

Calculated by Lambda Calculation Engine SAP Engine version v94.0.1.1

RRN: 6787-8340-6302-9202-7892
Address: CS9 Baseline;

1. Overall dwelling dimensions

Ground floor (extension 1)	7.95	2.71	21.5445	(1b)–	(3b)
First floor (extension 1)	10.93	2.96	32.3528	(1c)–	(3c)
Total floor area	125.4800				(4)
Dwelling volume (m³)			323.7627		(5)

2. Ventilation rate

Number of chimneys	0	(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	0.0000	(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	27	(14)
Window infiltration	0.1960	(15)
Infiltration rate	0.7960	(18)
Number of sides sheltered	2	(19)
Shelter factor	0.8500	(20)
Infiltration rate incorporating shelter factor	0.6766	(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	0.8627	0.8458	0.8288	0.7443	0.7273	0.6428	0.6428	0.6259	0.6766	0.7273	0.7612	0.7950	(22b)
Effective ach	0.8721	0.8576	0.8435	0.7770	0.7645	0.7066	0.7066	0.6958	0.7289	0.7645	0.7897	0.8160	(25)

3. Heat losses and heat loss parameter

Element	Net				U-value				A x U				K-value				A x K				
Element																	(Main)				
Doors	1. 8500				3. 0000				5. 5500								(26)				
Windows (1)	13. 7600				4. 0268				55. 4094								(27)				
Windows (2)	5. 0900				1. 8519				9. 4259								(27)				
Ground Floor	38. 5700				0. 3500				13. 4995								(28a)				
Exposed Floor	0. 0000				0. 0000				3. 5400								(28b)				
Walls	46. 9300				1. 8600				87. 2898								(29a)				
Roof	38. 5700				0. 1700				6. 5569								(30)				
Element (extension 1)																					
Windows (1)	2. 4400				4. 0268				9. 8255								(27)				
Windows (2)	0. 9000				1. 8519				1. 6667								(27)				
Ground Floor	7. 9500				0. 2400				1. 9080								(28a)				
Walls	46. 9500				0. 3000				14. 0850								(29a)				
Alternative wall	0. 0000				0. 0000				0. 0000								(29b)				
Roof	12. 6200				0. 2500				3. 1550								(30)				
Total area of elements (whole dwelling)																					
				218. 5800												(31)					
Party wall (main)				79. 7800				0. 2500				19. 9450				(32)					
Fabric heat loss												231. 8567				(33)					
Thermal mass parameter												250. 0000				(35)					
Thermal bridges (0.15 × total area)												32. 7870									
(36)																					
Total fabric heat loss												264. 6437				(37)					
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec									
Vent loss	93. 1762	91. 6324	90. 1192	83. 0119	81. 6821	75. 4918	75. 4918	74. 3455	77. 8762	81. 6821	84. 3722	87. 1846	(38)								
Heat transfer coeff	357. 8198	356. 2761	354. 7629	347. 6556	346. 3258	340. 1355	340. 1355	338. 9892	342. 5199	346. 3258	349. 0159	351. 8283	(39)								
Heat transfer coeff (average)	347. 6492												(39)								
HLP	2. 8516	2. 8393	2. 8272	2. 7706	2. 7600	2. 7107	2. 7107	2. 7015	2. 7297	2. 7600	2. 7814	2. 8039	(40)								
HLP (average)	2. 7706												(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

[illegible]

Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	47.9589	49.5576	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total	227.2267	200.1923	210.0433	188.0087	184.0387	162.7967	155.9716	173.0706	172.8852	194.9679	206.5122	221.6648	(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	227.2267	200.1923	210.0433	188.0087	184.0387	162.7967	155.9716	173.0706	172.8852	194.9679	206.5122	221.6648	(64)
Output from water heater(annual)										2297.3787			(64)
Heat gains (kWh)	71.3488	62.7667	65.6353	58.4444	56.9888	50.1733	47.7721	53.3419	53.4158	60.6227	64.5968	69.4994	(65)

5. Internal gains

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic	172.9336	172.9336	172.9336	172.9336	172.9336	172.9336	172.9336	172.9336	172.9336	172.9336	172.9336	172.9336	(66)
Lighting	87.8012	77.9843	63.4211	48.0138	35.8909	30.3006	32.7409	42.5578	57.1210	72.5283	84.6512	90.2415	(67)
Appliances	436.0984	440.6237	429.2200	404.9429	374.2974	345.4949	326.2531	321.7278	333.1315	357.4086	388.0541	416.8566	(68)
Cooking	55.1756	55.1756	55.1756	55.1756	55.1756	55.1756	55.1756	55.1756	55.1756	55.1756	55.1756	55.1756	(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	-115.2890	-115.2890	-115.2890	-115.2890	-115.2890	-115.2890	-115.2890	-115.2890	-115.2890	-115.2890	-115.2890	-115.2890	(71)
Water heating	95.8989	93.4028	88.2195	81.1728	76.5978	69.6851	64.2098	71.6961	74.1886	81.4822	89.7178	93.4132	(72)
Total internal	742.6186	734.8309	703.6807	656.9496	609.6062	568.3008	546.0238	558.8017	587.2612	634.2391	685.2432	723.3314	(73)

6. Solar gains

(calculation for January)													
Orientation			Area				Gains[W]						
East/West(1)(main)			13.7600				111.4335						(76)
East/West(2)(main)			5.0900				34.9164						(76)
East/West(1)(extn 1)			2.4400				19.7600						(76)
East/West(2)(extn 1)			0.9000				6.1738						(76)
					total:		172.2837						(83-1)
Solar gains	172.2837	337.0235	555.0297	809.4778	992.0454	1015.5350	966.8307	830.4933	645.5226	399.9068	214.8176	141.6778	(83)
Total gains	914.9023	1071.8544	1258.7104	1466.4274	1601.6516	1583.8358	1512.8546	1389.2951	1232.7838	1034.1459	900.0608	865.0091	(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	24.3527	24.4582	24.5626	25.0647	25.1610	25.6189	25.6189	25.7055	25.4405	25.1610	24.9670	24.7674	
alpha	2.6235	2.6305	2.6375	2.6710	2.6774	2.7079	2.7079	2.7137	2.6960	2.6774	2.6645	2.6512	
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	0.9938	0.9901	0.9815	0.9601	0.9161	0.8337	0.7263	0.7714	0.9090	0.9745	0.9908	0.9948	(86)
MIT 1	18.1053	18.3244	18.7591	19.3827	19.9852	20.5009	20.7682	20.7154	20.2777	19.4987	18.7154	18.0952	(87)
th2													(88)
util rest	0.9913	0.9860	0.9731	0.9394	0.8631	0.7008	0.4715	0.5370	0.8237	0.9573	0.9863	0.9927	(89)
MIT 2	16.3744	16.5964	17.0315	17.6624	18.2368	18.6958	18.8611	18.8462	18.5276	17.7892	17.0066	16.3802	(90)
Living area fraction =											0.2100		(91)
MIT	16.7379	16.9593	17.3943	18.0236	18.6039	19.0748	19.2616	19.2387	18.8951	18.1482	17.3654	16.7404	(92)
Temperature adjustment											0.0000		
adjusted MIT	16.7379	16.9593	17.3943	18.0236	18.6039	19.0748	19.2616	19.2387	18.8951	18.1482	17.3654	16.7404	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9874	0.9804	0.9644	0.9272	0.8535	0.7156	0.5281	0.5871	0.8240	0.9478	0.9810	0.9893	(94)
Useful gains W	903.4105	1050.8566	1213.9213	1359.7154	1367.0245	1133.4212	798.9502	815.6090	1015.7547	980.1717	882.9669	855.7331	(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	4450.5291	4296.4227	3864.8850	3171.8786	2391.0076	1522.0492	905.3082	962.2961	1642.4256	2614.1291	3582.7851	4412.0509	(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	2639.0562	2181.0204	1972.3170	1304.7575	761.8435	0.0000	0.0000	0.0000	0.0000	1215.6643	1943.8691	2645.9005	(98)
Space heating										14664.4284			(98)
Space heating per m2										116.8667			(99)

8c. Space cooling requirement

- not applicable

9. Energy requirements

Fraction of space heat from secondary											0.0000		(201)
Fraction of space heat from main system											1.0000		(202)
Fraction of total space heat from main system 1											1.0000		(204)
Efficiency of main heating system 1											90.3000		(206)
Efficiency of secondary heating system											100.0000		(208)
Space heating requirement											16239.6771		(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	2639.0562	2181.0204	1972.3170	1304.7575	761.8435	0.0000	0.0000	0.0000	0.0000	1215.6643	1943.8691	2645.9005	(98)
Space heating efficiency (main heating system)	90.3000	90.3000	90.3000	90.3000	90.3000	0.0000	0.0000	0.0000	0.0000	90.3000	90.3000	90.3000	(210)
Space heating fuel (main heating system)	2922.5429	2415.3050	2184.1827	1444.9141	843.6805	0.0000	0.0000	0.0000	0.0000	1346.2506	2152.6790	2930.1223	(211)
Water heating requirement	227.2267	200.1923	210.0433	188.0087	184.0387	162.7967	155.9716	173.0706	172.8852	194.9679	206.5122	221.6648	(64)
Efficiency of water heater	89.4074	89.3540	89.2186	88.8901	88.1403	80.2000	80.2000	80.2000	80.2000	88.7551	89.2209	89.4294	(216)
Water heating fuel	254.1475	224.0441	235.4254	211.5069	208.8020	202.9884	194.4784	215.7988	215.5675	219.6695	231.4616	247.8657	(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											16239.6771		(211)
Water heating fuel											2661.7557		(219)

central heating pump	120.0000	(230c)
boiler flue fan	45.0000	(230e)
Electricity for pumps and fans	165.0000	(231)
Electricity for lighting	620.2388	(232)
Total delivered energy for all uses	19686.6716	(238)

10. Fuel costs

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating – main system	16239.6771	3.4800	565.1408	(240)
Water heating	2661.7557	3.4800	92.6291	(247)
Pumps and fans for heating	0.0000	165.0000	21.7635	(249)
Electricity for lighting	620.2388	13.1900	81.8095	(250)
Additional standing charges			120.0000	(251)
Total energy cost			881.3429	(255)

11. SAP rating

Energy cost deflator	0.4200	(256)
Energy cost factor (ECF)	2.1713	(257)
SAP value	69.7103	
SAP rating	70	(258)
SAP BAND	C	

12. Carbon dioxide emissions

	Energy kWh/year	Emission factor	Emissions kg/year	
Space heating – main system	16239.6771	0.2160	3507.7703	(261)
Water heating	2661.7557	0.2160	574.9392	(264)
Space and water heating			4082.7095	(265)
Pumps and fans	0.5190	165.0000	85.6350	(267)
Energy for lighting	620.2388	0.5190	321.9039	(268)
Total kg/year			4490.2484	(272)
CO2 emissions per m2			kg/m2/year	
EI value			35.78	(273)
EI rating			64.7059	
EI band			65	(274)
			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: 6787-8340-6302-9202-7892
Address: CS9 Baseline;

1. Overall dwelling dimensions

Ground floor (extension 1)	7.95	2.71	21.5445	(1b)–	(3b)
First floor (extension 1)	10.93	2.96	32.3528	(1c)–	(3c)
Total floor area	125.4800				(4)
Dwelling volume (m³)			323.7627		(5)

2. Ventilation rate

Number of chimneys	0	(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 0.0000	(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	0.6500	(18)
Number of sides sheltered	2	(19)
Shelter factor	0.8500	(20)
Infiltration rate incorporating shelter factor	0.5525	(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	0.7044	0.6906	0.6768	0.6078	0.5939	0.5249	0.5249	0.5111	0.5525	0.5939	0.6216	0.6492	(22b)
Effective ach	0.7481	0.7385	0.7290	0.6847	0.6764	0.6377	0.6377	0.6306	0.6526	0.6764	0.6932	0.7107	(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					1. 8500		3. 0000		5. 5500				(26)
Windows					5. 0900		1. 8519		9. 4259				(27)
Windows					13. 7600		1. 5038		20. 6917				(27)
Ground Floor					38. 5700		0. 3500		13. 4995				(28a)
Exposed Floor					0. 0000		0. 0000		3. 5400				(28b)
Walls					46. 9300		0. 3000		14. 0790				(29a)
Roof					38. 5700		0. 1700		6. 5569				(30)

Element (extension 1)													
Windows					0. 9000		1. 8519		1. 6667				(27)
Windows					2. 4400		1. 5038		3. 6692				(27)
Ground Floor					7. 9500		0. 2400		1. 9080				(28a)
Walls					46. 9500		0. 3000		14. 0850				(29a)
Alternative wall					0. 0000		0. 0000		0. 0000				(29b)
Roof					12. 6200		0. 2500		3. 1550				(30)

Total area of elements (whole dwelling)					218. 5800								(31)
Party wall (main)					79. 7800		0. 2500		19. 9450				(32)
Fabric heat loss									117. 7719				(33)
Thermal mass parameter									250. 0000				(35)
Thermal bridges (0.15 × total area) (36)									32. 7870				
Total fabric heat loss									150. 5589				(37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Vent loss	79. 9300	78. 9006	77. 8916	73. 1524	72. 2657	68. 1380	68. 1380	67. 3736	69. 7279	72. 2657	74. 0595	75. 9348	(38)
Heat transfer coeff	230. 4889	229. 4595	228. 4505	223. 7113	222. 8246	218. 6969	218. 6969	217. 9325	220. 2868	222. 8246	224. 6183	226. 4937	(39)
Heat transfer coeff (average)										223. 7070			(39)
HLP	1. 8369	1. 8287	1. 8206	1. 7828	1. 7758	1. 7429	1. 7429	1. 7368	1. 7556	1. 7758	1. 7901	1. 8050	(40)
HLP (average)										1. 7828			(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											2. 8822		(42)
Average daily hot water use (litres/day)											108. 0557		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	118. 8612	114. 5390	110. 2168	105. 8945	101. 5723	97. 2501	97. 2501	101. 5723	105. 8945	110. 2168	114. 5390	118. 8612	(44)
Energy content	176. 2678	154. 1649	159. 0844	138. 6936	133. 0798	114. 8378	106. 4141	122. 1117	123. 5701	144. 0090	157. 1971	170. 7059	(45)
Energy content (annual)											1700. 1362		(45)
Distribution loss	26. 4402	23. 1247	23. 8627	20. 8040	19. 9620	17. 2257	15. 9621	18. 3168	18. 5355	21. 6014	23. 5796	25. 6059	(46)
Cylinder volume											0. 0000		(47)
Energy lost from cylinder in kWh/day											0. 0000		(55)
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)
Net 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	(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	50. 9589	46. 0274	50. 9589	49. 3151	50. 9589	47. 9589	49. 5576	50. 9589	49. 3151	50. 9589	49. 3151	50. 9589	(61)
Total	227. 2267	200. 1923	210. 0433	188. 0087	184. 0387	162. 7967	155. 9716	173. 0706	172. 8852	194. 9679	206. 5122	221. 6648	(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	25. 0292	41. 7666	71. 1333	95. 3326	117. 7754	115. 7920	114. 2618	99. 8311	78. 1878	53. 3930	29. 6883	20. 9452	(63)
Solar input (sum of months)											863. 1365		(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	202. 1974	158. 4257	138. 9100	92. 6760	66. 2633	47. 0047	41. 7099	73. 2395	94. 6974	141. 5749	176. 8239	200. 7196	(64)
Output from water heater (annual)											1434. 2423		(64)
Heat gains (kWh)	71. 3488	62. 7667	65. 6353	58. 4444	56. 9888	50. 1733	47. 7721	53. 3419	53. 4158	60. 6227	64. 5968	69. 4994	(65)

5. Internal gains

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic	172. 9336	172. 9336	172. 9336	172. 9336	172. 9336	172. 9336	172. 9336	172. 9336	172. 9336	172. 9336	172. 9336	172. 9336	(66)
Lighting	66. 7047	59. 2466	48. 1825	36. 4773	27. 2672	23. 0201	24. 8740	32. 3322	43. 3963	55. 1015	64. 3116	68. 5587	(67)
Appliances	436. 0984	440. 6237	429. 2200	404. 9429	374. 2974	345. 4949	326. 2531	321. 7278	333. 1315	357. 4086	388. 0541	416. 8566	(68)
Cooking	55. 1756	55. 1756	55. 1756	55. 1756	55. 1756	55. 1756	55. 1756	55. 1756	55. 1756	55. 1756	55. 1756	55. 1756	(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	-115. 2890	-115. 2890	-115. 2890	-115. 2890	-115. 2890	-115. 2890	-115. 2890	-115. 2890	-115. 2890	-115. 2890	-115. 2890	-115. 2890	(71)
Water heating	95. 8989	93. 4028	88. 2195	81. 1728	76. 5978	69. 6851	64. 2098	71. 6961	74. 1886	81. 4822	89. 7178	93. 4132	(72)
Total internal	721. 5221	716. 0932	688. 4421	645. 4131	600. 9825	561. 0203	538. 1570	548. 5762	573. 5365	616. 8124	664. 9036	701. 6486	(73)

6. Solar gains

(calculation for January)													
Orientation			Area				Gains[W]						
East			13. 7600				82. 5919						(76)
East			5. 0900				34. 9164						(76)
East			2. 4400				14. 6457						(76)
East			0. 9000				6. 1738						(76)
					total:		138. 3278						(83-1)
Solar gains	138. 3277	270. 5984	445. 6371	649. 9351	796. 5198	815. 3798	776. 2748	666. 8086	518. 2943	321. 0878	172. 4784	113. 7540	(83)
Total gains	859. 8499	986. 6916	1134. 0792	1295. 3481	1397. 5023	1376. 4001	1314. 4318	1215. 3847	1091. 8308	937. 9002	837. 3821	815. 4026	(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	37. 8061	37. 9757	38. 1434	38. 9515	39. 1065	39. 8446	39. 8446	39. 9844	39. 5570	39. 1065	38. 7942	38. 4730	
alpha	3. 5204	3. 5317	3. 5429	3. 5968	3. 6071	3. 6563	3. 6563	3. 6656	3. 6371	3. 6071	3. 5863	3. 5649	
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. 9960	0. 9931	0. 9851	0. 9619	0. 9061	0. 7918	0. 6502	0. 7045	0. 8922	0. 9769	0. 9935	0. 9968	(86)
MIT 1	19. 0091	19. 1919	19. 5358	20. 0196	20. 4585	20. 7907	20. 9273	20. 9011	20. 6320	20. 0586	19. 4648	18. 9991	(87)
th2													(88)
util rest	0. 9946	0. 9905	0. 9791	0. 9448	0. 8587	0. 6792	0. 4660	0. 5273	0. 8167	0. 9633	0. 9905	0. 9956	(89)
MIT 2	17. 6911	17. 8771	18. 2221	18. 7146	19. 1275	19. 4164	19. 4941	19. 4889	19. 3003	18. 7636	18. 1694	17. 6972	(90)
Living area fraction =											0. 2100		(91)
MIT	17. 9679	18. 1532	18. 4980	18. 9887	19. 4070	19. 7050	19. 7950	19. 7855	19. 5800	19. 0355	18. 4414	17. 9706	(92)

Temperature adjustment											0.0000			
adjusted MIT	17.9679	18.1532	18.4980	18.9887	19.4070	19.7050	19.7950	19.7855	19.5800	19.0355	18.4414	17.9706	(93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9925	0.9872	0.9738	0.9373	0.8555	0.6967	0.5055	0.5646	0.8219	0.9575	0.9875	0.9938	(94)
Useful gains W	853.3642	974.1015	1104.3737	1214.1069	1195.6222	958.9194	664.4579	686.2621	897.3569	897.9988	826.9197	810.3479	(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	3150.3030	3041.0647	2740.9474	2256.9479	1717.3079	1116.4372	698.7434	737.8068	1207.1649	1879.6370	2547.4956	3118.9482	(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	1708.9225	1388.9993	1217.6109	750.8455	388.1342	0.0000	0.0000	0.0000	0.0000	730.3388	1238.8146	1717.5986	(98)
Space heating										9141.2644			(98)
Space heating per m2										72.8504			(99)

8c. Space cooling requirement

- not applicable

9. Energy requirements

Fraction of space heat from secondary											0.0000		(201)
Fraction of space heat from main system											1.0000		(202)
Fraction of total space heat from main system 1											1.0000		(204)
Efficiency of main heating system 1											90.3000		(206)
Efficiency of secondary heating system											100.0000		(208)
Space heating requirement											10123.2164		(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1708.9225	1388.9993	1217.6109	750.8455	388.1342	0.0000	0.0000	0.0000	0.0000	730.3388	1238.8146	1717.5986	(98)
Space heating efficiency (main heating system)	90.3000	90.3000	90.3000	90.3000	90.3000	0.0000	0.0000	0.0000	0.0000	90.3000	90.3000	90.3000	(210)
Space heating fuel (main heating system)	1892.4944	1538.2052	1348.4063	831.5011	429.8275	0.0000	0.0000	0.0000	0.0000	808.7916	1371.8878	1902.1025	(211)
Water heating requirement	202.1974	158.4257	138.9100	92.6760	66.2633	47.0047	41.7099	73.2395	94.6974	141.5749	176.8239	200.7196	(64)
Efficiency of water heater	89.1127	89.1506	89.1503	89.0676	88.6716	80.2000	80.2000	80.2000	80.2000	88.4905	88.9016	89.1256	(216)
Water heating fuel	226.9009	177.7058	155.8154	104.0513	74.7289	58.6093	52.0073	91.3211	118.0766	159.9888	198.8986	225.2098	(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											10123.2164		(211)
Water heating fuel											1643.3138		(219)
central heating pump											120.0000		(230c)
boiler flue fan											45.0000		(230e)
pump for solar water heating											50.0000		(230g)
Electricity for pumps and fans											215.0000		(231)
Electricity for lighting											471.2107		(232)
PV generation											-1727.2394		(233)
Total delivered energy for all uses											10725.5014		(238)

10. Fuel costs

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system	10123.2164	3.4800	352.2879	(240)
Water heating	1643.3138	3.4800	57.1873	(247)
Pumps and fans for heating	0.0000	215.0000	28.3585	(249)
Electricity for lighting	471.2107	13.1900	62.1527	(250)
Additional standing charges			120.0000	(251)
Electricity generated - PVs	-1727.2394		-227.8229	(252)
Total energy cost			392.1636	(255)

11. SAP rating

Energy cost deflator	0.4200	(256)
Energy cost factor (ECF)	0.9661	(257)
SAP value	86.5223	
SAP rating	87	(258)
SAP BAND	B	

12. Carbon dioxide emissions

	Energy kWh/year	Emission factor	Emissions kg/year	
Space heating - main system	10123.2164	0.2160	2186.6147	(261)
Water heating	1643.3138	0.2160	354.9558	(264)
Space and water heating			2541.5705	(265)
Pumps and fans	0.5190	215.0000	111.5850	(267)
Energy for lighting	471.2107	0.5190	244.5583	(268)
Electricity generated - PVs	-1727.2394	0.5190	-896.4372	(269)
Total kg/year			2001.2766	(272)
			kg/m2/year	
CO2 emissions per m2			15.95	(273)
EI value			84.2696	
EI rating			84	(274)
EI band			B	