

Calculated by Lambda Calculation Engine SAP Engine version v94.0.1.1

RRN: 9021-8212-6750-6401-2704  
Address: CS3 Baseline;

1. Overall dwelling dimensions

Ground floor(main)	84.28	2.56	215.7568	(1b)–	(3b)
First floor(main)	85.41	2.67	228.0447	(1c)–	(3c)
Room(s)-in-roof	50.07	2.45	122.6715		
Total floor area	219.7600				(4)
Dwelling volume (m³)			566.4730		(5)

2. Ventilation rate

Number of chimneys	40	(6a)
Number of open flues	0	(6b)
Number of intermittent fans	0	(7a)
Number of passive vents	0	(7b)
Number of flueless gas fires	0	(7c)
Infiltration due to chimneys, flues and fans	ach 0.0706	(8)
Number of storeys	3	(9)
Additional infiltration	0.2000	(10)
Structural infiltration	0.3500	(11)
Floor infiltration	0.0000	(12)
0.05 if no draught lobby	0.0500	(13)
% of windows and doors draught proofed	6	(14)
Window infiltration	0.2380	(15)
Infiltration rate	0.9086	(18)
Number of sides sheltered	2	(19)
Shelter factor	0.8500	(20)
Infiltration rate incorporating shelter factor	0.7723	(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	0.9847	0.9654	0.9461	0.8496	0.8302	0.7337	0.7337	0.7144	0.7723	0.8302	0.8689	0.9075	(22b)
Effective ach	0.9848	0.9660	0.9475	0.8609	0.8447	0.7692	0.7692	0.7552	0.7982	0.8447	0.8775	0.9118	(25)

3. Heat losses and heat loss parameter

Element	Net				U-value				A x U				K-value				A x K																							
Doors	3.7000				3.0000				11.1000												(Main)																			
Windows (1)	31.6600				4.0268				127.4899												(26)																			
Windows (2)	2.0200				2.1898				4.4234												(27)																			
Ground Floor	84.2800				0.5000				42.1400												(27)																			
Exposed Floor	0.0000				0.0000				1.3560												(28a)																			
Walls	112.2000				2.0400				228.8880												(28b)																			
Roof	35.3400				0.4000				14.1360												(29a)																			
Roofroom flat ceiling	50.0700				0.4000				20.0280												(30)																			
Roofroom walls	63.5500				0.4000				25.4200												(30a)																			
																				(30e)																				
Total area of elements (whole dwelling)										383.9500																				(31)										
Party wall (main)										42.1500										0.2500										10.5375										(32)
Fabric heat loss																				485.5188																				(33)
Thermal mass parameter																				250.0000																				(35)
Thermal bridges (0.15 × total area)																				57.5925																				(36)
Total fabric heat loss																				543.1113																				(37)
																				(37)																				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec																												
Vent loss	184.0994	180.5801	177.1305	160.9276	157.8961	143.7840	143.7840	141.1706	149.2198	157.8961	164.0288	170.4403								(38)																				
Heat transfer coeff	727.2107	723.6914	720.2418	704.0389	701.0074	686.8953	686.8953	684.2819	692.3311	701.0074	707.1401	713.5516								(39)																				
Heat transfer coeff (average)													704.0244															(39)												
HLP	3.3091	3.2931	3.2774	3.2037	3.1899	3.1257	3.1257	3.1138	3.1504	3.1899	3.2178	3.2470								(40)																				
HLP (average)													3.2036															(40)												
Days in month	31.0000	28.0000	31.0000	30.0000	31.0000	30.0000	31.0000	31.0000	30.0000	31.0000	30.0000	31.0000								(41)																				

4. Water heating energy requirements

Assumed occupancy											3.0276		(42)
Average daily hot water use (litres/day)											111.6904		(43)
Daily hot water use	122.8595	118.3919	113.9242	109.4566	104.9890	100.5214	100.5214	104.9890	109.4566	113.9242	118.3919	122.8595	(44)
Energy content	182.1971	159.3507	164.4357	143.3590	137.5564	118.7007	109.9936	126.2193	127.7268	148.8532	162.4849	176.4481	(45)
Energy content (annual)											1757.3254		(45)
Distribution loss	27.3296	23.9026	24.6653	21.5038	20.6335	17.8051	16.4990	18.9329	19.1590	22.3280	24.3727	26.4672	(46)
Cylinder volume											110.0000		(47)
Cylinder loss factor (kWh/litre/day)											0.0115		(51)
Volume factor											1.0294		(52)
Temperature factor											0.6000		(53)
Energy lost from cylinder in kWh/day											0.7846		(55)
Total storage loss	24.3217	21.9680	24.3217	23.5371	24.3217	23.5371	24.3217	24.3217	23.5371	24.3217	23.5371	24.3217	(56)
Net storage loss	24.3217	21.9680	24.3217	23.5371	24.3217	23.5371	24.3217	24.3217	23.5371	24.3217	23.5371	24.3217	(57)
Primary loss	64.5792	58.3296	64.5792	62.4960	64.5792	41.9160	43.3132	43.3132	41.9160	64.5792	62.4960	64.5792	(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	271.0980	239.6483	253.3366	229.3921	226.4573	184.1538	177.6286	193.8542	193.1799	237.7541	248.5181	265.3490	(62)

WW heat rec.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(G10)
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	(63)
Solar input(sum of months)											0.0000		(63)
Flue gas heat rec.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(66)
Fghrs PV	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Output from w/h	271.0980	239.6483	253.3366	229.3921	226.4573	184.1538	177.6286	193.8542	193.1799	237.7541	248.5181	265.3490	(64)
Output from water heater(annual)											2720.3701		(64)
Heat gains (kWh)	131.7013	117.2222	125.7956	116.4934	116.8582	91.8305	90.6808	96.0759	94.8317	120.6144	122.8528	129.7897	(65)

5. Internal gains

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic	181.6570	181.6570	181.6570	181.6570	181.6570	181.6570	181.6570	181.6570	181.6570	181.6570	181.6570	181.6570	(66)
Lighting	134.1071	119.1127	96.8690	73.3360	54.8195	46.2810	50.0082	65.0026	87.2463	110.7793	129.2958	137.8343	(67)
Appliances	581.2812	587.3131	572.1129	539.7536	498.9058	460.5146	434.8670	428.8351	444.0352	476.3945	517.2423	555.6335	(68)
Cooking	56.1933	56.1933	56.1933	56.1933	56.1933	56.1933	56.1933	56.1933	56.1933	56.1933	56.1933	56.1933	(69)
Pumps, fans	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	(70)
Losses	-121.1047	-121.1047	-121.1047	-121.1047	-121.1047	-121.1047	-121.1047	-121.1047	-121.1047	-121.1047	-121.1047	-121.1047	(71)
Water heating	177.0178	174.4378	169.0801	161.7964	157.0675	127.5424	121.8828	129.1342	131.7106	162.1162	170.6288	174.4486	(72)
Total internal	1019.1517	1007.6092	964.8077	901.6317	837.5385	761.0836	733.5037	749.7175	789.7379	876.0356	943.9126	994.6621	(73)

6. Solar gains

(calculation for January)													
Orientation			Area					Gains[W]					
East/West(1)(main)			31.6600					256.3943					(76)
East/West(2)(main)			2.0200					14.6266					(76)
						total:		271.0209					(83-1)
Solar gains	271.0209	530.1745	873.1218	1273.3961	1560.5947	1597.5464	1520.9293	1306.4558	1015.4768	629.0967	337.9313	222.8744	(83)
Total gains	1290.1727	1537.7837	1837.9295	2175.0278	2398.1333	2358.6300	2254.4330	2056.1733	1805.2147	1505.1323	1281.8438	1217.5365	(84)

7. Mean internal temperature

Living room temperature during heating periods Th1												21.0000	(85)
Heating system responsiveness												1.0000	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	20.9858	21.0879	21.1889	21.6765	21.7703	22.2175	22.2175	22.3024	22.0431	21.7703	21.5815	21.3875	
alpha	2.3991	2.4059	2.4126	2.4451	2.4514	2.4812	2.4812	2.4868	2.4695	2.4514	2.4388	2.4258	
external 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	
util living area	0.9959	0.9933	0.9875	0.9733	0.9438	0.8883	0.8080	0.8445	0.9418	0.9833	0.9939	0.9965	(86)
MIT 1	17.6690	17.8882	18.3423	19.0089	19.6738	20.2769	20.6227	20.5558	20.0362	19.1895	18.3442	17.6681	(87)
th2													(88)
util rest	0.9941	0.9905	0.9815	0.9581	0.9024	0.7719	0.5412	0.6121	0.8750	0.9710	0.9908	0.9950	(89)
MIT 2	15.8063	16.0289	16.4851	17.1644	17.8125	18.3781	18.6211	18.5962	18.1790	17.3534	16.5049	15.8217	(90)
Living area fraction =											0.1300		(91)
MIT	16.0485	16.2706	16.7266	17.4042	18.0545	18.6249	18.8813	18.8510	18.4204	17.5921	16.7440	16.0618	(92)
Temperature adjustment											0.0000		
adjusted MIT	16.0485	16.2706	16.7266	17.4042	18.0545	18.6249	18.8813	18.8510	18.4204	17.5921	16.7440	16.0618	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9909	0.9856	0.9734	0.9448	0.8853	0.7669	0.5754	0.6375	0.8622	0.9610	0.9862	0.9922	(94)
Useful gains W	1278.4063	1515.6039	1789.0663	2054.9075	2123.0531	1808.7277	1297.1626	1310.9087	1556.4023	1446.4153	1264.1252	1208.0781	(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	8543.6261	8228.8318	7365.6125	5987.3091	4454.5642	2764.7029	1567.0281	1677.1558	2991.1567	4901.5017	6819.6736	8463.9910	(97)
Month fraction	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	5405.3235	4511.2892	4148.9504	2831.3292	1734.6442	0.0000	0.0000	0.0000	0.0000	2570.5842	3999.9948	5398.3992	(98)
Space heating											30600.5148		(98)
Space heating per m2											139.2452		(99)

8c. Space cooling requirement

- not applicable

9. Energy requirements

Fraction of space heat from secondary											0.1000		(201)
Fraction of space heat from main system											0.9000		(202)
Fraction of total space heat from main system 1											0.9000		(204)
Efficiency of main heating system 1											90.0000		(206)
Efficiency of secondary heating system											32.0000		(208)
Space heating requirement											30600.5148		(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	5405.3235	4511.2892	4148.9504	2831.3292	1734.6442	0.0000	0.0000	0.0000	0.0000	2570.5842	3999.9948	5398.3992	(98)
Space heating efficiency (main heating system)	90.0000	90.0000	90.0000	90.0000	90.0000	0.0000	0.0000	0.0000	0.0000	90.0000	90.0000	90.0000	(210)
Space heating fuel (main heating system)	5405.3235	4511.2892	4148.9504	2831.3292	1734.6442	0.0000	0.0000	0.0000	0.0000	2570.5842	3999.9948	5398.3992	(211)
Space heating fuel (secondary)	1689.1636	1409.7779	1296.5470	884.7904	542.0763	0.0000	0.0000	0.0000	0.0000	803.3076	1249.9984	1686.9998	(215)
Water heating requirement	271.0980	239.6483	253.3366	229.3921	226.4573	184.1538	177.6286	193.8542	193.1799	237.7541	248.5181	265.3490	(64)
Efficiency of water heater	89.3635	89.3282	89.2350	89.0081	88.4875	79.3000	79.3000	79.3000	79.3000	88.8824	89.2226	89.3755	(216)
Water heating fuel													(217)
	303.3654	268.2784	283.8982	257.7204	255.9201	232.2243	223.9957	244.4568	243.6064	267.4930	278.5372	296.8924	(219)
Space cooling fuel	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)
Annual totals:											kWh/year		
Space heating fuel - main system											30600.5148		(211)
Space heating fuel - secondary											9562.6609		(215)
Water heating fuel											3156.3882		(219)
central heating pump											120.0000		(230c)

boiler flue fan	45.0000	(230e)
Electricity for pumps and fans	165.0000	(231)
Electricity for lighting	947.3491	(232)
Total delivered energy for all uses	44431.9130	(238)

10. Fuel costs

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system	30600.5148	3.4800	1064.8979	(240)
Water heating	3156.3882	3.4800	109.8423	(247)
Pumps and fans for heating	0.0000	165.0000	21.7635	(249)
Electricity for lighting	947.3491	13.1900	124.9554	(250)
Additional standing charges			120.0000	(251)
Total energy cost			1441.4591	(255)

11. SAP rating

Energy cost deflator	0.4200	(256)
Energy cost factor (ECF)	2.2866	(257)
SAP value	68.1013	
SAP rating	68	(258)
SAP BAND	D	

12. Carbon dioxide emissions

	Energy kWh/year	Emission factor	Emissions kg/year	
Space heating - main system	30600.5148	0.2160	6609.7112	(261)
Water heating	3156.3882	0.2160	681.7798	(264)
Space and water heating			7291.4910	(265)
Pumps and fans	0.5190	165.0000	85.6350	(267)
Energy for lighting	947.3491	0.5190	491.6742	(268)
Total kg/year			7868.8002	(272)
			kg/m2/year	
CO2 emissions per m2			35.81	(273)
EI value			60.0597	
EI rating			60	(274)
EI band			D	

SAP 2012 WORKSHEET (Version 9.94, September 2019)  
CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 15 Mar 2021

Calculated by Lambda Calculation Engine SAP Engine version v94.0.1.1

RRN: 9021-8212-6750-6401-2704  
Address: CS3 Baseline;

1. Overall dwelling dimensions

Ground floor(main)	84.28	2.56	215.7568	(1b)-	(3b)
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Total floor area	219.7600				(4)
Dwelling volume (m³)			566.4730		(5)

2. Ventilation rate

Number of chimneys	40	(6a)
Number of open flues	0	(6b)
Number of intermittent fans	0	(7a)
Number of passive vents	0	(7b)
Number of flueless gas fires	0	(7c)

	ach	
Infiltration due to chimneys, flues and fans	0.0706	(8)
Number of storeys	3	(9)
Additional infiltration	0.2000	(10)
Structural infiltration	0.3500	(11)
Floor infiltration	0.0000	(12)
0.05 if no draught lobby	0.0500	(13)
% of windows and doors draught proofed	100	(14)
Window infiltration	0.0500	(15)
Infiltration rate	0.7206	(18)
Number of sides sheltered	2	(19)
Shelter factor	0.8500	(20)
Infiltration rate incorporating shelter factor	0.6125	(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	0.7810	0.7657	0.7503	0.6738	0.6585	0.5819	0.5819	0.5666	0.6125	0.6585	0.6891	0.7197	(22b)
Effective ach	0.8050	0.7931	0.7815	0.7270	0.7168	0.6693	0.6693	0.6605	0.6876	0.7168	0.7374	0.7590	(25)

3. Heat losses and heat loss parameter

Element	Net	U-value	A x U	K-value	A x K
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Element													(Main)
Doors													(26)
Windows													(27)
Windows													(27)
Ground Floor													(28a)
Exposed Floor													(28b)
Walls													(29a)
Roof													(30)
Roofroom flat ceiling													(30a)
Roofroom walls													(30e)

Total area of elements (whole dwelling)													(31)
Party wall (main)													(32)
Fabric heat loss													(33)
Thermal mass parameter													(35)
Thermal bridges (0.15 × total area)													(36)
Total fabric heat loss													(37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Vent loss	150.4746	148.2610	146.0912	135.8997	133.9929	125.1164	125.1164	123.4726	128.5355	133.9929	137.8503	141.8831	(38)
Heat transfer coeff	418.4770	416.2633	414.0935	403.9021	401.9953	393.1188	393.1188	391.4750	396.5379	401.9953	405.8527	409.8855	(39)
Heat transfer coeff (average)													(39)
HLP	1.9042	1.8942	1.8843	1.8379	1.8292	1.7889	1.7889	1.7814	1.8044	1.8292	1.8468	1.8652	(40)
HLP (average)													(40)
Days in month	31.0000	28.0000	31.0000	30.0000	31.0000	30.0000	31.0000	31.0000	30.0000	31.0000	30.0000	31.0000	(41)

4. Water heating energy requirements

Assumed occupancy													(42)
Average daily hot water use (litres/day)													(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	122.8595	118.3919	113.9242	109.4566	104.9890	100.5214	100.5214	104.9890	109.4566	113.9242	118.3919	122.8595	(44)
Energy content	182.1971	159.3507	164.4357	143.3590	137.5564	118.7007	109.9936	126.2193	127.7268	148.8532	162.4849	176.4481	(45)
Energy content (annual)													(45)
Distribution loss	27.3296	23.9026	24.6653	21.5038	20.6335	17.8051	16.4990	18.9329	19.1590	22.3280	24.3727	26.4672	(46)
Cylinder volume													(47)
Cylinder loss factor (kWh/litre/day)													(51)
Volume factor													(52)
Temperature factor													(53)
Energy lost from cylinder in kWh/day													(55)
Total storage loss	24.3217	21.9680	24.3217	23.5371	24.3217	23.5371	24.3217	24.3217	23.5371	24.3217	23.5371	24.3217	(56)
Net storage loss	24.3217	21.9680	24.3217	23.5371	24.3217	23.5371	24.3217	24.3217	23.5371	24.3217	23.5371	24.3217	(57)
Primary loss	64.5792	58.3296	64.5792	62.4960	64.5792	41.9160	43.3132	43.3132	41.9160	64.5792	62.4960	64.5792	(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	271.0980	239.6483	253.3366	229.3921	226.4573	184.1538	177.6286	193.8542	193.1799	237.7541	248.5181	265.3490	(62)
WW heat rec.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(G10)
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	(63)
Solar input(sum of months)													(63)
Flue gas heat rec.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(G6)
Fghrs PV	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Output from w/h	271.0980	239.6483	253.3366	229.3921	226.4573	184.1538	177.6286	193.8542	193.1799	237.7541	248.5181	265.3490	(64)
Output from water heater(annual)													(64)
Heat gains (kWh)	131.7013	117.2222	125.7956	116.4934	116.8582	91.8305	90.6808	96.0759	94.8317	120.6144	122.8528	129.7897	(65)

5. Internal gains

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic	181.6570	181.6570	181.6570	181.6570	181.6570	181.6570	181.6570	181.6570	181.6570	181.6570	181.6570	181.6570	(66)
Lighting	91.3484	81.1348	65.9833	49.9536	37.3409	31.5248	34.0636	44.2772	59.4287	75.4584	88.0711	93.8873	(67)
Appliances	581.2812	587.3131	572.1129	539.7536	498.9058	460.5146	434.8670	428.8351	444.0352	476.3945	517.2423	555.6335	(68)
Cooking	56.1933	56.1933	56.1933	56.1933	56.1933	56.1933	56.1933	56.1933	56.1933	56.1933	56.1933	56.1933	(69)
Pumps, fans	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	(70)
Losses	-121.1047	-121.1047	-121.1047	-121.1047	-121.1047	-121.1047	-121.1047	-121.1047	-121.1047	-121.1047	-121.1047	-121.1047	(71)
Water heating	177.0178	174.4378	169.0801	161.7964	157.0675	127.5424	121.8828	129.1342	131.7106	162.1162	170.6288	174.4486	(72)
Total internal	976.3931	969.6314	933.9220	878.2492	820.0599	746.3274	717.5591	728.9921	761.9203	840.7148	902.6880	950.7150	(73)

6. Solar gains

(calculation for January)													
Orientation													
East													(76)
East													(76)
													(83-1)
Solar gains	204.6601	400.3585	659.3334	961.5984	1178.4750	1206.3789	1148.5219	986.5633	766.8320	475.0591	255.1870	168.3025	(83)
Total gains	1181.0531	1369.9898	1593.2554	1839.8477	1998.5349	1952.7063	1866.0809	1715.5554	1528.7523	1315.7739	1157.8750	1119.0175	(84)

7. Mean internal temperature

Living room temperature during heating periods Th1													(85)
Heating system responsiveness													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	36.4682	36.6622	36.8543	37.7842	37.9634	38.8206	38.8206	38.9836	38.4859	37.9634	37.6026	37.2326	
alpha	3.4312	3.4441	3.4570	3.5189	3.5309	3.5880	3.5880	3.5989	3.5657	3.5309	3.5068	3.4822	
external 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	
util living area	0.9981	0.9966	0.9925	0.9797	0.9458	0.8688	0.7515	0.8011	0.9405	0.9884	0.9969	0.9985	(86)
MIT 1	18.8171	18.9916	19.3328	19.8285	20.2971	20.6863	20.8746	20.8366	20.5042	19.9046	19.2984	18.8188	(87)
th2													(88)
util rest	0.9974	0.9953	0.9893	0.9697	0.9137	0.7749	0.5622	0.6301	0.8889	0.9810	0.9955	0.9979	(89)
MIT 2	17.4666	17.6457	17.9903	18.5038	18.9593	19.3230	19.4463	19.4348	19.1732	18.5875	17.9757	17.4874	(90)
Living area fraction =													(91)
MIT	17.6422	17.8207	18.1649	18.6760	19.1332	19.5002	19.6320	19.6170	19.3462	18.7588	18.1476	17.6605	(92)
Temperature adjustment													(93)
adjusted MIT	17.6422	17.8207	18.1649	18.6760	19.1332	19.5002	19.6320	19.6170	19.3462	18.7588	18.1476	17.6605	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9962	0.9933	0.9854	0.9625	0.9045	0.7767	0.5858	0.6495	0.8829	0.9758	0.9936	0.9969	(94)
Useful gains W	1176.5376	1360.7762	1570.0076	1770.7803	1807.7542	1516.6709	1093.0892	1114.2806	1349.7818	1283.9405	1150.4112	1115.5662	(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	5583.3856	5378.4004	4830.3441	3948.5652	2988.1101	1926.3720	1191.9448	1259.3895	2080.3179	3279.7868	4483.7114	5517.2760	(97)
Month fraction	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	3278.6949	2699.8435	2425.6903	1568.0051	878.1848	0.0000	0.0000	0.0000	0.0000	1484.9096	2399.9762	3274.8721	(98)
Space heating										18010.1765			(98)
Space heating per m2										81.9538			(99)

8c. Space cooling requirement

- not applicable

9. Energy requirements

Fraction of space heat from secondary											0.1000		(201)
Fraction of space heat from main system											0.9000		(202)
Fraction of total space heat from main system 1											0.9000		(204)
Efficiency of main heating system 1											90.0000		(206)
Efficiency of secondary heating system											32.0000		(208)
Space heating requirement											18010.1765		(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	3278.6949	2699.8435	2425.6903	1568.0051	878.1848	0.0000	0.0000	0.0000	0.0000	1484.9096	2399.9762	3274.8721	(98)
Space heating efficiency (main heating system)	90.0000	90.0000	90.0000	90.0000	90.0000	0.0000	0.0000	0.0000	0.0000	90.0000	90.0000	90.0000	(210)
Space heating fuel (main heating system)	3278.6949	2699.8435	2425.6903	1568.0051	878.1848	0.0000	0.0000	0.0000	0.0000	1484.9096	2399.9762	3274.8721	(211)
Space heating fuel (secondary)	1024.5922	843.7011	758.0282	490.0016	274.4328	0.0000	0.0000	0.0000	0.0000	464.0343	749.9926	1023.3975	(215)
Water heating requirement	271.0980	239.6483	253.3366	229.3921	226.4573	184.1538	177.6286	193.8542	193.1799	237.7541	248.5181	265.3490	(64)
Efficiency of water heater	88.9897	88.9229	88.7548	88.3335	87.3744	79.3000	79.3000	79.3000	79.3000	88.2025	88.7642	89.0081	(216)
Water heating fuel	304.6398	269.5013	285.4342	259.6888	259.1805	232.2243	223.9957	244.4568	243.6064	269.5549	279.9757	298.1180	(217)
Space cooling fuel	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(219)
													(221)
Annual totals:											kWh/year		
Space heating fuel - main system											18010.1765		(211)
Space heating fuel - secondary											5628.1802		(215)
Water heating fuel											3170.3763		(219)
central heating pump											120.0000		(230c)
boiler flue fan											45.0000		(230e)
Electricity for pumps and fans											165.0000		(231)
Electricity for lighting											645.2965		(232)
PV generation											-1727.2394		(233)
Total delivered energy for all uses											25891.7901		(238)

10. Fuel costs

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system	18010.1765	3.4800	626.7541	(240)
Water heating	3170.3763	3.4800	110.3291	(247)
Pumps and fans for heating	0.0000	165.0000	21.7635	(249)
Electricity for lighting	645.2965	13.1900	85.1146	(250)
Additional standing charges			120.0000	(251)
Electricity generated - PVs	-1727.2394		-227.8229	(252)
Total energy cost			736.1385	(255)

11. SAP rating

Energy cost deflator	0.4200	(256)
Energy cost factor (ECF)	1.1678	(257)
SAP value	83.7096	
SAP rating	84	(258)
SAP BAND	B	

12. Carbon dioxide emissions

	Energy kWh/year	Emission factor	Emissions kg/year	
Space heating - main system	18010.1765	0.2160	3890.1981	(261)
Water heating	3170.3763	0.2160	684.8013	(264)
Space and water heating			4574.9994	(265)
Pumps and fans	0.5190	165.0000	85.6350	(267)
Energy for lighting	645.2965	0.5190	334.9089	(268)
Electricity generated - PVs	-1727.2394	0.5190	-896.4372	(269)
Total kg/year			4099.1061	(272)
			kg/m2/year	
CO2 emissions per m2			18.65	(273)
EI value			79.2537	
EI rating			79	(274)
EI band			C	