Full SAP Calculation Printout

Property Reference	Plot 1	**Issued on Date**	21/12/2023
Assessment Reference	Plot 1 Be Green	**Prop Type Ref**	Plot 1 Be Green
Property	Plot 1 , 95, Avenue Road, London, NW8 6HY		

SAP Rating	53 E	**DER**	9.64	**TER**	11.18
Environmental	90 B	**% DER < TER**			13.77
CO_2 Emissions (t/year)	1.28	**DFEE**	88.51	**TFEE**	50.08
Compliance Check	See BREL	**% DFEE < TFEE**			-76.75
% DPER < TPER	-69.20	**DPER**	99.67	**TPER**	58.91

Assessor Details	Mr. Graham Suttill	**Assessor ID**	P035-0001
Client	Carnell Warren Associates Ltd, Wendy Warren		

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)	
Ground floor	83.9900 (1b)	x	2.8000 (2b)	=	235.1720	(1b) - (3b)
First floor	71.7100 (1c)	x	3.2200 (2c)	=	230.9062	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	155.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	466.0782	(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		6.0000	(17)
Infiltration rate		0.3000	(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) =	0.2325	(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	0.2964	0.2906	0.2848	0.2557	0.2499	0.2209	0.2209	0.2151	0.2325	0.2499	0.2616	0.2732	(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) =	75.6000 (23c)

Effective ac	0.4184	0.4126	0.4068	0.3777	0.3719	0.3429	0.3429	0.3371	0.3545	0.3719	0.3836	0.3952	(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	
Entrance Door			2.8800	1.4000	4.0320			(26)
Windows (Uw = 1.40)			31.7400	1.3258	42.0795			(27)
Glazed Doors (Uw = 1.40)			6.0200	1.3258	7.9811			(27)
Glazed Wall (Uw = 1.40)			27.6900	1.3258	36.7102			(27)
GF RL			4.1000	1.2357	5.0665			(27a)
1F RL			7.1700	1.2357	8.8603			(27a)
Basement Floor			83.9900	0.2500	20.9975	110.0000	9238.9000	(28)
Retaining Wall	69.0000		69.0000	0.3000	20.7000	9.0000	621.0000	(29a)
Existing External Wall	59.0100		59.0100	0.3000	17.7030	9.0000	531.0900	(29a)
New External Wall	94.0100	68.3300	25.6800	0.1800	4.6224	150.0000	3852.0000	(29a)
Flat Roof GF	12.3600	4.1000	8.2600	0.1500	1.2390	9.0000	74.3400	(30)
Flat Roof First Floor	71.7100	7.1700	64.5400	0.1500	9.6810	9.0000	580.8600	(30)
Total net area of external elements Aum(A, m2)			390.0800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		179.6725			(33)

Party Wall 1	54.5700	0.0000	0.0000	70.0000	3819.9000 (32)
Internal Wall 1	235.2600			75.0000	17644.5000 (32c)
Internal Floor 1	70.4800			18.0000	1268.6400 (32d)
Internal Ceiling 1	70.4800			9.0000	634.3200 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 38265.5500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 245.7646 (35)
Thermal bridges (Default value 0.200 * total exposed area) 78.0160 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 257.6885 (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	64.3581	63.4641	62.5701	58.1001	57.2061	52.7362	52.7362	51.8422	54.5242	57.2061	58.9941	60.7821	(38)
Heat transfer coeff	322.0467	321.1527	320.2587	315.7887	314.8947	310.4247	310.4247	309.5307	312.2127	314.8947	316.6827	318.4707	(39)
Average = Sum(39)m / 12 =												315.5652	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.0684	2.0626	2.0569	2.0282	2.0224	1.9937	1.9937	1.9880	2.0052	2.0224	2.0339	2.0454	(40)
HLP (average)												2.0268	
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 2.9428 (42)
Hot water usage for mixer showers

82.7553	81.5117	79.6994	76.2320	73.6732	70.8196	69.1976	70.9961	72.9676	76.0315	79.5734	82.4383	(42a)

Hot water usage for baths

31.7566	31.2849	30.6208	29.3962	28.4792	27.4625	26.9133	27.5728	28.2909	29.3788	30.6286	31.6492	(42b)

Hot water usage for other uses

44.7668	43.1389	41.5111	39.8832	38.2553	36.6274	36.6274	38.2553	39.8832	41.5111	43.1389	44.7668	(42c)

Average daily hot water use (litres/day) 146.4381 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	159.2787	155.9356	151.8313	145.5114	140.4077	134.9095	132.7383	136.8242	141.1417	146.9215	153.3410	158.8543	(44)
Energy conte	252.2586	222.0502	233.3590	199.1979	189.0158	165.8869	160.5355	169.4169	174.0418	199.3710	218.4624	248.7275	(45)
Energy content (annual)										Total = Sum(45)m =		2432.3235	
Distribution loss (46)m = 0.15 x (45)m	37.8388	33.3075	35.0039	29.8797	28.3524	24.8830	24.0803	25.4125	26.1063	29.9057	32.7694	37.3091	(46)
Water storage loss:													
Store volume												300.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8000	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												1.0800	(55)
Total storage loss	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(56)
If cylinder contains dedicated solar storage	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(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	309.0010	273.3014	290.1014	254.1099	245.7582	220.7989	217.2779	226.1593	228.9538	256.1134	273.3744	305.4699	(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	309.0010	273.3014	290.1014	254.1099	245.7582	220.7989	217.2779	226.1593	228.9538	256.1134	273.3744	305.4699	(64)
										Total per year (kWh/year) = Sum(64)m =		3100.4195	(64)
12Total per year (kWh/year)												3100	(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	102.4859	90.6406	96.2018	84.2429	81.4577	73.1670	71.9880	74.9411	75.8785	84.9008	90.6483	101.3118	(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	147.1381	147.1381	147.1381	147.1381	147.1381	147.1381	147.1381	147.1381	147.1381	147.1381	147.1381	147.1381	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	164.7608	182.4137	164.7608	170.2528	164.7608	170.2528	164.7608	164.7608	170.2528	164.7608	170.2528	164.7608	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	326.6567	330.0464	321.5045	303.3199	280.3650	258.7907	244.3778	240.9881	249.5300	267.7146	290.6694	312.2437	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.7138	37.7138	37.7138	37.7138	37.7138	37.7138	37.7138	37.7138	37.7138	37.7138	37.7138	37.7138	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	(71)
Water heating gains (Table 5)	137.7499	134.8819	129.3035	117.0040	109.4861	101.6208	96.7580	100.7272	105.3868	114.1140	125.9005	136.1718	(72)
Total internal gains	699.3088	717.4834	685.7102	660.7181	624.7534	597.8058	573.0380	573.6175	592.3110	616.7308	656.9642	683.3177	(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	
East	17.3900	19.6403	0.4000	0.7000	0.5400	46.4773	(76)
South	7.8500	46.7521	0.4000	0.7000	0.5400	49.9419	(78)
West	6.5000	19.6403	0.4000	0.7000	0.5400	17.3722	(80)
South	6.0200	46.7521	0.4000	0.7000	0.5400	38.2994	(78)
South	20.2300	46.7521	0.4000	0.7000	0.5400	128.7037	(78)
West	7.4600	19.6403	0.4000	0.7000	0.5400	19.9379	(80)
East	7.1700	26.0000	0.4000	0.7000	1.0000	46.9778	(82)
West	4.1000	26.0000	0.4000	0.7000	1.0000	26.8632	(82)

Solar gains	374.5734	672.5681	995.1628	1331.2066	1560.7929	1574.8755	1508.1812	1336.5287	1113.3270	765.1553	455.3482	316.0040	(83)
Total gains	1073.8822	1390.0516	1680.8731	1991.9248	2185.5462	2172.6813	2081.2192	1910.1462	1705.6380	1381.8861	1112.3123	999.3217	(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	33.0055	33.0974	33.1898	33.6596	33.7552	34.2412	34.2412	34.3401	34.0451	33.7552	33.5646	33.3761	
alpha	3.2004	3.2065	3.2127	3.2440	3.2503	3.2827	3.2827	3.2893	3.2697	3.2503	3.2376	3.2251	
util living area	0.9954	0.9891	0.9753	0.9383	0.8623	0.7311	0.5885	0.6446	0.8462	0.9641	0.9913	0.9964	(86)
MIT	18.9755	19.2040	19.5574	20.0260	20.4348	20.7260	20.8424	20.8192	20.5846	20.0297	19.4205	18.9489	(87)
Th 2	19.2881	19.2919	19.2957	19.3146	19.3184	19.3375	19.3375	19.3413	19.3299	19.3184	19.3108	19.3032	(88)
util rest of house	0.9937	0.9851	0.9655	0.9120	0.7990	0.6021	0.3953	0.4539	0.7488	0.9436	0.9873	0.9950	(89)
MIT 2	17.0059	17.2994	17.7490	18.3422	18.8195	19.1228	19.2015	19.1961	19.0029	18.3632	17.5903	16.9819	(90)
Living area fraction									fLA = Living area / (4) =			0.1776	(91)
MIT	17.3558	17.6377	18.0703	18.6413	19.1064	19.4076	19.4930	19.4844	19.2839	18.6593	17.9155	17.3313	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.3558	17.6377	18.0703	18.6413	19.1064	19.4076	19.4930	19.4844	19.2839	18.6593	17.9155	17.3313	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9905	0.9790	0.9553	0.8978	0.7889	0.6085	0.4155	0.4729	0.7453	0.9317	0.9821	0.9925	(94)
Useful gains	1063.7146	1360.9278	1605.7241	1788.2790	1724.2489	1322.1320	864.8041	903.3110	1271.2466	1287.4838	1092.4514	991.7847	(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	4204.5674	4090.7520	3705.4857	3076.1976	2332.2438	1492.4031	898.0561	954.7216	1618.4663	2537.8253	3425.0702	4181.9354	(97)
Space heating kWh	2336.7945	1834.4418	1562.2226	927.3014	452.3483	0.0000	0.0000	0.0000	0.0000	930.2541	1679.4856	2373.4722	(98a)
Space heating requirement - total per year (kWh/year)												12096.3205	
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	2336.7945	1834.4418	1562.2226	927.3014	452.3483	0.0000	0.0000	0.0000	0.0000	930.2541	1679.4856	2373.4722	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												12096.3205	
Space heating per m2											(98c) / (4) =	77.6899	(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	2917.9922	2297.1428	2352.4334	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7027	0.7813	0.7401	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	2050.5745	1794.7837	1741.0337	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	2491.3619	2389.0625	2197.5149	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	317.3669	442.1435	339.6220	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			0.6101	(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	48.4102	67.4432	51.8049	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												167.6583	(107)

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 %)	170.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Cooling System Energy Efficiency Ratio (see Table 10c)	5.6000	(209)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	2336.7945	1834.4418	1562.2226	927.3014	452.3483	0.0000	0.0000	0.0000	0.0000	930.2541	1679.4856	2373.4722	(98)
Space heating efficiency (main heating system 1)	170.0000	170.0000	170.0000	170.0000	170.0000	0.0000	0.0000	0.0000	0.0000	170.0000	170.0000	170.0000	(210)
Space heating fuel (main heating system)	1374.5850	1079.0834	918.9545	545.4714	266.0872	0.0000	0.0000	0.0000	0.0000	547.2083	987.9327	1396.1601	(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	309.0010	273.3014	290.1014	254.1099	245.7582	220.7989	217.2779	226.1593	228.9538	256.1134	273.3744	305.4699	(64)
Efficiency of water heater												170.0000	(216)
(217)m	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	(217)
Fuel for water heating, kWh/month	181.7653	160.7655	170.6479	149.4764	144.5636	129.8817	127.8105	133.0349	134.6787	150.6550	160.8085	179.6881	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	8.6447	12.0434	9.2509	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	56.7930	51.2969	56.7930	54.9610	56.7930	54.9610	56.7930	56.7930	54.9610	56.7930	54.9610	56.7930	(231)
Lighting	40.1373	32.1996	28.9922	21.2409	16.4071	13.4047	14.9671	19.4548	25.2699	33.1554	37.4490	41.2528	(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	7115.4826	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	170.0000	
Water heating fuel used	1823.7761	(219)
Space cooling fuel	29.9390	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1760)		
mechanical ventilation fans (SFP = 1.1760)	668.6917	(230a)
Total electricity for the above, kWh/year	668.6917	(231)
Electricity for lighting (calculated in Appendix L)	323.9310	(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	9961.8204	(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	7115.4826	0.1548	1101.6089	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1823.7761	0.1410	257.0807	(264)
Space and water heating			1358.6896	(265)
Space cooling	29.9390	0.1139	3.4103	(266)
Pumps, fans and electric keep-hot	668.6917	0.1387	92.7558	(267)
Energy for lighting	323.9310	0.1443	46.7532	(268)
Total CO2, kg/year			1501.6089	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			9.6400	(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	7115.4826	1.5732	11193.8699	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1823.7761	1.5212	2774.3730	(278)
Space and water heating			13968.2429	(279)
Space cooling	29.9390	1.4199	42.5097	(280)
Pumps, fans and electric keep-hot	668.6917	1.5128	1011.5968	(281)
Energy for lighting	323.9310	1.5338	496.8561	(282)
Total Primary energy kWh/year			15519.2055	(286)
Dwelling Primary energy Rate (DPER)			99.6700	(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)	
Ground floor	83.9900 (1b)	x	2.8000 (2b)	=	235.1720	(1b) - (3b)
First floor	71.7100 (1c)	x	3.2200 (2c)	=	230.9062	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 155.7000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	466.0782	(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	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)

Number of flueless gas fires 0 * 40 = 0.0000 (7c)

Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 40.0000 / (5) = 0.0858 (8)
Pressure test Yes
Pressure Test Method Blower Door
Measured/design AP50 5.0000 (17)
Infiltration rate 0.3358 (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) = 0.2603 (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	0.3318	0.3253	0.3188	0.2863	0.2798	0.2472	0.2472	0.2407	0.2603	0.2798	0.2928	0.3058	(22b)
Effective ac	0.5551	0.5529	0.5508	0.5410	0.5391	0.5306	0.5306	0.5290	0.5339	0.5391	0.5429	0.5468	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.8800	1.0000	2.8800			(26)
TER Opening Type (Uw = 1.20)			30.7400	1.1450	35.1985			(27)
GF RL			1.9300	2.0221	3.9026			(27a)
1F RL			3.3700	2.0221	6.8143			(27a)
Basement Floor			83.9900	0.1300	10.9187			(28)
Retaining Wall	69.0000		69.0000	0.1800	12.4200			(29a)
Existing External Wall	59.0100		59.0100	0.1800	10.6218			(29a)
New External Wall	94.0100	33.6200	60.3900	0.1800	10.8702			(29a)
Flat Roof GF	12.3600	1.9300	10.4300	0.1100	1.1473			(30)
Flat Roof First Floor	71.7100	3.3700	68.3400	0.1100	7.5174			(30)
Total net area of external elements Aum(A, m2)			390.0800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		102.2908			(33)
Party Wall 1			54.5700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 245.7646 (35)
Thermal bridges (User defined value 0.050 * total exposed area) 19.5040 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 121.7948 (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	85.3710	85.0422	84.7199	83.2060	82.9227	81.6041	81.6041	81.3600	82.1120	82.9227	83.4957	84.0948	(38)
Heat transfer coeff	207.1658	206.8370	206.5146	205.0007	204.7175	203.3989	203.3989	203.1548	203.9068	204.7175	205.2905	205.8896	(39)
Average = Sum(39)m / 12 =												204.9994	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3305	1.3284	1.3264	1.3166	1.3148	1.3064	1.3064	1.3048	1.3096	1.3148	1.3185	1.3223	(40)
HLP (average)												1.3166	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9428 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	73.5603	72.4548	70.8439	67.7618	65.4873	62.9507	61.5090	63.1077	64.8601	67.5836	70.7319	73.2785	(42a)
Hot water usage for baths	31.7566	31.2849	30.6208	29.3962	28.4792	27.4625	26.9133	27.5728	28.2909	29.3788	30.6286	31.6492	(42b)
Hot water usage for other uses	44.7668	43.1389	41.5111	39.8832	38.2553	36.6274	36.6274	38.2553	39.8832	41.5111	43.1389	44.7668	(42c)
Average daily hot water use (litres/day)												137.9606	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	150.0837	146.8787	142.9758	137.0412	132.2218	127.0406	125.0497	128.9357	133.0342	138.4735	144.4995	149.6945	(44)
Energy conte	237.6959	209.1533	219.7485	187.6025	177.9960	156.2113	151.2367	159.6494	164.0444	187.9072	205.8661	234.3854	(45)
Energy content (annual)										Total = Sum(45)m =		2291.4968	
Distribution loss (46)m = 0.15 x (45)m	35.6544	31.3730	32.9623	28.1404	26.6994	23.4317	22.6855	23.9474	24.6067	28.1861	30.8799	35.1578	(46)
Water storage loss:													
Store volume												300.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												2.1127	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.1409	(55)
Total storage loss	35.3664	31.9439	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	34.2256	35.3664	34.2256	35.3664	(56)
If cylinder contains dedicated solar storage	35.3664	31.9439	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	34.2256	35.3664	34.2256	35.3664	(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	296.3247	262.1084	278.3773	244.3401	236.6248	212.9488	209.8655	218.2782	220.7820	246.5361	262.6036	293.0142	(62)
WWHRS	-33.6287	-29.7415	-31.1436	-25.7881	-24.0336	-20.5657	-19.2771	-20.4992	-21.2781	-25.0845	-28.4177	-33.0059	(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	262.6960	232.3669	247.2337	218.5520	212.5912	192.3831	190.5885	197.7790	199.5039	221.4515	234.1859	260.0083	(64)
										Total per year (kWh/year) = Sum(64)m =		2669.3399	(64)
12Total per year (kWh/year)												2669	(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	125.9369	111.9075	119.9694	107.7679	106.0867	97.3303	97.1893	99.9865	99.9348	109.3822	113.8405	124.8362	(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	147.1381	147.1381	147.1381	147.1381	147.1381	147.1381	147.1381	147.1381	147.1381	147.1381	147.1381	147.1381	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	165.8884	183.6621	165.8884	171.4180	165.8884	171.4180	165.8884	165.8884	171.4180	165.8884	171.4180	165.8884	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	326.6567	330.0464	321.5045	303.3199	280.3650	258.7907	244.3778	240.9881	249.5300	267.7146	290.6694	312.2437	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.7138	37.7138	37.7138	37.7138	37.7138	37.7138	37.7138	37.7138	37.7138	37.7138	37.7138	37.7138	(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)													
	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	(71)
Water heating gains (Table 5)													
	169.2701	166.5291	161.2492	149.6776	142.5897	135.1810	130.6307	134.3904	138.7984	147.0191	158.1118	167.7906	(72)
Total internal gains													
	731.9566	750.3790	718.7835	694.5569	658.9845	632.5312	608.0383	608.4084	626.8878	650.7635	690.3407	716.0642	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	8.1700	19.6403	0.6300	0.7000	0.5400	34.3910	(76)
South	16.0200	46.7521	0.6300	0.7000	0.5400	160.5233	(78)
West	6.5500	19.6403	0.6300	0.7000	0.5400	27.5717	(80)
East	3.3700	26.0000	0.6300	0.7000	1.0000	34.7764	(82)
West	1.9300	26.0000	0.6300	0.7000	1.0000	19.9164	(82)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	277.1788	497.7007	736.4445	985.1581	1155.0893	1165.5220	1116.1591	989.1069	823.9003	566.2218	336.9528	233.8370	(83)
Total gains	1009.1354	1248.0797	1455.2280	1679.7150	1814.0739	1798.0532	1724.1974	1597.5153	1450.7880	1216.9853	1027.2935	949.9011	(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	51.3083	51.3898	51.4701	51.8502	51.9219	52.2585	52.2585	52.3213	52.1283	51.9219	51.7770	51.6263	
alpha	4.4206	4.4260	4.4313	4.4567	4.4615	4.4839	4.4839	4.4881	4.4752	4.4615	4.4518	4.4418	
util living area													
	0.9969	0.9918	0.9786	0.9355	0.8361	0.6674	0.5055	0.5619	0.8046	0.9629	0.9932	0.9977	(86)
MIT	19.3430	19.5866	19.9387	20.3845	20.7378	20.9310	20.9841	20.9750	20.8376	20.3518	19.7593	19.3016	(87)
Th 2	19.8170	19.8186	19.8202	19.8278	19.8292	19.8359	19.8359	19.8371	19.8333	19.8292	19.8264	19.8234	(88)
util rest of house													
	0.9959	0.9891	0.9711	0.9125	0.7800	0.5678	0.3786	0.4310	0.7199	0.9450	0.9904	0.9969	(89)
MIT 2	17.9022	18.2138	18.6602	19.2132	19.6127	19.7976	19.8311	19.8287	19.7249	19.1868	18.4411	17.8536	(90)
Living area fraction									fLA = Living area / (4) =			0.1776	(91)
MIT	18.1582	18.4577	18.8873	19.4213	19.8126	19.9989	20.0360	20.0323	19.9226	19.3937	18.6753	18.1108	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1582	18.4577	18.8873	19.4213	19.8126	19.9989	20.0360	20.0323	19.9226	19.3937	18.6753	18.1108	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9936	0.9844	0.9629	0.9025	0.7791	0.5828	0.4011	0.4540	0.7274	0.9360	0.9863	0.9950	(94)
Useful gains	1002.6773	1228.5885	1401.1945	1515.9241	1413.3766	1047.9312	691.5708	725.3383	1055.2914	1139.0697	1013.2023	945.1721	(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													
	2870.9425	2804.2241	2558.1567	2156.8697	1660.7884	1098.1406	698.8688	737.9189	1187.2676	1800.2315	2376.2942	2864.0948	(97)
Space heating kWh													
	1389.9893	1058.8271	860.7798	461.4809	184.0744	0.0000	0.0000	0.0000	0.0000	491.9044	981.4261	1427.6785	(98a)
Space heating requirement - total per year (kWh/year)												6856.1605	
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													
	1389.9893	1058.8271	860.7798	461.4809	184.0744	0.0000	0.0000	0.0000	0.0000	491.9044	981.4261	1427.6785	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6856.1605	
Space heating per m2											(98c) / (4) =	44.0344	(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													
	1389.9893	1058.8271	860.7798	461.4809	184.0744	0.0000	0.0000	0.0000	0.0000	491.9044	981.4261	1427.6785	(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)													
	1505.9472	1147.1583	932.5892	499.9793	199.4305	0.0000	0.0000	0.0000	0.0000	532.9408	1063.3003	1546.7807	(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

	262.6960	232.3669	247.2337	218.5520	212.5912	192.3831	190.5885	197.7790	199.5039	221.4515	234.1859	260.0083	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.2361	87.0335	86.6202	85.6939	83.7384	79.8000	79.8000	79.8000	79.8000	85.7961	86.9116	87.2834	(217)
Fuel for water heating, kWh/month													
	301.1321	266.9855	285.4228	255.0380	253.8753	241.0816	238.8327	247.8433	250.0049	258.1136	269.4529	297.8897	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	34.4683	27.6518	24.8974	18.2409	14.0898	11.5115	12.8532	16.7070	21.7008	28.4726	32.1597	35.4263	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-71.2204	-96.8715	-134.3562	-145.5179	-152.2831	-140.3641	-138.4393	-132.7890	-122.3767	-107.8863	-76.9485	-61.9807	(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	-51.7575	-107.3120	-210.5395	-312.3981	-409.5550	-410.3862	-405.7225	-345.2637	-255.2915	-152.3715	-68.7200	-41.0649	(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	7428.1262	(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	3165.6723	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	278.1792	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-4151.4162	(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	6806.5615	(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	7428.1262	0.2100	1559.9065	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3165.6723	0.2100	664.7912	(264)
Space and water heating			2224.6977	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	278.1792	0.1443	40.1499	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1381.0338	0.1354	-186.9827	
PV Unit electricity exported	-2770.3824	0.1262	-349.7574	
Total			-536.7401	(269)
Total CO2, kg/year			1740.0367	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.1800	(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	7428.1262	1.1300	8393.7826	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3165.6723	1.1300	3577.2096	(278)
Space and water heating			11970.9923	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	278.1792	1.5338	426.6805	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1381.0338	1.5004	-2072.1520	
PV Unit electricity exported	-2770.3824	0.4634	-1283.8921	
Total			-3356.0441	(283)
Total Primary energy kWh/year			9171.7295	(286)
Target Primary Energy Rate (TPER)			58.9100	(287)

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)	
Ground floor	83.9900	(1b)	x 2.8000	(2b)	= 235.1720	(1b) - (3b)
First floor	71.7100	(1c)	x 3.2200	(2c)	= 230.9062	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	155.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)		= 466.0782	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.0858	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		6.0000	(17)
Infiltration rate		0.3858	(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) =	0.2990	(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	0.3812	0.3738	0.3663	0.3289	0.3214	0.2841	0.2841	0.2766	0.2990	0.3214	0.3364	0.3513	(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	0.5727	0.5699	0.5671	0.5541	0.5517	0.5403	0.5403	0.5383	0.5447	0.5517	0.5566	0.5617	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Entrance Door			2.8800	1.4000	4.0320			(26)
Windows (Uw = 1.40)			31.7400	1.3258	42.0795			(27)
Glazed Doors (Uw = 1.40)			6.0200	1.3258	7.9811			(27)
Glazed Wall (Uw = 1.40)			27.6900	1.3258	36.7102			(27)
GF RL			4.1000	1.2357	5.0665			(27a)
1F RL			7.1700	1.2357	8.8603			(27a)
Basement Floor			83.9900	0.2500	20.9975	110.0000	9238.9000	(28)
Retaining Wall	69.0000		69.0000	0.3000	20.7000	9.0000	621.0000	(29a)
Existing External Wall	59.0100		59.0100	0.3000	17.7030	9.0000	531.0900	(29a)
New External Wall	94.0100	68.3300	25.6800	0.1800	4.6224	150.0000	3852.0000	(29a)
Flat Roof GF	12.3600	4.1000	8.2600	0.1500	1.2390	9.0000	74.3400	(30)
Flat Roof First Floor	71.7100	7.1700	64.5400	0.1500	9.6810	9.0000	580.8600	(30)
Total net area of external elements Aum(A, m2)			390.0800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		179.6725			(33)
Party Wall 1			54.5700	0.0000	0.0000	70.0000	3819.9000	(32)
Internal Wall 1			235.2600			75.0000	17644.5000	(32c)
Internal Floor 1			70.4800			18.0000	1268.6400	(32d)
Internal Ceiling 1			70.4800			9.0000	634.3200	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	38265.5500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		245.7646 (35)
Thermal bridges (Default value 0.200 * total exposed area)		78.0160 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	257.6885 (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	88.0803	87.6463	87.2209	85.2226	84.8487	83.1083	83.1083	82.7860	83.7787	84.8487	85.6050	86.3958	(38)
Heat transfer coeff	345.7689	345.3348	344.9094	342.9111	342.5373	340.7968	340.7968	340.4745	341.4672	342.5373	343.2936	344.0843	(39)
Average = Sum(39)m / 12 =												342.9093	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.2207	2.2180	2.2152	2.2024	2.2000	2.1888	2.1888	2.1867	2.1931	2.2000	2.2048	2.2099	(40)
HLP (average)												2.2024	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.9428 (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

	31.7566	31.2849	30.6208	29.3962	28.4792	27.4625	26.9133	27.5728	28.2909	29.3788	30.6286	31.6492	(42b)

Hot water usage for other uses

	44.7668	43.1389	41.5111	39.8832	38.2553	36.6274	36.6274	38.2553	39.8832	41.5111	43.1389	44.7668	(42c)

Average daily hot water use (litres/day)	70.1405 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	76.5234	74.4239	72.1318	69.2794	66.7345	64.0899	63.5407	65.8281	68.1741	70.8899	73.7676	76.4160	(44)
Energy conte	121.1943	105.9786	110.8640	94.8400	89.8375	78.8060	76.8470	81.5089	84.0654	96.1969	105.0955	119.6490	(45)
Energy content (annual)										Total = Sum(45)m =		1164.8832	
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

103.0152	90.0818	94.2344	80.6140	76.3619	66.9851	65.3199	69.2826	71.4556	81.7674	89.3311	101.7017	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

103.0152	90.0818	94.2344	80.6140	76.3619	66.9851	65.3199	69.2826	71.4556	81.7674	89.3311	101.7017	(64)

Total per year (kWh/year) = Sum(64)m = 990.1507 (64)

12Total per year (kWh/year) 990 (64)

Electric shower(s)

58.9095	52.4889	57.3159	54.6958	55.7222	53.1535	54.9253	55.7222	54.6958	57.3159	56.2381	58.9095	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 670.0926 (64a)

Heat gains from water heating, kWh/month

40.4812	35.6427	37.8876	33.8275	33.0210	30.0347	30.0613	31.2512	31.5379	34.7708	36.3923	40.1528	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.1381	147.1381	147.1381	147.1381	147.1381	147.1381	147.1381	147.1381	147.1381	147.1381	147.1381	147.1381	(66)

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

164.7608	182.4137	164.7608	170.2528	164.7608	170.2528	164.7608	164.7608	170.2528	164.7608	170.2528	164.7608	(67)

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

326.6567	330.0464	321.5045	303.3199	280.3650	258.7907	244.3778	240.9881	249.5300	267.7146	290.6694	312.2437	(68)

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

37.7138	37.7138	37.7138	37.7138	37.7138	37.7138	37.7138	37.7138	37.7138	37.7138	37.7138	37.7138	(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)

-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	(71)

Water heating gains (Table 5)

54.4102	53.0397	50.9241	46.9826	44.3831	41.7148	40.4050	42.0043	43.8026	46.7350	50.5449	53.9688	(72)

Total internal gains

612.9691	632.6412	604.3308	587.6967	556.6503	537.8998	516.6850	514.8946	530.7268	546.3518	578.6086	598.1148	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	17.3900	19.6403	0.4000	0.7000	0.5400	46.4773	(76)
South	7.8500	46.7521	0.4000	0.7000	0.5400	49.9419	(78)
West	6.5000	19.6403	0.4000	0.7000	0.5400	17.3722	(80)
South	6.0200	46.7521	0.4000	0.7000	0.5400	38.2994	(78)
South	20.2300	46.7521	0.4000	0.7000	0.5400	128.7037	(78)
West	7.4600	19.6403	0.4000	0.7000	0.5400	19.9379	(80)
East	7.1700	26.0000	0.4000	0.7000	1.0000	46.9778	(82)
West	4.1000	26.0000	0.4000	0.7000	1.0000	26.8632	(82)

Solar gains	374.5734	672.5681	995.1628	1331.2066	1560.7929	1574.8755	1508.1812	1336.5287	1113.3270	765.1553	455.3482	316.0040	(83)
Total gains	987.5426	1305.2094	1599.4937	1918.9033	2117.4432	2112.7753	2024.8662	1851.4233	1644.0538	1311.5071	1033.9567	914.1188	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	30.7411	30.7797	30.8177	30.9973	31.0311	31.1896	31.1896	31.2191	31.1284	31.0311	30.9628	30.8916	
alpha	3.0494	3.0520	3.0545	3.0665	3.0687	3.0793	3.0793	3.0813	3.0752	3.0687	3.0642	3.0594	
util living area													
	0.9962	0.9908	0.9789	0.9472	0.8818	0.7667	0.6327	0.6886	0.8701	0.9701	0.9928	0.9970	(86)
MIT	18.2088	18.5129	18.9966	19.6376	20.2294	20.6714	20.8721	20.8294	20.4584	19.6613	18.8124	18.1582	(87)
Th 2	19.1902	19.1920	19.1937	19.2018	19.2033	19.2104	19.2104	19.2117	19.2077	19.2033	19.2003	19.1971	(88)
util rest of house													
	0.9947	0.9872	0.9702	0.9233	0.8218	0.6345	0.4191	0.4820	0.7764	0.9519	0.9894	0.9959	(89)
MIT 2	16.7628	17.0662	17.5455	18.1729	18.7182	19.0753	19.1864	19.1737	18.9341	18.2105	17.3715	16.7167	(90)
Living area fraction										fLA = Living area / (4) =		0.1776	(91)
MIT	17.0196	17.3232	17.8033	18.4331	18.9866	19.3589	19.4859	19.4678	19.2049	18.4683	17.6275	16.9728	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.0196	17.3232	17.8033	18.4331	18.9866	19.3589	19.4859	19.4678	19.2049	18.4683	17.6275	16.9728	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9918	0.9814	0.9601	0.9089	0.8123	0.6479	0.4572	0.5175	0.7762	0.9405	0.9845	0.9935	(94)
Useful gains	979.4706	1280.9761	1535.7203	1744.1636	1720.0861	1368.8888	925.7241	958.1350	1276.1656	1233.5100	1017.9062	908.1745	(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													
4398.0536	4290.1538	3898.6166	3269.0074	2495.9384	1621.8091	983.4907	1044.5179	1743.1435	2695.1769	3614.0165	4394.9086	(97)	
Space heating kWh													
2543.4257	2022.1674	1757.9949	1097.8875	577.2341	0.0000	0.0000	0.0000	0.0000	1087.4802	1869.1994	2594.1301	(98a)	

Space heating requirement - total per year (kWh/year) 13549.5192

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

2543.4257	2022.1674	1757.9949	1097.8875	577.2341	0.0000	0.0000	0.0000	0.0000	1087.4802	1869.1994	2594.1301	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 13549.5192

Space heating per m2 (98c) / (4) = 87.0232 (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	3203.4901	2521.8965	2587.6064	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6429	0.7244	0.6787	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	2059.4663	1826.9173	1756.1249	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	2430.0467	2331.1869	2136.8128	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	266.8179	375.1766	283.2318	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 66.7045 93.7942 70.8079 0.0000 0.0000 0.0000 0.0000	(107)
Space cooling requirement		231.3066 (107)
Energy for space heating		87.0232 (99)
Energy for space cooling		1.4856 (108)
Total		88.5088 (109)
Fabric Energy Efficiency (DFEE)		88.5 (109)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	83.9900	(1b)	x 2.8000	(2b) =	235.1720	(1b) - (3b)
First floor	71.7100	(1c)	x 3.2200	(2c) =	230.9062	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	155.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		466.0782	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.0858 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3358 (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) =	0.2603 (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	0.3318	0.3253	0.3188	0.2863	0.2798	0.2472	0.2472	0.2407	0.2603	0.2798	0.2928	0.3058	(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	0.5551	0.5529	0.5508	0.5410	0.5391	0.5306	0.5306	0.5290	0.5339	0.5391	0.5429	0.5468	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.8800	1.0000	2.8800			(26)
TER Opening Type (Uw = 1.20)			30.7400	1.1450	35.1985			(27)
GF RL			1.9300	2.0221	3.9026			(27a)
1F RL			3.3700	2.0221	6.8143			(27a)
Basement Floor			83.9900	0.1300	10.9187			(28)
Retaining Wall	69.0000		69.0000	0.1800	12.4200			(29a)
Existing External Wall	59.0100		59.0100	0.1800	10.6218			(29a)
New External Wall	94.0100	33.6200	60.3900	0.1800	10.8702			(29a)
Flat Roof GF	12.3600	1.9300	10.4300	0.1100	1.1473			(30)
Flat Roof First Floor	71.7100	3.3700	68.3400	0.1100	7.5174			(30)
Total net area of external elements Aum(A, m2)			390.0800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		102.2908			(33)
Party Wall 1			54.5700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		245.7646 (35)
Thermal bridges (User defined value 0.050 * total exposed area)		19.5040 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	121.7948 (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	85.3710	85.0422	84.7199	83.2060	82.9227	81.6041	81.6041	81.3600	82.1120	82.9227	83.4957	84.0948	(38)
Heat transfer coeff	207.1658	206.8370	206.5146	205.0007	204.7175	203.3989	203.3989	203.1548	203.9068	204.7175	205.2905	205.8896	(39)
Average = Sum(39)m / 12 =												204.9994	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3305	1.3284	1.3264	1.3166	1.3148	1.3064	1.3064	1.3048	1.3096	1.3148	1.3185	1.3223	(40)
HLP (average)												1.3166	
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 2.9428 (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

31.7566	31.2849	30.6208	29.3962	28.4792	27.4625	26.9133	27.5728	28.2909	29.3788	30.6286	31.6492	(42b)

Hot water usage for other uses

44.7668	43.1389	41.5111	39.8832	38.2553	36.6274	36.6274	38.2553	39.8832	41.5111	43.1389	44.7668	(42c)

Average daily hot water use (litres/day) 70.1405 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	76.5234	74.4239	72.1318	69.2794	66.7345	64.0899	63.5407	65.8281	68.1741	70.8899	73.7676	76.4160	(44)
Energy conte	121.1943	105.9786	110.8640	94.8400	89.8375	78.8060	76.8470	81.5089	84.0654	96.1969	105.0955	119.6490	(45)
Energy content (annual)										Total = Sum(45)m =		1164.8832	

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

103.0152	90.0818	94.2344	80.6140	76.3619	66.9851	65.3199	69.2826	71.4556	81.7674	89.3311	101.7017	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

103.0152	90.0818	94.2344	80.6140	76.3619	66.9851	65.3199	69.2826	71.4556	81.7674	89.3311	101.7017	(64)
								Total per year (kWh/year) = Sum(64)m =			990.1507	(64)
12Total per year (kWh/year)											990	(64)

Electric shower(s)

58.9095	52.4889	57.3159	54.6958	55.7222	53.1535	54.9253	55.7222	54.6958	57.3159	56.2381	58.9095	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 670.0926 (64a)

Heat gains from water heating, kWh/month

40.4812	35.6427	37.8876	33.8275	33.0210	30.0347	30.0613	31.2512	31.5379	34.7708	36.3923	40.1528	(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	147.1381	147.1381	147.1381	147.1381	147.1381	147.1381	147.1381	147.1381	147.1381	147.1381	147.1381	147.1381	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	165.8884	183.6621	165.8884	171.4180	165.8884	171.4180	165.8884	165.8884	171.4180	165.8884	171.4180	165.8884	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	326.6567	330.0464	321.5045	303.3199	280.3650	258.7907	244.3778	240.9881	249.5300	267.7146	290.6694	312.2437	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.7138	37.7138	37.7138	37.7138	37.7138	37.7138	37.7138	37.7138	37.7138	37.7138	37.7138	37.7138	(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)	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	(71)
Water heating gains (Table 5)	54.4102	53.0397	50.9241	46.9826	44.3831	41.7148	40.4050	42.0043	43.8026	46.7350	50.5449	53.9688	(72)
Total internal gains	614.0967	633.8897	605.4585	588.8619	557.7780	539.0650	517.8126	516.0222	531.8920	547.4794	579.7737	599.2424	(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	
East	8.1700	19.6403	0.6300	0.7000	0.5400	34.3910	(76)
South	16.0200	46.7521	0.6300	0.7000	0.5400	160.5233	(78)
West	6.5500	19.6403	0.6300	0.7000	0.5400	27.5717	(80)
East	3.3700	26.0000	0.6300	0.7000	1.0000	34.7764	(82)
West	1.9300	26.0000	0.6300	0.7000	1.0000	19.9164	(82)

Solar gains	277.1788	497.7007	736.4445	985.1581	1155.0893	1165.5220	1116.1591	989.1069	823.9003	566.2218	336.9528	233.8370	(83)
Total gains	891.2755	1131.5904	1341.9029	1574.0200	1712.8673	1704.5870	1633.9717	1505.1291	1355.7923	1113.7012	916.7266	833.0794	(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	51.3083	51.3898	51.4701	51.8502	51.9219	52.2585	52.2585	52.3213	52.1283	51.9219	51.7770	51.6263	
alpha	4.4206	4.4260	4.4313	4.4567	4.4615	4.4839	4.4839	4.4881	4.4752	4.4615	4.4518	4.4418	
util living area	0.9982	0.9944	0.9841	0.9475	0.8573	0.6939	0.5304	0.5910	0.8322	0.9727	0.9957	0.9986	(86)

MIT	19.2644	19.5105	19.8687	20.3303	20.7051	20.9193	20.9808	20.9695	20.8111	20.2918	19.6865	19.2233	(87)
Th 2	19.8170	19.8186	19.8202	19.8278	19.8292	19.8359	19.8359	19.8371	19.8333	19.8292	19.8264	19.8234	(88)
util rest of house	0.9975	0.9925	0.9783	0.9278	0.8049	0.5940	0.3987	0.4559	0.7522	0.9589	0.9938	0.9982	(89)
MIT 2	18.2465	18.4927	18.8484	19.2999	19.6359	19.8003	19.8313	19.8289	19.7321	19.2729	18.6748	18.2103	(90)
Living area fraction										fLA = Living area / (4) =		0.1776	(91)
MIT	18.4273	18.6735	19.0296	19.4829	19.8259	19.9991	20.0355	20.0315	19.9238	19.4539	18.8545	18.3902	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4273	18.6735	19.0296	19.4829	19.8259	19.9991	20.0355	20.0315	19.9238	19.4539	18.8545	18.3902	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9964	0.9898	0.9730	0.9205	0.8048	0.6092	0.4222	0.4798	0.7594	0.9528	0.9916	0.9973	(94)
Useful gains	888.0369	1120.0555	1305.6783	1448.9071	1378.4432	1038.4019	689.8276	722.1141	1029.6485	1061.1406	909.0409	830.8153	(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	2926.6993	2848.8755	2587.5495	2169.5064	1663.5066	1098.1655	698.7815	737.7574	1187.5123	1812.5513	2413.0973	2921.6221	(97)
Space heating kWh	1516.7648	1161.7671	953.7122	518.8315	212.0872	0.0000	0.0000	0.0000	0.0000	559.0496	1082.9206	1555.5603	(98a)
Space heating requirement - total per year (kWh/year)												7560.6932	
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	1516.7648	1161.7671	953.7122	518.8315	212.0872	0.0000	0.0000	0.0000	0.0000	559.0496	1082.9206	1555.5603	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												7560.6932	
Space heating per m2											(98c) / (4) =	48.5594	(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	1911.9500	1505.1521	1543.9761	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8242	0.8932	0.8592	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1575.8322	1344.3525	1326.5355	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1943.1447	1864.3590	1720.8493	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	264.4650	386.8849	293.3695	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	66.1163	96.7212	73.3424	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												236.1798	(107)
Energy for space heating												48.5594	(99)
Energy for space cooling												1.5169	(108)
Total												50.0763	(109)
Fabric Energy Efficiency (TFEE)												50.1	(109)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	83.9900	(1b)	x 2.8000	(2b) =	235.1720	(1b) - (3b)
First floor	71.7100	(1c)	x 3.2200	(2c) =	230.9062	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	155.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		466.0782	(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		6.0000	(17)
Infiltration rate		0.3000	(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) =	0.2325	(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	0.2964	0.2906	0.2848	0.2557	0.2499	0.2209	0.2209	0.2151	0.2325	0.2499	0.2616	0.2732	(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) = 75.6000 (23c)

Effective ac	0.4184	0.4126	0.4068	0.3777	0.3719	0.3429	0.3429	0.3371	0.3545	0.3719	0.3836	0.3952	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Entrance Door			2.8800	1.4000	4.0320			(26)
Windows (Uw = 1.40)			31.7400	1.3258	42.0795			(27)
Glazed Doors (Uw = 1.40)			6.0200	1.3258	7.9811			(27)
Glazed Wall (Uw = 1.40)			27.6900	1.3258	36.7102			(27)
GF RL			4.1000	1.2357	5.0665			(27a)
1F RL			7.1700	1.2357	8.8603			(27a)
Basement Floor			83.9900	0.2500	20.9975	110.0000	9238.9000	(28)
Retaining Wall	69.0000		69.0000	0.3000	20.7000	9.0000	621.0000	(29a)
Existing External Wall	59.0100		59.0100	0.3000	17.7030	9.0000	531.0900	(29a)
New External Wall	94.0100	68.3300	25.6800	0.1800	4.6224	150.0000	3852.0000	(29a)
Flat Roof GF	12.3600	4.1000	8.2600	0.1500	1.2390	9.0000	74.3400	(30)
Flat Roof First Floor	71.7100	7.1700	64.5400	0.1500	9.6810	9.0000	580.8600	(30)
Total net area of external elements Aum(A, m2)			390.0800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		179.6725			(33)
Party Wall 1			54.5700	0.0000	0.0000	70.0000	3819.9000	(32)
Internal Wall 1			235.2600			75.0000	17644.5000	(32c)
Internal Floor 1			70.4800			18.0000	1268.6400	(32d)
Internal Ceiling 1			70.4800			9.0000	634.3200	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 38265.5500 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 245.7646 (35)

Thermal bridges (Default value 0.200 * total exposed area) 78.0160 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 257.6885 (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	64.3581	63.4641	62.5701	58.1001	57.2061	52.7362	52.7362	51.8422	54.5242	57.2061	58.9941	60.7821	(38)
Heat transfer coeff	322.0467	321.1527	320.2587	315.7887	314.8947	310.4247	310.4247	309.5307	312.2127	314.8947	316.6827	318.4707	(39)

Average = Sum(39)m / 12 = 315.5652

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.0684	2.0626	2.0569	2.0282	2.0224	1.9937	1.9937	1.9880	2.0052	2.0224	2.0339	2.0454	(40)
HLP (average)												2.0268	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9428 (42)

Hot water usage for mixer showers

82.7553	81.5117	79.6994	76.2320	73.6732	70.8196	69.1976	70.9961	72.9676	76.0315	79.5734	82.4383	(42a)

Hot water usage for baths

31.7566	31.2849	30.6208	29.3962	28.4792	27.4625	26.9133	27.5728	28.2909	29.3788	30.6286	31.6492	(42b)

Hot water usage for other uses

44.7668	43.1389	41.5111	39.8832	38.2553	36.6274	36.6274	38.2553	39.8832	41.5111	43.1389	44.7668	(42c)

Average daily hot water use (litres/day) 146.4381 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	159.2787	155.9356	151.8313	145.5114	140.4077	134.9095	132.7383	136.8242	141.1417	146.9215	153.3410	158.8543	(44)
Energy conte	252.2586	222.0502	233.3590	199.1979	189.0158	165.8869	160.5355	169.4169	174.0418	199.3710	218.4624	248.7275	(45)
Energy content (annual)											Total = Sum(45)m =	2432.3235	
Distribution loss (46)m = 0.15 x (45)m	37.8388	33.3075	35.0039	29.8797	28.3524	24.8830	24.0803	25.4125	26.1063	29.9057	32.7694	37.3091	(46)

Water storage loss:

Store volume 300.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)

Temperature factor from Table 2b 0.6000 (49)

Enter (49) or (54) in (55) 1.0800 (55)

Total storage loss

33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(56)

If cylinder contains dedicated solar storage

33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(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

309.0010	273.3014	290.1014	254.1099	245.7582	220.7989	217.2779	226.1593	228.9538	256.1134	273.3744	305.4699	(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

309.0010	273.3014	290.1014	254.1099	245.7582	220.7989	217.2779	226.1593	228.9538	256.1134	273.3744	305.4699	(64)

Total per year (kWh/year) = Sum(64)m = 3100.4195 (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

102.4859	90.6406	96.2018	84.2429	81.4577	73.1670	71.9880	74.9411	75.8785	84.9008	90.6483	101.3118	(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	176.5658	176.5658	176.5658	176.5658	176.5658	176.5658	176.5658	176.5658	176.5658	176.5658	176.5658	176.5658	(66)

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

	45.8558	40.7287	33.1228	25.0761	18.7447	15.8250	17.0995	22.2266	29.8325	37.8792	44.2106	47.1303	(67)

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

	487.5473	492.6065	479.8574	452.7162	418.4553	386.2548	364.7429	359.6837	372.4328	399.5740	433.8350	466.0354	(68)

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

	55.5993	55.5993	55.5993	55.5993	55.5993	55.5993	55.5993	55.5993	55.5993	55.5993	55.5993	55.5993	(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)

	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	(71)

Water heating gains (Table 5)

	137.7499	134.8819	129.3035	117.0040	109.4861	101.6208	96.7580	100.7272	105.3868	114.1140	125.9005	136.1718	(72)

Total internal gains

	788.6075	785.6717	759.7383	712.2509	664.1407	618.1553	593.0551	597.0921	622.1067	669.0218	721.4007	766.7920	(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	
East	17.3900	19.6403	0.4000	0.7000	0.5400	46.4773	(76)
South	7.8500	46.7521	0.4000	0.7000	0.5400	49.9419	(78)
West	6.5000	19.6403	0.4000	0.7000	0.5400	17.3722	(80)
South	6.0200	46.7521	0.4000	0.7000	0.5400	38.2994	(78)
South	20.2300	46.7521	0.4000	0.7000	0.5400	128.7037	(78)
West	7.4600	19.6403	0.4000	0.7000	0.5400	19.9379	(80)
East	7.1700	26.0000	0.4000	0.7000	1.0000	46.9778	(82)
West	4.1000	26.0000	0.4000	0.7000	1.0000	26.8632	(82)

Solar gains	374.5734	672.5681	995.1628	1331.2066	1560.7929	1574.8755	1508.1812	1336.5287	1113.3270	765.1553	455.3482	316.0040	(83)
Total gains	1163.1810	1458.2398	1754.9012	2043.4575	2224.9335	2193.0308	2101.2363	1933.6208	1735.4337	1434.1771	1176.7488	1082.7960	(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	33.0055	33.0974	33.1898	33.6596	33.7552	34.2412	34.2412	34.3401	34.0451	33.7552	33.5646	33.3761	
alpha	3.2004	3.2065	3.2127	3.2440	3.2503	3.2827	3.2827	3.2893	3.2697	3.2503	3.2376	3.2251	
util living area	0.9942	0.9875	0.9722	0.9343	0.8572	0.7273	0.5843	0.6393	0.8409	0.9604	0.9897	0.9954	(86)
MIT	19.0147	19.2332	19.5873	20.0442	20.4450	20.7289	20.8438	20.8214	20.5918	20.0500	19.4484	18.9857	(87)
Th 2	19.2881	19.2919	19.2957	19.3146	19.3184	19.3375	19.3375	19.3413	19.3299	19.3184	19.3108	19.3032	(88)
util rest of house	0.9920	0.9829	0.9614	0.9068	0.7927	0.5980	0.3918	0.4491	0.7419	0.9382	0.9851	0.9937	(89)
MIT 2	17.0557	17.3362	17.7860	18.3631	18.8295	19.1247	19.2019	19.1968	19.0089	18.3873	17.6256	17.0289	(90)
Living area fraction									fLA = Living area / (4) =			0.1776	(91)
MIT	17.4037	17.6732	18.1060	18.6618	19.1165	19.4097	19.4936	19.4854	19.2901	18.6827	17.9494	17.3765	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.4037	17.6732	18.1060	18.6618	19.1165	19.4097	19.4936	19.4854	19.2901	18.6827	17.9494	17.3765	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9882	0.9763	0.9505	0.8924	0.7829	0.6046	0.4120	0.4681	0.7389	0.9259	0.9793	0.9906	(94)
Useful gains	1149.4908	1423.6933	1668.1120	1823.5378	1741.9144	1325.9560	865.7897	905.1331	1282.2887	1327.8684	1152.3922	1072.5875	(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	4220.0071	4102.1393	3716.9320	3082.6595	2335.4106	1493.0527	898.2327	955.0401	1620.4134	2545.1950	3435.8178	4196.3395	(97)
Space heating kWh	2284.4641	1799.9157	1524.3221	906.5676	441.5612	0.0000	0.0000	0.0000	0.0000	905.6910	1644.0664	2324.0715	(98a)
Space heating requirement - total per year (kWh/year)												11830.6596	
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	2284.4641	1799.9157	1524.3221	906.5676	441.5612	0.0000	0.0000	0.0000	0.0000	905.6910	1644.0664	2324.0715	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												11830.6596	
Space heating per m2											(98c) / (4) =	75.9837	(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	2917.9922	2297.1428	2352.4334	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7027	0.7813	0.7401	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	2050.5745	1794.7837	1741.0337	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	2491.3619	2389.0625	2197.5149	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	317.3669	442.1435	339.6220	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			0.6101	(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	48.4102	67.4432	51.8049	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												167.6583	(107)

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 %)												170.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Cooling System Energy Efficiency Ratio (see Table 10c)												5.6000	(209)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	2284.4641	1799.9157	1524.3221	906.5676	441.5612	0.0000	0.0000	0.0000	0.0000	905.6910	1644.0664	2324.0715	(98)
Space heating efficiency (main heating system 1)													
	170.0000	170.0000	170.0000	170.0000	170.0000	0.0000	0.0000	0.0000	0.0000	170.0000	170.0000	170.0000	(210)
Space heating fuel (main heating system)													
	1343.8024	1058.7739	896.6601	533.2751	259.7419	0.0000	0.0000	0.0000	0.0000	532.7594	967.0979	1367.1009	(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													
	309.0010	273.3014	290.1014	254.1099	245.7582	220.7989	217.2779	226.1593	228.9538	256.1134	273.3744	305.4699	(64)
Efficiency of water heater												170.0000	(216)
(217)m	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	(217)
Fuel for water heating, kWh/month													
	181.7653	160.7655	170.6479	149.4764	144.5636	129.8817	127.8105	133.0349	134.6787	150.6550	160.8085	179.6881	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	8.6447	12.0434	9.2509	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	56.7930	51.2969	56.7930	54.9610	56.7930	54.9610	56.7930	56.7930	54.9610	56.7930	54.9610	56.7930	(231)
Lighting	40.1373	32.1996	28.9922	21.2409	16.4071	13.4047	14.9671	19.4548	25.2699	33.1554	37.4490	41.2528	(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												6959.2115	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												170.0000	
Water heating fuel used												1823.7761	(219)
Space cooling fuel												29.9390	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1760)													
mechanical ventilation fans (SFP = 1.1760)												668.6917	(230a)
Total electricity for the above, kWh/year												668.6917	(231)
Electricity for lighting (calculated in Appendix L)												323.9310	(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												9805.5493	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	6959.2115	16.4900	1147.5740	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1823.7761	16.4900	300.7407	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Space cooling	29.9390	16.4900	4.9369	(248)
Pumps, fans and electric keep-hot	668.6917	16.4900	110.2673	(249)
Energy for lighting	323.9310	16.4900	53.4162	(250)
Additional standing charges			0.0000	(251)
Total energy cost			1616.9351	(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] =	2.9003	(257)
SAP value		52.9856	
SAP rating (Section 12)		53	(258)
SAP band		E	

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	6959.2115	0.1548	1077.5014	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1823.7761	0.1410	257.0807	(264)

Space and water heating			1334.5821	(265)
Space cooling	29.9390	0.1139	3.4103	(266)
Pumps, fans and electric keep-hot	668.6917	0.1387	92.7558	(267)
Energy for lighting	323.9310	0.1443	46.7532	(268)
Total CO2, kg/year			1477.5014	(272)
CO2 emissions per m2			9.4900	(273)
EI value			90.1353	
EI rating			90	(274)
EI band			B	

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	83.9900 (1b)	x	2.8000 (2b)	=	235.1720	(1b) - (3b)
First floor	71.7100 (1c)	x	3.2200 (2c)	=	230.9062	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	155.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	466.0782	(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		6.0000	(17)
Infiltration rate		0.3000	(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) =	0.2325	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.2000	4.1000	3.8000	3.9000	3.4000	3.5000	3.4000	3.4000	3.7000	3.6000	4.0000	(22)
Wind factor	1.0750	1.0500	1.0250	0.9500	0.9750	0.8500	0.8750	0.8500	0.8500	0.9250	0.9000	1.0000	(22a)
Adj infilt rate	0.2499	0.2441	0.2383	0.2209	0.2267	0.1976	0.2034	0.1976	0.1976	0.2151	0.2092	0.2325	(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) =	75.6000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.3719	0.3661	0.3603	0.3429	0.3487	0.3196	0.3254	0.3196	0.3196	0.3371	0.3312	0.3545	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Entrance Door			2.8800	1.4000	4.0320			(26)
Windows (Uw = 1.40)			31.7400	1.3258	42.0795			(27)
Glazed Doors (Uw = 1.40)			6.0200	1.3258	7.9811			(27)
Glazed Wall (Uw = 1.40)			27.6900	1.3258	36.7102			(27)
GF RL			4.1000	1.2357	5.0665			(27a)
1F RL			7.1700	1.2357	8.8603			(27a)
Basement Floor			83.9900	0.2500	20.9975	110.0000	9238.9000	(28)
Retaining Wall	69.0000		69.0000	0.3000	20.7000	9.0000	621.0000	(29a)
Existing External Wall	59.0100		59.0100	0.3000	17.7030	9.0000	531.0900	(29a)
New External Wall	94.0100	68.3300	25.6800	0.1800	4.6224	150.0000	3852.0000	(29a)
Flat Roof GF	12.3600	4.1000	8.2600	0.1500	1.2390	9.0000	74.3400	(30)
Flat Roof First Floor	71.7100	7.1700	64.5400	0.1500	9.6810	9.0000	580.8600	(30)
Total net area of external elements Aum(A, m2)			390.0800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		179.6725			(33)
Party Wall 1			54.5700	0.0000	0.0000	70.0000	3819.9000	(32)
Internal Wall 1			235.2600			75.0000	17644.5000	(32c)
Internal Floor 1			70.4800			18.0000	1268.6400	(32d)
Internal Ceiling 1			70.4800			9.0000	634.3200	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	38265.5500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		245.7646 (35)
Thermal bridges (Default value 0.200 * total exposed area)		78.0160 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	257.6885 (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	57.2061	56.3122	55.4182	52.7362	53.6302	49.1602	50.0542	49.1602	49.1602	51.8422	50.9482	54.5242	(38)

Heat transfer coeff

	314.8947	314.0007	313.1067	310.4247	311.3187	306.8487	307.7427	306.8487	306.8487	309.5307	308.6367	312.2127 (39)
Average = Sum(39)m / 12 =												310.2012

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.0224	2.0167	2.0110	1.9937	1.9995	1.9708	1.9765	1.9708	1.9708	1.9880	1.9823	2.0052	(40)
HLP (average)												1.9923	
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												2.9428	(42)
Hot water usage for mixer showers													
	82.7553	81.5117	79.6994	76.2320	73.6732	70.8196	69.1976	70.9961	72.9676	76.0315	79.5734	82.4383	(42a)
Hot water usage for baths													
	31.7566	31.2849	30.6208	29.3962	28.4792	27.4625	26.9133	27.5728	28.2909	29.3788	30.6286	31.6492	(42b)
Hot water usage for other uses													
	44.7668	43.1389	41.5111	39.8832	38.2553	36.6274	36.6274	38.2553	39.8832	41.5111	43.1389	44.7668	(42c)
Average daily hot water use (litres/day)												146.4381	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	159.2787	155.9356	151.8313	145.5114	140.4077	134.9095	132.7383	136.8242	141.1417	146.9215	153.3410	158.8543	(44)
Energy conte	252.2586	222.0502	233.3590	199.1979	189.0158	165.8869	160.5355	169.4169	174.0418	199.3710	218.4624	248.7275	(45)
Energy content (annual)										Total = Sum(45)m =		2432.3235	
Distribution loss (46)m = 0.15 x (45)m													
	37.8388	33.3075	35.0039	29.8797	28.3524	24.8830	24.0803	25.4125	26.1063	29.9057	32.7694	37.3091	(46)
Water storage loss:													
Store volume												300.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8000	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												1.0800	(55)
Total storage loss													
	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(56)
If cylinder contains dedicated solar storage													
	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(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													
	309.0010	273.3014	290.1014	254.1099	245.7582	220.7989	217.2779	226.1593	228.9538	256.1134	273.3744	305.4699	(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													
	309.0010	273.3014	290.1014	254.1099	245.7582	220.7989	217.2779	226.1593	228.9538	256.1134	273.3744	305.4699	(64)
										Total per year (kWh/year) = Sum(64)m =		3100.4195	(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													
	102.4859	90.6406	96.2018	84.2429	81.4577	73.1670	71.9880	74.9411	75.8785	84.9008	90.6483	101.3118	(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	176.5658	176.5658	176.5658	176.5658	176.5658	176.5658	176.5658	176.5658	176.5658	176.5658	176.5658	176.5658	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	45.8558	40.7287	33.1228	25.0761	18.7447	15.8250	17.0995	22.2266	29.8325	37.8792	44.2106	47.1303	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	487.5473	492.6065	479.8574	452.7162	418.4553	386.2548	364.7429	359.6837	372.4328	399.5740	433.8350	466.0354	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	55.5993	55.5993	55.5993	55.5993	55.5993	55.5993	55.5993	55.5993	55.5993	55.5993	55.5993	55.5993	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	(71)
Water heating gains (Table 5)													
	137.7499	134.8819	129.3035	117.0040	109.4861	101.6208	96.7580	100.7272	105.3868	114.1140	125.9005	136.1718	(72)
Total internal gains													
	788.6075	785.6717	759.7383	712.2509	664.1407	618.1553	593.0551	597.0921	622.1067	669.0218	721.4007	766.7920	(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	
East	17.3900	21.5704	0.4000	0.7000	0.5400	51.0447	(76)
South	7.8500	49.1384	0.4000	0.7000	0.5400	52.4910	(78)
West	6.5000	21.5704	0.4000	0.7000	0.5400	19.0794	(80)
South	6.0200	49.1384	0.4000	0.7000	0.5400	40.2543	(78)
South	20.2300	49.1384	0.4000	0.7000	0.5400	135.2731	(78)
West	7.4600	21.5704	0.4000	0.7000	0.5400	21.8973	(80)
East	7.1700	29.0000	0.4000	0.7000	1.0000	52.3984	(82)
West	4.1000	29.0000	0.4000	0.7000	1.0000	29.9628	(82)

Solar gains	402.4010	649.1842	965.8026	1336.9198	1528.6488	1648.2516	1573.8254	1436.3754	1187.4240	807.0754	505.2595	333.2340	(83)
Total gains	1191.0085	1434.8559	1725.5410	2049.1707	2192.7895	2266.4069	2166.8805	2033.4676	1809.5307	1476.0971	1226.6602	1100.0260	(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	33.7552	33.8513	33.9479	34.2412	34.1429	34.6403	34.5396	34.6403	34.6403	34.3401	34.4396	34.0451	
alpha	3.2503	3.2568	3.2632	3.2827	3.2762	3.3094	3.3026	3.3094	3.3094	3.2893	3.2960	3.2697	

util living area													
	0.9923	0.9854	0.9641	0.9062	0.7847	0.5471	0.3344	0.3814	0.7175	0.9342	0.9843	0.9939	(86)
MIT	19.2379	19.4184	19.8188	20.2712	20.6423	20.8570	20.9005	20.8969	20.7719	20.2969	19.7042	19.2127	(87)
Th 2	19.3184	19.3222	19.3260	19.3375	19.3337	19.3529	19.3490	19.3529	19.3529	19.3413	19.3452	19.3299	(88)
util rest of house													
	0.9892	0.9796	0.9487	0.8639	0.6822	0.3637	0.1063	0.1436	0.5520	0.8931	0.9765	0.9915	(89)
MIT 2	17.3615	17.5930	18.0987	18.6518	19.0454	19.2216	19.2294	19.2333	19.1803	18.7024	17.9742	17.3373	(90)
Living area fraction									fLA = Living area / (4) =			0.1776	(91)
MIT	17.6949	17.9173	18.4043	18.9395	19.3291	19.5121	19.5263	19.5289	19.4631	18.9857	18.2815	17.6705	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.6949	17.9173	18.4043	18.9395	19.3291	19.5121	19.5263	19.5289	19.4631	18.9857	18.2815	17.6705	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9845	0.9724	0.9367	0.8506	0.6818	0.3831	0.1314	0.1699	0.5653	0.8805	0.9688	0.9876	(94)
Useful gains	1172.5960	1395.1913	1616.2290	1742.9934	1495.1428	868.2531	284.7509	345.5714	1022.9488	1299.7435	1188.4404	1086.3830	(95)
Ext temp.	5.5000	6.0000	8.0000	10.5000	13.6000	16.6000	18.6000	18.4000	15.8000	12.2000	8.5000	5.5000	(96)
Heat loss rate W													
	3840.1004	3742.0276	3257.6485	2619.8205	1783.5611	893.5876	285.0560	346.3934	1124.0115	2100.3717	3018.9315	3799.7745	(97)
Space heating kWh													
	1984.6233	1577.0740	1221.2161	631.3156	214.5832	0.0000	0.0000	0.0000	0.0000	595.6674	1317.9536	2018.7633	(98a)
Space heating requirement - total per year (kWh/year)												9561.1964	
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													
	1984.6233	1577.0740	1221.2161	631.3156	214.5832	0.0000	0.0000	0.0000	0.0000	595.6674	1317.9536	2018.7633	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												9561.1964	
Space heating per m2											(98c) / (4) =	61.4078	(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.	5.5000	6.0000	8.0000	10.5000	13.6000	16.6000	18.6000	18.4000	15.8000	12.2000	8.5000	5.5000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	2270.6805	1661.8107	1718.3528	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8139	0.8915	0.8670	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1848.0904	1481.4899	1489.8241	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	2576.3812	2464.9004	2314.3235	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	524.3693	731.6574	613.4275	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			0.6101	(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	79.9857	111.6048	93.5704	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												285.1608	(107)

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 %)	170.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Cooling System Energy Efficiency Ratio (see Table 10c)	5.6000	(209)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	1984.6233	1577.0740	1221.2161	631.3156	214.5832	0.0000	0.0000	0.0000	0.0000	595.6674	1317.9536	2018.7633	(98)
Space heating efficiency (main heating system 1)													
	170.0000	170.0000	170.0000	170.0000	170.0000	0.0000	0.0000	0.0000	0.0000	170.0000	170.0000	170.0000	(210)
Space heating fuel (main heating system)													
	1167.4254	927.6906	718.3624	371.3621	126.2254	0.0000	0.0000	0.0000	0.0000	350.3926	775.2668	1187.5078	(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													
	309.0010	273.3014	290.1014	254.1099	245.7582	220.7989	217.2779	226.1593	228.9538	256.1134	273.3744	305.4699	(64)
Efficiency of water heater												170.0000	(216)
(217)m	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	(217)
Fuel for water heating, kWh/month													
	181.7653	160.7655	170.6479	149.4764	144.5636	129.8817	127.8105	133.0349	134.6787	150.6550	160.8085	179.6881	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	14.2832	19.9294	16.7090	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	56.7930	51.2969	56.7930	54.9610	56.7930	54.9610	56.7930	56.7930	54.9610	56.7930	54.9610	56.7930	(231)
Lighting	40.1373	32.1996	28.9922	21.2409	16.4071	13.4047	14.9671	19.4548	25.2699	33.1554	37.4490	41.2528	(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	5624.2332	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	170.0000	
Water heating fuel used	1823.7761	(219)
Space cooling fuel	50.9216	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1760)		
mechanical ventilation fans (SFP = 1.1760)	668.6917	(230a)
Total electricity for the above, kWh/year	668.6917	(231)
Electricity for lighting (calculated in Appendix L)	323.9310	(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	8491.5536	(238)

10a. Fuel costs - using BEDF prices (533)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	5624.2332	21.5100	1209.7726	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1823.7761	21.5100	392.2942	(247)
Energy for instantaneous electric shower(s)	0.0000	21.5100	0.0000	(247a)
Space cooling	50.9216	21.5100	10.9532	(248)
Pumps, fans and electric keep-hot	668.6917	21.5100	143.8356	(249)
Energy for lighting	323.9310	21.5100	69.6775	(250)
Additional standing charges			0.0000	(251)
Total energy cost			1826.5332	(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	5624.2332	0.1559	876.6793	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1823.7761	0.1410	257.0807	(264)
Space and water heating			1133.7600	(265)
Space cooling	50.9216	0.1139	5.7976	(266)
Pumps, fans and electric keep-hot	668.6917	0.1387	92.7558	(267)
Energy for lighting	323.9310	0.1443	46.7532	(268)
Total CO2, kg/year			1279.0665	(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	5624.2332	1.5771	8869.9188	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1823.7761	1.5212	2774.3730	(278)
Space and water heating			11644.2917	(279)
Space cooling	50.9216	1.4197	72.2923	(280)
Pumps, fans and electric keep-hot	668.6917	1.5128	1011.5968	(281)
Energy for lighting	323.9310	1.5338	496.8561	(282)
Total Primary energy kWh/year			13225.0370	(286)

SAP 10 EPC IMPROVEMENTS

Plot 1 Be Green

Current energy efficiency rating: E 53
Current environmental impact rating: B 90

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	+ 1.4	-£ 71	-41 kg (3.2%)
U Solar photovoltaic panels	+ 5.0	-£ 226	-141 kg (11.4%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£71	0.26 kg/m²	E 54	B 90
Solar photovoltaic panels	£226	0.91 kg/m²	D 59	B 91
Total Savings	£297	1.17 kg/m²		

Potential energy efficiency rating: D 59
Potential environmental impact rating: B 91

Fuel prices for cost data on this page from database revision number 533 TEST (30 Nov 2023)
Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current	Potential	Saving
Electricity	£1827	£1756	£71

Space heating	£1354	£1371	-£17
Space cooling	£11	£11	£0
Water heating	£392	£304	£88
Lighting	£70	£70	£0
Generated (PV)	-£0	-£226	£226
Total cost of fuels	£1827	£1530	£297
Total cost of uses	£1827	£1530	£297
Delivered energy	55 kWh/m²	46 kWh/m²	9 kWh/m²
Carbon dioxide emissions	1.3 tonnes	1.1 tonnes	0.2 tonnes
CO2 emissions per m²	8 kg/m²	7 kg/m²	1 kg/m²
Primary energy	85 kWh/m²	72 kWh/m²	13 kWh/m²

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	83.9900	(1b)	x 2.8000	(2b)	= 235.1720	(1b) - (3b)
First floor	71.7100	(1c)	x 3.2200	(2c)	= 230.9062	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	155.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)		= 466.0782	(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		6.0000	(17)
Infiltration rate		0.3000	(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)	= 0.2325	(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	0.2964	0.2906	0.2848	0.2557	0.2499	0.2209	0.2209	0.2151	0.2325	0.2499	0.2616	0.2732	(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) =	75.6000	(23c)

Effective ac	0.4184	0.4126	0.4068	0.3777	0.3719	0.3429	0.3429	0.3371	0.3545	0.3719	0.3836	0.3952	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Entrance Door			2.8800	1.4000	4.0320			(26)
Windows (Uw = 1.40)			31.7400	1.3258	42.0795			(27)
Glazed Doors (Uw = 1.40)			6.0200	1.3258	7.9811			(27)
Glazed Wall (Uw = 1.40)			27.6900	1.3258	36.7102			(27)
GF RL			4.1000	1.2357	5.0665			(27a)
1F RL			7.1700	1.2357	8.8603			(27a)
Basement Floor			83.9900	0.2500	20.9975	110.0000	9238.9000	(28)
Retaining Wall	69.0000		69.0000	0.3000	20.7000	9.0000	621.0000	(29a)
Existing External Wall	59.0100		59.0100	0.3000	17.7030	9.0000	531.0900	(29a)
New External Wall	94.0100	68.3300	25.6800	0.1800	4.6224	150.0000	3852.0000	(29a)
Flat Roof GF	12.3600	4.1000	8.2600	0.1500	1.2390	9.0000	74.3400	(30)
Flat Roof First Floor	71.7100	7.1700	64.5400	0.1500	9.6810	9.0000	580.8600	(30)
Total net area of external elements Aum(A, m2)			390.0800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	179.6725			(33)
Party Wall 1			54.5700	0.0000	0.0000	70.0000	3819.9000	(32)
Internal Wall 1			235.2600			75.0000	17644.5000	(32c)
Internal Floor 1			70.4800			18.0000	1268.6400	(32d)
Internal Ceiling 1			70.4800			9.0000	634.3200	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 38265.5500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	245.7646	(35)
Thermal bridges (Default value 0.200 * total exposed area)	78.0160	(36)
Point Thermal bridges	(36a) = 0.0000	

Total fabric heat loss (33) + (36) + (36a) = 257.6885 (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	64.3581	63.4641	62.5701	58.1001	57.2061	52.7362	52.7362	51.8422	54.5242	57.2061	58.9941	60.7821	(38)
Heat transfer coeff	322.0467	321.1527	320.2587	315.7887	314.8947	310.4247	310.4247	309.5307	312.2127	314.8947	316.6827	318.4707	(39)
Average = Sum(39)m / 12 =												315.5652	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.0684	2.0626	2.0569	2.0282	2.0224	1.9937	1.9937	1.9880	2.0052	2.0224	2.0339	2.0454	(40)
HLP (average)												2.0268	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9428 (42)

Hot water usage for mixer showers	82.7553	81.5117	79.6994	76.2320	73.6732	70.8196	69.1976	70.9961	72.9676	76.0315	79.5734	82.4383 (42a)
Hot water usage for baths	31.7566	31.2849	30.6208	29.3962	28.4792	27.4625	26.9133	27.5728	28.2909	29.3788	30.6286	31.6492 (42b)
Hot water usage for other uses	44.7668	43.1389	41.5111	39.8832	38.2553	36.6274	36.6274	38.2553	39.8832	41.5111	43.1389	44.7668 (42c)
Average daily hot water use (litres/day)												146.4381 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	159.2787	155.9356	151.8313	145.5114	140.4077	134.9095	132.7383	136.8242	141.1417	146.9215	153.3410	158.8543	(44)
Energy conte	252.2586	222.0502	233.3590	199.1979	189.0158	165.8869	160.5355	169.4169	174.0418	199.3710	218.4624	248.7275	(45)
Energy content (annual)										Total = Sum(45)m =		2432.3235	
Distribution loss (46)m = 0.15 x (45)m	37.8388	33.3075	35.0039	29.8797	28.3524	24.8830	24.0803	25.4125	26.1063	29.9057	32.7694	37.3091	(46)

Water storage loss:

Store volume	300.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.8000	(48)
Temperature factor from Table 2b	0.6000	(49)
Enter (49) or (54) in (55)	1.0800	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(56)
If cylinder contains dedicated solar storage	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(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	309.0010	273.3014	290.1014	254.1099	245.7582	220.7989	217.2779	226.1593	228.9538	256.1134	273.3744	305.4699	(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	646.0983	(H24)
Heat delivered to space heating	0.0000	(H29)
Solar input	646.0983	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar input	-0.0000	-16.1823	-59.2705	-82.5895	-109.8426	-101.6531	-101.1418	-87.4462	-59.1618	-28.8106	-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	309.0010	257.1191	230.8309	171.5204	135.9156	119.1458	116.1361	138.7132	169.7920	227.3028	273.3744	305.4699	(64)
									Total per year (kWh/year) = Sum(64)m =			2454.3211	(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	102.4859	90.6406	96.2018	84.2429	81.4577	73.1670	71.9880	74.9411	75.8785	84.9008	90.6483	101.3118	(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	176.5658	176.5658	176.5658	176.5658	176.5658	176.5658	176.5658	176.5658	176.5658	176.5658	176.5658	176.5658	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	45.8558	40.7287	33.1228	25.0761	18.7447	15.8250	17.0995	22.2266	29.8325	37.8792	44.2106	47.1303	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	487.5473	492.6065	479.8574	452.7162	418.4553	386.2548	364.7429	359.6837	372.4328	399.5740	433.8350	466.0354	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.5993	55.5993	55.5993	55.5993	55.5993	55.5993	55.5993	55.5993	55.5993	55.5993	55.5993	55.5993	(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)	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	(71)
Water heating gains (Table 5)	137.7499	134.8819	129.3035	117.0040	109.4861	101.6208	96.7580	100.7272	105.3868	114.1140	125.9005	136.1718	(72)
Total internal gains	788.6075	785.6717	759.7383	712.2509	664.1407	618.1553	593.0551	597.0921	622.1067	669.0218	721.4007	766.7920	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	17.3900	19.6403	0.4000	0.7000	0.5400	46.4773	(76)
South	7.8500	46.7521	0.4000	0.7000	0.5400	49.9419	(78)

West			6.5000	19.6403	0.4000	0.7000	0.5400				17.3722	(80)
South			6.0200	46.7521	0.4000	0.7000	0.5400				38.2994	(78)
South			20.2300	46.7521	0.4000	0.7000	0.5400				128.7037	(78)
West			7.4600	19.6403	0.4000	0.7000	0.5400				19.9379	(80)
East			7.1700	26.0000	0.4000	0.7000	1.0000				46.9778	(82)
West			4.1000	26.0000	0.4000	0.7000	1.0000				26.8632	(82)
Solar gains	374.5734	672.5681	995.1628	1331.2066	1560.7929	1574.8755	1508.1812	1336.5287	1113.3270	765.1553	455.3482	316.0040 (83)
Total gains	1163.1810	1458.2398	1754.9012	2043.4575	2224.9335	2193.0308	2101.2363	1933.6208	1735.4337	1434.1771	1176.7488	1082.7960 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	33.0055	33.0974	33.1898	33.6596	33.7552	34.2412	34.2412	34.3401	34.0451	33.7552	33.5646	33.3761	
alpha	3.2004	3.2065	3.2127	3.2440	3.2503	3.2827	3.2827	3.2893	3.2697	3.2503	3.2376	3.2251	
util living area	0.9942	0.9875	0.9722	0.9343	0.8572	0.7273	0.5843	0.6393	0.8409	0.9604	0.9897	0.9954	(86)
MIT	19.0147	19.2332	19.5873	20.0442	20.4450	20.7289	20.8438	20.8214	20.5918	20.0500	19.4484	18.9857	(87)
Th 2	19.2881	19.2919	19.2957	19.3146	19.3184	19.3375	19.3375	19.3413	19.3299	19.3184	19.3108	19.3032	(88)
util rest of house	0.9920	0.9829	0.9614	0.9068	0.7927	0.5980	0.3918	0.4491	0.7419	0.9382	0.9851	0.9937	(89)
MIT 2	17.0557	17.3362	17.7860	18.3631	18.8295	19.1247	19.2019	19.1968	19.0089	18.3873	17.6256	17.0289	(90)
Living area fraction									fLA = Living area / (4) =			0.1776	(91)
MIT	17.4037	17.6732	18.1060	18.6618	19.1165	19.4097	19.4936	19.4854	19.2901	18.6827	17.9494	17.3765	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.4037	17.6732	18.1060	18.6618	19.1165	19.4097	19.4936	19.4854	19.2901	18.6827	17.9494	17.3765	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9882	0.9763	0.9505	0.8924	0.7829	0.6046	0.4120	0.4681	0.7389	0.9259	0.9793	0.9906	(94)
Useful gains	1149.4908	1423.6933	1668.1120	1823.5378	1741.9144	1325.9560	865.7897	905.1331	1282.2887	1327.8684	1152.3922	1072.5875	(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	4220.0071	4102.1393	3716.9320	3082.6595	2335.4106	1493.0527	898.2327	955.0401	1620.4134	2545.1950	3435.8178	4196.3395	(97)
Space heating kWh	2284.4641	1799.9157	1524.3221	906.5676	441.5612	0.0000	0.0000	0.0000	0.0000	905.6910	1644.0664	2324.0715	(98a)
Space heating requirement - total per year (kWh/year)												11830.6596	
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	2284.4641	1799.9157	1524.3221	906.5676	441.5612	0.0000	0.0000	0.0000	0.0000	905.6910	1644.0664	2324.0715	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												11830.6596	
Space heating per m2										(98c) / (4) =		75.9837	(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	2917.9922	2297.1428	2352.4334	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7027	0.7813	0.7401	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	2050.5745	1794.7837	1741.0337	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	2491.3619	2389.0625	2197.5149	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	317.3669	442.1435	339.6220	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			0.6101	(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	48.4102	67.4432	51.8049	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												167.6583	(107)

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 %)	170.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Cooling System Energy Efficiency Ratio (see Table 10c)	5.6000	(209)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	2284.4641	1799.9157	1524.3221	906.5676	441.5612	0.0000	0.0000	0.0000	0.0000	905.6910	1644.0664	2324.0715	(98)
Space heating efficiency (main heating system 1)	170.0000	170.0000	170.0000	170.0000	170.0000	0.0000	0.0000	0.0000	0.0000	170.0000	170.0000	170.0000	(210)
Space heating fuel (main heating system)	1343.8024	1058.7739	896.6601	533.2751	259.7419	0.0000	0.0000	0.0000	0.0000	532.7594	967.0979	1367.1009	(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	309.0010	257.1191	230.8309	171.5204	135.9156	119.1458	116.1361	138.7132	169.7920	227.3028	273.3744	305.4699	(64)
Efficiency of water heater												170.0000	(216)
(217)m	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	(217)
Fuel for water heating, kWh/month	181.7653	151.2465	135.7829	100.8943	79.9504	70.0858	68.3153	81.5960	99.8776	133.7075	160.8085	179.6881	(219)

Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	8.6447	12.0434	9.2509	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	63.5875	57.4339	63.5875	61.5363	63.5875	61.5363	63.5875	63.5875	61.5363	63.5875	61.5363	63.5875	(231)
Lighting	40.1373	32.1996	28.9922	21.2409	16.4071	13.4047	14.9671	19.4548	25.2699	33.1554	37.4490	41.2528	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-42.8663	-66.8142	-104.5855	-124.4205	-133.4673	-110.6526	-109.3362	-101.4544	-87.2831	-77.9684	-48.9557	-36.3693	(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	6959.2115	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	170.0000	
Water heating fuel used	1443.7183	(219)
Space cooling fuel	29.9390	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1760)		
mechanical ventilation fans (SFP = 1.1760)	668.6917	(230a)
pump for solar water heating	80.0000	(230g)
Total electricity for the above, kWh/year	748.6917	(231)
Electricity for lighting (calculated in Appendix L)	323.9310	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1044.1735	(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	8461.3180	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	6959.2115	16.4900	1147.5740	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1443.7183	16.4900	238.0691	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Space cooling	29.9390	16.4900	4.9369	(248)
Pumps, fans and electric keep-hot	668.6917	16.4900	110.2673	(249)
Pump for solar water heating	80.0000	16.4900	13.1920	(249)
Energy for lighting	323.9310	16.4900	53.4162	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1044.1735	16.4900	-172.1842	
PV Unit electricity exported	0.0000	5.5900	0.0000	
Total			-172.1842	(252)
Total energy cost			1395.2713	(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] =	2.5027	(257)
SAP value	59.4308	
SAP rating (Section 12)	59	(258)
SAP band	D	

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	6959.2115	0.1548	1077.5014	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1443.7183	0.1445	208.6559	(264)
Space and water heating			1286.1573	(265)
Space cooling	29.9390	0.1139	3.4103	(266)
Pumps, fans and electric keep-hot	748.6917	0.1387	103.8528	(267)
Energy for lighting	323.9310	0.1443	46.7532	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1044.1735	0.1345	-140.4391	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-140.4391	(269)
Total CO2, kg/year			1299.7344	(272)
CO2 emissions per m2			8.3500	(273)
EI value			91.3222	
EI rating			91	(274)
EI band			B	

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	83.9900 (1b)	x	2.8000 (2b)	=	235.1720	(1b) - (3b)
First floor	71.7100 (1c)	x	3.2200 (2c)	=	230.9062	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	155.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	466.0782	(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		6.0000 (17)
Infiltration rate		0.3000 (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) =	0.2325 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.2000	4.1000	3.8000	3.9000	3.4000	3.5000	3.4000	3.4000	3.7000	3.6000	4.0000	(22)
Wind factor	1.0750	1.0500	1.0250	0.9500	0.9750	0.8500	0.8750	0.8500	0.8500	0.9250	0.9000	1.0000	(22a)
Adj infilt rate	0.2499	0.2441	0.2383	0.2209	0.2267	0.1976	0.2034	0.1976	0.1976	0.2151	0.2092	0.2325	(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) =	75.6000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.3719	0.3661	0.3603	0.3429	0.3487	0.3196	0.3254	0.3196	0.3196	0.3371	0.3312	0.3545	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Entrance Door			2.8800	1.4000	4.0320			(26)
Windows (Uw = 1.40)			31.7400	1.3258	42.0795			(27)
Glazed Doors (Uw = 1.40)			6.0200	1.3258	7.9811			(27)
Glazed Wall (Uw = 1.40)			27.6900	1.3258	36.7102			(27)
GF RL			4.1000	1.2357	5.0665			(27a)
1F RL			7.1700	1.2357	8.8603			(27a)
Basement Floor			83.9900	0.2500	20.9975	110.0000	9238.9000	(28)
Retaining Wall	69.0000		69.0000	0.3000	20.7000	9.0000	621.0000	(29a)
Existing External Wall	59.0100		59.0100	0.3000	17.7030	9.0000	531.0900	(29a)
New External Wall	94.0100	68.3300	25.6800	0.1800	4.6224	150.0000	3852.0000	(29a)
Flat Roof GF	12.3600	4.1000	8.2600	0.1500	1.2390	9.0000	74.3400	(30)
Flat Roof First Floor	71.7100	7.1700	64.5400	0.1500	9.6810	9.0000	580.8600	(30)
Total net area of external elements Aum(A, m2)			390.0800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		179.6725			(33)
Party Wall 1			54.5700	0.0000	0.0000	70.0000	3819.9000	(32)
Internal Wall 1			235.2600			75.0000	17644.5000	(32c)
Internal Floor 1			70.4800			18.0000	1268.6400	(32d)
Internal Ceiling 1			70.4800			9.0000	634.3200	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	38265.5500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		245.7646 (35)
Thermal bridges (Default value 0.200 * total exposed area)		78.0160 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	257.6885 (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	57.2061	56.3122	55.4182	52.7362	53.6302	49.1602	50.0542	49.1602	49.1602	51.8422	50.9482	54.5242	(38)
Heat transfer coeff	314.8947	314.0007	313.1067	310.4247	311.3187	306.8487	307.7427	306.8487	306.8487	309.5307	308.6367	312.2127	(39)
Average = Sum(39)m / 12 =												310.2012	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.0224	2.0167	2.0110	1.9937	1.9995	1.9708	1.9765	1.9708	1.9708	1.9880	1.9823	2.0052	(40)
HLP (average)												1.9923	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9428	(42)
Hot water usage for mixer showers		

	82.7553	81.5117	79.6994	76.2320	73.6732	70.8196	69.1976	70.9961	72.9676	76.0315	79.5734	82.4383	(42a)
Hot water usage for baths													
	31.7566	31.2849	30.6208	29.3962	28.4792	27.4625	26.9133	27.5728	28.2909	29.3788	30.6286	31.6492	(42b)
Hot water usage for other uses													
	44.7668	43.1389	41.5111	39.8832	38.2553	36.6274	36.6274	38.2553	39.8832	41.5111	43.1389	44.7668	(42c)
Average daily hot water use (litres/day)												146.4381	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	159.2787	155.9356	151.8313	145.5114	140.4077	134.9095	132.7383	136.8242	141.1417	146.9215	153.3410	158.8543	(44)
Energy conte	252.2586	222.0502	233.3590	199.1979	189.0158	165.8869	160.5355	169.4169	174.0418	199.3710	218.4624	248.7275	(45)
Energy content (annual)										Total = Sum(45)m =		2432.3235	
Distribution loss (46)m = 0.15 x (45)m													
	37.8388	33.3075	35.0039	29.8797	28.3524	24.8830	24.0803	25.4125	26.1063	29.9057	32.7694	37.3091	(46)
Water storage loss:													
Store volume												300.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8000	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												1.0800	(55)
Total storage loss													
	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(56)
If cylinder contains dedicated solar storage													
	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(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													
	309.0010	273.3014	290.1014	254.1099	245.7582	220.7989	217.2779	226.1593	228.9538	256.1134	273.3744	305.4699	(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												695.7349	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												695.7349	
Solar input	-0.0000	-15.9741	-59.0529	-85.6473	-109.9981	-109.9752	-109.1802	-98.8817	-68.1405	-35.5017	-3.3831	-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													
	309.0010	257.3272	231.0485	168.4626	135.7601	110.8238	108.0977	127.2776	160.8133	220.6117	269.9913	305.4699	(64)
									Total per year (kWh/year) = Sum(64)m =			2404.6846	(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													
	102.4859	90.6406	96.2018	84.2429	81.4577	73.1670	71.9880	74.9411	75.8785	84.9008	90.6483	101.3118	(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	176.5658	176.5658	176.5658	176.5658	176.5658	176.5658	176.5658	176.5658	176.5658	176.5658	176.5658	176.5658	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	45.8558	40.7287	33.1228	25.0761	18.7447	15.8250	17.0995	22.2266	29.8325	37.8792	44.2106	47.1303	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	487.5473	492.6065	479.8574	452.7162	418.4553	386.2548	364.7429	359.6837	372.4328	399.5740	433.8350	466.0354	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	55.5993	55.5993	55.5993	55.5993	55.5993	55.5993	55.5993	55.5993	55.5993	55.5993	55.5993	55.5993	(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)													
	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	-117.7105	(71)
Water heating gains (Table 5)													
	137.7499	134.8819	129.3035	117.0040	109.4861	101.6208	96.7580	100.7272	105.3868	114.1140	125.9005	136.1718	(72)
Total internal gains													
	788.6075	785.6717	759.7383	712.2509	664.1407	618.1553	593.0551	597.0921	622.1067	669.0218	721.4007	766.7920	(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	
East	17.3900	21.5704	0.4000	0.7000	0.5400	51.0447	(76)
South	7.8500	49.1384	0.4000	0.7000	0.5400	52.4910	(78)
West	6.5000	21.5704	0.4000	0.7000	0.5400	19.0794	(80)
South	6.0200	49.1384	0.4000	0.7000	0.5400	40.2543	(78)
South	20.2300	49.1384	0.4000	0.7000	0.5400	135.2731	(78)
West	7.4600	21.5704	0.4000	0.7000	0.5400	21.8973	(80)
East	7.1700	29.0000	0.4000	0.7000	1.0000	52.3984	(82)
West	4.1000	29.0000	0.4000	0.7000	1.0000	29.9628	(82)

Solar gains	402.4010	649.1842	965.8026	1336.9198	1528.6488	1648.2516	1573.8254	1436.3754	1187.4240	807.0754	505.2595	333.2340	(83)
Total gains	1191.0085	1434.8559	1725.5410	2049.1707	2192.7895	2266.4069	2166.8805	2033.4676	1809.5307	1476.0971	1226.6602	1100.0260	(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	33.7552	33.8513	33.9479	34.2412	34.1429	34.6403	34.5396	34.6403	34.6403	34.3401	34.4396	34.0451	
alpha	3.2503	3.2568	3.2632	3.2827	3.2762	3.3094	3.3026	3.3094	3.3094	3.2893	3.2960	3.2697	
util living area													

	0.9923	0.9854	0.9641	0.9062	0.7847	0.5471	0.3344	0.3814	0.7175	0.9342	0.9843	0.9939	(86)
MIT	19.2379	19.4184	19.8188	20.2712	20.6423	20.8570	20.9005	20.8969	20.7719	20.2969	19.7042	19.2127	(87)
Th 2	19.3184	19.3222	19.3260	19.3375	19.3337	19.3529	19.3490	19.3529	19.3529	19.3413	19.3452	19.3299	(88)
util rest of house													
	0.9892	0.9796	0.9487	0.8639	0.6822	0.3637	0.1063	0.1436	0.5520	0.8931	0.9765	0.9915	(89)
MIT 2	17.3615	17.5930	18.0987	18.6518	19.0454	19.2216	19.2294	19.2333	19.1803	18.7024	17.9742	17.3373	(90)
Living area fraction										fLA = Living area / (4) =		0.1776	(91)
MIT	17.6949	17.9173	18.4043	18.9395	19.3291	19.5121	19.5263	19.5289	19.4631	18.9857	18.2815	17.6705	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.6949	17.9173	18.4043	18.9395	19.3291	19.5121	19.5263	19.5289	19.4631	18.9857	18.2815	17.6705	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9845	0.9724	0.9367	0.8506	0.6818	0.3831	0.1314	0.1699	0.5653	0.8805	0.9688	0.9876	(94)
Useful gains	1172.5960	1395.1913	1616.2290	1742.9934	1495.1428	868.2531	284.7509	345.5714	1022.9488	1299.7435	1188.4404	1086.3830	(95)
Ext temp.	5.5000	6.0000	8.0000	10.5000	13.6000	16.6000	18.6000	18.4000	15.8000	12.2000	8.5000	5.5000	(96)
Heat loss rate W													
	3840.1004	3742.0276	3257.6485	2619.8205	1783.5611	893.5876	285.0560	346.3934	1124.0115	2100.3717	3018.9315	3799.7745	(97)
Space heating kWh													
	1984.6233	1577.0740	1221.2161	631.3156	214.5832	0.0000	0.0000	0.0000	0.0000	595.6674	1317.9536	2018.7633	(98a)
Space heating requirement - total per year (kWh/year)												9561.1964	
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													
	1984.6233	1577.0740	1221.2161	631.3156	214.5832	0.0000	0.0000	0.0000	0.0000	595.6674	1317.9536	2018.7633	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												9561.1964	
Space heating per m2											(98c) / (4) =	61.4078	(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.	5.5000	6.0000	8.0000	10.5000	13.6000	16.6000	18.6000	18.4000	15.8000	12.2000	8.5000	5.5000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	2270.6805	1661.8107	1718.3528	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8139	0.8915	0.8670	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1848.0904	1481.4899	1489.8241	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	2576.3812	2464.9004	2314.3235	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	524.3693	731.6574	613.4275	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		0.6101	(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	79.9857	111.6048	93.5704	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												285.1608	(107)

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 %)												170.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Cooling System Energy Efficiency Ratio (see Table 10c)												5.6000	(209)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	1984.6233	1577.0740	1221.2161	631.3156	214.5832	0.0000	0.0000	0.0000	0.0000	595.6674	1317.9536	2018.7633	(98)
Space heating efficiency (main heating system 1)													
	170.0000	170.0000	170.0000	170.0000	170.0000	0.0000	0.0000	0.0000	0.0000	170.0000	170.0000	170.0000	(210)
Space heating fuel (main heating system)													
	1167.4254	927.6906	718.3624	371.3621	126.2254	0.0000	0.0000	0.0000	0.0000	350.3926	775.2668	1187.5078	(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													
	309.0010	257.3272	231.0485	168.4626	135.7601	110.8238	108.0977	127.2776	160.8133	220.6117	269.9913	305.4699	(64)
Efficiency of water heater												170.0000	(216)
(217)m	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	(217)
Fuel for water heating, kWh/month													
	181.7653	151.3690	135.9109	99.0956	79.8589	65.1904	63.5869	74.8692	94.5961	129.7716	158.8184	179.6881	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	14.2832	19.9294	16.7090	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	63.5875	57.4339	63.5875	61.5363	63.5875	61.5363	63.5875	63.5875	61.5363	63.5875	61.5363	63.5875	(231)
Lighting	40.1373	32.1996	28.9922	21.2409	16.4071	13.4047	14.9671	19.4548	25.2699	33.1554	37.4490	41.2528	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-45.7281	-64.5499	-100.4834	-120.6001	-124.2141	-113.5029	-111.9893	-106.0115	-91.3535	-79.3477	-53.3263	-38.1789	(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												5624.2332	(211)

Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	170.0000	
Water heating fuel used	1414.5203	(219)
Space cooling fuel	50.9216	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1760)		
mechanical ventilation fans (SFP = 1.1760)	668.6917	(230a)
pump for solar water heating	80.0000	(230g)
Total electricity for the above, kWh/year	748.6917	(231)
Electricity for lighting (calculated in Appendix L)	323.9310	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1049.2858	(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	7113.0119	(238)

10a. Fuel costs - using BEDF prices (533)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	5624.2332	21.5100	1209.7726	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1414.5203	21.5100	304.2633	(247)
Energy for instantaneous electric shower(s)	0.0000	21.5100	0.0000	(247a)
Space cooling	50.9216	21.5100	10.9532	(248)
Pumps, fans and electric keep-hot	668.6917	21.5100	143.8356	(249)
Pump for solar water heating	80.0000	21.5100	17.2080	(249)
Energy for lighting	323.9310	21.5100	69.6775	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1049.2858	21.5100	-225.7014	
PV Unit electricity exported	0.0000	5.5900	0.0000	
Total			-225.7014	(252)
Total energy cost			1530.0089	(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	5624.2332	0.1559	876.6793	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1414.5203	0.1450	205.0799	(264)
Space and water heating			1081.7592	(265)
Space cooling	50.9216	0.1139	5.7976	(266)
Pumps, fans and electric keep-hot	748.6917	0.1387	103.8528	(267)
Energy for lighting	323.9310	0.1443	46.7532	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1049.2858	0.1343	-140.9340	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-140.9340	(269)
Total CO2, kg/year			1097.2288	(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	5624.2332	1.5771	8869.9188	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1414.5203	1.5363	2173.0856	(278)
Space and water heating			11043.0043	(279)
Space cooling	50.9216	1.4197	72.2923	(280)
Pumps, fans and electric keep-hot	748.6917	1.5128	1132.6208	(281)
Energy for lighting	323.9310	1.5338	496.8561	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1049.2858	1.4964	-1570.1554	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-1570.1554	(283)
Total Primary energy kWh/year			11174.6182	(286)