

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	P1 Riley			Issued on Date	12/09/2022
Assessment Reference	P1 Riley	Prop Type Ref			
Property	Plot 1, Riley Road, Reading				
SAP Rating	88 B	DER	13.27	TER	16.58
Environmental	89 B	% DER<TER	19.95		
CO ₂ Emissions (t/year)	1.00	DFEE	45.30	TFEE	50.13
General Requirements Compliance	Pass	% DFEE<TFEE	9.63		
Assessor Details	Mr. Alan Ironmonger, Forum Energy Consultants, Tel: 01303 260656, forumenergy@btinternet.com			Assessor ID	L609-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Semi-Detached House, total floor area 99 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 16.58 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 13.27 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 50.1 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE) 45.3 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.20 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.27 (max. 2.00)	1.30 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 5.00 (design value)

Maximum 10.0 OK

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas

Data from manufacturer

X X

Efficiency: 90%

Minimum: 88% OK

Secondary heating system:

None

5 Cylinder insulation

Hot water storage Nominal cylinder loss: 2.01 kWh/day

Permitted by DBSCG 2.56 OK

Primary pipework insulated: Yes OK

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls:

Cylinderstat OK

Independent timer for DHW OK

Boiler interlock

Yes OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%

Minimum 75% OK

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames Valley): Slight OK

Based on:

Overshading: Average

Windows facing South East: 5.90 m², Overhang width less than twice window, ratio 0.05

Windows facing South West: 9.63 m², Overhang width less than twice window, ratio 0.05

Windows facing North West: 5.21 m², Overhang width less than twice window, ratio 0.05

Air change rate: 4.00 ach

Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K

Roof U-value 0.10 W/m²K

Floor U-value 0.11 W/m²K

Door U-value 1.00 W/m²K

Photovoltaic array 1.00 kW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	49.7000 (1b)	x 2.3800 (2b)	= 118.2860 (1b) - (3b)
First floor	49.7000 (1c)	x 2.5900 (2c)	= 128.7230 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	99.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 247.0090 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) = 0.1619 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4119 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3810 (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	0.4858	0.4763	0.4668	0.4191	0.4096	0.3620	0.3620	0.3525	0.3810	0.4096	0.4287	0.4477 (22b)
Effective ac	0.6180	0.6134	0.6089	0.5878	0.5839	0.5655	0.5655	0.5621	0.5726	0.5839	0.5919	0.6002 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
windows (Uw = 1.30)			20.7400	1.2357	25.6293		(27)
pers door			2.0000	1.0000	2.0000		(26a)
Heat Loss Floor 1			49.7000	0.1100	5.4670	75.0000	3727.5000 (28a)
render	105.1600	22.7400	82.4200	0.2000	16.4840	70.0000	5769.4000 (29a)
External Roof 1	49.7000		49.7000	0.1000	4.9700	9.0000	447.3000 (30)
Total net area of external elements Aum(A, m ²)			204.5600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	54.5503		(33)
Party Wall 1			46.6100	0.0000	0.0000	180.0000	8389.8000 (32)
Internal Wall 1			35.0000			9.0000	315.0000 (32c)
Internal Wall 2			35.0000			100.0000	3500.0000 (32c)
Internal Floor 1			49.7000			18.0000	894.6000 (32d)
Internal Ceiling 1			49.7000			18.0000	894.6000 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 50.3762	Feb 50.0027	Mar 49.6365	Apr 47.9167	May 47.5950	Jun 46.0971	Jul 46.0971	Aug 45.8197	Sep 46.6740	Oct 47.5950	Nov 48.2459	Dec 48.9264 (38)
Heat transfer coeff	125.2468	124.8733	124.5071	122.7873	122.4655	120.9677	120.9677	120.6903	121.5446	122.4655	123.1165	123.7970 (39)
Average = Sum(39)m / 12 =												122.7858 (39)
HLP	Jan 1.2600	Feb 1.2563	Mar 1.2526	Apr 1.2353	May 1.2320	Jun 1.2170	Jul 1.2170	Aug 1.2142	Sep 1.2228	Oct 1.2320	Nov 1.2386	Dec 1.2454 (40)
HLP (average)												1.2353 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7339 (42)
Average daily hot water use (litres/day)												99.1302 (43)
Daily hot water use	Jan 109.0432	Feb 105.0780	Mar 101.1128	Apr 97.1476	May 93.1824	Jun 89.2171	Jul 89.2171	Aug 93.1824	Sep 97.1476	Oct 101.1128	Nov 105.0780	Dec 109.0432 (44)
Energy conte	161.7079	141.4308	145.9439	127.2374	122.0873	105.3521	97.6242	112.0252	113.3631	132.1138	144.2125	156.6055 (45)
Energy content (annual)										Total = Sum(45)m =		1559.7035 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	24.2562	21.2146	21.8916	19.0856	18.3131	15.8028	14.6436	16.8038	17.0045	19.8171	21.6319	23.4908 (46)
Water storage loss:												
Store volume												250.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0103 (51)
Volume factor from Table 2a												0.7830 (52)
Temperature factor from Table 2b												0.5400 (53)
Enter (49) or (54) in (55)												1.0875 (55)
Total storage loss	33.7127	30.4501	33.7127	32.6252	33.7127	32.6252	33.7127	33.7127	32.6252	33.7127	32.6252	33.7127 (56)
If cylinder contains dedicated solar storage	33.7127	30.4501	33.7127	32.6252	33.7127	32.6252	33.7127	33.7127	32.6252	33.7127	32.6252	33.7127 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	218.6829	192.8921	202.9189	182.3746	179.0624	160.4892	154.5992	169.0002	168.5003	189.0888	199.3497	213.5805 (62)
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) = Sum(63)m =												0.0000 (63)
Output from w/h	218.6829	192.8921	202.9189	182.3746	179.0624	160.4892	154.5992	169.0002	168.5003	189.0888	199.3497	213.5805 (64)
Total per year (kWh/year) = Sum(64)m =												2230.5388 (64)
Heat gains from water heating, kWh/month	99.3479	88.1948	94.1064	86.4162	86.1741	79.1393	78.0401	82.8284	81.8030	89.5079	92.0604	97.6514 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.6951	136.6951	136.6951	136.6951	136.6951	136.6951	136.6951	136.6951	136.6951	136.6951	136.6951	136.6951	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.8381	20.2846	16.4966	12.4890	9.3356	7.8815	8.5163	11.0698	14.8578	18.8654	22.0188	23.4729	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	255.3541	258.0039	251.3265	237.1113	219.1670	202.3019	191.0350	188.3853	195.0626	209.2779	227.2222	244.0872	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.6695	36.6695	36.6695	36.6695	36.6695	36.6695	36.6695	36.6695	36.6695	36.6695	36.6695	36.6695	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-109.3561	-109.3561	-109.3561	-109.3561	-109.3561	-109.3561	-109.3561	-109.3561	-109.3561	-109.3561	-109.3561	-109.3561	(71)
Water heating gains (Table 5)	133.5321	131.2423	126.4871	120.0224	115.8254	109.9157	104.8926	111.3285	113.6152	120.3063	127.8616	131.2518	(72)
Total internal gains	478.7329	476.5393	461.3187	436.6312	411.3365	387.1077	371.4524	377.7921	390.5442	415.4582	444.1111	465.8204	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
Southeast				5.9000	36.7938		0.7200		0.7000		0.7700		75.8212 (77)
Southwest				9.6300	36.7938		0.7200		0.7000		0.7700		123.7557 (79)
Northwest				5.2100	11.2829		0.7200		0.7000		0.7700		20.5316 (81)
Solar gains	220.1085	381.7461	540.4362	699.9894	811.7602	818.0803	783.6437	698.3940	595.3980	426.7949	264.8812	187.5634	(83)
Total gains	698.8415	858.2853	1001.7549	1136.6206	1223.0967	1205.1880	1155.0961	1076.1860	985.9422	842.2530	708.9923	653.3838	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	53.0912	53.2500	53.4066	54.1546	54.2969	54.9692	54.9692	55.0956	54.7083	54.2969	54.0098	53.7129	
alpha	4.5394	4.5500	4.5604	4.6103	4.6198	4.6646	4.6646	4.6730	4.6472	4.6198	4.6007	4.5809	
util living area	0.9954	0.9880	0.9685	0.9121	0.7916	0.6106	0.4540	0.5043	0.7506	0.9444	0.9898	0.9966	(86)
MIT	19.6691	19.8909	20.2027	20.5700	20.8363	20.9632	20.9925	20.9880	20.9053	20.5417	20.0337	19.6343	(87)
Th 2	19.8723	19.8752	19.8782	19.8919	19.8944	19.9064	19.9064	19.9087	19.9018	19.8944	19.8892	19.8838	(88)
util rest of house	0.9939	0.9841	0.9583	0.8844	0.7325	0.5191	0.3447	0.3904	0.6647	0.9207	0.9858	0.9955	(89)
MIT 2	18.1187	18.4425	18.8914	19.4088	19.7434	19.8834	19.9038	19.9040	19.8318	19.3853	18.6617	18.0760	(90)
Living area fraction									fLA = Living area / (4) =			0.2225	(91)
MIT	18.4637	18.7648	19.1832	19.6672	19.9866	20.1237	20.1461	20.1452	20.0707	19.6426	18.9670	18.4228	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.3137	18.6148	19.0332	19.5172	19.8366	19.9737	19.9961	19.9952	19.9207	19.4926	18.8170	18.2728	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9907	0.9780	0.9482	0.8731	0.7291	0.5250	0.3538	0.3997	0.6664	0.9095	0.9803	0.9930	(94)
Useful gains	692.3699	839.4072	949.8230	992.3924	891.7018	632.7086	408.6797	430.1753	656.9919	766.0408	695.0002	648.7944	(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	1755.1758	1712.6178	1560.4762	1303.6529	996.4547	650.0475	410.8164	433.9104	707.4734	1089.0409	1442.5616	1742.1688	(97)
Month fracti	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	790.7276	586.7976	454.3260	224.1075	77.9361	0.0000	0.0000	0.0000	0.0000	240.3120	538.2442	813.4705	(98)
Space heating												3725.9216	(98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Space heating per m2 (98) / (4) = 37.4841 (99)

8c. Space cooling requirement

Not applicable

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.0000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													4139.9129 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	790.7276	586.7976	454.3260	224.1075	77.9361	0.0000	0.0000	0.0000	0.0000	240.3120	538.2442	813.4705	(98)
Space heating efficiency (main heating system 1)	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)	878.5862	651.9973	504.8067	249.0083	86.5957	0.0000	0.0000	0.0000	0.0000	267.0134	598.0491	903.8562	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	218.6829	192.8921	202.9189	182.3746	179.0624	160.4892	154.5992	169.0002	168.5003	189.0888	199.3497	213.5805	(64)
Efficiency of water heater (217)m	90.0000	90.0000	90.0000	90.0000	90.0000	90.0000	90.0000	90.0000	90.0000	90.0000	90.0000	90.0000	(216)
Fuel for water heating, kWh/month	242.9810	214.3245	225.4655	202.6384	198.9582	178.3214	171.7769	187.7780	187.2225	210.0987	221.4996	237.3117	(219)
Water heating fuel used													(219)
Annual totals kWh/year													
Space heating fuel - main system													4139.9129 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													75.0000 (231)
Electricity for lighting (calculated in Appendix L)													403.3283 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.00 * 1080 * 0.80) =									-690.8958				-690.8958 (233)
Total delivered energy for all uses													6405.7219 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	4139.9129	0.2160	894.2212 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2478.3765	0.2160	535.3293 (264)
Space and water heating			1429.5505 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	403.3283	0.5190	209.3274 (268)
Energy saving/generation technologies			
PV Unit	-690.8958	0.5190	-358.5749 (269)
Total CO2, kg/year			1319.2280 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			13.2700 (273)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER			13.2700 ZC1
Total Floor Area		TFA	99.4000
Assumed number of occupants		N	2.7339
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			15.2231 ZC2
CO2 emissions from cooking, equation (L16)			1.8573 ZC3
Total CO2 emissions			30.3504 ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000 ZC7
Net CO2 emissions			30.3504 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	49.7000 (1b)	x 2.3800 (2b)	= 118.2860 (1b) - (3b)
First floor	49.7000 (1c)	x 2.5900 (2c)	= 128.7230 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	99.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 247.0090 (5)

2. Ventilation rate

										main	secondary	other	total	m3 per hour			
										heating	heating						
Number of chimneys										0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues										0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans																3 * 10 =	30.0000 (7a)
Number of passive vents																0 * 10 =	0.0000 (7b)
Number of flueless gas fires																0 * 40 =	0.0000 (7c)
										Air changes per hour							
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000	/ (5) =	0.1215 (8)
Pressure test																Yes	
Measured/design AP50																5.0000	
Infiltration rate																0.3715 (18)	
Number of sides sheltered																1 (19)	
Shelter factor															(20) = 1 - [0.075 x (19)] =	0.9250 (20)	
Infiltration rate adjusted to include shelter factor															(21) = (18) x (20) =	0.3436 (21)	
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
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	(22)				
Adj infilt rate	0.4381	0.4295	0.4209	0.3780	0.3694	0.3264	0.3264	0.3178	0.3436	0.3694	0.3865	0.4037	(22a)				
Effective ac	0.5960	0.5922	0.5886	0.5714	0.5682	0.5533	0.5533	0.5505	0.5590	0.5682	0.5747	0.5815	(25)				

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Semi-glazed door			2.0000	1.2000	2.4000			(26a)				
TER Opening Type (Uw = 1.40)			20.7400	1.3258	27.4962			(27)				
Heat Loss Floor 1			49.7000	0.1300	6.4610			(28a)				
render	105.1600	22.7400	82.4200	0.1800	14.8356			(29a)				
External Roof 1	49.7000		49.7000	0.1300	6.4610			(30)				
Total net area of external elements Aum(A, m2)			204.5600					(31)				
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		57.6538			(33)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								11.1164 (36)				
Total fabric heat loss						(33) + (36) =		68.7702 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 48.5783	Feb 48.2746	Mar 47.9769	Apr 46.5785	May 46.3169	Jun 45.0989	Jul 45.0989	Aug 44.8734	Sep 45.5681	Oct 46.3169	Nov 46.8461	Dec 47.3995 (38)
Heat transfer coeff	117.3485	117.0448	116.7471	115.3487	115.0871	113.8692	113.8692	113.6436	114.3383	115.0871	115.6164	116.1697 (39)
Average = Sum(39)m / 12 =												115.3475 (39)
HLP	Jan 1.1806	Feb 1.1775	Mar 1.1745	Apr 1.1604	May 1.1578	Jun 1.1456	Jul 1.1456	Aug 1.1433	Sep 1.1503	Oct 1.1578	Nov 1.1631	Dec 1.1687 (40)
HLP (average)												1.1604 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7339 (42)
Average daily hot water use (litres/day)												99.1302 (43)
Daily hot water use	Jan 109.0432	Feb 105.0780	Mar 101.1128	Apr 97.1476	May 93.1824	Jun 89.2171	Jul 89.2171	Aug 93.1824	Sep 97.1476	Oct 101.1128	Nov 105.0780	Dec 109.0432 (44)
Energy conte	161.7079	141.4308	145.9439	127.2374	122.0873	105.3521	97.6242	112.0252	113.3631	132.1138	144.2125	156.6055 (45)
Energy content (annual)										Total = Sum(45)m =		1559.7035 (45)
Distribution loss (46)m = 0.15 x (45)m												
	24.2562	21.2146	21.8916	19.0856	18.3131	15.8028	14.6436	16.8038	17.0045	19.8171	21.6319	23.4908 (46)
Water storage loss:												
Store volume												250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8903 (48)
Temperature factor from Table 2b												0.5400 (49)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Enter (49) or (54) in (55)												1.0208 (55)
Total storage loss												
31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(56)
If cylinder contains dedicated solar storage												
31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month												
216.6147	191.0240	200.8507	180.3730	176.9941	158.4877	152.5310	166.9320	166.4987	187.0206	197.3481	211.5122	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Output from w/h												
216.6147	191.0240	200.8507	180.3730	176.9941	158.4877	152.5310	166.9320	166.4987	187.0206	197.3481	211.5122	(64)
Heat gains from water heating, kWh/month												
97.6933	86.7003	92.4518	84.8149	84.5195	77.5380	76.3855	81.1738	80.2017	87.8533	90.4591	95.9967	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.6951	136.6951	136.6951	136.6951	136.6951	136.6951	136.6951	136.6951	136.6951	136.6951	136.6951	136.6951	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.8381	20.2846	16.4966	12.4890	9.3356	7.8815	8.5163	11.0698	14.8578	18.8654	22.0188	23.4729	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	255.3541	258.0039	251.3265	237.1113	219.1670	202.3019	191.0350	188.3853	195.0626	209.2779	227.2222	244.0872	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.6695	36.6695	36.6695	36.6695	36.6695	36.6695	36.6695	36.6695	36.6695	36.6695	36.6695	36.6695	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-109.3561	-109.3561	-109.3561	-109.3561	-109.3561	-109.3561	-109.3561	-109.3561	-109.3561	-109.3561	-109.3561	-109.3561	(71)
Water heating gains (Table 5)	131.3082	129.0183	124.2631	117.7985	113.6014	107.6917	102.6686	109.1046	111.3913	118.0823	125.6377	129.0279	(72)
Total internal gains	476.5090	474.3154	459.0948	434.4072	409.1126	384.8837	369.2285	375.5681	388.3203	413.2342	441.8871	463.5965	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
Southeast					5.9000	36.7938	0.6300	0.7000	0.7700		66.3436 (77)	
Southwest					9.6300	36.7938	0.6300	0.7000	0.7700		108.2862 (79)	
Northwest					5.2100	11.2829	0.6300	0.7000	0.7700		17.9652 (81)	
Solar gains	192.5950	334.0278	472.8817	612.4907	710.2902	715.8203	685.6882	611.0947	520.9732	373.4455	231.7711	164.1180 (83)
Total gains	669.1039	808.3431	931.9764	1046.8980	1119.4028	1100.7040	1054.9167	986.6629	909.2935	786.6797	673.6582	627.7145 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	58.8229	58.9755	59.1259	59.8427	59.9787	60.6203	60.6203	60.7406	60.3715	59.9787	59.7042	59.4198
alpha	4.9215	4.9317	4.9417	4.9895	4.9986	5.0414	5.0414	5.0494	5.0248	4.9986	4.9803	4.9613
util living area	0.9967	0.9912	0.9758	0.9275	0.8141	0.6316	0.4690	0.5195	0.7698	0.9542	0.9923	0.9976 (86)
MIT	19.7852	19.9816	20.2631	20.5995	20.8499	20.9682	20.9941	20.9904	20.9159	20.5790	20.1153	19.7519 (87)
Th 2	19.9356	19.9380	19.9404	19.9518	19.9539	19.9638	19.9638	19.9656	19.9600	19.9539	19.9496	19.9451 (88)
util rest of house	0.9956	0.9882	0.9676	0.9034	0.7583	0.5418	0.3617	0.4080	0.6872	0.9338	0.9893	0.9967 (89)
MIT 2	18.3273	18.6144	19.0210	19.4973	19.8143	19.9439	19.9617	19.9619	19.8974	19.4814	18.8187	18.2854 (90)
Living area fraction									fLA = Living area / (4) =			0.2225 (91)
MIT	18.6517	18.9187	19.2974	19.7426	20.0447	20.1719	20.1915	20.1908	20.1241	19.7256	19.1072	18.6118 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6517	18.9187	19.2974	19.7426	20.0447	20.1719	20.1915	20.1908	20.1241	19.7256	19.1072	18.6118 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9936	0.9843	0.9611	0.8976	0.7637	0.5607	0.3857	0.4328	0.7015	0.9281	0.9858	0.9952	(94)
Useful gains	664.7941	795.6621	895.7444	939.7349	854.8570	617.1245	406.8437	427.0770	637.8563	730.1145	664.0665	624.6863	(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	1684.1525	1640.8101	1494.0624	1250.6765	960.3717	634.4620	408.9590	430.7986	688.7842	1050.2442	1388.2304	1674.2087	(97)
Month fracti	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	758.4026	567.9395	445.1486	223.8779	78.5030	0.0000	0.0000	0.0000	0.0000	238.1766	521.3981	780.8447	(98)
Space heating												3614.2910	(98)
Space heating per m2											(98) / (4) =	36.3611	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												93.5000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												3865.5519 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	758.4026	567.9395	445.1486	223.8779	78.5030	0.0000	0.0000	0.0000	0.0000	238.1766	521.3981	780.8447 (98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000 (210)
Space heating fuel (main heating system)	811.1258	607.4219	476.0948	239.4417	83.9604	0.0000	0.0000	0.0000	0.0000	254.7343	557.6450	835.1280 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	216.6147	191.0240	200.8507	180.3730	176.9941	158.4877	152.5310	166.9320	166.4987	187.0206	197.3481	211.5122 (64)
Efficiency of water heater (217)m	87.8821	87.5455	86.8781	85.3912	82.8082	79.8000	79.8000	79.8000	79.8000	85.4599	87.2864	79.8000 (216)
Fuel for water heating, kWh/month	246.4833	218.1996	231.1867	211.2313	213.7398	198.6061	191.1416	209.1879	208.6450	218.8402	226.0925	240.3946 (219)
Water heating fuel used												2613.7486 (219)
Annual totals kWh/year												
Space heating fuel - main system												3865.5519 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												75.0000 (231)
Electricity for lighting (calculated in Appendix L)												403.3283 (232)
Total delivered energy for all uses												6957.6288 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3865.5519	0.2160	834.9592 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2613.7486	0.2160	564.5697 (264)
Space and water heating			1399.5289 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	403.3283	0.5190	209.3274 (268)
Total CO2, kg/m2/year			1647.7813 (272)
Emissions per m2 for space and water heating			14.0798 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.1059 (272b)
Emissions per m2 for pumps and fans			0.3916 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.0798 * 1.00) + 2.1059 + 0.3916, rounded to 2 d.p.			16.5800 (273)