

Calculated by Lambda Calculation Engine SAP Engine version v94.0.1.1 RRN: 2966-9322-

2303-6895-3401

1. Overall dwelling dimensions

Ground floor(main)	72.36	2.6	188.136	(1b)-	(3b)
First floor(main)	68.22	2.54	173.2788	(1c)-	(3c)
Lowest floor (extension 1)(assumed at level 1)		17.48	2.65	46.322	(1c)- (3c)
Second floor (extension 1)	20.19	2.98	60.1662	(1d)-	(3d)
Ground floor (extension 2)	42.93	2.93	125.7849	(1b)-	(3b)
Total floor area	221.1800		(4)		
Dwelling volume (m³)			593.6879	(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	2	(9) Additional infiltration	0.1000	(10)
Structural infiltration			0.3500	(11)
Floor infiltration			0.2000	(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.....			0.7500	(18)
Number of sides sheltered	2	(19) Shelter factor	0.8500	(20)
Infiltration rate incorporating shelter factor			0.6375	(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	0.8128		0.7969	0.7809	0.7013	0.6853	0.6056	0.6056	0.5897	0.6375	0.6853	0.7172	0.7491	(22b)
Effective ach	0.8303		0.8175	0.8049	0.7459	0.7348	0.6834	0.6834	0.6739	0.7032	0.7348	0.7572	0.7805	(25)

3. Heat losses and heat loss parameter

Element Net U-value A x U K-value A xK

Element (26)	(Main) Doors				3.7000	3.0000	11.1000
Windows(1)	0.0000	4.0268	0.0000				(27)
Windows(2)	21.5200	2.3551	50.6812				(27)
Ground Floor	72.3600	0.5500	39.7980				(28a)
Walls	105.6400	1.8200	192.2648				(29a)
Roof	72.3600	0.2100	15.1956				(30)
Element (extension 1)							
Windows(1)	0.0000	4.0268	0.0000				(27)
Windows(2)	5.7700	2.3551	13.5888				(27)
Ground Floor	0.0000	0.0000	0.0000				(28a)
Exposed Floor	0.0000	0.0000	20.9760				(28b)
Walls	50.1000	1.2000	60.1200				(29a)
Alternative wall	0.0000	0.0000	0.0000				(29b)
Roof	20.1900	0.2100	4.2399				(30)
Element (extension 2)							
Windows(1)	0.0000	4.0268	0.0000				(27)
Windows(2)	6.5700	2.3551	15.4728				(27)
Ground Floor	42.9300	0.6100	26.1873				(28a)
Walls	46.0500	0.6000	27.6300				(29a)
Roof	49.5700	0.3500	17.3495				(30)

Total area of elements (whole dwelling)	514.2400				(31)		
Party wall (main)	0.0000	0.0000	0.0000			(32)	
Fabric heat loss	494.6039					(33)	
Thermal mass parameter	250.0000					(35)	
Thermal bridges (0.15 × total area)	77.1360 (36)						
Total fabric heat loss	571.7399				(37)		

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Vent loss	162.6762	160.1631	157.6998	146.1298	143.9650	133.8879	133.8879	132.0217	137.7695	143.9650	148.3442	.....	152.9225	(38)
Heat transfer coeff	734.4160	731.9030	729.4397	717.8696	715.7049	705.6277	705.6277	703.7616	709.5093	715.7049	720.0841	.....	724.6623	(39)
Heat transfer coeff (average).....	717.8592												(39)	
HLP	3.3204	3.3091	3.2979	3.2456	3.2358	3.1903	3.1903	3.1819	3.2078	3.2358	3.2556	.....	3.2763	(40)
HLP (average).....	3.2456												(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	3.0295	(42)
Average daily hot water use (litres/day)	111.7366	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Daily hot water use	122.9102	118.4408	113.9713	109.5019	105.0324	100.5629	100.5629	105.0324	109.5019	113.9713	118.4408		122.9102	(44)
Energy content	182.2723	159.4166	164.5036	143.4182	137.6132	118.7497	110.0391	126.2715	127.7795	148.9147	162.5521		176.5210	(45)
Energy content(annual)												1758.0516		(45)
Distribution loss	27.3409	23.9125	24.6755	21.5127	20.6420	17.8125	16.5059	18.9407	19.1669	22.3372	24.3828		26.4782	(46)
Cylinder volume												160.0000		(47)
Cylinder loss factor (kWh/litre/day)												0.0115		(51)
Volume factor												0.9086		(52)
Temperature factor												0.6000		(53)
Energy lost from cylinder in kWh/day												1.0072		(55)
Total storage loss	31.2233	28.2017	31.2233	30.2161	31.2233	30.2161	31.2233	31.2233	30.2161	31.2233	30.2161		31.2233	(56)
Net storage loss	31.2233	28.2017	31.2233	30.2161	31.2233	30.2161	31.2233	31.2233	30.2161	31.2233	30.2161		31.2233	(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	278.0749	245.9479	260.3061	236.1303	233.4157	190.8819	184.5756	200.8080	199.9117	244.7173	255.2642		272.3236	(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	(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	278.0749	245.9479	260.3061	236.1303	233.4157	190.8819	184.5756	200.8080	199.9117	244.7173	255.2642		272.3236	(64)
Output from water heater(annual)												2802.3570		(64)
Heat gains (kWh)	137.2476	122.2311	131.3395	121.8563	122.3984	97.1900	96.2172	101.6145	100.1924	126.1562	128.2183		135.3353	(65)

5. Internal gains

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Metabolic	181.7678	181.7678	181.7678	181.7678	181.7678	181.7678	181.7678	181.7678	181.7678	181.7678	181.7678		181.7678	(66)
Lighting	91.6735	81.4236	66.2181	50.1314	37.4738	31.6369	34.1848	44.4347	59.6402	75.7270	88.3845		94.2214	(67)
Appliances	583.2163	589.2683	574.0175	541.5505	500.5667	462.0477	436.3147	430.2627	445.5135	477.9805	518.9643		557.4833	(68)
Cooking	56.2062	56.2062	56.2062	56.2062	56.2062	56.2062	56.2062	56.2062	56.2062	56.2062	56.2062		56.2062	(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	-121.1785	-121.1785	-121.1785	-121.1785	-121.1785	-121.1785	-121.1785	-121.1785	-121.1785	-121.1785	-121.1785		121.1785	(71)
Water heating	184.4725	181.8914	176.5315	169.2448	164.5140	134.9861	129.3242	136.5786	139.1561	169.5647	178.0809		181.9022	(72)
Total internal	986.1579	979.3788	943.5627	887.7222	829.3500	755.4663	726.6192	738.0716	771.1053	850.0677	912.2253		960.4024	(73)

6. Solar gains

(calculation for January)	
Orientation Area	Gains[W]
East/West(1)(main)	
East/West(2)(main)	
East/West(1)(extn 1)	
East/West(2)(extn 1)	
East/West(1)(extn 2)	
East/West(2)(extn 2)	

(76)
(76)
(76)
(76)
(76)
(76)
(83-1)

Solar gains	245.1767	479.6176	789.8618	1151.9664	1411.7780	1445.2060	1375.8951	1181.8735	918.6420	569.1067	305.7065		201.6214	(83)
Total gains	1231.3345	1458.9964	1733.4245	2039.6886	2241.1280	2200.6723	2102.5143	1919.9451	1689.7473	1419.1744	1217.9317		1162.0238	(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	20.9142	20.9860	21.0569	21.3963	21.4610	21.7675
21.7675	21.8252	21.6484	21.4610															21.3305	21.1957
alpha	2.3943	2.3991	2.4038	2.4264	2.4307	2.4512	2.4512	2.4550	2.4432	2.4307	2.4220								2.4130
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	0.9963	0.9942	0.9892	0.9771	0.9518	0.9039	0.8321	0.8649	0.9500	0.9855	0.9946								0.9969
MIT 1	17.6410	17.8508	18.2952	18.9431	19.6082	20.2178	20.5805	20.5114	19.9838	19.1400	18.2999								17.6283
th2												(88) util rest	0.9948	0.9916	0.9839	0.9638	0.9151	0.7966	0.5711
0.9918																			0.6415
MIT 2	14.4639	14.7723	15.4226	16.3724	17.3235	18.1545	18.5439	18.4983	17.8699	16.6678	15.4393								0.8902
Living area fraction =																		0.1300	0.9747
MIT	14.8769	15.1725	15.7960	16.7065	17.6205	18.4227	18.8086	18.7600	18.1446	16.9892	15.8111								0.9956
Temperature adjustment	0.0000																		0.9022
adjusted MIT	14.8769	15.1725	15.7960	16.7065	17.6205	18.4227	18.8086	18.7600	18.1446	16.9892	15.8111								0.9747

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation	0.9898	0.9842	0.9717	0.9435	0.8871	0.7784	0.5983	0.6575	0.8656	0.9591	0.9847		0.9912	(94)
Useful gains W	1218.7158	1435.8918	1684.3407	1924.3913	1988.2059	1713.0037	1257.9767	1262.3360	1462.5862	1361.1756	1199.3374		1151.8046	(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	7767.8502	7518.4450	6780.8426	5604.0737	4237.3200	2697.3727	1558.4556	1660.8618	2869.7129	4572.7585	6272.7430		7729.0179	(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	4872.5560	4087.4758	3791.7974	2649.3713	1673.3408	0.0000	0.0000	0.0000	0.0000	2389.4177	3652.8520		4893.4467	(98)
Space heating												28010.2577		(98)
Space heating per m2												126.6401		(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	89.7000	(206)
Efficiency of secondary heating system	72.0000	(208)
Space heating requirement	28103.9375	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Space heating requirement
	4872.5560	4087.4758	3791.7974	2649.3713	1673.3408	0.0000	0.0000	0.0000	0.0000	0.0000	2389.4177	3652.8520	4893.4467 (98)

Space heating efficiency (main heating system)														
89.7000	89.7000	89.7000	89.7000	89.7000	0.0000	0.0000	0.0000	0.0000	89.7000	89.7000	89.7000	(210)	Space heating fuel (main heating system)	
4888.8522	4101.1462	3804.4790	2658.2320	1678.9373	0.0000	0.0000	0.0000	0.0000	0.0000	2397.4090	3665.0689	4909.8128	(211)	Space heating fuel (secondary)
676.7439	567.7050	526.6385	367.9682	232.4085	0.0000	0.0000	0.0000	0.0000	331.8636	507.3406	679.6454	(215)	Water heating requirement	
278.0749	245.9479	260.3061	236.1303	233.4157	190.8819	184.5756	200.8080	199.9117	244.7173	255.2642	272.3236	(64)	Efficiency of water heater 88.9814 (216)	
88.9814	88.9451	88.8471	88.6185	88.0988	79.0000	79.0000	79.0000	79.0000	88.4757	88.8331	88.9980	(217)	Water heating fuel	
312.5092	276.5166	292.9820	266.4573	264.9477	241.6226	233.6400	254.1873	253.0527	276.5928	287.3526	305.9882	(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	0.0000	(221)						

Annual totals: kWh/year

Space heating fuel - main system	28103.9375	(211)
Space heating fuel - secondary	3890.3136	(215)
Water heating fuel	3265.8490	(219)
central heating pump	120.0000	(230c)
boiler flue fan	45.0000	(230e)
Electricity for pumps and fans	165.0000	(231)
Electricity for lighting	647.5930	(232)
Total delivered energy for all uses	36072.6931	(238)

10. Fuel costs

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year		
Space heating - main system		28103.9375	3.4800	978.0170	(240)
Space heating - secondary		3890.3136	3.4800	135.3829	(242)
Water heating	3265.8490		3.4800	113.6515	(247)
Pumps and fans for heating		0.0000	165.0000	21.7635	(249)
Electricity for lighting	647.5930		13.1900	85.4175	(250)
Additional standing charges				120.0000	(251)
Total energy cost				1454.2325	(255)

11. SAP rating

Energy cost deflator	0.4200	(256)
Energy cost factor (ECF)	2.2946	(257)
SAP value 67.9903		
SAP rating	68	(258) SAP BAND D

12. Carbon dioxide emissions

	Energy kWh/year	Emission factor	Emissions kg/year		
Space heating - main system		28103.9375	0.2160	6070.4505	(261)
Space heating - secondary		3890.3136	0.2160	840.3077	(263)
Water heating	3265.8490		0.2160	705.4234	(264)
Space and water heating				7616.1816	(265)
Pumps and fans	0.5190		165.0000	85.6350	(267)
Energy for lighting	647.5930		0.5190	336.1008	(268)
Total kg/year				8037.9174	(272)

	kg/m2/year		
CO2 emissions per m2	36.34	(273)	
EI value 59.4030			
EI rating	59	(274) EI band D	

SAP 2012 WORKSHEET (Version 9.94, September 2019)
CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 07 Dec 2020

Calculated by Lambda Calculation Engine SAP Engine version v94.0.1.1 RRN: 2966-9322-

2303-6895-3401

1. Overall dwelling dimensions

Ground floor(main)	72.36	2.6	188.136	(1b)-	(3b)
First floor(main)	68.22	2.54	173.2788	(1c)-	(3c)
Lowest floor (extension 1)(assumed at level 1)		17.48 2.65	46.322	(1c)-	(3c)
Second floor (extension 1)	20.19	2.98	60.1662	(1d)-	(3d)
Ground floor (extension 2)	42.93	2.93	125.7849	(1b)-	(3b)
Total floor area	221.1800		(4)		
Dwelling volume (m³)	593.6879		(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	2	(9) Additional infiltration	0.1000	(10)

Structural infiltration												0.3500	(11)
Floor infiltration												0.2000	(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.....												0.7500	(18)
Number of sides sheltered								2		(19)	Shelter factor	0.8500	(20)
Infiltration rate incorporating shelter factor												0.6375	(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	0.8128		0.7969		0.7809		0.7013		0.6853		0.6056		0.6056	0.5897	0.6375	0.6853	0.7172.....	0.7491	(22b)
Effective ach	0.8303		0.8175		0.8049		0.7459		0.7348		0.6834		0.6834	0.6739	0.7032	0.7348	0.7572.....	0.7805	(25)

3. Heat losses and heat loss parameter

Element Net U-value A x U K-value A xK

Element (26)														(Main) Doors		3.7000	3.0000	11.1000	
Windows(1)													0.0000	4.0268	0.0000				(27)
Windows(2)													21.5200	2.3551	50.6812				(27)
Ground Floor													72.3600	0.5500	39.7980				(28a)
Walls													105.6400	0.3000	31.6920				(29a)
Roof													72.3600	0.2100	15.1956				(30)

Element (extension 1)																			
Windows(1)													0.0000	4.0268	0.0000				(27)
Windows(2)													5.7700	2.3551	13.5888				(27)
Ground Floor													0.0000	0.0000	0.0000				(28a)
Exposed Floor													0.0000	0.0000	20.9760				(28b)
Walls													50.1000	0.6300	31.5630				(29a)
Alternative wall													0.0000	0.0000	0.0000				(29b)
Roof													20.1900	0.2100	4.2399				(30)

Element (extension 2)																			
Windows(1)													0.0000	4.0268	0.0000				(27)
Windows(2)													6.5700	2.3551	15.4728				(27)
Ground Floor													42.9300	0.6100	26.1873				(28a)
Walls													46.0500	0.3500	16.1175				(29a)
Roof													49.5700	0.3500	17.3495				(30)

Total area of elements (whole dwelling)																514.2400			(31)
Party wall (main)													0.0000	0.0000	0.0000				(32)
Fabric heat loss																293.9616			(33)
Thermal mass parameter																250.0000			(35)
Thermal bridges (0.15 x total area)																77.1360	(36)		
Total fabric heat loss.....																	371.0976	(37)	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Vent loss	162.6762	160.1631	157.6998	146.1298	143.9650	133.8879	133.8879	132.0217	137.7695	143.9650	148.3442		152.9225	(38)
Heat transfer coeff	533.7737	531.2607	528.7974	517.2273	515.0626	504.9854	504.9854	503.1193	508.8670	515.0626	519.4418		524.0200	(39)
Heat transfer coeff (average).....													517.2169	(39)
HLP	2.4133	2.4019	2.3908	2.3385	2.3287	2.2831	2.2831	2.2747	2.3007	2.3287	2.3485		2.3692	(40)
HLP (average).....													2.3384	(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)
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4. Water heating energy requirements

Assumed occupancy																		3.0295	(42)
Average daily hot water use (litres/day)																		111.7366	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec							
Daily hot water use	122.9102	118.4408	113.9713	109.5019	105.0324	100.5629	100.5629	105.0324	109.5019	113.9713	118.4408		122.9102	(44)					
Energy content	182.2723	159.4166	164.5036	143.4182	137.6132	118.7497	110.0391	126.2715	127.7795	148.9147	162.5521		176.5210	(45)					
Energy content(annual)													1758.0516	(45)					
Distribution loss	27.3409	23.9125	24.6755	21.5127	20.6420	17.8125	16.5059	18.9407	19.1669	22.3372	24.3828		26.4782	(46)					
Cylinder volume													160.0000	(47)					
Cylinder loss factor (kWh/litre/day)													0.0115	(51)					
Volume factor													0.9086	(52)					
Temperature factor													0.6000	(53)					
Energy lost from cylinder in kWh/day													1.0072	(55)					
Total storage loss	31.2233	28.2017	31.2233	30.2161	31.2233	30.2161	31.2233	31.2233	30.2161	31.2233	30.2161		31.2233	(56)					
Net storage loss	31.2233	28.2017	31.2233	30.2161	31.2233	30.2161	31.2233	31.2233	30.2161	31.2233	30.2161		31.2233	(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	278.0749	245.9479	260.3061	236.1303	233.4157	190.8819	184.5756	200.8080	199.9117	244.7173	255.2642		272.3236	(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	(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	278.0749	245.9479	260.3061	236.1303	233.4157	190.8819	184.5756	200.8080	199.9117	244.7173	255.2642		272.3236	(64)					
Output from water heater(annual)													2802.3570	(64)					
Heat gains (kWh)	137.2476	122.2311	131.3395	121.8563	122.3984	97.1900	96.2172	101.6145	100.1924	126.1562	128.2183		135.3353	(65)					

5. Internal gains

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Metabolic	181.7678	181.7678	181.7678	181.7678	181.7678	181.7678	181.7678	181.7678	181.7678	181.7678	181.7678		181.7678	(66)
Lighting	91.6735	81.4236	66.2181	50.1314	37.4738	31.6369	34.1848	44.4347	59.6402	75.7270	88.3845		94.2214	(67)
Appliances	583.2163	589.2683	574.0175	541.5505	500.5667	462.0477	436.3147	430.2627	445.5135	477.9805	518.9643		557.4833	(68)
Cooking	56.2062	56.2062	56.2062	56.2062	56.2062	56.2062	56.2062	56.2062	56.2062	56.2062	56.2062		56.2062	(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	-121.1785	-121.1785	-121.1785	-121.1785	-121.1785	-121.1785	-121.1785	-121.1785	-121.1785	-121.1785	-121.1785		-121.1785	(71)
Water heating	184.4725	181.8914	176.5315	169.2448	164.5140	134.9861	129.3242	136.5786	139.1561	169.5647	178.0809		181.9022	(72)
Total internal	986.1579	979.3788	943.5627	887.7222	829.3500	755.4663	726.6192	738.0716	771.1053	850.0677	912.2253		960.4024	(73)

6. Solar gains

(calculation for January)

Orientation Area Gains[W]

East/West(1)(main)	0.0000	0.0000	(76)
East/West(2)(main)	21.5200	155.8240	(76)
East/West(1)(extn 1)	0.0000	0.0000	(76)
East/West(2)(extn 1)	5.7700	41.7800	(76)
East/West(1)(extn 2)	0.0000	0.0000	(76)
East/West(2)(extn 2)	6.5700	47.5727	(76)
total:		245.1767	(83-1)

Solar gains	245.1767	479.6176	789.8618	1151.9664	1411.7780	1445.2060	1375.8951	1181.8735	918.6420	569.1067	305.7065	.....20
Total gains	1231.3345	1458.9964	1733.4245	2039.6886	2241.1280	2200.6723	2102.5143	1919.9451	1689.7473	1419.1744	1217.9317	.....11

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	28.7757	28.9118	29.0465	29.6963	29.8211	30.4162
30.4162	30.5290	30.1842	29.8211																
alpha	2.9184	2.9275	2.9364	2.9798	2.9881	3.0277	3.0277	3.0353	3.0123	2.9881	2.9713							29.5697	29.3
external Temp	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000								
util living area	0.9973	0.9953	0.9901	0.9759	0.9422	0.8734	0.7721	0.8175	0.9395	0.9860	0.9958								
MIT 1	18.3469	18.5447	18.9388	19.5102	20.0637	20.5390	20.7893	20.7375	20.3247	19.6167	18.9062								
th2								(88) util rest		0.9963	0.9934	0.9857	0.9632	0.9048	0.7678	0.5502	0.6		
0.9937																			
MIT 2	15.7058	15.9981	16.5763	17.4199	18.2039	18.8375	19.0834	19.0552	18.5867	17.5852	16.5440								
Living area fraction =																		0.1300	
MIT	16.0491	16.3291	16.8834	17.6916	18.4456	19.0587	19.3052	19.2738	18.8126	17.8492	16.8511								
Temperature adjustment		0.0000																	
adjusted MIT	16.0491	16.3291	16.8834	17.6916	18.4456	19.0587	19.3052	19.2738	18.8126	17.8492	16.8511								

8. Space heating requirement

[illegible]

8c. Space cooling requirement

- not applicable

9. Energy requirements

Fraction of space heat from secondary	0.1000
Fraction of space heat from main system	0.9000
Fraction of total space heat from main system 1	0.9000
Efficiency of main heating system 1	89.7000
Efficiency of secondary heating system.....	72.0000
Space heating requirement	21059.0312

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Space heating requirement			
3756.1580	3111.3252	2825.6242	1882.9171	1110.8875	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1759.2246	2779.6596	3763.0383	(98) Space heating efficiency (main heating system)
89.7000	89.7000	89.7000	89.7000	89.7000	89.7000	0.0000	0.0000	0.0000	0.0000	0.0000	89.7000	89.7000	89.7000	(210) Space heating fuel (main heating system)	
3768.7204	3121.7309	2835.0744	1889.2145	1114.6028	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1765.1083	2788.9561	3775.6237	(211) Space heating fuel (secondary heating system)
521.6886	432.1285	392.4478	261.5163	154.2899	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	244.3368	386.0638	522.6442	(215) Water heating requirement
278.0749	245.9479	260.3061	236.1303	233.4157	190.8819	184.5756	200.8080	199.9117	244.7173	255.2642	272.3236	(64) Efficiency of water heater	88.7860	88.7860	88.7860
88.7860	88.7297	88.5859	88.2384	87.4579	79.0000	79.0000	79.0000	79.0000	79.0000	88.1025	88.5890	88.8048	(217) Water heating fuel		
313.1967	277.1878	293.8460	267.6051	266.8891	241.6226	233.6400	254.1873	253.0527	277.7641	288.1442	306.6540	(219) Space cooling fuel	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	21059.0312
Space heating fuel - secondary	2915.1159
Water heating fuel	3273.7898
central heating pump	120.0000
boiler flue fan	45.0000
Electricity for pumps and fans	165.0000
Electricity for lighting	647.5930
PV generation	1727.2394
Total delivered energy for all uses	26333.2906

10. Fuel costs

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system		21059.0312	3.4800	732.8543
Space heating - secondary		2915.1159	3.4800	101.4460
Water heating	3273.7898		3.4800	113.9279
Pumps and fans for heating		0.0000	165.0000	21.7635
Electricity for lighting	647.5930		13.1900	85.4175
Additional standing charges				120.0000
Electricity generated - PVs	-1727.2394		13.1900	227.8229
Total energy cost				947.5863

11. SAP rating			
Energy cost deflator.....	0.4200		(256)
Energy cost factor (ECF).....	1.4952		(257)
SAP value	79.1423		
SAP rating	79	(258) SAP BAND C	

12. Carbon dioxide emissions

	Energy kWh/year	Emission factor	Emissions kg/year	
Space heating - main system		21059.0312	0.2160.....	4548.7507 (261)
Space heating - secondary		2915.1159	0.2160.....	629.6650 (263)
Water heating	3273.7898		0.2160.....	707.1386 (264)
Space and water heating				5885.5544 (265)
Pumps and fans	0.5190	165.0000.....		85.6350 (267)
Energy for lighting	647.5930	0.5190.....		336.1008 (268)
Electricity generated - PVs	-1727.2394	0.5190.....		896.4372 (269)
Total kg/year.....				5410.8529 (272)
		kg/m2/year		
CO2 emissions per m2				24.46 (273)
EI value	72.7608			
EI rating	73	(274) EI band C		