Full SAP Calculation Printout

Property Reference	Plot 2	**Issued on Date**	21/12/2023
Assessment Reference	Plot 2 Be Green	**Prop Type Ref**	Plot 1 Be Green
Property	Plot 1 , 95, Avenue Road, London, NW8 6HY		

SAP Rating	49 E	**DER**	10.33	**TER**	12.08
Environmental	89 B	**% DER < TER**			14.49
CO_2 Emissions (t/year)	1.49	**DFEE**	97.01	**TFEE**	56.59
Compliance Check	See BREL	**% DFEE < TFEE**			-71.41
% DPER < TPER	-66.48	**DPER**	106.67	**TPER**	64.07

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)	
Basement floor	99.1000	(1a)	x 2.6900	(2a) =	266.5790	(1a) - (3a)
Ground floor	69.6600	(1b)	x 3.2200	(2b) =	224.3052	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	168.7600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		490.8842	(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)			28.5800	1.3258	37.8902			(27)
Glazed Doors (Uw = 1.40)			6.0200	1.3258	7.9811			(27)
Glazed Wall (Uw = 1.40)			27.7200	1.3258	36.7500			(27)
GF RL			2.9500	1.2357	3.6454			(27a)
1F RL			7.1700	1.2357	8.8603			(27a)
Basement Floor			77.2700	0.2500	19.3175	110.0000	8499.7000	(28)
Basement Floor 2			21.8700	0.2500	5.4675	110.0000	2405.7000	(28)
Retaining Wall	92.3800		92.3800	0.3000	27.7140	9.0000	831.4200	(29a)
External Wall	57.9400		57.9400	0.3000	17.3820	9.0000	521.4600	(29a)
New External Wall	108.5300	65.2000	43.3300	0.1800	7.7994	150.0000	6499.5000	(29a)
Flat Roof GF	30.4900	2.9500	27.5400	0.1500	4.1310	9.0000	247.8600	(30)
Flat Roof First Floor	69.6600	7.1700	62.4900	0.1500	9.3735	9.0000	562.4100	(30)
Total net area of external elements Aum(A, m2)			458.1400					(31)

Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	190.3438			(33)
Party Wall 1	52.9900	0.0000	0.0000	70.0000	3709.3000 (32)
Internal Wall 1	265.7400			75.0000	19930.5000 (32c)
Internal Floor 1	68.2000			18.0000	1227.6000 (32d)
Internal Ceiling 1	68.2000			9.0000	613.8000 (32e)
Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =				45049.2500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K					266.9427 (35)
Thermal bridges (Default value 0.200 * total exposed area)					91.6280 (36)
Point Thermal bridges				(36a) =	0.0000
Total fabric heat loss				(33) + (36) + (36a) =	281.9718 (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	67.7834	66.8419	65.9003	61.1924	60.2508	55.5429	55.5429	54.6014	57.4261	60.2508	62.1340	64.0171	(38)
Heat transfer coeff	349.7553	348.8137	347.8721	343.1642	342.2226	337.5147	337.5147	336.5732	339.3979	342.2226	344.1058	345.9889	(39)
Average = Sum(39)m / 12 =												342.9288	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.0725	2.0669	2.0613	2.0334	2.0279	2.0000	2.0000	1.9944	2.0111	2.0279	2.0390	2.0502	(40)
HLP (average)												2.0321	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9609	(42)
Hot water usage for mixer showers	83.0977	81.8489	80.0291	76.5474	73.9779	71.1125	69.4838	71.2898	73.2695	76.3460	79.9026	82.7793	(42a)
Hot water usage for baths	31.8874	31.4138	30.7469	29.5173	28.5966	27.5756	27.0242	27.6864	28.4075	29.4999	30.7548	31.7796	(42b)
Hot water usage for other uses	44.9527	43.3180	41.6834	40.0488	38.4141	36.7795	36.7795	38.4141	40.0488	41.6834	43.3180	44.9527	(42c)
Average daily hot water use (litres/day)												147.0440	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	159.9377	156.5807	152.4594	146.1134	140.9886	135.4676	133.2875	137.3903	141.7257	147.5293	153.9755	159.5116	(44)
Energy conte	253.3023	222.9689	234.3245	200.0220	189.7978	166.5732	161.1996	170.1179	174.7619	200.1959	219.3663	249.7565	(45)
Energy content (annual)										Total = Sum(45)m =		2442.3868	
Distribution loss (46)m = 0.15 x (45)m	37.9953	33.4453	35.1487	30.0033	28.4697	24.9860	24.1799	25.5177	26.2143	30.0294	32.9049	37.4635	(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	310.0447	274.2201	291.0669	254.9340	246.5402	221.4852	217.9420	226.8603	229.6739	256.9383	274.2783	306.4989	(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	310.0447	274.2201	291.0669	254.9340	246.5402	221.4852	217.9420	226.8603	229.6739	256.9383	274.2783	306.4989	(64)
										Total per year (kWh/year) = Sum(64)m =		3110.4828	(64)
12Total per year (kWh/year)												3110	(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	102.8329	90.9461	96.5228	84.5169	81.7177	73.3952	72.2088	75.1741	76.1179	85.1751	90.9489	101.6540	(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	148.0455	148.0455	148.0455	148.0455	148.0455	148.0455	148.0455	148.0455	148.0455	148.0455	148.0455	148.0455	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	171.6337	190.0230	171.6337	177.3548	171.6337	177.3548	171.6337	171.6337	177.3548	171.6337	177.3548	171.6337	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	340.2829	343.8140	334.9158	315.9726	292.0603	269.5860	254.5718	251.0407	259.9389	278.8821	302.7945	325.2687	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.8046	37.8046	37.8046	37.8046	37.8046	37.8046	37.8046	37.8046	37.8046	37.8046	37.8046	37.8046	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	(71)
Water heating gains (Table 5)	138.2163	135.3365	129.7350	117.3846	109.8356	101.9378	97.0548	101.0405	105.7194	114.4826	126.3179	136.6317	(72)
Total internal gains	720.5465	739.5871	706.6981	681.1257	643.9432	616.2922	590.6740	591.1285	610.4267	635.4120	676.8808	703.9477	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.8500	10.6334	0.4000	0.7000	0.5400	11.3589	(74)
East	17.3900	19.6403	0.4000	0.7000	0.5400	46.4773	(76)
West	3.3400	19.6403	0.4000	0.7000	0.5400	8.9266	(80)
North	6.0200	10.6334	0.4000	0.7000	0.5400	8.7109	(74)
North	20.2300	10.6334	0.4000	0.7000	0.5400	29.2726	(74)
West	7.4900	19.6403	0.4000	0.7000	0.5400	20.0181	(80)
East	7.1700	26.0000	0.4000	0.7000	1.0000	46.9778	(82)

West			2.9500	26.0000	0.4000	0.7000	1.0000	19.3284 (82)					
Solar gains	191.0708	379.5505	648.0349	994.2813	1270.6476	1325.7858	1251.7769	1038.8822	768.5240	455.6334	239.0706	156.7128 (83)	
Total gains	911.6173	1119.1376	1354.7330	1675.4069	1914.5908	1942.0780	1842.4508	1630.0107	1378.9507	1091.0454	915.9515	860.6605 (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	35.7784	35.8750	35.9721	36.4656	36.5659	37.0760	37.0760	37.1797	36.8702	36.5659	36.3658	36.1679	
alpha	3.3852	3.3917	3.3981	3.4310	3.4377	3.4717	3.4717	3.4786	3.4580	3.4377	3.4244	3.4112	
util living area	0.9984	0.9966	0.9916	0.9730	0.9224	0.8157	0.6865	0.7563	0.9273	0.9880	0.9972	0.9987	(86)
MIT	18.9862	19.1526	19.4637	19.9209	20.3543	20.6843	20.8245	20.7870	20.4925	19.9363	19.3934	18.9717	(87)
Th 2	19.2854	19.2891	19.2928	19.3111	19.3148	19.3334	19.3334	19.3371	19.3259	19.3148	19.3074	19.3001	(88)
util rest of house	0.9978	0.9952	0.9877	0.9591	0.8767	0.6954	0.4770	0.5596	0.8618	0.9798	0.9957	0.9982	(89)
MIT 2	17.0011	17.2167	17.6165	18.2064	18.7326	19.0946	19.1974	19.1848	18.9161	18.2360	17.5381	16.9925	(90)
Living area fraction									fLA = Living area / (4) =			0.1647	(91)
MIT	17.3281	17.5356	17.9208	18.4889	18.9998	19.3564	19.4654	19.4487	19.1758	18.5161	17.8438	17.3185	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.3281	17.5356	17.9208	18.4889	18.9998	19.3564	19.4654	19.4487	19.1758	18.5161	17.8438	17.3185	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9966	0.9928	0.9828	0.9490	0.8649	0.6975	0.4967	0.5762	0.8531	0.9733	0.9937	0.9972	(94)
Useful gains	908.4729	1111.1273	1331.4646	1589.9701	1655.9736	1354.6553	915.1866	939.1788	1176.4142	1061.9428	910.1432	858.2588	(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	4556.6509	4407.4699	3972.9836	3290.5534	2498.1479	1605.3637	967.1279	1026.1115	1722.7021	2709.0545	3696.9876	4538.8620	(97)
Space heating kWh	2714.2444	2215.1422	1965.2901	1224.4200	626.5777	0.0000	0.0000	0.0000	0.0000	1225.4511	2006.5280	2738.3688	(98a)
Space heating requirement - total per year (kWh/year)												14716.0223	
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	2714.2444	2215.1422	1965.2901	1224.4200	626.5777	0.0000	0.0000	0.0000	0.0000	1225.4511	2006.5280	2738.3688	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												14716.0223	
Space heating per m2											(98c) / (4) =	87.2009	(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	3172.6386	2497.6091	2557.9561	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6201	0.7028	0.6367	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1967.3741	1755.4023	1628.6026	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	2203.5315	2089.9664	1842.3290	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	170.0333	248.9157	159.0124	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			0.5926	(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	25.1886	36.8742	23.5560	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												85.6188	(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	2714.2444	2215.1422	1965.2901	1224.4200	626.5777	0.0000	0.0000	0.0000	0.0000	1225.4511	2006.5280	2738.3688	(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)	1596.6144	1303.0248	1156.0530	720.2471	368.5751	0.0000	0.0000	0.0000	0.0000	720.8536	1180.3106	1610.8052	(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	310.0447	274.2201	291.0669	254.9340	246.5402	221.4852	217.9420	226.8603	229.6739	256.9383	274.2783	306.4989	(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	182.3792	161.3059	171.2158	149.9612	145.0236	130.2854	128.2012	133.4472	135.1023	151.1402	161.3402	180.2935	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	4.4980	6.5847	4.2064	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	59.8157	54.0271	59.8157	57.8861	59.8157	57.8861	59.8157	59.8157	57.8861	59.8157	57.8861	59.8157	(231)
Lighting	42.6002	34.1755	30.7712	22.5443	17.4139	14.2273	15.8855	20.6486	26.8205	35.1899	39.7469	43.7842	(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	8656.4837	(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	1829.6958	(219)
Space cooling fuel	15.2891	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1760)		
mechanical ventilation fans (SFP = 1.1760)	704.2814	(230a)
Total electricity for the above, kWh/year	704.2814	(231)
Electricity for lighting (calculated in Appendix L)	343.8080	(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	11549.5579	(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	8656.4837	0.1543	1336.0797	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1829.6958	0.1410	257.9188	(264)
Space and water heating			1593.9985	(265)
Space cooling	15.2891	0.1139	1.7418	(266)
Pumps, fans and electric keep-hot	704.2814	0.1387	97.6925	(267)
Energy for lighting	343.8080	0.1443	49.6221	(268)
Total CO2, kg/year			1743.0549	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.3300	(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	8656.4837	1.5714	13603.0542	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1829.6958	1.5212	2783.3917	(278)
Space and water heating			16386.4459	(279)
Space cooling	15.2891	1.4199	21.7097	(280)
Pumps, fans and electric keep-hot	704.2814	1.5128	1065.4369	(281)
Energy for lighting	343.8080	1.5338	527.3442	(282)
Total Primary energy kWh/year			18000.9366	(286)
Dwelling Primary energy Rate (DPER)			106.6700	(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)	
Basement floor	99.1000	(1a)	x	2.6900	(2a)	= 266.5790	(1a) - (3a)
Ground floor	69.6600	(1b)	x	3.2200	(2b)	= 224.3052	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	168.7600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)		= 490.8842	(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) =	0.0815 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3315 (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) =	0.2569 (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	0.3275	0.3211	0.3147	0.2826	0.2762	0.2441	0.2441	0.2376	0.2569	0.2762	0.2890	0.3019	(22b)
Effective ac	0.5536	0.5516	0.5495	0.5399	0.5381	0.5298	0.5298	0.5282	0.5330	0.5381	0.5418	0.5456	(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	
TER Opaque door			2.8800	1.0000	2.8800			(26)
TER Opening Type (Uw = 1.20)			33.8200	1.1450	38.7252			(27)
GF RL			1.6000	2.0221	3.2353			(27a)
1F RL			3.8900	2.0221	7.8658			(27a)
Basement Floor			77.2700	0.1300	10.0451			(28)
Basement Floor 2			21.8700	0.1300	2.8431			(28)
Retaining Wall	92.3800		92.3800	0.1800	16.6284			(29a)
External Wall	57.9400		57.9400	0.1800	10.4292			(29a)
New External Wall	108.5300	36.7000	71.8300	0.1800	12.9294			(29a)
Flat Roof GF	30.4900	1.6000	28.8900	0.1100	3.1779			(30)
Flat Roof First Floor	69.6600	3.8900	65.7700	0.1100	7.2347			(30)
Total net area of external elements Aum(A, m2)			458.1400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		115.9941			(33)
Party Wall 1			52.9900	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		266.9427 (35)
Thermal bridges (User defined value 0.050 * total exposed area)		22.9070 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	138.9011 (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	89.6858	89.3484	89.0176	87.4641	87.1734	85.8203	85.8203	85.5697	86.3415	87.1734	87.7614	88.3762	(38)
Heat transfer coeff	228.5869	228.2495	227.9187	226.3652	226.0745	224.7214	224.7214	224.4708	225.2426	226.0745	226.6625	227.2772	(39)
Average = Sum(39)m / 12 =												226.3638	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3545	1.3525	1.3505	1.3413	1.3396	1.3316	1.3316	1.3301	1.3347	1.3396	1.3431	1.3467	(40)
HLP (average)												1.3413	
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		2.9609 (42)

Hot water usage for mixer showers

73.8646	72.7545	71.1370	68.0421	65.7582	63.2111	61.7634	63.3687	65.1284	67.8631	71.0245	73.5816	(42a)

Hot water usage for baths

31.8874	31.4138	30.7469	29.5173	28.5966	27.5756	27.0242	27.6864	28.4075	29.4999	30.7548	31.7796	(42b)

Hot water usage for other uses

44.9527	43.3180	41.6834	40.0488	38.4141	36.7795	36.7795	38.4141	40.0488	41.6834	43.3180	44.9527	(42c)

Average daily hot water use (litres/day)		138.5314 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	150.7047	147.4864	143.5673	137.6082	132.7689	127.5662	125.5670	129.4692	133.5846	139.0464	145.0974	150.3139	(44)
Energy conte	238.6793	210.0187	220.6576	188.3787	178.7324	156.8576	151.8624	160.3099	164.7232	188.6847	206.7178	235.3552	(45)
Energy content (annual)										Total = Sum(45)m =		2300.9776	
Distribution loss (46)m = 0.15 x (45)m	35.8019	31.5028	33.0986	28.2568	26.8099	23.5286	22.7794	24.0465	24.7085	28.3027	31.0077	35.3033	(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	297.3082	262.9737	279.2864	245.1163	237.3612	213.5951	210.4913	218.9387	221.4607	247.3135	263.4554	293.9840	(62)
WWHRS	-33.7678	-29.8645	-31.2724	-25.8948	-24.1330	-20.6508	-19.3568	-20.5840	-21.3661	-25.1883	-28.5353	-33.1425	(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	263.5404	233.1092	248.0140	219.2215	213.2282	192.9443	191.1344	198.3547	200.0946	222.1252	234.9201	260.8415	(64)
									Total per year (kWh/year) = Sum(64)m =			2677.5283	(64)
12Total per year (kWh/year)												2678	(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	126.2639	112.1953	120.2717	108.0260	106.3316	97.5452	97.3973	100.2061	100.1605	109.6407	114.1237	125.1586	(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	148.0455	148.0455	148.0455	148.0455	148.0455	148.0455	148.0455	148.0455	148.0455	148.0455	148.0455	148.0455	(66)

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

	172.7571	191.2668	172.7571	178.5157	172.7571	178.5157	172.7571	172.7571	178.5157	172.7571	178.5157	172.7571	(67)

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

	340.2829	343.8140	334.9158	315.9726	292.0603	269.5860	254.5718	251.0407	259.9389	278.8821	302.7945	325.2687	(68)

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

	37.8046	37.8046	37.8046	37.8046	37.8046	37.8046	37.8046	37.8046	37.8046	37.8046	37.8046	37.8046	(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)

	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	(71)

Water heating gains (Table 5)

	169.7096	166.9572	161.6555	150.0361	142.9188	135.4794	130.9104	134.6856	139.1118	147.3666	158.5052	168.2240	(72)

Total internal gains

	753.1633	772.4517	739.7421	714.9381	678.1498	650.9948	625.6530	625.8972	644.9801	669.4195	710.2290	736.6635	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	18.5100	10.6334	0.6300	0.7000	0.5400	42.1845	(74)
East	9.4400	19.6403	0.6300	0.7000	0.5400	39.7369	(76)
West	5.8700	19.6403	0.6300	0.7000	0.5400	24.7093	(80)
East	3.8900	26.0000	0.6300	0.7000	1.0000	40.1425	(82)
West	1.6000	26.0000	0.6300	0.7000	1.0000	16.5110	(82)

Solar gains	163.2842	324.3522	553.7899	849.6859	1085.8692	1132.9936	1069.7450	887.8034	656.7571	389.3697	204.3033	133.9231	(83)
Total gains	916.4475	1096.8039	1293.5320	1564.6239	1764.0191	1783.9884	1695.3980	1513.7005	1301.7372	1058.7892	914.5323	870.5866	(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	54.7436	54.8246	54.9041	55.2809	55.3520	55.6853	55.6853	55.7475	55.5565	55.3520	55.2084	55.0591	
alpha	4.6496	4.6550	4.6603	4.6854	4.6901	4.7124	4.7124	4.7165	4.7038	4.6901	4.6806	4.6706	
util living area	0.9990	0.9975	0.9923	0.9676	0.8881	0.7262	0.5631	0.6419	0.8891	0.9868	0.9978	0.9992	(86)
MIT	19.3102	19.4967	19.8222	20.2850	20.6872	20.9166	20.9801	20.9644	20.7682	20.2374	19.6943	19.2809	(87)
Th 2	19.7984	19.7999	19.8014	19.8086	19.8099	19.8162	19.8162	19.8173	19.8138	19.8099	19.8072	19.8044	(88)
util rest of house	0.9986	0.9965	0.9891	0.9533	0.8398	0.6228	0.4219	0.4964	0.8199	0.9789	0.9968	0.9989	(89)
MIT 2	17.8350	18.0748	18.4913	19.0764	19.5462	19.7703	19.8105	19.8056	19.6491	19.0267	18.3334	17.8016	(90)

Living area fraction fLA = Living area / (4) = 0.1647 (91)

MIT	18.0780	18.3090	18.7105	19.2755	19.7342	19.9592	20.0032	19.9965	19.8334	19.2261	18.5576	18.0453	(92)

Temperature adjustment 0.0000

adjusted MIT	18.0780	18.3090	18.7105	19.2755	19.7342	19.9592	20.0032	19.9965	19.8334	19.2261	18.5576	18.0453	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9977	0.9946	0.9847	0.9447	0.8361	0.6366	0.4452	0.5201	0.8214	0.9731	0.9951	0.9982	(94)
Useful gains	914.3564	1090.8595	1273.7911	1478.1649	1474.8580	1135.6089	754.8058	787.3249	1069.2191	1030.3213	910.0422	869.0270	(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	3149.4788	3060.6073	2783.0063	2348.6490	1816.3192	1204.3173	764.7692	807.3022	1291.4156	1950.1431	2597.0062	3146.7176	(97)
Space heating kWh	1662.9311	1323.6705	1122.8561	626.7486	254.0471	0.0000	0.0000	0.0000	0.0000	684.3475	1214.6141	1694.6018	(98a)

Space heating requirement - total per year (kWh/year) 8583.8168

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	1662.9311	1323.6705	1122.8561	626.7486	254.0471	0.0000	0.0000	0.0000	0.0000	684.3475	1214.6141	1694.6018	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 8583.8168

Space heating per m2 (98c) / (4) = 50.8640 (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	1662.9311	1323.6705	1122.8561	626.7486	254.0471	0.0000	0.0000	0.0000	0.0000	684.3475	1214.6141	1694.6018	(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)	1801.6588	1434.0959	1216.5288	679.0342	275.2407	0.0000	0.0000	0.0000	0.0000	741.4382	1315.9416	1835.9717	(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													
	263.5404	233.1092	248.0140	219.2215	213.2282	192.9443	191.1344	198.3547	200.0946	222.1252	234.9201	260.8415	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.4508	87.3253	87.0243	86.2784	84.4536	79.8000	79.8000	79.8000	79.8000	86.4119	87.2060	87.4839	(217)
Fuel for water heating, kWh/month													
	301.3586	266.9436	284.9939	254.0861	252.4797	241.7849	239.5168	248.5648	250.7452	257.0540	269.3852	298.1596	(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	35.8955	28.7967	25.9283	18.9962	14.6732	11.9881	13.3854	17.3988	22.5993	29.6515	33.4913	36.8932	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-81.0123	-108.7272	-148.8139	-158.9738	-164.5703	-151.0368	-148.9311	-143.7018	-133.8299	-119.9718	-86.9823	-70.6797	(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	-64.0896	-132.1894	-258.1294	-381.3224	-498.3437	-498.7948	-493.1267	-420.3537	-311.7816	-187.1070	-84.8924	-50.9041	(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	9299.9099	(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	3165.0722	(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)	289.6974	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-4898.2658	(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	7942.4138	(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	9299.9099	0.2100	1952.9811	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3165.0722	0.2100	664.6652	(264)
Space and water heating			2617.6463	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	289.6974	0.1443	41.8123	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1517.2309	0.1357	-205.8753	
PV Unit electricity exported	-3381.0349	0.1264	-427.3033	
Total			-633.1787	(269)
Total CO2, kg/year			2038.2092	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.0800	(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	9299.9099	1.1300	10508.8982	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3165.0722	1.1300	3576.5316	(278)
Space and water heating			14085.4298	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	289.6974	1.5338	444.3476	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1517.2309	1.5016	-2278.2035	
PV Unit electricity exported	-3381.0349	0.4639	-1568.5681	
Total			-3846.7716	(283)
Total Primary energy kWh/year			10813.1066	(286)
Target Primary Energy Rate (TPER)			64.0700	(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)	
Basement floor	99.1000	(1a)	x 2.6900	(2a)	= 266.5790	(1a) - (3a)
Ground floor	69.6600	(1b)	x 3.2200	(2b)	= 224.3052	(1b) - (3b)

Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 168.7600 (4)
Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 490.8842 (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) =	0.0815	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		6.0000	(17)
Infiltration rate		0.3815	(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) =	0.2957	(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	0.3770	0.3696	0.3622	0.3252	0.3178	0.2809	0.2809	0.2735	0.2957	0.3178	0.3326	0.3474	(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	0.5710	0.5683	0.5656	0.5529	0.5505	0.5394	0.5394	0.5374	0.5437	0.5505	0.5553	0.5603	(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)			28.5800	1.3258	37.8902			(27)
Glazed Doors (Uw = 1.40)			6.0200	1.3258	7.9811			(27)
Glazed Wall (Uw = 1.40)			27.7200	1.3258	36.7500			(27)
GF RL			2.9500	1.2357	3.6454			(27a)
1F RL			7.1700	1.2357	8.8603			(27a)
Basement Floor			77.2700	0.2500	19.3175	110.0000	8499.7000	(28)
Basement Floor 2			21.8700	0.2500	5.4675	110.0000	2405.7000	(28)
Retaining Wall	92.3800		92.3800	0.3000	27.7140	9.0000	831.4200	(29a)
External Wall	57.9400		57.9400	0.3000	17.3820	9.0000	521.4600	(29a)
New External Wall	108.5300	65.2000	43.3300	0.1800	7.7994	150.0000	6499.5000	(29a)
Flat Roof GF	30.4900	2.9500	27.5400	0.1500	4.1310	9.0000	247.8600	(30)
Flat Roof First Floor	69.6600	7.1700	62.4900	0.1500	9.3735	9.0000	562.4100	(30)
Total net area of external elements Aum(A, m2)			458.1400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	190.3438			(33)
Party Wall 1			52.9900	0.0000	0.0000	70.0000	3709.3000	(32)
Internal Wall 1			265.7400			75.0000	19930.5000	(32c)
Internal Floor 1			68.2000			18.0000	1227.6000	(32d)
Internal Ceiling 1			68.2000			9.0000	613.8000	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	45049.2500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		266.9427 (35)
Thermal bridges (Default value 0.200 * total exposed area)		91.6280 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	281.9718 (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	92.5050	92.0581	91.6201	89.5625	89.1775	87.3854	87.3854	87.0536	88.0757	89.1775	89.9563	90.7705	(38)
Heat transfer coeff	374.4769	374.0299	373.5919	371.5343	371.1493	369.3573	369.3573	369.0254	370.0475	371.1493	371.9281	372.7423	(39)
Average = Sum(39)m / 12 =												371.5325	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.2190	2.2163	2.2137	2.2016	2.1993	2.1887	2.1887	2.1867	2.1927	2.1993	2.2039	2.2087	(40)
HLP (average)												2.2015	
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 2.9609 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

31.8874	31.4138	30.7469	29.5173	28.5966	27.5756	27.0242	27.6864	28.4075	29.4999	30.7548	31.7796	(42b)

Hot water usage for other uses

44.9527	43.3180	41.6834	40.0488	38.4141	36.7795	36.7795	38.4141	40.0488	41.6834	43.3180	44.9527	(42c)

Average daily hot water use (litres/day) 70.4307 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	76.8401	74.7319	72.4303	69.5661	67.0107	64.3551	63.8037	66.1005	68.4562	71.1833	74.0729	76.7323	(44)
Energy conte	121.6959	106.4172	111.3227	95.2325	90.2093	79.1321	77.1650	81.8463	84.4133	96.5951	105.5304	120.1442	(45)
Energy content (annual)										Total = Sum(45)m =		1169.7039	

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													
	103.4415	90.4546	94.6243	80.9476	76.6779	67.2623	65.5902	69.5693	71.7513	82.1058	89.7008	102.1226	(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													
	103.4415	90.4546	94.6243	80.9476	76.6779	67.2623	65.5902	69.5693	71.7513	82.1058	89.7008	102.1226	(64)
										Total per year (kWh/year) = Sum(64)m =		994.2484	(64)
12Total per year (kWh/year)												994	(64)
Electric shower(s)													
	59.1532	52.7060	57.5529	54.9221	55.9527	53.3734	55.1525	55.9527	54.9221	57.5529	56.4707	59.1532	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		672.8644	(64a)
Heat gains from water heating, kWh/month													
	40.6487	35.7902	38.0443	33.9674	33.1576	30.1589	30.1857	31.3805	31.6684	34.9147	36.5429	40.3189	(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	148.0455	148.0455	148.0455	148.0455	148.0455	148.0455	148.0455	148.0455	148.0455	148.0455	148.0455	148.0455	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	171.6337	190.0230	171.6337	177.3548	171.6337	177.3548	171.6337	171.6337	177.3548	171.6337	177.3548	171.6337	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	340.2829	343.8140	334.9158	315.9726	292.0603	269.5860	254.5718	251.0407	259.9389	278.8821	302.7945	325.2687	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.8046	37.8046	37.8046	37.8046	37.8046	37.8046	37.8046	37.8046	37.8046	37.8046	37.8046	37.8046	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	(71)
Water heating gains (Table 5)													
	54.6353	53.2592	51.1348	47.1770	44.5667	41.8874	40.5722	42.1781	43.9838	46.9283	50.7540	54.1921	(72)
Total internal gains													
	633.9656	654.5098	625.0980	607.9180	575.6743	556.2418	534.1913	532.2661	548.6912	564.8578	598.3169	618.5082	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.8500	10.6334	0.4000	0.7000	0.5400	11.3589	(74)
East	17.3900	19.6403	0.4000	0.7000	0.5400	46.4773	(76)
West	3.3400	19.6403	0.4000	0.7000	0.5400	8.9266	(80)
North	6.0200	10.6334	0.4000	0.7000	0.5400	8.7109	(74)
North	20.2300	10.6334	0.4000	0.7000	0.5400	29.2726	(74)
West	7.4900	19.6403	0.4000	0.7000	0.5400	20.0181	(80)
East	7.1700	26.0000	0.4000	0.7000	1.0000	46.9778	(82)
West	2.9500	26.0000	0.4000	0.7000	1.0000	19.3284	(82)

Solar gains	191.0708	379.5505	648.0349	994.2813	1270.6476	1325.7858	1251.7769	1038.8822	768.5240	455.6334	239.0706	156.7128	(83)
Total gains	825.0363	1034.0603	1273.1328	1602.1993	1846.3219	1882.0276	1785.9681	1571.1483	1317.2152	1020.4911	837.3876	775.2210	(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	33.4164	33.4564	33.4956	33.6811	33.7160	33.8796	33.8796	33.9101	33.8164	33.7160	33.6454	33.5719	
alpha	3.2278	3.2304	3.2330	3.2454	3.2477	3.2586	3.2586	3.2607	3.2544	3.2477	3.2430	3.2381	
util living area													
	0.9987	0.9972	0.9929	0.9771	0.9344	0.8439	0.7279	0.7940	0.9403	0.9902	0.9977	0.9990	(86)
MIT	18.2370	18.4594	18.8851	19.5052	20.1190	20.6035	20.8338	20.7699	20.3284	19.5458	18.7895	18.2034	(87)
Th 2	19.1913	19.1930	19.1946	19.2023	19.2038	19.2105	19.2105	19.2118	19.2079	19.2038	19.2009	19.1978	(88)
util rest of house													
	0.9982	0.9960	0.9895	0.9647	0.8926	0.7256	0.5040	0.5905	0.8808	0.9831	0.9965	0.9986	(89)
MIT 2	16.7728	16.9959	17.4210	18.0381	18.6235	19.0381	19.1777	19.1556	18.8350	18.0862	17.3312	16.7433	(90)
Living area fraction										fLA = Living area / (4) =		0.1647	(91)
MIT	17.0140	17.2370	17.6622	18.2798	18.8699	19.2960	19.4505	19.4215	19.0810	18.3266	17.5714	16.9839	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.0140	17.2370	17.6622	18.2798	18.8699	19.2960	19.4505	19.4215	19.0810	18.3266	17.5714	16.9839	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9971	0.9938	0.9849	0.9550	0.8815	0.7331	0.5412	0.6220	0.8743	0.9772	0.9946	0.9977	(94)
Useful gains	822.6540	1027.6519	1253.9177	1530.0220	1627.5503	1379.6212	966.5377	977.2550	1151.6198	997.2708	832.8837	773.4064	(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													
	4761.0863	4614.3902	4170.1058	3484.9194	2661.0872	1734.4943	1052.8655	1115.0257	1843.2171	2867.7264	3894.6105	4765.0838	(97)
Space heating kWh													
	2930.1936	2410.2881	2169.6440	1407.5261	768.9515	0.0000	0.0000	0.0000	0.0000	1391.6189	2204.4433	2969.8080	(98a)
Space heating requirement - total per year (kWh/year)												16252.4735	
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													
	2930.1936	2410.2881	2169.6440	1407.5261	768.9515	0.0000	0.0000	0.0000	0.0000	1391.6189	2204.4433	2969.8080	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												16252.4735	
Space heating per m2											(98c) / (4) =	96.3052	(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	3471.9582	2733.2437	2804.5929	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.5607	0.6421	0.5734	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1946.8156	1755.0566	1608.1315	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	2141.7023	2031.5616	1780.9682	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	140.3184	205.7198	128.5905	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	35.0796	51.4299	32.1476	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												118.6572	(107)
Energy for space heating												96.3052	(99)
Energy for space cooling												0.7031	(108)
Total												97.0084	(109)
Fabric Energy Efficiency (DFEE)												97.0	(109)

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

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Basement floor		99.1000 (1a)	x	2.6900 (2a)	=	266.5790	(1a) - (3a)
Ground floor		69.6600 (1b)	x	3.2200 (2b)	=	224.3052	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	168.7600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	490.8842	(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) =	0.0815	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3315	(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) =	0.2569	(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													
	0.3275	0.3211	0.3147	0.2826	0.2762	0.2441	0.2441	0.2376	0.2569	0.2762	0.2890	0.3019	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5536	0.5516	0.5495	0.5399	0.5381	0.5298	0.5298	0.5282	0.5330	0.5381	0.5418	0.5456	(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	
TER Opaque door			2.8800	1.0000	2.8800			(26)
TER Opening Type (Uw = 1.20)			33.8200	1.1450	38.7252			(27)
GF RL			1.6000	2.0221	3.2353			(27a)
1F RL			3.8900	2.0221	7.8658			(27a)
Basement Floor			77.2700	0.1300	10.0451			(28)
Basement Floor 2			21.8700	0.1300	2.8431			(28)
Retaining Wall	92.3800		92.3800	0.1800	16.6284			(29a)
External Wall	57.9400		57.9400	0.1800	10.4292			(29a)
New External Wall	108.5300	36.7000	71.8300	0.1800	12.9294			(29a)
Flat Roof GF	30.4900	1.6000	28.8900	0.1100	3.1779			(30)
Flat Roof First Floor	69.6600	3.8900	65.7700	0.1100	7.2347			(30)
Total net area of external elements Aum(A, m2)			458.1400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	115.9941			(33)
Party Wall 1			52.9900	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 266.9427 (35)
Thermal bridges (User defined value 0.050 * total exposed area) 22.9070 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 138.9011 (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	89.6858	89.3484	89.0176	87.4641	87.1734	85.8203	85.8203	85.5697	86.3415	87.1734	87.7614	88.3762	(38)
Heat transfer coeff	228.5869	228.2495	227.9187	226.3652	226.0745	224.7214	224.7214	224.4708	225.2426	226.0745	226.6625	227.2772	(39)

Average = Sum(39)m / 12 = 226.3638

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3545	1.3525	1.3505	1.3413	1.3396	1.3316	1.3316	1.3301	1.3347	1.3396	1.3431	1.3467	(40)
HLP (average)												1.3413	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9609 (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

31.8874	31.4138	30.7469	29.5173	28.5966	27.5756	27.0242	27.6864	28.4075	29.4999	30.7548	31.7796	(42b)

Hot water usage for other uses

44.9527	43.3180	41.6834	40.0488	38.4141	36.7795	36.7795	38.4141	40.0488	41.6834	43.3180	44.9527	(42c)

Average daily hot water use (litres/day) 70.4307 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	76.8401	74.7319	72.4303	69.5661	67.0107	64.3551	63.8037	66.1005	68.4562	71.1833	74.0729	76.7323	(44)
Energy conte	121.6959	106.4172	111.3227	95.2325	90.2093	79.1321	77.1650	81.8463	84.4133	96.5951	105.5304	120.1442	(45)

Energy content (annual) Total = Sum(45)m = 1169.7039

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

103.4415	90.4546	94.6243	80.9476	76.6779	67.2623	65.5902	69.5693	71.7513	82.1058	89.7008	102.1226	(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

103.4415	90.4546	94.6243	80.9476	76.6779	67.2623	65.5902	69.5693	71.7513	82.1058	89.7008	102.1226	(64)

Total per year (kWh/year) = Sum(64)m = 994.2484 (64)

12Total per year (kWh/year) 994 (64)

Electric shower(s)

59.1532	52.7060	57.5529	54.9221	55.9527	53.3734	55.1525	55.9527	54.9221	57.5529	56.4707	59.1532	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 672.8644 (64a)

Heat gains from water heating, kWh/month

40.6487	35.7902	38.0443	33.9674	33.1576	30.1589	30.1857	31.3805	31.6684	34.9147	36.5429	40.3189	(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	148.0455	148.0455	148.0455	148.0455	148.0455	148.0455	148.0455	148.0455	148.0455	148.0455	148.0455	148.0455	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	172.7571	191.2668	172.7571	178.5157	172.7571	178.5157	172.7571	172.7571	178.5157	172.7571	178.5157	172.7571	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	340.2829	343.8140	334.9158	315.9726	292.0603	269.5860	254.5718	251.0407	259.9389	278.8821	302.7945	325.2687	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.8046	37.8046	37.8046	37.8046	37.8046	37.8046	37.8046	37.8046	37.8046	37.8046	37.8046	37.8046	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	(71)
Water heating gains (Table 5)	54.6353	53.2592	51.1348	47.1770	44.5667	41.8874	40.5722	42.1781	43.9838	46.9283	50.7540	54.1921	(72)
Total internal gains	635.0891	655.7536	626.2214	609.0790	576.7978	557.4028	535.3148	533.3896	549.8521	565.9812	599.4779	619.6317	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	18.5100	10.6334	0.6300	0.7000	0.5400	42.1845	(74)
East	9.4400	19.6403	0.6300	0.7000	0.5400	39.7369	(76)
West	5.8700	19.6403	0.6300	0.7000	0.5400	24.7093	(80)
East	3.8900	26.0000	0.6300	0.7000	1.0000	40.1425	(82)
West	1.6000	26.0000	0.6300	0.7000	1.0000	16.5110	(82)

Solar gains	163.2842	324.3522	553.7899	849.6859	1085.8692	1132.9936	1069.7450	887.8034	656.7571	389.3697	204.3033	133.9231	(83)
Total gains	798.3733	980.1059	1180.0113	1458.7648	1662.6670	1690.3963	1605.0598	1421.1930	1206.6092	955.3509	803.7811	753.5548	(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	54.7436	54.8246	54.9041	55.2809	55.3520	55.6853	55.6853	55.7475	55.5565	55.3520	55.2084	55.0591	
alpha	4.6496	4.6550	4.6603	4.6854	4.6901	4.7124	4.7124	4.7165	4.7038	4.6901	4.6806	4.6706	
util living area													
	0.9995	0.9984	0.9947	0.9749	0.9056	0.7524	0.5903	0.6741	0.9110	0.9913	0.9988	0.9996	(86)
MIT	19.2417	19.4294	19.7582	20.2315	20.6516	20.9028	20.9758	20.9564	20.7342	20.1803	19.6302	19.2129	(87)
Th 2	19.7984	19.7999	19.8014	19.8086	19.8099	19.8162	19.8162	19.8173	19.8138	19.8099	19.8072	19.8044	(88)
util rest of house													
	0.9992	0.9978	0.9924	0.9634	0.8620	0.6502	0.4445	0.5258	0.8502	0.9858	0.9982	0.9994	(89)
MIT 2	18.1999	18.3886	18.7173	19.1877	19.5763	19.7735	19.8107	19.8057	19.6612	19.1442	18.5949	18.1756	(90)
Living area fraction										fLA = Living area / (4) =		0.1647	(91)
MIT	18.3716	18.5600	18.8888	19.3596	19.7534	19.9595	20.0026	19.9953	19.8379	19.3149	18.7654	18.3465	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3716	18.5600	18.8888	19.3596	19.7534	19.9595	20.0026	19.9953	19.8379	19.3149	18.7654	18.3465	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9988	0.9969	0.9899	0.9576	0.8595	0.6640	0.4687	0.5501	0.8518	0.9824	0.9974	0.9991	(94)
Useful gains	797.4516	977.0264	1168.1503	1396.9282	1429.0227	1122.4907	752.3056	781.8651	1027.7399	938.5695	801.6543	752.8966	(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													
	3216.5747	3117.8908	2823.6337	2367.6950	1820.6737	1204.3947	764.6441	807.0316	1292.4275	1970.2194	2644.1186	3215.1800	(97)
Space heating kWh													
	1799.8276	1438.6608	1231.6796	698.9521	291.3883	0.0000	0.0000	0.0000	0.0000	767.5475	1326.5743	1831.9389	(98a)
Space heating requirement - total per year (kWh/year)												9386.5691	
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													
	1799.8276	1438.6608	1231.6796	698.9521	291.3883	0.0000	0.0000	0.0000	0.0000	767.5475	1326.5743	1831.9389	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												9386.5691	
Space heating per m2											(98c) / (4) =	55.6208	(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	2112.3810	1662.9382	1705.9781	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7819	0.8593	0.7983	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1651.7261	1428.9308	1361.8916	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1913.8853	1816.4911	1602.5337	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	188.7546	288.3448	179.0378	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	47.1886	72.0862	44.7594	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												164.0343	(107)
Energy for space heating												55.6208	(99)
Energy for space cooling												0.9720	(108)
Total												56.5928	(109)
Fabric Energy Efficiency (TFEE)												56.6	(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)	
Basement floor	99.1000	(1a)	x 2.6900	(2a) =	266.5790	(1a) - (3a)
Ground floor	69.6600	(1b)	x 3.2200	(2b) =	224.3052	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	168.7600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		490.8842	(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)

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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)			28.5800	1.3258	37.8902			(27)
Glazed Doors (Uw = 1.40)			6.0200	1.3258	7.9811			(27)
Glazed Wall (Uw = 1.40)			27.7200	1.3258	36.7500			(27)
GF RL			2.9500	1.2357	3.6454			(27a)
1F RL			7.1700	1.2357	8.8603			(27a)
Basement Floor			77.2700	0.2500	19.3175	110.0000	8499.7000	(28)
Basement Floor 2			21.8700	0.2500	5.4675	110.0000	2405.7000	(28)
Retaining Wall	92.3800		92.3800	0.3000	27.7140	9.0000	831.4200	(29a)
External Wall	57.9400		57.9400	0.3000	17.3820	9.0000	521.4600	(29a)
New External Wall	108.5300	65.2000	43.3300	0.1800	7.7994	150.0000	6499.5000	(29a)
Flat Roof GF	30.4900	2.9500	27.5400	0.1500	4.1310	9.0000	247.8600	(30)
Flat Roof First Floor	69.6600	7.1700	62.4900	0.1500	9.3735	9.0000	562.4100	(30)
Total net area of external elements Aum(A, m2)			458.1400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		190.3438			(33)
Party Wall 1			52.9900	0.0000	0.0000	70.0000	3709.3000	(32)
Internal Wall 1			265.7400			75.0000	19930.5000	(32c)
Internal Floor 1			68.2000			18.0000	1227.6000	(32d)
Internal Ceiling 1			68.2000			9.0000	613.8000	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 45049.2500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 266.9427 (35)
Thermal bridges (Default value 0.200 * total exposed area) 91.6280 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 281.9718 (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	67.7834	66.8419	65.9003	61.1924	60.2508	55.5429	55.5429	54.6014	57.4261	60.2508	62.1340	64.0171	(38)
Heat transfer coeff	349.7553	348.8137	347.8721	343.1642	342.2226	337.5147	337.5147	336.5732	339.3979	342.2226	344.1058	345.9889	(39)
Average = Sum(39)m / 12 =												342.9288	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.0725	2.0669	2.0613	2.0334	2.0279	2.0000	2.0000	1.9944	2.0111	2.0279	2.0390	2.0502	(40)
HLP (average)												2.0321	
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 2.9609 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	83.0977	81.8489	80.0291	76.5474	73.9779	71.1125	69.4838	71.2898	73.2695	76.3460	79.9026	82.7793	(42a)
Hot water usage for baths	31.8874	31.4138	30.7469	29.5173	28.5966	27.5756	27.0242	27.6864	28.4075	29.4999	30.7548	31.7796	(42b)
Hot water usage for other uses	44.9527	43.3180	41.6834	40.0488	38.4141	36.7795	36.7795	38.4141	40.0488	41.6834	43.3180	44.9527	(42c)
Average daily hot water use (litres/day)												147.0440	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	159.9377	156.5807	152.4594	146.1134	140.9886	135.4676	133.2875	137.3903	141.7257	147.5293	153.9755	159.5116	(44)
Energy conte	253.3023	222.9689	234.3245	200.0220	189.7978	166.5732	161.1996	170.1179	174.7619	200.1959	219.3663	249.7565	(45)
Energy content (annual)										Total = Sum(45)m =		2442.3868	
Distribution loss (46)m = 0.15 x (45)m	37.9953	33.4453	35.1487	30.0033	28.4697	24.9860	24.1799	25.5177	26.2143	30.0294	32.9049	37.4635	(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	310.0447	274.2201	291.0669	254.9340	246.5402	221.4852	217.9420	226.8603	229.6739	256.9383	274.2783	306.4989	(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	310.0447	274.2201	291.0669	254.9340	246.5402	221.4852	217.9420	226.8603	229.6739	256.9383	274.2783	306.4989	(64)
										Total per year (kWh/year) = Sum(64)m =		3110.4828	(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	102.8329	90.9461	96.5228	84.5169	81.7177	73.3952	72.2088	75.1741	76.1179	85.1751	90.9489	101.6540	(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	177.6546	177.6546	177.6546	177.6546	177.6546	177.6546	177.6546	177.6546	177.6546	177.6546	177.6546	177.6546	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	48.6696	43.2279	35.1553	26.6148	19.8949	16.7961	18.1488	23.5905	31.6631	40.2035	46.9235	50.0223	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	507.8850	513.1552	499.8744	471.6009	435.9108	402.3672	379.9579	374.6877	387.9686	416.2420	451.9321	485.4757	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	55.7264	55.7264	55.7264	55.7264	55.7264	55.7264	55.7264	55.7264	55.7264	55.7264	55.7264	55.7264	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	(71)
Water heating gains (Table 5)													
	138.2163	135.3365	129.7350	117.3846	109.8356	101.9378	97.0548	101.0405	105.7194	114.4826	126.3179	136.6317	(72)
Total internal gains													
	812.7154	809.6642	782.7092	733.5449	683.5859	636.0456	610.1061	614.2632	640.2955	688.8727	743.1180	790.0743	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.8500	10.6334	0.4000	0.7000	0.5400	11.3589	(74)
East	17.3900	19.6403	0.4000	0.7000	0.5400	46.4773	(76)
West	3.3400	19.6403	0.4000	0.7000	0.5400	8.9266	(80)
North	6.0200	10.6334	0.4000	0.7000	0.5400	8.7109	(74)
North	20.2300	10.6334	0.4000	0.7000	0.5400	29.2726	(74)
West	7.4900	19.6403	0.4000	0.7000	0.5400	20.0181	(80)
East	7.1700	26.0000	0.4000	0.7000	1.0000	46.9778	(82)
West	2.9500	26.0000	0.4000	0.7000	1.0000	19.3284	(82)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	191.0708	379.5505	648.0349	994.2813	1270.6476	1325.7858	1251.7769	1038.8822	768.5240	455.6334	239.0706	156.7128	(83)
Total gains	1003.7862	1189.2147	1430.7440	1727.8262	1954.2335	1961.8314	1861.8830	1653.1454	1408.8195	1144.5061	982.1887	946.7870	(84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
tau	35.7784	35.8750	35.9721	36.4656	36.5659	37.0760	37.0760	37.1797	36.8702	36.5659	36.3658	36.1679	
alpha	3.3852	3.3917	3.3981	3.4310	3.4377	3.4717	3.4717	3.4786	3.4580	3.4377	3.4244	3.4112	
util living area	0.9979	0.9959	0.9901	0.9706	0.9185	0.8122	0.6819	0.7506	0.9233	0.9862	0.9965	0.9983	(86)
MIT	19.0218	19.1796	19.4923	19.9393	20.3656	20.6878	20.8263	20.7902	20.5012	19.9563	19.4190	19.0052	(87)
Th 2	19.2854	19.2891	19.2928	19.3111	19.3148	19.3334	19.3334	19.3371	19.3259	19.3148	19.3074	19.3001	(88)
util rest of house	0.9970	0.9942	0.9856	0.9555	0.8711	0.6910	0.4727	0.5533	0.8555	0.9768	0.9947	0.9976	(89)
MIT 2	17.0467	17.2510	17.6526	18.2287	18.7446	19.0971	19.1980	19.1861	18.9245	18.2606	17.5708	17.0353	(90)
Living area fraction									fLA = Living area / (4) =			0.1647	(91)
MIT	17.3721	17.5687	17.9557	18.5104	19.0117	19.3592	19.4663	19.4503	19.1843	18.5399	17.8752	17.3598	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.3721	17.5687	17.9557	18.5104	19.0117	19.3592	19.4663	19.4503	19.1843	18.5399	17.8752	17.3598	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9954	0.9915	0.9801	0.9451	0.8594	0.6934	0.4924	0.5701	0.8470	0.9697	0.9922	0.9963	(94)
Useful gains	999.1572	1179.0521	1402.2028	1632.8883	1679.5412	1360.2731	916.8290	942.5040	1193.3089	1109.8550	974.5300	943.2487	(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	4572.0345	4419.0217	3985.1065	3297.9607	2502.2123	1606.2863	967.4054	1026.6611	1725.5910	2717.2241	3707.8259	4553.1581	(97)
Space heating kWh	2658.2207	2177.2596	1921.6803	1198.8521	612.0673	0.0000	0.0000	0.0000	0.0000	1195.8826	1967.9730	2685.7726	(98a)
Space heating requirement - total per year (kWh/year)												14417.7082	
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	2658.2207	2177.2596	1921.6803	1198.8521	612.0673	0.0000	0.0000	0.0000	0.0000	1195.8826	1967.9730	2685.7726	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												14417.7082	
Space heating per m2											(98c) / (4) =	85.4332	(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	3172.6386	2497.6091	2557.9561	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6201	0.7028	0.6367	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1967.3741	1755.4023	1628.6026	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	2203.5315	2089.9664	1842.3290	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	170.0333	248.9157	159.0124	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		0.5926	(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	25.1886	36.8742	23.5560	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												85.6188	(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													
	2658.2207	2177.2596	1921.6803	1198.8521	612.0673	0.0000	0.0000	0.0000	0.0000	1195.8826	1967.9730	2685.7726	(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)													
	1563.6592	1280.7409	1130.4002	705.2071	360.0396	0.0000	0.0000	0.0000	0.0000	703.4604	1157.6312	1579.8662	(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													
	310.0447	274.2201	291.0669	254.9340	246.5402	221.4852	217.9420	226.8603	229.6739	256.9383	274.2783	306.4989	(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													
	182.3792	161.3059	171.2158	149.9612	145.0236	130.2854	128.2012	133.4472	135.1023	151.1402	161.3402	180.2935	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	4.4980	6.5847	4.2064	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	59.8157	54.0271	59.8157	57.8861	59.8157	57.8861	59.8157	59.8157	57.8861	59.8157	57.8861	59.8157	(231)
Lighting	42.6002	34.1755	30.7712	22.5443	17.4139	14.2273	15.8855	20.6486	26.8205	35.1899	39.7469	43.7842	(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												8481.0049	(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												1829.6958	(219)
Space cooling fuel												15.2891	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1760)													
mechanical ventilation fans (SFP = 1.1760)												704.2814	(230a)
Total electricity for the above, kWh/year												704.2814	(231)
Electricity for lighting (calculated in Appendix L)												343.8080	(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												11374.0791	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	8481.0049	16.4900	1398.5177	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1829.6958	16.4900	301.7168	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Space cooling	15.2891	16.4900	2.5212	(248)
Pumps, fans and electric keep-hot	704.2814	16.4900	116.1360	(249)
Energy for lighting	343.8080	16.4900	56.6939	(250)
Additional standing charges			0.0000	(251)
Total energy cost			1875.5856	(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] =	3.1587	(257)
SAP value		48.7969	
SAP rating (Section 12)		49	(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	8481.0049	0.1544	1309.1072	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1829.6958	0.1410	257.9188	(264)
Space and water heating			1567.0260	(265)
Space cooling	15.2891	0.1139	1.7418	(266)
Pumps, fans and electric keep-hot	704.2814	0.1387	97.6925	(267)
Energy for lighting	343.8080	0.1443	49.6221	(268)
Total CO2, kg/year			1716.0824	(272)
CO2 emissions per m2			10.1700	(273)
EI value			89.2424	
EI rating			89	(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)	
Basement floor	99.1000	(1a)	x 2.6900	(2a) =	266.5790	(1a) - (3a)
Ground floor	69.6600	(1b)	x 3.2200	(2b) =	224.3052	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	168.7600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		490.8842	(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	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)

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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)			28.5800	1.3258	37.8902			(27)
Glazed Doors (Uw = 1.40)			6.0200	1.3258	7.9811			(27)
Glazed Wall (Uw = 1.40)			27.7200	1.3258	36.7500			(27)
GF RL			2.9500	1.2357	3.6454			(27a)
1F RL			7.1700	1.2357	8.8603			(27a)
Basement Floor			77.2700	0.2500	19.3175	110.0000	8499.7000	(28)
Basement Floor 2			21.8700	0.2500	5.4675	110.0000	2405.7000	(28)
Retaining Wall	92.3800		92.3800	0.3000	27.7140	9.0000	831.4200	(29a)
External Wall	57.9400		57.9400	0.3000	17.3820	9.0000	521.4600	(29a)
New External Wall	108.5300	65.2000	43.3300	0.1800	7.7994	150.0000	6499.5000	(29a)
Flat Roof GF	30.4900	2.9500	27.5400	0.1500	4.1310	9.0000	247.8600	(30)
Flat Roof First Floor	69.6600	7.1700	62.4900	0.1500	9.3735	9.0000	562.4100	(30)
Total net area of external elements Aum(A, m2)			458.1400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		190.3438			(33)
Party Wall 1			52.9900	0.0000	0.0000	70.0000	3709.3000	(32)
Internal Wall 1			265.7400			75.0000	19930.5000	(32c)
Internal Floor 1			68.2000			18.0000	1227.6000	(32d)
Internal Ceiling 1			68.2000			9.0000	613.8000	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 45049.2500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	266.9427	(35)
Thermal bridges (Default value 0.200 * total exposed area)	91.6280	(36)

Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 281.9718 (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	60.2508	59.3092	58.3677	55.5429	56.4845	51.7766	52.7182	51.7766	51.7766	54.6014	53.6598	57.4261	(38)
Heat transfer coeff	342.2226	341.2811	340.3395	337.5147	338.4563	333.7484	334.6900	333.7484	333.7484	336.5732	335.6316	339.3979	(39)
Average = Sum(39)m / 12 =												337.2794	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.0279	2.0223	2.0167	2.0000	2.0055	1.9777	1.9832	1.9777	1.9777	1.9944	1.9888	2.0111	(40)
HLP (average)												1.9986	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9609 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	83.0977	81.8489	80.0291	76.5474	73.9779	71.1125	69.4838	71.2898	73.2695	76.3460	79.9026	82.7793	(42a)
Hot water usage for baths	31.8874	31.4138	30.7469	29.5173	28.5966	27.5756	27.0242	27.6864	28.4075	29.4999	30.7548	31.7796	(42b)
Hot water usage for other uses	44.9527	43.3180	41.6834	40.0488	38.4141	36.7795	36.7795	38.4141	40.0488	41.6834	43.3180	44.9527	(42c)
Average daily hot water use (litres/day)												147.0440	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	159.9377	156.5807	152.4594	146.1134	140.9886	135.4676	133.2875	137.3903	141.7257	147.5293	153.9755	159.5116	(44)
Energy conte	253.3023	222.9689	234.3245	200.0220	189.7978	166.5732	161.1996	170.1179	174.7619	200.1959	219.3663	249.7565	(45)
Energy content (annual)										Total = Sum(45)m =		2442.3868	
Distribution loss (46)m = 0.15 x (45)m	37.9953	33.4453	35.1487	30.0033	28.4697	24.9860	24.1799	25.5177	26.2143	30.0294	32.9049	37.4635	(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	310.0447	274.2201	291.0669	254.9340	246.5402	221.4852	217.9420	226.8603	229.6739	256.9383	274.2783	306.4989	(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	310.0447	274.2201	291.0669	254.9340	246.5402	221.4852	217.9420	226.8603	229.6739	256.9383	274.2783	306.4989	(64)
										Total per year (kWh/year) = Sum(64)m =		3110.4828	(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	102.8329	90.9461	96.5228	84.5169	81.7177	73.3952	72.2088	75.1741	76.1179	85.1751	90.9489	101.6540	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	177.6546	177.6546	177.6546	177.6546	177.6546	177.6546	177.6546	177.6546	177.6546	177.6546	177.6546	177.6546	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	48.6696	43.2279	35.1553	26.6148	19.8949	16.7961	18.1488	23.5905	31.6631	40.2035	46.9235	50.0223	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	507.8850	513.1552	499.8744	471.6009	435.9108	402.3672	379.9579	374.6877	387.9686	416.2420	451.9321	485.4757	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.7264	55.7264	55.7264	55.7264	55.7264	55.7264	55.7264	55.7264	55.7264	55.7264	55.7264	55.7264	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	(71)
Water heating gains (Table 5)	138.2163	135.3365	129.7350	117.3846	109.8356	101.9378	97.0548	101.0405	105.7194	114.4826	126.3179	136.6317	(72)
Total internal gains	812.7154	809.6642	782.7092	733.5449	683.5859	636.0456	610.1061	614.2632	640.2955	688.8727	743.1180	790.0743	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.8500	11.5683	0.4000	0.7000	0.5400	12.3576	(74)
East	17.3900	21.5704	0.4000	0.7000	0.5400	51.0447	(76)
West	3.3400	21.5704	0.4000	0.7000	0.5400	9.8039	(80)
North	6.0200	11.5683	0.4000	0.7000	0.5400	9.4768	(74)
North	20.2300	11.5683	0.4000	0.7000	0.5400	31.8464	(74)
West	7.4900	21.5704	0.4000	0.7000	0.5400	21.9853	(80)
East	7.1700	29.0000	0.4000	0.7000	1.0000	52.3984	(82)
West	2.9500	29.0000	0.4000	0.7000	1.0000	21.5586	(82)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	210.4717	376.0720	644.9527	1019.6597	1264.8243	1406.8869	1325.8535	1137.8730	839.4146	493.3442	272.1312	169.3528	(83)
Total gains	1023.1871	1185.7362	1427.6619	1753.2046	1948.4102	2042.9325	1935.9596	1752.1361	1479.7102	1182.2169	1015.2492	959.4271	(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	36.5659	36.6668	36.7682	37.0760	36.9728	37.4943	37.3889	37.4943	37.4943	37.1797	37.2840	36.8702	
alpha	3.4377	3.4445	3.4512	3.4717	3.4649	3.4996	3.4926	3.4996	3.4996	3.4786	3.4856	3.4580	
util living area													
	0.9972	0.9950	0.9863	0.9541	0.8620	0.6365	0.4035	0.4729	0.8352	0.9750	0.9946	0.9977	(86)
MIT	19.2285	19.3627	19.7246	20.1736	20.5861	20.8455	20.9030	20.8965	20.7144	20.1976	19.6536	19.2172	(87)
Th 2	19.3148	19.3185	19.3222	19.3334	19.3296	19.3483	19.3445	19.3483	19.3483	19.3371	19.3408	19.3259	(88)
util rest of house													
	0.9959	0.9928	0.9793	0.9281	0.7742	0.4336	0.1286	0.1803	0.6845	0.9550	0.9915	0.9967	(89)
MIT 2	17.3315	17.5056	17.9687	18.5344	18.9978	19.2193	19.2313	19.2350	19.1484	18.5789	17.8937	17.3247	(90)
Living area fraction										fLA = Living area / (4) =		0.1647	(91)
MIT	17.6440	17.8115	18.2580	18.8044	19.2595	19.4872	19.5067	19.5087	19.4063	18.8455	18.1836	17.6365	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.6440	17.8115	18.2580	18.8044	19.2595	19.4872	19.5067	19.5087	19.4063	18.8455	18.1836	17.6365	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9939	0.9895	0.9725	0.9163	0.7694	0.4531	0.1565	0.2105	0.6917	0.9456	0.9880	0.9950	(94)
Useful gains	1016.9429	1173.3165	1388.3814	1606.4174	1499.0482	925.6103	303.0600	368.7636	1023.4631	1117.8619	1003.0899	954.6483	(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													
	4155.9583	4031.0403	3491.1948	2802.8738	1915.4852	963.6030	303.4556	370.0289	1203.6077	2236.7021	3250.1374	4119.0870	(97)
Space heating kWh													
	2335.4274	1920.3904	1564.4932	861.4486	309.8292	0.0000	0.0000	0.0000	0.0000	832.4171	1617.8743	2354.3424	(98a)
Space heating requirement - total per year (kWh/year)												11796.2224	
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													
	2335.4274	1920.3904	1564.4932	861.4486	309.8292	0.0000	0.0000	0.0000	0.0000	832.4171	1617.8743	2354.3424	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												11796.2224	
Space heating per m2											(98c) / (4) =	69.8994	(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	2469.7385	1807.3261	1868.9913	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7492	0.8436	0.7957	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1850.3753	1524.7246	1487.2322	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	2299.5951	2177.6797	1959.3159	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	323.4383	485.7986	351.2303	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		0.5926	(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	47.9139	71.9659	52.0310	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												171.9109	(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													
	2335.4274	1920.3904	1564.4932	861.4486	309.8292	0.0000	0.0000	0.0000	0.0000	832.4171	1617.8743	2354.3424	(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)													
	1373.7808	1129.6414	920.2901	506.7345	182.2524	0.0000	0.0000	0.0000	0.0000	489.6571	951.6907	1384.9073	(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													
	310.0447	274.2201	291.0669	254.9340	246.5402	221.4852	217.9420	226.8603	229.6739	256.9383	274.2783	306.4989	(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													
	182.3792	161.3059	171.2158	149.9612	145.0236	130.2854	128.2012	133.4472	135.1023	151.1402	161.3402	180.2935	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	8.5561	12.8511	9.2913	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	59.8157	54.0271	59.8157	57.8861	59.8157	57.8861	59.8157	59.8157	57.8861	59.8157	57.8861	59.8157	(231)
Lighting	42.6002	34.1755	30.7712	22.5443	17.4139	14.2273	15.8855	20.6486	26.8205	35.1899	39.7469	43.7842	(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	6938.9544	(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	1829.6958	(219)
Space cooling fuel	30.6984	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1760)		
mechanical ventilation fans (SFP = 1.1760)	704.2814	(230a)
Total electricity for the above, kWh/year	704.2814	(231)
Electricity for lighting (calculated in Appendix L)	343.8080	(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	9847.4379	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	6938.9544	21.5100	1492.5691	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1829.6958	21.5100	393.5676	(247)
Energy for instantaneous electric shower(s)	0.0000	21.5100	0.0000	(247a)
Space cooling	30.6984	21.5100	6.6032	(248)
Pumps, fans and electric keep-hot	704.2814	21.5100	151.4909	(249)
Energy for lighting	343.8080	21.5100	73.9531	(250)
Additional standing charges			0.0000	(251)
Total energy cost			2118.1839	(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	6938.9544	0.1554	1078.0322	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1829.6958	0.1410	257.9188	(264)
Space and water heating			1335.9510	(265)
Space cooling	30.6984	0.1138	3.4938	(266)
Pumps, fans and electric keep-hot	704.2814	0.1387	97.6925	(267)
Energy for lighting	343.8080	0.1443	49.6221	(268)
Total CO2, kg/year			1486.7594	(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	6938.9544	1.5752	10930.2134	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1829.6958	1.5212	2783.3917	(278)
Space and water heating			13713.6051	(279)
Space cooling	30.6984	1.4195	43.5778	(280)
Pumps, fans and electric keep-hot	704.2814	1.5128	1065.4369	(281)
Energy for lighting	343.8080	1.5338	527.3442	(282)
Total Primary energy kWh/year			15349.9640	(286)

SAP 10 EPC IMPROVEMENTS

Plot 2 Be Green

Current energy efficiency rating:	E 49
Current environmental impact rating:	B 89

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 (2.8%)
U Solar photovoltaic panels	+ 4.8	-£ 230	-144 kg (10.0%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£71	0.24 kg/m²	E 50	B 89
Solar photovoltaic panels	£230	0.85 kg/m²	D 55	B 90
Total Savings	£301	1.10 kg/m²		

Potential energy efficiency rating:	D 55
Potential environmental impact rating:	B 90

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	£2118	£2047	£71
Space heating	£1644	£1661	-£17
Space cooling	£7	£7	£0
Water heating	£394	£305	£88
Lighting	£74	£74	£0
Generated (PV)	-£0	-£230	£230
Total cost of fuels	£2118	£1817	£301
Total cost of uses	£2119	£1817	£301
Delivered energy	58 kWh/m²	50 kWh/m²	8 kWh/m²
Carbon dioxide emissions	1.5 tonnes	1.3 tonnes	0.2 tonnes
CO2 emissions per m²	9 kg/m²	8 kg/m²	1 kg/m²
Primary energy	91 kWh/m²	79 kWh/m²	12 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)	
Basement floor	99.1000 (1a)	x	2.6900 (2a)	=	266.5790	(1a) - (3a)
Ground floor	69.6600 (1b)	x	3.2200 (2b)	=	224.3052	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	168.6600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	490.8842	(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)			28.5800	1.3258	37.8902			(27)
Glazed Doors (Uw = 1.40)			6.0200	1.3258	7.9811			(27)
Glazed Wall (Uw = 1.40)			27.7200	1.3258	36.7500			(27)
GF RL			2.9500	1.2357	3.6454			(27a)
1F RL			7.1700	1.2357	8.8603			(27a)
Basement Floor			77.2700	0.2500	19.3175	110.0000	8499.7000	(28)
Basement Floor 2			21.8700	0.2500	5.4675	110.0000	2405.7000	(28)
Retaining Wall	92.3800		92.3800	0.3000	27.7140	9.0000	831.4200	(29a)
External Wall	57.9400		57.9400	0.3000	17.3820	9.0000	521.4600	(29a)
New External Wall	108.5300	65.2000	43.3300	0.1800	7.7994	150.0000	6499.5000	(29a)
Flat Roof GF	30.4900	2.9500	27.5400	0.1500	4.1310	9.0000	247.8600	(30)
Flat Roof First Floor	69.6600	7.1700	62.4900	0.1500	9.3735	9.0000	562.4100	(30)
Total net area of external elements Aum(A, m2)			458.1400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	190.3438			(33)
Party Wall 1			52.9900	0.0000	0.0000	70.0000	3709.3000	(32)
Internal Wall 1			265.7400			75.0000	19930.5000	(32c)

Internal Floor 1						68.2000					18.0000	1227.6000	(32d)
Internal Ceiling 1						68.2000					9.0000	613.8000	(32e)
Heat capacity Cm = Sum(A x k)										(28)...(30) + (32) + (32a)...(32e) =		45049.2500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												266.9427	(35)
Thermal bridges (Default value 0.200 * total exposed area)												91.6280	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss										(33) + (36) + (36a) =		281.9718	(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	67.7834	66.8419	65.9003	61.1924	60.2508	55.5429	55.5429	54.6014	57.4261	60.2508	62.1340	64.0171	(38)
Heat transfer coeff	349.7553	348.8137	347.8721	343.1642	342.2226	337.5147	337.5147	336.5732	339.3979	342.2226	344.1058	345.9889	(39)
Average = Sum(39)m / 12 =												342.9288	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.0725	2.0669	2.0613	2.0334	2.0279	2.0000	2.0000	1.9944	2.0111	2.0279	2.0390	2.0502	(40)
HLP (average)												2.0321	
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												2.9609	(42)
Hot water usage for mixer showers	83.0977	81.8489	80.0291	76.5474	73.9779	71.1125	69.4838	71.2898	73.2695	76.3460	79.9026	82.7793	(42a)
Hot water usage for baths	31.8874	31.4138	30.7469	29.5173	28.5966	27.5756	27.0242	27.6864	28.4075	29.4999	30.7548	31.7796	(42b)
Hot water usage for other uses	44.9527	43.3180	41.6834	40.0488	38.4141	36.7795	36.7795	38.4141	40.0488	41.6834	43.3180	44.9527	(42c)
Average daily hot water use (litres/day)												147.0440	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	159.9377	156.5807	152.4594	146.1134	140.9886	135.4676	133.2875	137.3903	141.7257	147.5293	153.9755	159.5116	(44)
Energy conte	253.3023	222.9689	234.3245	200.0220	189.7978	166.5732	161.1996	170.1179	174.7619	200.1959	219.3663	249.7565	(45)
Energy content (annual)										Total = Sum(45)m =		2442.3868	
Distribution loss (46)m = 0.15 x (45)m	37.9953	33.4453	35.1487	30.0033	28.4697	24.9860	24.1799	25.5177	26.2143	30.0294	32.9049	37.4635	(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	310.0447	274.2201	291.0669	254.9340	246.5402	221.4852	217.9420	226.8603	229.6739	256.9383	274.2783	306.4989	(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												646.4834	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												646.4834	
Solar input	-0.0000	-16.1817	-59.2916	-82.6347	-109.9225	-101.7297	-101.2193	-87.5022	-59.1879	-28.8137	-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	310.0447	258.0384	231.7752	172.2993	136.6177	119.7556	116.7227	139.3581	170.4860	228.1246	274.2783	306.4989	(64)
										Total per year (kWh/year) = Sum(64)m =		2463.9994	(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	102.8329	90.9461	96.5228	84.5169	81.7177	73.3952	72.2088	75.1741	76.1179	85.1751	90.9489	101.6540	(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	177.6546	177.6546	177.6546	177.6546	177.6546	177.6546	177.6546	177.6546	177.6546	177.6546	177.6546	177.6546	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	48.6696	43.2279	35.1553	26.6148	19.8949	16.7961	18.1488	23.5905	31.6631	40.2035	46.9235	50.0223	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	507.8850	513.1552	499.8744	471.6009	435.9108	402.3672	379.9579	374.6877	387.9686	416.2420	451.9321	485.4757	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.7264	55.7264	55.7264	55.7264	55.7264	55.7264	55.7264	55.7264	55.7264	55.7264	55.7264	55.7264	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	(71)
Water heating gains (Table 5)	138.2163	135.3365	129.7350	117.3846	109.8356	101.9378	97.0548	101.0405	105.7194	114.4826	126.3179	136.6317	(72)
Total internal gains	812.7154	809.6642	782.7092	733.5449	683.5859	636.0456	610.1061	614.2632	640.2955	688.8727	743.1180	790.0743	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.8500	10.6334	0.4000	0.7000	0.5400	11.3589	(74)
East	17.3900	19.6403	0.4000	0.7000	0.5400	46.4773	(76)
West	3.3400	19.6403	0.4000	0.7000	0.5400	8.9266	(80)
North	6.0200	10.6334	0.4000	0.7000	0.5400	8.7109	(74)
North	20.2300	10.6334	0.4000	0.7000	0.5400	29.2726	(74)
West	7.4900	19.6403	0.4000	0.7000	0.5400	20.0181	(80)
East	7.1700	26.0000	0.4000	0.7000	1.0000	46.9778	(82)
West	2.9500	26.0000	0.4000	0.7000	1.0000	19.3284	(82)

Solar gains	191.0708	379.5505	648.0349	994.2813	1270.6476	1325.7858	1251.7769	1038.8822	768.5240	455.6334	239.0706	156.7128	(83)
Total gains	1003.7862	1189.2147	1430.7440	1727.8262	1954.2335	1961.8314	1861.8830	1653.1454	1408.8195	1144.5061	982.1887	946.7870	(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	35.7784	35.8750	35.9721	36.4656	36.5659	37.0760	37.0760	37.1797	36.8702	36.5659	36.3658	36.1679	
alpha	3.3852	3.3917	3.3981	3.4310	3.4377	3.4717	3.4717	3.4786	3.4580	3.4377	3.4244	3.4112	
util living area	0.9979	0.9959	0.9901	0.9706	0.9185	0.8122	0.6819	0.7506	0.9233	0.9862	0.9965	0.9983	(86)
MIT	19.0218	19.1796	19.4923	19.9393	20.3656	20.6878	20.8263	20.7902	20.5012	19.9563	19.4190	19.0052	(87)
Th 2	19.2854	19.2891	19.2928	19.3111	19.3148	19.3334	19.3334	19.3371	19.3259	19.3148	19.3074	19.3001	(88)
util rest of house	0.9970	0.9942	0.9856	0.9555	0.8711	0.6910	0.4727	0.5533	0.8555	0.9768	0.9947	0.9976	(89)
MIT 2	17.0467	17.2510	17.6526	18.2287	18.7446	19.0971	19.1980	19.1861	18.9245	18.2606	17.5708	17.0353	(90)
Living area fraction										fLA = Living area / (4) =		0.1647	(91)
MIT	17.3721	17.5687	17.9557	18.5104	19.0117	19.3592	19.4663	19.4503	19.1843	18.5399	17.8752	17.3598	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.3721	17.5687	17.9557	18.5104	19.0117	19.3592	19.4663	19.4503	19.1843	18.5399	17.8752	17.3598	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9954	0.9915	0.9801	0.9451	0.8594	0.6934	0.4924	0.5701	0.8470	0.9697	0.9922	0.9963	(94)
Useful gains	999.1572	1179.0521	1402.2028	1632.8883	1679.5412	1360.2731	916.8290	942.5040	1193.3089	1109.8550	974.5300	943.2487	(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	4572.0345	4419.0217	3985.1065	3297.9607	2502.2123	1606.2863	967.4054	1026.6611	1725.5910	2717.2241	3707.8259	4553.1581	(97)
Space heating kWh	2658.2207	2177.2596	1921.6803	1198.8521	612.0673	0.0000	0.0000	0.0000	0.0000	1195.8826	1967.9730	2685.7726	(98a)
Space heating requirement - total per year (kWh/year)												14417.7082	
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	2658.2207	2177.2596	1921.6803	1198.8521	612.0673	0.0000	0.0000	0.0000	0.0000	1195.8826	1967.9730	2685.7726	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												14417.7082	
Space heating per m2											(98c) / (4) =	85.4332	(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	3172.6386	2497.6091	2557.9561	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6201	0.7028	0.6367	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1967.3741	1755.4023	1628.6026	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	2203.5315	2089.9664	1842.3290	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	170.0333	248.9157	159.0124	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		0.5926	(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	25.1886	36.8742	23.5560	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												85.6188	(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	2658.2207	2177.2596	1921.6803	1198.8521	612.0673	0.0000	0.0000	0.0000	0.0000	1195.8826	1967.9730	2685.7726	(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)	1563.6592	1280.7409	1130.4002	705.2071	360.0396	0.0000	0.0000	0.0000	0.0000	703.4604	1157.6312	1579.8662	(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

	310.0447	258.0384	231.7752	172.2993	136.6177	119.7556	116.7227	139.3581	170.4860	228.1246	274.2783	306.4989	(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													
	182.3792	151.7873	136.3384	101.3525	80.3633	70.4444	68.6604	81.9753	100.2859	134.1909	161.3402	180.2935	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	4.4980	6.5847	4.2064	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	66.6102	60.1641	66.6102	64.4615	66.6102	64.4615	66.6102	66.6102	64.4615	66.6102	64.4615	66.6102	(231)
Lighting	42.6002	34.1755	30.7712	22.5443	17.4139	14.2273	15.8855	20.6486	26.8205	35.1899	39.7469	43.7842	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-43.2432	-67.8300	-107.0910	-128.7939	-139.0328	-112.1148	-110.7831	-102.6608	-88.1520	-79.9345	-49.5507	-36.6512	(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	8481.0049	(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	1449.4114	(219)
Space cooling fuel	15.2891	(221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1760)		
mechanical ventilation fans (SFP = 1.1760)	704.2814	(230a)
pump for solar water heating	80.0000	(230g)
Total electricity for the above, kWh/year	784.2814	(231)
Electricity for lighting (calculated in Appendix L)	343.8080	(232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	-1065.8380	(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	10007.9567	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	8481.0049	16.4900	1398.5177	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1449.4114	16.4900	239.0079	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Space cooling	15.2891	16.4900	2.5212	(248)
Pumps, fans and electric keep-hot	704.2814	16.4900	116.1360	(249)
Pump for solar water heating	80.0000	16.4900	13.1920	(249)
Energy for lighting	343.8080	16.4900	56.6939	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1065.8380	16.4900	-175.7567	
PV Unit electricity exported	0.0000	5.5900	0.0000	
Total			-175.7567	(252)
Total energy cost			1650.3121	(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] =	2.7793	(257)
SAP value	54.9469	
SAP rating (Section 12)	55	(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	8481.0049	0.1544	1309.1072	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1449.4114	0.1445	209.4658	(264)
Space and water heating			1518.5730	(265)
Space cooling	15.2891	0.1139	1.7418	(266)
Pumps, fans and electric keep-hot	784.2814	0.1387	108.7895	(267)
Energy for lighting	343.8080	0.1443	49.6221	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1065.8380	0.1345	-143.3869	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-143.3869	(269)
Total CO2, kg/year			1535.3396	(272)
CO2 emissions per m2			9.1000	(273)
EI value			90.3754	
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 FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Basement floor	99.1000	(1a)	x 2.6900	(2a) =	266.5790	(1a) - (3a)
Ground floor	69.6600	(1b)	x 3.2200	(2b) =	224.3052	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	168.7600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		490.8842	(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)			28.5800	1.3258	37.8902			(27)
Glazed Doors (Uw = 1.40)			6.0200	1.3258	7.9811			(27)
Glazed Wall (Uw = 1.40)			27.7200	1.3258	36.7500			(27)
GF RL			2.9500	1.2357	3.6454			(27a)
1F RL			7.1700	1.2357	8.8603			(27a)
Basement Floor			77.2700	0.2500	19.3175	110.0000	8499.7000	(28)
Basement Floor 2			21.8700	0.2500	5.4675	110.0000	2405.7000	(28)
Retaining Wall	92.3800		92.3800	0.3000	27.7140	9.0000	831.4200	(29a)
External Wall	57.9400		57.9400	0.3000	17.3820	9.0000	521.4600	(29a)
New External Wall	108.5300	65.2000	43.3300	0.1800	7.7994	150.0000	6499.5000	(29a)
Flat Roof GF	30.4900	2.9500	27.5400	0.1500	4.1310	9.0000	247.8600	(30)
Flat Roof First Floor	69.6600	7.1700	62.4900	0.1500	9.3735	9.0000	562.4100	(30)
Total net area of external elements Aum(A, m2)			458.1400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	190.3438			(33)
Party Wall 1			52.9900	0.0000	0.0000	70.0000	3709.3000	(32)
Internal Wall 1			265.7400			75.0000	19930.5000	(32c)
Internal Floor 1			68.2000			18.0000	1227.6000	(32d)
Internal Ceiling 1			68.2000			9.0000	613.8000	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	45049.2500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		266.9427 (35)
Thermal bridges (Default value 0.200 * total exposed area)		91.6280 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	281.9718 (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	60.2508	59.3092	58.3677	55.5429	56.4845	51.7766	52.7182	51.7766	51.7766	54.6014	53.6598	57.4261	(38)
Heat transfer coeff	342.2226	341.2811	340.3395	337.5147	338.4563	333.7484	334.6900	333.7484	333.7484	336.5732	335.6316	339.3979	(39)
Average = Sum(39)m / 12 =												337.2794	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.0279	2.0223	2.0167	2.0000	2.0055	1.9777	1.9832	1.9777	1.9777	1.9944	1.9888	2.0111	(40)
HLP (average)												1.9986	
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												2.9609	(42)
Hot water usage for mixer showers													
	83.0977	81.8489	80.0291	76.5474	73.9779	71.1125	69.4838	71.2898	73.2695	76.3460	79.9026	82.7793	(42a)
Hot water usage for baths													
	31.8874	31.4138	30.7469	29.5173	28.5966	27.5756	27.0242	27.6864	28.4075	29.4999	30.7548	31.7796	(42b)
Hot water usage for other uses													
	44.9527	43.3180	41.6834	40.0488	38.4141	36.7795	36.7795	38.4141	40.0488	41.6834	43.3180	44.9527	(42c)
Average daily hot water use (litres/day)												147.0440	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	159.9377	156.5807	152.4594	146.1134	140.9886	135.4676	133.2875	137.3903	141.7257	147.5293	153.9755	159.5116	(44)
Energy conte	253.3023	222.9689	234.3245	200.0220	189.7978	166.5732	161.1996	170.1179	174.7619	200.1959	219.3663	249.7565	(45)
Energy content (annual)										Total = Sum(45)m =		2442.3868	
Distribution loss (46)m = 0.15 x (45)m													
	37.9953	33.4453	35.1487	30.0033	28.4697	24.9860	24.1799	25.5177	26.2143	30.0294	32.9049	37.4635	(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													
	310.0447	274.2201	291.0669	254.9340	246.5402	221.4852	217.9420	226.8603	229.6739	256.9383	274.2783	306.4989	(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												696.1624	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												696.1624	
Solar input	-0.0000	-15.9737	-59.0737	-85.6950	-110.0768	-110.0626	-109.2685	-98.9513	-68.1747	-35.5090	-3.3771	-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													
	310.0447	258.2463	231.9932	169.2390	136.4634	111.4226	108.6736	127.9090	161.4992	221.4293	270.9012	306.4989	(64)
										Total per year (kWh/year) = Sum(64)m =		2414.3204	(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													
	102.8329	90.9461	96.5228	84.5169	81.7177	73.3952	72.2088	75.1741	76.1179	85.1751	90.9489	101.6540	(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	177.6546	177.6546	177.6546	177.6546	177.6546	177.6546	177.6546	177.6546	177.6546	177.6546	177.6546	177.6546	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	48.6696	43.2279	35.1553	26.6148	19.8949	16.7961	18.1488	23.5905	31.6631	40.2035	46.9235	50.0223	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	507.8850	513.1552	499.8744	471.6009	435.9108	402.3672	379.9579	374.6877	387.9686	416.2420	451.9321	485.4757	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	55.7264	55.7264	55.7264	55.7264	55.7264	55.7264	55.7264	55.7264	55.7264	55.7264	55.7264	55.7264	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	-118.4364	(71)
Water heating gains (Table 5)													
	138.2163	135.3365	129.7350	117.3846	109.8356	101.9378	97.0548	101.0405	105.7194	114.4826	126.3179	136.6317	(72)
Total internal gains													
	812.7154	809.6642	782.7092	733.5449	683.5859	636.0456	610.1061	614.2632	640.2955	688.8727	743.1180	790.0743	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.8500	11.5683	0.4000	0.7000	0.5400	12.3576	(74)
East	17.3900	21.5704	0.4000	0.7000	0.5400	51.0447	(76)
West	3.3400	21.5704	0.4000	0.7000	0.5400	9.8039	(80)
North	6.0200	11.5683	0.4000	0.7000	0.5400	9.4768	(74)
North	20.2300	11.5683	0.4000	0.7000	0.5400	31.8464	(74)
West	7.4900	21.5704	0.4000	0.7000	0.5400	21.9853	(80)
East	7.1700	29.0000	0.4000	0.7000	1.0000	52.3984	(82)
West	2.9500	29.0000	0.4000	0.7000	1.0000	21.5586	(82)

Solar gains	210.4717	376.0720	644.9527	1019.6597	1264.8243	1406.8869	1325.8535	1137.8730	839.4146	493.3442	272.1312	169.3528	(83)
Total gains	1023.1871	1185.7362	1427.6619	1753.2046	1948.4102	2042.9325	1935.9596	1752.1361	1479.7102	1182.2169	1015.2492	959.4271	(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	36.5659	36.6668	36.7682	37.0760	36.9728	37.4943	37.3889	37.4943	37.4943	37.1797	37.2840	36.8702	
alpha	3.4377	3.4445	3.4512	3.4717	3.4649	3.4996	3.4926	3.4996	3.4996	3.4786	3.4856	3.4580	
util living area													
	0.9972	0.9950	0.9863	0.9541	0.8620	0.6365	0.4035	0.4729	0.8352	0.9750	0.9946	0.9977	(86)
MIT	19.2285	19.3627	19.7246	20.1736	20.5861	20.8455	20.9030	20.8965	20.7144	20.1976	19.6536	19.2172	(87)
Th 2	19.3148	19.3185	19.3222	19.3334	19.3296	19.3483	19.3445	19.3483	19.3483	19.3371	19.3408	19.3259	(88)
util rest of house													
	0.9959	0.9928	0.9793	0.9281	0.7742	0.4336	0.1286	0.1803	0.6845	0.9550	0.9915	0.9967	(89)
MIT 2	17.3315	17.5056	17.9687	18.5344	18.9978	19.2193	19.2313	19.2350	19.1484	18.5789	17.8937	17.3247	(90)
Living area fraction										fLA = Living area / (4) =		0.1647	(91)
MIT	17.6440	17.8115	18.2580	18.8044	19.2595	19.4872	19.5067	19.5087	19.4063	18.8455	18.1836	17.6365	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.6440	17.8115	18.2580	18.8044	19.2595	19.4872	19.5067	19.5087	19.4063	18.8455	18.1836	17.6365	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9939	0.9895	0.9725	0.9163	0.7694	0.4531	0.1565	0.2105	0.6917	0.9456	0.9880	0.9950	(94)
Useful gains	1016.9429	1173.3165	1388.3814	1606.4174	1499.0482	925.6103	303.0600	368.7636	1023.4631	1117.8619	1003.0899	954.6483	(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													
	4155.9583	4031.0403	3491.1948	2802.8738	1915.4852	963.6030	303.4556	370.0289	1203.6077	2236.7021	3250.1374	4119.0870	(97)
Space heating kWh													
	2335.4274	1920.3904	1564.4932	861.4486	309.8292	0.0000	0.0000	0.0000	0.0000	832.4171	1617.8743	2354.3424	(98a)
Space heating requirement - total per year (kWh/year)												11796.2224	
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													
	2335.4274	1920.3904	1564.4932	861.4486	309.8292	0.0000	0.0000	0.0000	0.0000	832.4171	1617.8743	2354.3424	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												11796.2224	
Space heating per m2											(98c) / (4) =	69.8994	(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	2469.7385	1807.3261	1868.9913	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7492	0.8436	0.7957	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1850.3753	1524.7246	1487.2322	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	2299.5951	2177.6797	1959.3159	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	323.4383	485.7986	351.2303	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		0.5926	(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	47.9139	71.9659	52.0310	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												171.9109	(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													
	2335.4274	1920.3904	1564.4932	861.4486	309.8292	0.0000	0.0000	0.0000	0.0000	832.4171	1617.8743	2354.3424	(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)													
	1373.7808	1129.6414	920.2901	506.7345	182.2524	0.0000	0.0000	0.0000	0.0000	489.6571	951.6907	1384.9073	(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													
	310.0447	258.2463	231.9932	169.2390	136.4634	111.4226	108.6736	127.9090	161.4992	221.4293	270.9012	306.4989	(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													
	182.3792	151.9096	136.4666	99.5524	80.2726	65.5427	63.9256	75.2406	94.9995	130.2525	159.3536	180.2935	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	8.5561	12.8511	9.2913	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	66.6102	60.1641	66.6102	64.4615	66.6102	64.4615	66.6102	66.6102	64.4615	66.6102	64.4615	66.6102	(231)
Lighting	42.6002	34.1755	30.7712	22.5443	17.4139	14.2273	15.8855	20.6486	26.8205	35.1899	39.7469	43.7842	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-46.1810	-65.5558	-103.0055	-125.0595	-128.6214	-115.0656	-113.5308	-107.3516	-92.3121	-81.6399	-54.1048	-38.5066	(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	6938.9544	(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	1420.1885	(219)
Space cooling fuel	30.6984	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1760)		
mechanical ventilation fans (SFP = 1.1760)	704.2814	(230a)
pump for solar water heating	80.0000	(230g)
Total electricity for the above, kWh/year	784.2814	(231)
Electricity for lighting (calculated in Appendix L)	343.8080	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1070.9348	(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	8446.9958	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	6938.9544	21.5100	1492.5691	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1420.1885	21.5100	305.4825	(247)
Energy for instantaneous electric shower(s)	0.0000	21.5100	0.0000	(247a)
Space cooling	30.6984	21.5100	6.6032	(248)
Pumps, fans and electric keep-hot	704.2814	21.5100	151.4909	(249)
Pump for solar water heating	80.0000	21.5100	17.2080	(249)
Energy for lighting	343.8080	21.5100	73.9531	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1070.9348	21.5100	-230.3581	
PV Unit electricity exported	0.0000	5.5900	0.0000	
Total			-230.3581	(252)
Total energy cost			1816.9488	(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	6938.9544	0.1554	1078.0322	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1420.1885	0.1450	205.8870	(264)
Space and water heating			1283.9192	(265)
Space cooling	30.6984	0.1138	3.4938	(266)
Pumps, fans and electric keep-hot	784.2814	0.1387	108.7895	(267)
Energy for lighting	343.8080	0.1443	49.6221	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1070.9348	0.1344	-143.8825	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-143.8825	(269)
Total CO2, kg/year			1301.9422	(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	6938.9544	1.5752	10930.2134	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1420.1885	1.5362	2181.7385	(278)
Space and water heating			13111.9519	(279)
Space cooling	30.6984	1.4195	43.5778	(280)
Pumps, fans and electric keep-hot	784.2814	1.5128	1186.4609	(281)
Energy for lighting	343.8080	1.5338	527.3442	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1070.9348	1.4966	-1602.7086	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-1602.7086	(283)
Total Primary energy kWh/year			13266.6262	(286)