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

Calculated by Lambda Calculation Engine SAP Engine version v94.0.1.1

RRN: 9029-5231-1520-0875-0954
Address: CS15 Baseline;

1. Overall dwelling dimensions

First floor(main)	52.37	2.69		140.8753	(1c)- (3c)
Second floor(main)	53.56	2.81		150.5036	(1d)- (3d)
Room(s)-in-roof	54.4	2.45	133.28		
Total floor area	160.3300				(4)
Dwelling volume (m³)				424.6589	(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	0.0942	(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	45	(14)
Window infiltration	0.1600	(15)
Infiltration rate	0.8542	(18)
Number of sides sheltered	2	(19)
Shelter factor	0.8500	(20)
Infiltration rate incorporating shelter factor	0.7261	(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	0.9257	0.9076	0.8894	0.7987	0.7805	0.6898	0.6898	0.6716	0.7261	0.7805	0.8168	0.8531	(22b)
Effective ach	0.9285	0.9119	0.8955	0.8189	0.8046	0.7379	0.7379	0.7255	0.7636	0.8046	0.8336	0.8639	(25)

3. Heat losses and heat loss parameter

Element	Net	U-value	A x U	K-value	A x K	
Element						(Main)
Doors	3.7000	3.0000	11.1000			(26)
Windows(1)	14.5400	4.0268	58.5503			(27)
Windows(2)	11.9000	2.7580	32.8203			(27)
Ground Floor	0.0000	0.0000	0.0000			(28a)
Exposed Floor	0.0000	0.0000	64.2720			(28b)
Walls	92.3400	1.9800	182.8332			(29a)
Roof	0.0000	0.4000	0.0000			(30)
Roofroom flat ceiling	54.4000	0.4000	21.7600			(30a)
Roofroom walls	66.2400	0.4000	26.4960			(30e)
Total area of elements (whole dwelling)	296.6800					(31)
Party wall (main)	38.8000	0.2500	9.7000			(32)
Fabric heat loss			407.5318			(33)
Thermal mass parameter			250.0000			(35)
Thermal bridges (0.15 × total area)			44.5020			
(36)						
Total fabric heat loss			452.0338			(37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Vent loss	130.1162	127.7845	125.4989	114.7638	112.7553	103.4053	103.4053	101.6739	107.0068	112.7553	116.8185	121.0664	(38)
Heat transfer coeff	582.1500	579.8183	577.5327	566.7976	564.7891	555.4392	555.4392	553.7077	559.0406	564.7891	568.8523	573.1002	(39)
Heat transfer coeff (average)											566.7880		(39)
HLP	3.6309	3.6164	3.6022	3.5352	3.5227	3.4643	3.4643	3.4536	3.4868	3.5227	3.5480	3.5745	(40)
HLP (average)											3.5351		(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											2.9494		(42)
Average daily hot water use (litres/day)											109.7342		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	120.7076	116.3183	111.9289	107.5395	103.1502	98.7608	98.7608	103.1502	107.5395	111.9289	116.3183	120.7076	(44)
Energy content	179.0060	156.5598	161.5556	140.8481	135.1471	116.6217	108.0671	124.0086	125.4897	146.2461	159.6391	173.3577	(45)
Energy content(annual)											1726.5467		(45)
Distribution loss	26.8509	23.4840	24.2333	21.1272	20.2721	17.4933	16.2101	18.6013	18.8235	21.9369	23.9459	26.0037	(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	48.7040	50.3274	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total	229.9649	202.5871	212.5145	190.1632	186.1060	165.3257	158.3946	174.9675	174.8048	197.2050	208.9542	224.3166	(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	229.9649	202.5871	212.5145	190.1632	186.1060	165.3257	158.3946	174.9675	174.8048	197.2050	208.9542	224.3166	(64)
Output from water heater(annual)											2325.3041		(64)
Heat gains (kWh)	72.2592	63.5630	66.4570	59.1608	57.6761	50.9527	48.5142	53.9726	54.0541	61.3666	65.4088	70.3812	(65)

5. Internal gains

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic	176.9621	176.9621	176.9621	176.9621	176.9621	176.9621	176.9621	176.9621	176.9621	176.9621	176.9621	176.9621	(66)
Lighting	109.3939	97.1627	79.0180	59.8217	44.7174	37.7523	40.7927	53.0239	71.1686	90.3649	105.4692	112.4343	(67)
Appliances	494.8516	499.9866	487.0465	459.4987	424.7244	392.0416	370.2074	365.0724	378.0125	405.5603	440.3345	473.0174	(68)
Cooking	55.6456	55.6456	55.6456	55.6456	55.6456	55.6456	55.6456	55.6456	55.6456	55.6456	55.6456	55.6456	(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	-117.9748	-117.9748	-117.9748	-117.9748	-117.9748	-117.9748	-117.9748	-117.9748	-117.9748	-117.9748	-117.9748	-117.9748	(71)
Water heating	97.1226	94.5877	89.3239	82.1677	77.5217	70.7676	65.2072	72.5438	75.0751	82.4819	90.8455	94.5983	(72)
Total internal	826.0010	816.3700	780.0214	726.1211	671.5965	625.1945	600.8403	615.2731	648.8892	703.0401	761.2822	804.6830	(73)

6. Solar gains

(calculation for January)

Orientation	Area	Gains[W]	
East/West(1)(main)	14.5400	117.7503	(76)
East/West(2)(main)	11.9000	86.1666	(76)
	total:	203.9169	(83-1)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	203.9169	398.9047	656.9393	958.1068	1174.1958	1201.9984	1144.3514	982.9810	764.0476	473.3341	254.2604	167.6913	(83)
Total gains	1029.9179	1215.2747	1436.9607	1684.2278	1845.7923	1827.1929	1745.1918	1598.2541	1412.9367	1176.3742	1015.5426	972.3744	(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	19.1257	19.2026	19.2786	19.6437	19.7136	20.0454	20.0454	20.1081	19.9163	19.7136	19.5728	19.4277	
alpha	2.2750	2.2802	2.2852	2.3096	2.3142	2.3364	2.3364	2.3405	2.3278	2.3142	2.3049	2.2952	
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	0.9946	0.9917	0.9852	0.9703	0.9405	0.8849	0.8071	0.8414	0.9366	0.9806	0.9923	0.9953	(86)
MIT 1	17.4909	17.7140	18.1824	18.8667	19.5617	20.2014	20.5734	20.5039	19.9588	19.0693	18.1872	17.4811	(87)
th2													(88)
util rest	0.9923	0.9880	0.9780	0.9531	0.8958	0.7602	0.5209	0.5909	0.8623	0.9660	0.9882	0.9934	(89)
MIT 2	15.5524	15.7777	16.2469	16.9383	17.6142	18.2073	18.4673	18.4410	18.0102	17.1487	16.2661	15.5550	(90)
Living area fraction =											0.1600		(91)
MIT	15.8626	16.0875	16.5565	17.2468	17.9258	18.5264	18.8043	18.7710	18.3219	17.4559	16.5734	15.8631	(92)
Temperature adjustment											0.0000		
adjusted MIT	15.8626	16.0875	16.5565	17.2468	17.9258	18.5264	18.8043	18.7710	18.3219	17.4559	16.5734	15.8631	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9881	0.9821	0.9688	0.9387	0.8788	0.7594	0.5697	0.6293	0.8515	0.9549	0.9826	0.9897	(94)
Useful gains W	1017.7057	1193.5035	1392.0591	1581.0002	1622.0321	1387.6269	994.1656	1005.7145	1203.1172	1123.3677	997.8745	962.4028	(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	6731.1489	6486.7169	5807.9625	4730.9650	3516.2581	2180.8540	1224.3323	1312.8578	2360.2342	3872.1559	5388.9713	6684.1414	(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	4250.8018	3557.0394	3285.4322	2267.9746	1409.3041	0.0000	0.0000	0.0000	0.0000	2045.0984	3161.5897	4256.9735	(98)
Space heating											24234.2137		(98)
Space heating per m2											151.1521		(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	26837.4460	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	4250.8018	3557.0394	3285.4322	2267.9746	1409.3041	0.0000	0.0000	0.0000	0.0000	2045.0984	3161.5897	4256.9735	(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)													
	4707.4217	3939.1356	3638.3524	2511.5998	1560.6912	0.0000	0.0000	0.0000	0.0000	2264.7823	3501.2067	4714.2564	(211)
Water heating requirement													
	229.9649	202.5871	212.5145	190.1632	186.1060	165.3257	158.3946	174.9675	174.8048	197.2050	208.9542	224.3166	(64)
Efficiency of water heater											89.7201		(216)
	89.7201	89.6914	89.6144	89.4287	88.9927	80.2000	80.2000	80.2000	80.2000	89.3108	89.6005	89.7343	(217)
Water heating fuel													
	256.3136	225.8714	237.1434	212.6421	209.1252	206.1417	197.4995	218.1640	217.9610	220.8075	233.2065	249.9786	(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	26837.4460	(211)
Water heating fuel	2684.8547	(219)
central heating pump	120.0000	(230c)
boiler flue fan	45.0000	(230e)
Electricity for pumps and fans	165.0000	(231)
Electricity for lighting	772.7722	(232)
Total delivered energy for all uses	30460.0729	(238)

10. Fuel costs

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system	26837.4460	3.4800	933.9431	(240)
Water heating	2684.8547	3.4800	93.4329	(247)
Pumps and fans for heating	0.0000	165.0000	21.7635	(249)
Electricity for lighting	772.7722	13.1900	101.9287	(250)
Additional standing charges			120.0000	(251)
Total energy cost			1271.0682	(255)

11. SAP rating

Energy cost deflator	0.4200	(256)
Energy cost factor (ECF)	2.6000	(257)
SAP value	63.7306	
SAP rating	64	(258)
SAP BAND	D	

12. Carbon dioxide emissions

	Energy kWh/year	Emission factor	Emissions kg/year	
Space heating - main system	26837.4460	0.2160	5796.8883	(261)
Water heating	2684.8547	0.2160	579.9286	(264)
Space and water heating			6376.8169	(265)
Pumps and fans	0.5190	165.0000	85.6350	(267)
Energy for lighting	772.7722	0.5190	401.0688	(268)
Total kg/year			6863.5207	(272)
			kg/m2/year	
CO2 emissions per m2			42.81	(273)
EI value			55.2110	
EI rating			55	(274)
EI band			D	

1. Overall dwelling dimensions

First floor(main)	52.37	2.69	140.8753	(1c)-	(3c)
Second floor(main)	53.56	2.81	150.5036	(1d)-	(3d)
Room(s)-in-roof	54.4	2.45	133.28		
Total floor area	160.3300				(4)
Dwelling volume (m³)			424.6589		(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)
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Infiltration due to chimneys, flues and fans	0.0942	(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	0.7442	(18)
Number of sides sheltered	2	(19)
Shelter factor	0.8500	(20)
Infiltration rate incorporating shelter factor	0.6326	(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	0.8065	0.7907	0.7749	0.6958	0.6800	0.6009	0.6009	0.5851	0.6326	0.6800	0.7116	0.7433	(22b)
Effective ach	0.8252	0.8126	0.8002	0.7421	0.7312	0.6806	0.6806	0.6712	0.7001	0.7312	0.7532	0.7762	(25)

3. Heat losses and heat loss parameter

Element	Net	U-value	A x U	K-value	A x K	
Element						(Main)
Doors	3.7000	3.0000	11.1000			(26)
Windows	11.9000	2.7580	32.8203			(27)
Windows	14.5400	1.5038	21.8647			(27)
Ground Floor	0.0000	0.0000	0.0000			(28a)

Exposed Floor	0.0000	0.0000	64.2720	(28b)
Walls	92.3400	0.3000	27.7020	(29a)
Roof	0.0000	0.4000	0.0000	(30)
Roofroom flat ceiling	54.4000	0.4000	21.7600	(30a)
Roofroom walls	66.2400	0.4000	26.4960	(30e)

Total area of elements (whole dwelling)	296.6800			(31)
Party wall (main)	38.8000	0.2500	9.7000	(32)
Fabric heat loss			215.7149	(33)
Thermal mass parameter			250.0000	(35)
Thermal bridges (0.15 × total area)			44.5020	
(36)				
Total fabric heat loss			260.2169	(37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Vent loss	115.6466	113.8767	112.1419	103.9936	102.4691	95.3722	95.3722	94.0580	98.1058	102.4691	105.5532	108.7775	(38)
Heat transfer coeff	375.8635	374.0937	372.3589	364.2106	362.6861	355.5892	355.5892	354.2749	358.3228	362.6861	365.7702	368.9944	(39)
Heat transfer coeff (average)											364.2033		(39)
HLP	2.3443	2.3333	2.3225	2.2716	2.2621	2.2179	2.2179	2.2097	2.2349	2.2621	2.2814	2.3015	(40)
HLP (average)											2.2716		(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			2.9494	(42)
Average daily hot water use (litres/day)			109.7342	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	120.7076	116.3183	111.9289	107.5395	103.1502	98.7608	98.7608	103.1502	107.5395	111.9289	116.3183	120.7076	(44)
Energy content	179.0060	156.5598	161.5556	140.8481	135.1471	116.6217	108.0671	124.0086	125.4897	146.2461	159.6391	173.3577	(45)
Energy content(annual)											1726.5467		(45)
Distribution loss	26.8509	23.4840	24.2333	21.1272	20.2721	17.4933	16.2101	18.6013	18.8235	21.9369	23.9459	26.0037	(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	48.7040	50.3274	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total	229.9649	202.5871	212.5145	190.1632	186.1060	165.3257	158.3946	174.9675	174.8048	197.2050	208.9542	224.3166	(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	229.9649	202.5871	212.5145	190.1632	186.1060	165.3257	158.3946	174.9675	174.8048	197.2050	208.9542	224.3166	(64)
Output from water heater(annual)											2325.3041		(64)
Heat gains (kWh)	72.2592	63.5630	66.4570	59.1608	57.6761	50.9527	48.5142	53.9726	54.0541	61.3666	65.4088	70.3812	(65)

5. Internal gains

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic	176.9621	176.9621	176.9621	176.9621	176.9621	176.9621	176.9621	176.9621	176.9621	176.9621	176.9621	176.9621	(66)
Lighting	76.6433	68.0739	55.3614	41.9121	31.3298	26.4500	28.5801	37.1495	49.8620	63.3112	73.8936	78.7734	(67)
Appliances	494.8516	499.9866	487.0465	459.4987	424.7244	392.0416	370.2074	365.0724	378.0125	405.5603	440.3345	473.0174	(68)
Cooking	55.6456	55.6456	55.6456	55.6456	55.6456	55.6456	55.6456	55.6456	55.6456	55.6456	55.6456	55.6456	(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	-117.9748	-117.9748	-117.9748	-117.9748	-117.9748	-117.9748	-117.9748	-117.9748	-117.9748	-117.9748	-117.9748	-117.9748	(71)
Water heating	97.1226	94.5877	89.3239	82.1677	77.5217	70.7676	65.2072	72.5438	75.0751	82.4819	90.8455	94.5983	(72)
Total internal	793.2504	787.2812	756.3648	708.2115	658.2089	613.8921	588.6277	599.3987	627.5825	675.9865	729.7066	771.0221	(73)

6. Solar gains

(calculation for January)

Orientation	Area	Gains[W]	
East	14.5400	87.2737	(76)
East	11.9000	86.1666	(76)
	total:	173.4403	(83-1)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	173.4404	339.2862	558.7560	814.9123	998.7056	1022.3529	973.3216	836.0689	649.8563	402.5916	216.2598	142.6289	(83)
Total gains	966.6908	1126.5673	1315.1208	1523.1238	1656.9145	1636.2450	1561.9493	1435.4676	1277.4388	1078.5781	945.9663	913.6511	(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	29.6225	29.7627	29.9013	30.5703	30.6988	31.3115	31.3115	31.4276	31.0726	30.6988	30.4400	30.1740	
alpha	2.9748	2.9842	2.9934	3.0380	3.0466	3.0874	3.0874	3.0952	3.0715	3.0466	3.0293	3.0116	
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	0.9968	0.9945	0.9889	0.9737	0.9382	0.8629	0.7560	0.8015	0.9318	0.9842	0.9950	0.9973	(86)
MIT 1	18.4437	18.6375	19.0216	19.5778	20.1142	20.5764	20.8118	20.7647	20.3729	19.6797	18.9878	18.4395	(87)
th2													(88)
util rest	0.9955	0.9923	0.9840	0.9602	0.8992	0.7546	0.5364	0.6034	0.8684	0.9736	0.9926	0.9963	(89)
MIT 2	16.8979	17.0955	17.4822	18.0524	18.5714	18.9968	19.1509	19.1359	18.8334	18.1628	17.4673	16.9113	(90)
Living area fraction =											0.1600		(91)
MIT	17.1452	17.3422	17.7285	18.2965	18.8182	19.2495	19.4166	19.3965	19.0797	18.4055	17.7106	17.1558	(92)
Temperature adjustment											0.0000		
adjusted MIT	17.1452	17.3422	17.7285	18.2965	18.8182	19.2495	19.4166	19.3965	19.0797	18.4055	17.7106	17.1558	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9933	0.9890	0.9783	0.9507	0.8888	0.7593	0.5716	0.6328	0.8631	0.9666	0.9895	0.9945	(94)
Useful gains W	960.2177	1114.1416	1286.5709	1448.0109	1472.5892	1242.3205	892.7395	908.3892	1102.5702	1042.5518	935.9933	908.5836	(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	4828.0323	4654.5453	4181.0163	3422.2919	2581.6804	1653.3056	1001.5681	1061.5868	1784.3323	2830.9463	3881.0246	4780.6252	(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	2877.6541	2379.1513	2153.4674	1421.4823	825.1639	0.0000	0.0000	0.0000	0.0000	1330.5655	2120.4225	2880.7989	(98)
Space heating											15988.7059		(98)
Space heating per m2											99.7237		(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	17706.2081	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	2877.6541	2379.1513	2153.4674	1421.4823	825.1639	0.0000	0.0000	0.0000	0.0000	1330.5655	2120.4225	2880.7989	(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)													
	3186.7709	2634.7190	2384.7923	1574.1775	913.8028	0.0000	0.0000	0.0000	0.0000	1473.4945	2348.1977	3190.2535	(211)
Water heating requirement													
	229.9649	202.5871	212.5145	190.1632	186.1060	165.3257	158.3946	174.9675	174.8048	197.2050	208.9542	224.3166	(64)
Efficiency of water heater											89.4662		(216)
	89.4662	89.4164	89.2900	88.9778	88.2546	80.2000	80.2000	80.2000	80.2000	88.8556	89.2913	89.4859	(217)
Water heating fuel													
	257.0409	226.5660	238.0049	213.7197	210.8740	206.1417	197.4995	218.1640	217.9610	221.9388	234.0140	250.6726	(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	17706.2081	(211)
Water heating fuel	2692.5973	(219)
central heating pump	120.0000	(230c)
boiler flue fan	45.0000	(230e)
Electricity for pumps and fans	165.0000	(231)
Electricity for lighting	541.4177	(232)
PV generation	-1727.2394	(233)
Total delivered energy for all uses	19377.9838	(238)

10. Fuel costs

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system	17706.2081	3.4800	616.1760	(240)
Water heating	2692.5973	3.4800	93.7024	(247)
Pumps and fans for heating	0.0000	165.0000	21.7635	(249)
Electricity for lighting	541.4177	13.1900	71.4130	(250)
Additional standing charges			120.0000	(251)
Electricity generated - PVs	-1727.2394	13.1900	-227.8229	(252)
Total energy cost			695.2321	(255)

11. SAP rating

Energy cost deflator	0.4200	(256)
Energy cost factor (ECF)	1.4221	(257)
SAP value	80.1619	
SAP rating	80	(258)
SAP BAND	C	

12. Carbon dioxide emissions

	Energy kWh/year	Emission factor	Emissions kg/year	
Space heating - main system	17706.2081	0.2160	3824.5410	(261)
Water heating	2692.5973	0.2160	581.6010	(264)
Space and water heating			4406.1420	(265)
Pumps and fans	0.5190	165.0000	85.6350	(267)
Energy for lighting	541.4177	0.5190	280.9958	(268)
Electricity generated - PVs	-1727.2394	0.5190	-896.4372	(269)
Total kg/year			3876.3356	(272)
			kg/m2/year	
CO2 emissions per m2			24.18	(273)
EI value			74.7027	
EI rating			75	(274)
EI band			C	