Average = Sum(39)m / 12 = 93.8865

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0100	1.0100	1.0100	1.0100	1.0100	1.0100	1.0100	1.0100	1.0100	1.0100	1.0100	1.0100	(40)
HLP (average)												1.0100	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6641 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	68.8881	67.8528	66.3443	63.4579	61.3278	58.9524	57.6022	59.0993	60.7405	63.2910	66.2394	68.6241	(42a)
Hot water usage for baths	29.7474	29.3056	28.6834	27.5363	26.6774	25.7250	25.2105	25.8283	26.5009	27.5201	28.6908	29.6468	(42b)
Hot water usage for other uses	41.9131	40.3890	38.8649	37.3408	35.8167	34.2926	34.2926	35.8167	37.3408	38.8649	40.3890	41.9131	(42c)

Average daily hot water use (litres/day) 129.1958 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	140.5486	137.5474	133.8926	128.3350	123.8219	118.9699	117.1053	120.7443	124.5822	129.6760	135.3192	140.1840	(44)
Energy conte	222.5946	195.8657	205.7879	175.6842	166.6880	146.2874	141.6287	149.5067	153.6223	175.9690	192.7870	219.4943	(45)

Energy content (annual) Total = Sum(45)m = 2145.9157

Distribution loss (46)m = 0.15 x (45)m	33.3892	29.3798	30.8682	26.3526	25.0032	21.9431	21.2443	22.4260	23.0433	26.3954	28.9180	32.9242	(46)

Water storage loss:
Store volume 180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.1800 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.6372 (55)

Total storage loss	19.7532	17.8416	19.7532	19.1160	19.7532	19.1160	19.7532	19.7532	19.1160	19.7532	19.1160	19.7532	(56)
If cylinder contains dedicated solar storage	19.7532	17.8416	19.7532	19.1160	19.7532	19.1160	19.7532	19.7532	19.1160	19.7532	19.1160	19.7532	(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	265.6102	234.7185	247.4078	210.5586	196.9093	175.3087	171.6173	180.4258	189.8475	217.5889	234.4150	262.5099	(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 691.5492 (H24)
Heat delivered to space heating 0.0000 (H29)
Solar input 691.5492

Solar input	-0.6950	-20.1010	-65.1781	-90.0693	-108.2897	-108.0904	-102.7672	-93.1981	-67.2985	-35.8620	-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	264.9151	214.6175	182.2297	120.4893	88.6197	67.2183	68.8501	87.2277	122.5489	181.7269	234.4150	262.5099	(64)

Total per year (kWh/year) = Sum(64)m = 1895.3681 (64)

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

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month	108.4252	96.2076	101.7204	86.3145	79.6008	71.8576	71.0825	74.4463	80.0595	91.8056	97.4041	107.3943	(65)

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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	159.8464	159.8464	159.8464	159.8464	159.8464	159.8464	159.8464	159.8464	159.8464	159.8464	159.8464	159.8464	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.8255	27.3789	22.2660	16.8568	12.6007	10.6380	11.4947	14.9413	20.0542	25.4634	29.7196	31.6822	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	364.8048	368.5903	359.0509	338.7426	313.1070	289.0132	272.9170	269.1315	278.6709	298.9792	324.6148	348.7086	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.6487	53.6487	53.6487	53.6487	53.6487	53.6487	53.6487	53.6487	53.6487	53.6487	53.6487	53.6487	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	(71)
Water heating gains (Table 5)													

	145.7328	143.1660	136.7209	119.8813	106.9903	99.8022	95.5409	100.0622	111.1938	123.3946	135.2834	144.3472	(72)
Total internal gains	648.2939	646.0661	624.9687	582.4116	539.6289	506.3843	486.8836	491.0659	516.8498	554.7681	596.5487	631.6689	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	3.1100	12.7650	0.3100	0.0000	0.7700	9.4762	(74)
South	5.5300	54.2217	0.3100	0.0000	0.7700	71.5733	(78)
West	0.7100	23.8018	0.3100	0.0000	0.7700	4.0339	(80)
North	3.7800	12.7650	0.3500	0.0000	0.7700	13.0039	(74)

Solar gains	98.0872	149.4529	210.8474	281.1786	312.1504	342.8552	315.4282	282.8744	240.7129	170.9019	11.5846	81.1528	(83)
Total gains	746.3811	795.5190	835.8161	863.5902	851.7793	849.2395	802.3118	773.9403	757.5627	725.6700	608.1333	712.8217	(84)

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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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	45.6984	45.6984	45.6984	45.6984	45.6984	45.6984	45.6984	45.6984	45.6984	45.6984	45.6984	45.6984	
alpha	4.0466	4.0466	4.0466	4.0466	4.0466	4.0466	4.0466	4.0466	4.0466	4.0466	4.0466	4.0466	
util living area	0.9700	0.9603	0.9351	0.8851	0.7894	0.6148	0.4872	0.5030	0.7143	0.8871	0.9706	0.9742	(86)
Living	19.7197	19.8457	20.1338	20.4569	20.7500	20.9330	20.9791	20.9766	20.8724	20.5355	19.9449	19.6716	
Non living	18.9284	19.0513	19.3313	19.6375	19.8998	20.0404	20.0677	20.0667	20.0006	19.7160	19.1536	18.8815	
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	20.3451	19.8457	20.1338	20.4569	20.7500	20.9330	20.9791	20.9766	20.8724	20.5355	19.9449	19.8574	(87)
Th 2	20.0750	20.0750	20.0750	20.0750	20.0750	20.0750	20.0750	20.0750	20.0750	20.0750	20.0750	20.0750	(88)
util rest of house	0.9638	0.9522	0.9213	0.8597	0.7414	0.5359	0.3893	0.4028	0.6429	0.8568	0.9630	0.9687	(89)
MIT 2	19.4885	19.0513	19.3313	19.6375	19.8998	20.0404	20.0677	20.0667	20.0006	19.7160	19.1536	19.0485	(90)
Living area fraction										fLA = Living area / (4) =		0.1479	(91)
MIT	19.6152	19.1688	19.4500	19.7587	20.0255	20.1724	20.2025	20.2013	20.1295	19.8372	19.2706	19.1681	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6152	19.1688	19.4500	19.7587	20.0255	20.1724	20.2025	20.2013	20.1295	19.8372	19.2706	19.1681	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9602	0.9422	0.9101	0.8497	0.7386	0.5447	0.4032	0.4170	0.6474	0.8477	0.9543	0.9620	(94)
Useful gains	716.6457	749.5527	760.6926	733.8140	629.1341	462.5855	323.5262	322.7329	490.4740	615.1607	580.3704	685.7338	(95)
Ext temp.	4.9000	5.3000	7.0000	9.3000	12.2000	15.0000	16.7000	16.7000	14.4000	11.1000	7.8000	4.9000	(96)
Heat loss rate W	1381.5549	1302.0967	1168.8866	981.9274	734.7127	485.6182	328.8388	328.7267	537.9254	820.3066	1076.9366	1339.5837	(97)
Space heating kWh	494.6924	371.3095	303.6964	178.6416	78.5505	0.0000	0.0000	0.0000	0.0000	152.6285	357.5276	486.4643	(98a)
Space heating requirement - total per year (kWh/year)												2423.5109	
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	494.6924	371.3095	303.6964	178.6416	78.5505	0.0000	0.0000	0.0000	0.0000	152.6285	357.5276	486.4643	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2423.5109	
Space heating per m2										(98c) / (4) =		26.0705	(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 %)	262.7707	(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	494.6924	371.3095	303.6964	178.6416	78.5505	0.0000	0.0000	0.0000	0.0000	152.6285	357.5276	486.4643	(98)
Space heating efficiency (main heating system 1)	262.7707	262.7707	262.7707	262.7707	262.7707	0.0000	0.0000	0.0000	0.0000	262.7707	262.7707	262.7707	(210)
Space heating fuel (main heating system)	188.2601	141.3055	115.5747	67.9839	29.8932	0.0000	0.0000	0.0000	0.0000	58.0843	136.0607	185.1289	(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	264.9151	214.6175	182.2297	120.4893	88.6197	67.2183	68.8501	87.2277	122.5489	181.7269	234.4150	262.5099	(64)
Efficiency of water heater												290.4902	(216)
(217)m	290.4902	290.4902	290.4902	290.4902	290.4902	290.4902	290.4902	290.4902	290.4902	290.4902	290.4902	290.4902	(217)
Fuel for water heating, kWh/month	91.1959	73.8811	62.7318	41.4779	30.5069	23.1396	23.7014	30.0278	42.1869	62.5587	80.6963	90.3679	(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	9.0099	8.1380	9.0099	8.7193	9.0099	8.7193	9.0099	9.0099	8.7193	9.0099	8.7193	9.0099	(231)
Lighting	26.9814	21.6454	19.4893	14.2787	11.0293	9.0110	10.0613	13.0780	16.9871	22.2880	25.1742	27.7312	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-43.6479	-58.2866	-86.5508	-99.3485	-101.3121	-94.1398	-91.4053	-87.1575	-78.2223	-67.1301	-6.2261	-36.3391	(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	(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	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	922.2913	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	290.4902	
Water heating fuel used	652.4722	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.4040, total flow = 37.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	26.0846	(230a)
pump for solar water heating	80.0000	(230g)
Total electricity for the above, kWh/year	106.0846	(231)
Electricity for lighting (calculated in Appendix L)	217.7550	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-849.7661	(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	1048.8369	(238)

10a. Fuel costs - using BEDF prices (568)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	922.2913	26.0600	240.3491	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	652.4722	26.0600	170.0343	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	26.0846	26.0600	6.7976	(249)
Pump for solar water heating	80.0000	26.0600	20.8480	(249)
Energy for lighting	217.7550	26.0600	56.7469	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-849.7661	26.0600	-221.4490	
PV Unit electricity exported	0.0000	5.8100	0.0000	
Total			-221.4490	(252)
Total energy cost			273.3269	(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	922.2913	0.1553	143.2664	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	652.4722	0.1465	95.5827	(264)
Space and water heating			238.8492	(265)
Pumps, fans and electric keep-hot	106.0846	0.1387	14.7152	(267)
Energy for lighting	217.7550	0.1443	31.4288	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-849.7661	0.1342	-114.0034	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-114.0034	(269)
Total CO2, kg/year			170.9898	(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	922.2913	1.5751	1452.6681	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	652.4722	1.5419	1006.0613	(278)
Space and water heating			2458.7294	(279)
Pumps, fans and electric keep-hot	106.0846	1.5128	160.4847	(281)
Energy for lighting	217.7550	1.5338	333.9998	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-849.7661	1.4959	-1271.1269	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-1271.1269	(283)
Total Primary energy kWh/year			1682.0871	(286)