

Full SAP Calculation Printout



Plot Reference	UNIT 04			Issued on Date	08/07/2026
Assessment Reference	001	Plot Type Ref	UNIT 04		
Plot Address	UNIT 04, Stoney Wood Quarter, 34 The Fairway, LONDON, NW7 3HS			SAP Version	10.2
SAP Rating	82 B	DER	3.49	TER	13.55
Environmental	97 A	% DER < TER			74.24
CO ₂ Emissions (t/year)	0.29	DFEE	35.33	TFEE	39.89
Compliance Check	See BREL	% DFEE < TFEE			11.43
% DPER < TPER	48.32	DPER	37.15	TPER	71.89
Assessor Details	Mr. Ondrej Gajdos			Assessor ID	W452-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Basement floor	37.3000 (1a)	x 2.7500 (2a)	= 102.5750 (1a) - (3a)
Ground floor	30.8000 (1b)	x 2.8000 (2b)	= 86.2400 (1b) - (3b)
First floor	22.0000 (1c)	x 2.1500 (2c)	= 47.3000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.1000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 236.1150 (5)

2. Ventilation rate

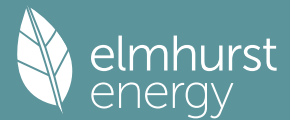
	m ³ per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (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	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												81.0000 (23c)
Effective ac	0.2432	0.2403	0.2374	0.2229	0.2200	0.2054	0.2054	0.2025	0.2112	0.2200	0.2258	0.2316 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
dl			2.8800	1.0000	2.8800		(26)
1			32.1900	0.7940	25.5575		(27)
basement floor			37.3000	0.1000	3.7300	110.0000	4102.9999 (28)
exposed wall	76.8950	35.0700	41.8250	0.1500	6.2737	60.0000	2509.4998 (29a)
basement wall	25.6950		25.6950	0.1500	3.8542	9.0000	231.2550 (29a)
terrace above LGF	5.0000		5.0000	0.1000	0.5000	9.0000	45.0000 (30)
terrace above GF	5.8000		5.8000	0.1000	0.5800	9.0000	52.2000 (30)
pitched rafters	9.1000		9.1000	0.1000	0.9100	9.0000	81.9000 (30)
flat roof above 1F	16.5000		16.5000	0.1000	1.6500	9.0000	148.5000 (30)
Total net area of external elements Aum(A, m ²)			176.2900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.9355		(33)
Main dwelling							
pw			78.6480	0.0000	0.0000	110.0000	8651.2803 (32)

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iw	189.3400	9.0000	1704.0600 (32c)
if	52.0000	18.0000	936.0000 (32d)
ic	52.0000	9.0000	468.0000 (32e)

Heat capacity $C_m = \text{Sum}(A \times k)$ (28)...(30) + (32) + (32a)...(32e) = 18930.6950 (34)
Thermal mass parameter (TMP = C_m / TFA) in kJ/m²K 210.1076 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	13.6700	0.0500	0.6835
E2 Other lintels (including other steel lintels)	12.5200	0.0500	0.6260
E3 Sill	34.8000	0.0500	1.7400
E4 Jamb	5.1000	0.1600	0.8160
E5 Ground floor (normal)	8.5000	0.0700	0.5950
E22 Basement floor	9.5000	0.0000	0.0000
E6 Intermediate floor within a dwelling	9.8000	0.2400	2.3520
E24 Eaves (insulation at ceiling level - inverted)	4.7000	0.0400	0.1880
E11 Eaves (insulation at rafter level)	1.7000	0.0800	0.1360
E13 Gable (insulation at rafter level)	8.6000	0.1600	1.3760
E14 Flat roof	8.1000	0.5600	4.5360
E15 Flat roof with parapet	9.8500	0.0900	0.8865
E16 Corner (normal)	5.5000	-0.0900	-0.4950
E17 Corner (inverted - internal area greater than external area)	26.5500	0.0600	1.5930
E18 Party wall between dwellings			

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.0330 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 60.9685 (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	18.9511	18.7247	18.4982	17.3660	17.1395	16.0073	16.0073	15.7808	16.4602	17.1395	17.5924	18.0453 (38)
Heat transfer coeff	79.9196	79.6932	79.4667	78.3345	78.1080	76.9758	76.9758	76.7493	77.4287	78.1080	78.5609	79.0138 (39)
Average = Sum(39)m / 12 =												78.2779

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8870	0.8845	0.8820	0.8694	0.8669	0.8543	0.8543	0.8518	0.8594	0.8669	0.8719	0.8770 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6271 (42)
Hot water usage for mixer showers	68.2674	67.2414	65.7465	62.8861	60.7752	58.4212	57.0832	58.5668	60.1932	62.7207	65.6425	68.0058 (42a)	
Hot water usage for baths	29.4804	29.0426	28.4260	27.2892	26.4380	25.4941	24.9843	25.5965	26.2632	27.2731	28.4334	29.3808 (42b)	
Hot water usage for other uses	41.5340	40.0237	38.5133	37.0030	35.4927	33.9824	33.9824	35.4927	37.0030	38.5133	40.0237	41.5340 (42c)	
Average daily hot water use (litres/day)												128.0314 (43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	139.2818	136.3077	132.6859	127.1784	122.7059	117.8977	116.0498	119.6560	123.4594	128.5072	134.0995	138.9206 (44)	
Energy content (annual)	220.5883	194.1004	203.9332	174.1008	165.1858	144.9690	140.3522	148.1592	152.2377	174.3830	191.0494	217.5160 (45)	
Distribution loss (46)m = 0.15 x (45)m	33.0882	29.1151	30.5900	26.1151	24.7779	21.7453	21.0528	22.2239	22.8357	26.1575	28.6574	32.6274 (46)	
Water storage loss (or HIU loss):													
Store volume												110.0000 (47)	
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)	
Volume factor from Table 2a												1.0294 (52)	
Temperature factor from Table 2b												0.6000 (53)	
Enter (49) or (54) in (55)												1.0327 (55)	
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)	
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (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	275.8651	244.0278	259.2100	227.5945	220.4626	198.4626	195.6290	203.4360	205.7314	229.6598	244.5430	272.7928 (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	275.8651	244.0278	259.2100	227.5945	220.4626	198.4626	195.6290	203.4360	205.7314	229.6598	244.5430	272.7928 (64)	
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				2777.4147 (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	117.5671	104.4803	112.0292	100.6835	99.1457	90.9971	90.8885	93.4844	93.4140	102.2038	106.3189	116.5455 (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	131.3543	131.3543	131.3543	131.3543	131.3543	131.3543	131.3543	131.3543	131.3543	131.3543	131.3543	131.3543 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	120.6800	133.6100	120.6800	124.7027	120.6800	124.7027	120.6800	120.6800	124.7027	120.6800	124.7027	120.6800 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	239.2616	241.7444	235.4878	222.1684	205.3550	189.5528	178.9959	176.5131	182.7697	196.0891	212.9025	228.7047 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1354	36.1354	36.1354	36.1354	36.1354	36.1354	36.1354	36.1354	36.1354	36.1354	36.1354	36.1354 (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)	-105.0835	-105.0835	-105.0835	-105.0835	-105.0835	-105.0835	-105.0835	-105.0835	-105.0835	-105.0835	-105.0835	-105.0835 (71)
Water heating gains (Table 5)	158.0202	155.4767	150.5769	139.8381	133.2604	126.3849	122.1620	125.6510	129.7417	137.3707	147.6651	156.6472 (72)
Total internal gains	580.3681	593.2373	569.1511	549.1155	521.7017	503.0466	484.2442	485.2505	499.6203	516.5461	547.6766	568.4382 (73)

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6. Solar gains

[Jan]			Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W
Northeast			19.4100	11.2829	0.5300		0.7000	0.7700		56.3060 (75)
Southeast			12.7800	36.7938	0.5300		0.7000	0.7700		120.8963 (77)
Solar gains	177.2023	320.5437	488.2593	688.2439	846.8928	874.1994	828.9091	705.4389	556.7086	367.6634 215.6535 149.4444 (83)
Total gains	757.5705	913.7810	1057.4104	1237.3594	1368.5945	1377.2460	1313.1533	1190.6894	1056.3289	884.2095 763.3300 717.8826 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)											21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)											
tau	65.7977	65.9847	66.1727	67.1291	67.3238	68.3140	68.3140	68.5156	67.9145	67.3238	66.9356
alpha	5.3865	5.3990	5.4115	5.4753	5.4883	5.5543	5.5543	5.5677	5.5276	5.4883	5.4624
util living area	0.9790	0.9480	0.8779	0.7154	0.5229	0.3569	0.2578	0.2963	0.4999	0.8079	0.9528
MIT	20.1458	20.3993	20.6770	20.9093	20.9845	20.9985	20.9998	20.9996	20.9911	20.8582	20.4729
Th 2	20.1786	20.1807	20.1828	20.1936	20.1957	20.2065	20.2065	20.2086	20.2022	20.1957	20.1914
util rest of house	0.9740	0.9370	0.8556	0.6783	0.4801	0.3130	0.2114	0.2454	0.4444	0.7684	0.9408
MIT 2	19.1968	19.5121	19.8449	20.1095	20.1837	20.2056	20.2064	20.2085	20.1965	20.0656	19.6159
Living area fraction	19.3421	19.6479	19.9722	20.2319	20.3062	20.3270	20.3278	20.3296	20.3181	20.1869	19.7471
MIT	19.3421	19.6479	19.9722	20.2319	20.3062	20.3270	20.3278	20.3296	20.3181	20.1869	19.7471
Temperature adjustment											0.0000
adjusted MIT	19.3421	19.6479	19.9722	20.2319	20.3062	20.3270	20.3278	20.3296	20.3181	20.1869	19.7471

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9676	0.9286	0.8492	0.6802	0.4861	0.3197	0.2185	0.2532	0.4525	0.7679	0.9329	0.9738 (94)
Useful gains	732.9900	848.4924	897.9648	841.6065	665.2367	440.3013	286.9056	301.4833	478.0324	679.0197	712.0909	699.0834 (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	1202.1555	1175.3038	1070.5930	887.6773	672.2162	440.8373	286.9537	301.5910	481.4574	748.8164	993.5640	1192.7543 (97)
Space heating kWh	349.0591	219.6173	128.4354	33.1709	5.1928	0.0000	0.0000	0.0000	0.0000	51.9287	202.6606	367.2912 (98a)
Space heating requirement - total per year (kWh/year)												1357.3560
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	349.0591	219.6173	128.4354	33.1709	5.1928	0.0000	0.0000	0.0000	0.0000	51.9287	202.6606	367.2912 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1357.3560
Space heating per m2										(98c) / (4) =		15.0650 (99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (301)
Fraction of space heat from community system												1.0000 (302)
Fraction of heat from community Heat pump-Space and Water												1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating												1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system												1.5000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	349.0591	219.6173	128.4354	33.1709	5.1928	0.0000	0.0000	0.0000	0.0000	51.9287	202.6606	367.2912 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	523.5887	329.4260	192.6531	49.7564	7.7892	0.0000	0.0000	0.0000	0.0000	77.8931	303.9909	550.9367
Space heating requirement	523.5887	329.4260	192.6531	49.7564	7.7892	0.0000	0.0000	0.0000	0.0000	77.8931	303.9909	550.9367 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement	275.8651	244.0278	259.2100	227.5945	220.4626	198.4626	195.6290	203.4360	205.7314	229.6598	244.5430	272.7928 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	413.7977	366.0417	388.8150	341.3917	330.6938	297.6940	293.4435	305.1540	308.5971	344.4897	366.8146	409.1892
Water heating fuel	413.7977	366.0417	388.8150	341.3917	330.6938	297.6940	293.4435	305.1540	308.5971	344.4897	366.8146	409.1892 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	16.9545	15.3138	16.9545	16.4076	16.9545	16.4076	16.9545	16.9545	16.4076	16.9545	16.4076	16.9545 (331)
Lighting	25.0749	20.1160	18.1123	13.2698	10.2500	8.3743	9.3504	12.1540	15.7868	20.7132	23.3955	25.7718 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-3.8701	-6.8980	-12.7857	-18.0869	-22.6994	-22.4182	-21.9409	-18.8325	-14.1000	-9.0155	-4.6542	-3.1569 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)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 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)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 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-0.4629	-1.2305	-3.2133	-6.1051	-9.2986	-9.8378	-9.5570	-7.3325	-4.4472	-1.9838	-0.6680	-0.3428 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)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 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)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 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												2036.0340 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												4166.1220 (310)

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Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	20.3603 (313)
Space cooling fuel	0.0000 (321)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6930)	
mechanical ventilation fans (SFP = 0.6930)	199.6258 (330a)
Total electricity for the above, kWh/year	199.6258 (331)
Electricity for lighting (calculated in Appendix L)	202.3690 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-212.9380 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	6391.2128 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			330.0000 (367)
Space and Water heating from Heat pump	1879.4412	0.1581	97.5670 (367)
Electrical energy for heat distribution (space & water)	20.3603	0.0000	9.0901 (372)
Overall CO2 factor for heat network			0.0459 (386)
Total CO2 associated with community systems			284.5462 (373)
Space and water heating			284.5462 (376)
Pumps, fans and electric keep-hot	199.6258	0.1387	27.6906 (378)
Energy for lighting	202.3690	0.1443	29.2081 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-158.4584	0.1305	-20.6720
PV Unit electricity exported	-54.4796	0.1206	-6.5678
Total			-27.2398 (380)
Total CO2, kg/year			314.2050 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.4900 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			330.0000 (467a)
Space and Water heating from Heat pump	1879.4412	1.5853	978.1291 (467)
Electrical energy for heat distribution (space & water)	20.3603	0.0000	95.6459 (472)
Overall CO2 factor for heat network			0.4827 (486)
Total CO2 associated with community systems			2994.0061 (473)
Space and water heating			2994.0061 (476)
Pumps, fans and electric keep-hot	199.6258	1.5128	301.9939 (478)
Energy for lighting	202.3690	1.5338	310.4003 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-158.4584	1.4819	-234.8203
PV Unit electricity exported	-54.4796	0.4422	-24.0931
Total			-258.9134 (480)
Total Primary energy kWh/year			3347.4868 (483)
Dwelling Primary energy Rate (DPER)			37.1500 (484)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Basement floor	37.3000 (1a)	x 2.7500 (2a)	= 102.5750 (1a) - (3a)
Ground floor	30.8000 (1b)	x 2.8000 (2b)	= 86.2400 (1b) - (3b)
First floor	22.0000 (1c)	x 2.1500 (2c)	= 47.3000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.1000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 236.1150 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 30.0000 / (5) = 0.1271 (8)
Pressure test	Yes

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Pressure Test Method
Measured/design AP50
Infiltration rate
Number of sides sheltered

Blower Door
5.0000 (17)
0.3771 (18)
3 (19)

Shelter factor

Infiltration rate adjusted to include shelter factor

$$(20) = 1 - [0.075 \times (19)] = 0.7750 (20)$$
$$(21) = (18) \times (20) = 0.2922 (21)$$

	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 infiltr rate													
Effective ac	0.3726	0.3653	0.3580	0.3214	0.3141	0.2776	0.2776	0.2703	0.2922	0.3141	0.3287	0.3434	(22b)
	0.5694	0.5667	0.5641	0.5517	0.5493	0.5385	0.5385	0.5365	0.5427	0.5493	0.5540	0.5589	(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								
TER Opaque door			2.8800	1.0000	2.8800			(26)
TER Opening Type			19.6500	1.1450	22.5000			(27)
basement floor			37.3000	0.1300	4.8490			(28)
exposed wall	76.8950	22.5300	54.3650	0.1800	9.7857			(29a)
basement wall	25.6950		25.6950	0.1800	4.6251			(29a)
terrace above LGF	5.0000		5.0000	0.1100	0.5500			(30)
terrace above GF	5.8000		5.8000	0.1100	0.6380			(30)
pitched rafters	9.1000		9.1000	0.1100	1.0010			(30)
flat roof above 1F	16.5000		16.5000	0.1100	1.8150			(30)
Total net area of external elements Aum(A, m2)			176.2900					(31)
Fabric heat loss, W/K = Sum (A x U)					48.6438			(33)
Main dwelling								
pw			78.6480	0.0000	0.0000			(32)

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

210.1076 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element	13.6700	0.0500	0.6835	
E2 Other lintels (including other steel lintels)	12.5200	0.0500	0.6260	
E3 Sill	34.8000	0.0500	1.7400	
E4 Jamb	5.1000	0.1600	0.8160	
E5 Ground floor (normal)	8.5000	0.0700	0.5950	
E22 Basement floor	9.5000	0.0000	0.0000	
E6 Intermediate floor within a dwelling	9.8000	0.2400	2.3520	
E24 Eaves (insulation at ceiling level - inverted)	4.7000	0.0400	0.1880	
E11 Eaves (insulation at rafter level)	1.7000	0.0800	0.1360	
E13 Gable (insulation at rafter level)	8.6000	0.0800	0.6880	
E14 Flat roof	8.1000	0.5600	4.5360	
E15 Flat roof with parapet	9.8500	0.0900	0.8865	
E16 Corner (normal)	5.5000	-0.0900	-0.4950	
E17 Corner (inverted - internal area greater than external area)	26.5500	0.0600	1.5930	
E18 Party wall between dwellings				

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

14.3450 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 62.9888 (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	44.3671	44.1571	43.9512	42.9844	42.8035	41.9614	41.9614	41.8055	42.2858	42.8035	43.1694	43.5520	(38)
Heat transfer coeff	107.3559	107.1459	106.9400	105.9732	105.7923	104.9502	104.9502	104.7943	105.2746	105.7923	106.1582	106.5408	(39)
Average = Sum(39)m / 12 =												105.9723	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1915	1.1892	1.1869	1.1762	1.1742	1.1648	1.1648	1.1631	1.1684	1.1742	1.1782	1.1825	(40)
HLP (average)												1.1762	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy

2.6271 (42)

Hot water usage for mixer showers

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	68.2674	67.2414	65.7465	62.8861	60.7752	58.4212	57.0832	58.5668	60.1932	62.7207	65.6425	68.0058	(42a)
Hot water usage for baths	29.4804	29.0426	28.4260	27.2892	26.4380	25.4941	24.9843	25.5965	26.2632	27.2731	28.4334	29.3808	(42b)
Hot water usage for other uses	41.5340	40.0237	38.5133	37.0030	35.4927	33.9824	33.9824	35.4927	37.0030	38.5133	40.0237	41.5340	(42c)
Average daily hot water use (litres/day)												128.0314	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.2818	136.3077	132.6859	127.1784	122.7059	117.8977	116.0498	119.6560	123.4594	128.5072	134.0995	138.9206	(44)
Energy conte	220.5883	194.1004	203.9332	174.1008	165.1858	144.9690	140.3522	148.1592	152.2377	174.3830	191.0494	217.5160	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m	33.0882	29.1151	30.5900	26.1151	24.7779	21.7453	21.0528	22.2239	22.8357	26.1575	28.6574	32.6274	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	271.5472	240.1278	254.8921	223.4159	216.1447	194.2840	191.3111	199.1181	201.5528	225.3419	240.3644	268.4749	(62)
WWHRS	-31.2090	-27.6015	-28.9027	-23.9326	-22.3043	-19.0859	-17.8900	-19.0242	-19.7470	-23.2796	-26.3730	-30.6310	(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	240.3382	212.5263	225.9894	199.4833	193.8404	175.1981	173.4211	180.0938	181.8057	202.0623	213.9915	237.8439	(64)
Total per year (kWh/year)												2436.5940	(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)

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Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	86.0853	76.0452	80.5475	70.2173	67.6640	60.5309	59.4068	62.0027	62.9478	70.7221	75.8527	85.0638 (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	131.3543	131.3543	131.3543	131.3543	131.3543	131.3543	131.3543	131.3543	131.3543	131.3543	131.3543	131.3543 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	120.7591	133.6975	120.7591	124.7844	120.7591	124.7844	120.7591	120.7591	124.7844	120.7591	124.7844	120.7591 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	239.2616	241.7444	235.4878	222.1684	205.3550	189.5528	178.9959	176.5131	182.7697	196.0891	212.9025	228.7047 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1354	36.1354	36.1354	36.1354	36.1354	36.1354	36.1354	36.1354	36.1354	36.1354	36.1354	36.1354 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-105.0835	-105.0835	-105.0835	-105.0835	-105.0835	-105.0835	-105.0835	-105.0835	-105.0835	-105.0835	-105.0835	-105.0835 (71)
Water heating gains (Table 5)	115.7061	113.1625	108.2628	97.5240	90.9462	84.0708	79.8479	83.3369	87.4275	95.0566	105.3509	114.3331 (72)
Total internal gains	541.1331	554.0108	529.9160	509.8831	482.4666	460.8142	442.0092	443.0154	457.3879	477.3111	508.4441	529.2032 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Northeast				11.8500	11.2829	0.6300	0.7000	0.7700	40.8613 (75)			
Southeast				7.8000	36.7938	0.6300	0.7000	0.7700	87.7085 (77)			
Solar gains	128.5698	232.5744	354.2694	499.3838	614.5064	634.3233	601.4592	511.8635	403.9380	266.7645	156.4686	108.4296 (83)
Total gains	669.7028	786.5851	884.1854	1009.2669	1096.9730	1095.1376	1043.4684	954.8790	861.3259	744.0756	664.9128	637.6328 (84)

7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	48.9822	49.0782	49.1727	49.6213	49.7061	50.1050	50.1050	50.1795	49.9506	49.7061	49.5348	49.3569
alpha	4.2655	4.2719	4.2782	4.3081	4.3137	4.3403	4.3403	4.3453	4.3300	4.3137	4.3023	4.2905
util living area	0.9906	0.9807	0.9590	0.8945	0.7652	0.5827	0.4353	0.4917	0.7375	0.9315	0.9819	0.9923 (86)
MIT	19.4754	19.7121	20.0506	20.4861	20.8043	20.9544	20.9897	20.9829	20.8763	20.4485	19.8864	19.4351 (87)
Th 2	19.9268	19.9287	19.9305	19.9391	19.9407	19.9482	19.9482	19.9496	19.9453	19.9407	19.9375	19.9340 (88)
util rest of house	0.9879	0.9755	0.9477	0.8663	0.7088	0.4984	0.3348	0.3856	0.6574	0.9067	0.9761	0.9901 (89)
MIT 2	18.1670	18.4679	18.8932	19.4255	19.7769	19.9213	19.9446	19.9430	19.8598	19.3957	18.6977	18.1207 (90)
Living area fraction	18.3673	18.6583	19.0704	19.5879	19.9342	20.0794	20.1046	20.1022	20.0154	19.5568	18.8797	18.3219 (92)
MIT	18.3673	18.6583	19.0704	19.5879	19.9342	20.0794	20.1046	20.1022	20.0154	19.5568	18.8797	18.3219 (93)
Temperature adjustment	18.3673	18.6583	19.0704	19.5879	19.9342	20.0794	20.1046	20.1022	20.0154	19.5568	18.8797	18.3219 (93)
adjusted MIT	18.3673	18.6583	19.0704	19.5879	19.9342	20.0794	20.1046	20.1022	20.0154	19.5568	18.8797	18.3219 (93)

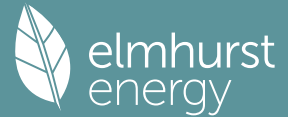
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9824	0.9669	0.9360	0.8552	0.7085	0.5094	0.3500	0.4014	0.6632	0.8953	0.9680	0.9854 (94)
Useful gains	657.9252	760.5654	827.5741	863.1591	777.1705	557.8369	365.2188	383.3305	571.2492	666.2078	643.6031	628.2970 (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	1510.2035	1474.1456	1344.2738	1132.6269	871.1130	575.0656	367.8068	387.9673	622.7378	947.5652	1250.5096	1504.5549 (97)
Space heating kWh	634.0951	479.5259	384.4246	194.0168	69.8933	0.0000	0.0000	0.0000	0.0000	209.3299	436.9727	651.9359 (98a)
Space heating requirement - total per year (kWh/year)												3060.1941
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	634.0951	479.5259	384.4246	194.0168	69.8933	0.0000	0.0000	0.0000	0.0000	209.3299	436.9727	651.9359 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3060.1941
Space heating per m ²										(98c) / (4) =		33.9644 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	634.0951	479.5259	384.4246	194.0168	69.8933	0.0000	0.0000	0.0000	0.0000	209.3299	436.9727	651.9359 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	686.2501	518.9674	416.0440	209.9749	75.6421	0.0000	0.0000	0.0000	0.0000	226.5475	472.9141	705.5583 (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)												

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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	240.3382	212.5263	225.9894	199.4833	193.8404	175.1981	173.4211	180.0938	181.8057	202.0623	213.9915	237.8439	(64)
Efficiency of water heater	86.3580	86.0692	85.5095	84.3219	82.4128	80.3000	80.3000	80.3000	80.3000	84.4573	85.8766	86.4258	(216)
(217)m	86.3580	86.0692	85.5095	84.3219	82.4128	80.3000	80.3000	80.3000	80.3000	84.4573	85.8766	86.4258	(217)
Fuel for water heating, kWh/month	278.3046	246.9248	264.2857	236.5735	235.2066	218.1794	215.9665	224.2763	226.4082	239.2480	249.1849	275.2001	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	25.0914	20.1292	18.1241	13.2785	10.2567	8.3798	9.3565	12.1619	15.7972	20.7267	23.4108	25.7887	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.3816	-31.7860	-48.1445	-57.1283	-64.2294	-60.8989	-60.1394	-55.4579	-47.6826	-37.6319	-24.0770	-18.2980	(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	-7.5607	-16.2676	-33.0252	-50.6402	-67.9966	-68.7177	-67.9266	-57.0496	-41.1999	-23.6186	-10.2054	-5.9533	(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												3311.8984	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2909.7586	(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)												202.5016	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-977.0170	(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												5533.1415	(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	3311.8984	0.2100	695.4987 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2909.7586	0.2100	611.0493 (264)
Space and water heating			1306.5480 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	202.5016	0.1443	29.2272 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-526.8556	0.1335	-70.3328
PV Unit electricity exported	-450.1614	0.1253	-56.3995
Total			-126.7322 (269)
Total CO2, kg/year			1220.9722 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.5500 (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	3311.8984	1.1300	3742.4452 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2909.7586	1.1300	3288.0272 (278)
Space and water heating			7030.4724 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	202.5016	1.5338	310.6037 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-526.8556	1.4933	-786.7609
PV Unit electricity exported	-450.1614	0.4599	-207.0114
Total			-993.7723 (283)
Total Primary energy kWh/year			6477.4045 (286)
Target Primary Energy Rate (TPER)			71.8900 (287)