

PREDICTED ENERGY ASSESSMENT

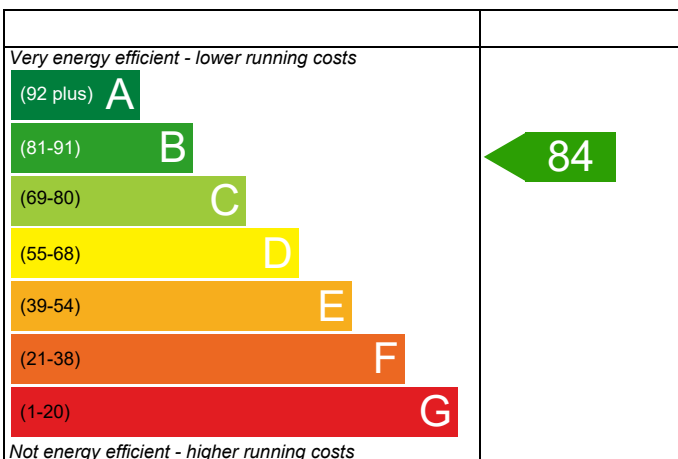
Shrivenham,
SN6

Dwelling type: House, Semi-Detached
Date of assessment: 03/08/2023
Produced by: Briary Energy Limited
Total floor area: 79 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP2012 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.

Energy Efficiency Rating

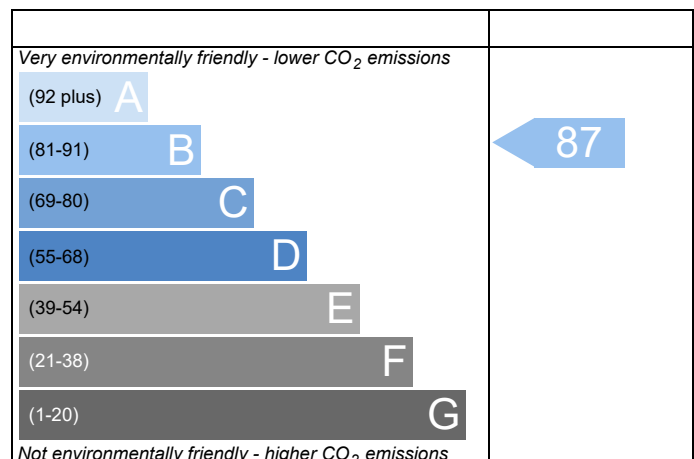


England

EU Directive
2002/91/EC

The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

Environmental Impact (CO₂) Rating



England

EU Directive
2002/91/EC

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions. The higher the rating the less impact it has on the environment.

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	375 - PRJ012557				Issued on Date	03/08/2023
Assessment Reference	375	Prop Type Ref	VW0052.V2 SAN SD CL 4.6			
Property	Shrivenham, SN6					
SAP Rating	84 B	DER	16.93	TER	18.77	
Environmental	87 B	% DER<TER	9.83			
CO ₂ Emissions (t/year)	1.17	DFEE	42.95	TFEE	50.92	
General Requirements Compliance	Pass	% DFEE<TFEE	15.65			
Assessor Details	Mr. Christopher Nicholls, Briary Energy Limited, Tel: 0203 397 1373, chris@briaryenergy.co.uk				Assessor ID	4299-0004
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 79 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) 18.77 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 16.93 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)50.9 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)43.0 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.23 (max. 0.30)	0.24 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.23 (max. 0.25)	0.23 (max. 0.70)	OK
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.26 (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: 5.01 (design value)
Maximum 10.0 OK

4 Heating efficiency

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

Data from database

Ideal LOGIC COMBI ESP1 30

Combi boiler

Efficiency: 89.6% SEDBUK2009

Minimum: 88.0% OK

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls:

No cylinder

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 (Severn Valley): Not significant OK

Based on:

Overshading:

Average

Windows facing North:

3.36 m², No overhang

Windows facing South:

3.53 m², No overhang

Air change rate:

4.68 ach

Blinds/curtains:

Dark-coloured curtain or roller blind, closed 100% of daylight hours

10 Key features

Party wall U-value

0.00 W/m²K

Roof U-value

0.11 W/m²K

Thermal bridging y-value

0.022 W/m²K

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	39.5000 (1b)	x 2.3300 (2b)	= 92.0350 (1b) - (3b)
First floor	39.5000 (1c)	x 2.5300 (2c)	= 99.9350 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	191.9700 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 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					3 * 10 = 30.0000 (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) =					30.0000 / (5) = 0.1563 (8)
Pressure test					Yes
Measured/design AP50					5.0100
Infiltration rate					0.4068 (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) = 0.3763 (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	0.4797	0.4703	0.4609	0.4139	0.4045	0.3575	0.3575	0.3480	0.3763	0.4045	0.4233	0.4421 (22b)
Effective ac	0.6151	0.6106	0.6062	0.5857	0.5818	0.5639	0.5639	0.5606	0.5708	0.5818	0.5896	0.5977 (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
Solid Door			4.2000	1.2000	5.0400		(26)
Windows (Uw = 1.30)			6.8900	1.2357	8.5143		(27)
Flr - Ground			39.5020	0.2273	8.9793	75.6000	2986.3512 (28a)
Brick	8.2800		8.2800	0.2400	1.9872	38.9500	322.5060 (29a)
Clad	78.4860	11.0940	67.3920	0.2300	15.5002	38.9500	2624.9184 (29a)
Rf - Ins Joist	39.5020		39.5020	0.1100	4.3452	9.0000	355.5180 (30)
Total net area of external elements Aum(A, m ²)			165.7660				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.3662		(33)
Party Wall			39.3810	0.0000	0.0000	39.3700	1550.4300 (32)
Stud			52.6653			7.4000	389.7232 (32c)
Stud			86.0394			7.4000	636.6918 (32c)
Internal Floor			39.5020			7.4000	292.3148 (32d)
Internal Ceiling			39.5020			7.4000	292.3148 (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
(28)...(30) + (32) + (32a)...(32e) = 9450.7682 (34)
119.6300 (35)
3.6652 (36)
(33) + (36) = 48.0313 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	38.9651	38.6820	38.4045	37.1012	36.8574	35.7223	35.7223	35.5120	36.1595	36.8574	37.3507	37.8664 (38)
Heat transfer coeff	86.9964	86.7133	86.4359	85.1326	84.8887	83.7536	83.7536	83.5434	84.1908	84.8887	85.3820	85.8977 (39)
Average = Sum(39)m / 12 =												85.1314 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1012	1.0976	1.0941	1.0776	1.0745	1.0602	1.0602	1.0575	1.0657	1.0745	1.0808	1.0873 (40)
HLP (average)												1.0776 (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
Average daily hot water use (litres/day)
2.4436 (42)
92.2358 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	101.4594	97.7700	94.0805	90.3911	86.7017	83.0122	83.0122	86.7017	90.3911	94.0805	97.7700	101.4594 (44)
Energy conte	150.4613	131.5945	135.7937	118.3882	113.5963	98.0250	90.8346	104.2340	105.4789	122.9255	134.1828	145.7138 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy content (annual)												Total = Sum(45)m =	1451.2285 (45)
Distribution loss (46)m = 0.15 x (45)m													
	22.5692	19.7392	20.3691	17.7582	17.0394	14.7037	13.6252	15.6351	15.8218	18.4388	20.1274	21.8571	(46)
Water storage loss:													
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)
If cylinder contains dedicated solar storage	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)
Combi loss	14.6683	13.2271	14.6002	14.0793	14.5124	14.0024	14.4431	14.4880	14.0443	14.5639	14.1519	14.6541	(61)
Total heat required for water heating calculated for each month	165.1296	144.8215	150.3939	132.4676	128.1087	112.0274	105.2777	118.7220	119.5232	137.4893	148.3346	160.3678	(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	165.1296	144.8215	150.3939	132.4676	128.1087	112.0274	105.2777	118.7220	119.5232	137.4893	148.3346	160.3678	(64)
Heat gains from water heating, kWh/month	53.6955	47.0619	48.8014	42.8839	41.3989	36.0939	33.8133	38.2798	38.5828	44.5137	48.1537	52.1133	(65)
Total per year (kWh/year) = Sum(64)m =												1622.6634	(64)

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	122.1807	122.1807	122.1807	122.1807	122.1807	122.1807	122.1807	122.1807	122.1807	122.1807	122.1807	122.1807	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.0054	20.4332	16.6174	12.5804	9.4040	7.9393	8.5787	11.1509	14.9667	19.0036	22.1801	23.6448	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	217.3379	219.5931	213.9099	201.8109	186.5382	172.1839	162.5944	160.3391	166.0223	178.1213	193.3941	207.7483	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2181	35.2181	35.2181	35.2181	35.2181	35.2181	35.2181	35.2181	35.2181	35.2181	35.2181	35.2181	(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)	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	(71)
Water heating gains (Table 5)	72.1713	70.0326	65.5933	59.5610	55.6436	50.1304	45.4479	51.4514	53.5872	59.8302	66.8802	70.0448	(72)
Total internal gains	375.1688	372.7132	358.7748	336.6066	314.2400	292.9078	279.2752	285.5955	297.2305	319.6094	345.1085	364.0922	(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	
North					3.3620	10.6334	0.4700	0.0000	0.7700		12.9377 (74)	
South					3.5280	46.7521	0.4700	0.0000	0.7700		59.6923 (78)	

Solar gains	72.6300	122.4852	166.5428	208.2295	237.5727	238.4644	228.7674	206.0131	180.5994	134.8754	86.7160	62.3651 (83)
Total gains	447.7988	495.1984	525.3176	544.8361	551.8127	531.3722	508.0426	491.6086	477.8298	454.4847	431.8245	426.4573 (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	30.1761	30.2746	30.3718	30.8368	30.9253	31.3445	31.3445	31.4234	31.1817	30.9253	30.7467	30.5621	
alpha	3.0117	3.0183	3.0248	3.0558	3.0617	3.0896	3.0896	3.0949	3.0788	3.0617	3.0498	3.0375	
util living area	0.9798	0.9713	0.9568	0.9272	0.8688	0.7588	0.6243	0.6564	0.8229	0.9319	0.9704	0.9825	(86)
MIT	18.9174	19.1185	19.4549	19.9139	20.3579	20.7236	20.8932	20.8717	20.6102	20.0487	19.4130	18.8876	(87)
Th 2	19.9998	20.0028	20.0056	20.0191	20.0217	20.0335	20.0335	20.0357	20.0289	20.0217	20.0166	20.0112	(88)
util rest of house	0.9764	0.9663	0.9488	0.9122	0.8378	0.6942	0.5191	0.5560	0.7711	0.9149	0.9643	0.9795	(89)
MIT 2	17.2066	17.5000	17.9890	18.6566	19.2812	19.7708	19.9609	19.9430	19.6313	18.8569	17.9385	17.1700	(90)
Living area fraction	17.5925	17.8651	18.3196	18.9402	19.5240	19.9857	20.1712	20.1525	19.8521	19.1258	18.2711	17.5574	(91)
MIT	17.5925	17.8651	18.3196	18.9402	19.5240	19.9857	20.1712	20.1525	19.8521	19.1258	18.2711	17.5574	(92)
Temperature adjustment	17.4425	17.7151	18.1696	18.7902	19.3740	19.8357	20.0212	20.0025	19.7021	18.9758	18.1211	17.4074	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9630	0.9497	0.9282	0.8874	0.8124	0.6788	0.5176	0.5522	0.7499	0.8906	0.9475	0.9674	(94)
Useful gains	431.2262	470.2938	487.5986	483.4900	448.2880	360.7082	262.9798	271.4451	358.3193	404.7476	409.1348	412.5618	(95)
Ext temp.	4.3000	4.9000	6.5000	8.0000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1143.3516	1111.2422	1008.6760	841.9813	651.4390	438.5086	286.5356	300.9645	471.6440	711.0074	941.0041	1134.4878	(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	529.8213	430.7173	387.6816	258.1137	151.1444	0.0000	0.0000	0.0000	0.0000	227.8573	382.9459	537.1129	(98)
Space heating												2905.3944	(98)
Space heating per m2												(98) / (4) =	36.7771 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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 %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3210.3805 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	529.8213	430.7173	387.6816	258.1137	151.1444	0.0000	0.0000	0.0000	0.0000	227.8573	382.9459	537.1129	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	585.4379	475.9307	428.3775	285.2085	167.0103	0.0000	0.0000	0.0000	0.0000	251.7760	423.1446	593.4950	(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	165.1296	144.8215	150.3939	132.4676	128.1087	112.0274	105.2777	118.7220	119.5232	137.4893	148.3346	160.3678	(64)
Efficiency of water heater (217)m	89.7186	89.6729	89.5822	89.3887	89.0033	87.3000	87.3000	87.3000	87.3000	89.2686	89.5832	87.3000	(216)
Fuel for water heating, kWh/month	184.0529	161.4997	167.8836	148.1927	143.9370	128.3246	120.5930	135.9931	136.9109	154.0176	165.5831	178.6955	(219)
Water heating fuel used													1825.6837 (219)
Annual totals kWh/year													
Space heating fuel - main system													3210.3805 (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)													406.2828 (232)
Total delivered energy for all uses													5517.3470 (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	3210.3805	0.2160	693.4422 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1825.6837	0.2160	394.3477 (264)
Space and water heating			1087.7899 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	406.2828	0.5190	210.8608 (268)
Total CO2, kg/year			1337.5756 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			16.9300 (273)

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

DER		16.9300 ZC1
Total Floor Area	TFA	79.0000
Assumed number of occupants	N	2.4436
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.3025 ZC2
CO2 emissions from cooking, equation (L16)		2.2487 ZC3
Total CO2 emissions		35.4812 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		35.4812 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	39.5000 (1b)	x 2.3300 (2b)	= 92.0350 (1b) - (3b)
First floor	39.5000 (1c)	x 2.5300 (2c)	= 99.9350 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 191.9700 (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) =	0.1563 (8)
Pressure test										Yes							
Measured/design AP50										5.0000							
Infiltration rate										0.4063 (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) =					0.3758 (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	0.4791	0.4698	0.4604	0.4134	0.4040	0.3570	0.3570	0.3476	0.3758	0.4040	0.4228	0.4416	(22b)				
Effective ac	0.6148	0.6103	0.6060	0.5854	0.5816	0.5637	0.5637	0.5604	0.5706	0.5816	0.5894	0.5975	(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 Opaque door			4.2000	1.0000	4.2000		(26)					
TER Opening Type (Uw = 1.40)			6.8900	1.3258	9.1345		(27)					
Flr - Ground			39.5020	0.1300	5.1353		(28a)					
Brick	8.2800		8.2800	0.1800	1.4904		(29a)					
Clad	78.4860	11.0940	67.3920	0.1800	12.1306		(29a)					
Rf - Ins Joist	39.5020		39.5020	0.1300	5.1353		(30)					
Total net area of external elements Aum(A, m2)			165.7660				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	37.2259	(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.7849 (36)					
Total fabric heat loss						(33) + (36) =	46.0108 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 38.9472	Feb 38.6648	Mar 38.3880	Apr 37.0879	May 36.8446	Jun 35.7123	Jul 35.7123	Aug 35.5026	Sep 36.1485	Oct 36.8446	Nov 37.3367	Dec 37.8512 (38)
Heat transfer coeff	84.9580	84.6756	84.3988	83.0987	82.8555	81.7231	81.7231	81.5134	82.1593	82.8555	83.3475	83.8620 (39)
Average = Sum(39)m / 12 =												83.0975 (39)
HLP	Jan 1.0754	Feb 1.0718	Mar 1.0683	Apr 1.0519	May 1.0488	Jun 1.0345	Jul 1.0345	Aug 1.0318	Sep 1.0400	Oct 1.0488	Nov 1.0550	Dec 1.0615 (40)
HLP (average)												1.0519 (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												2.4436 (42)
Average daily hot water use (litres/day)												92.2358 (43)
Daily hot water use	Jan 101.4594	Feb 97.7700	Mar 94.0805	Apr 90.3911	May 86.7017	Jun 83.0122	Jul 83.0122	Aug 86.7017	Sep 90.3911	Oct 94.0805	Nov 97.7700	Dec 101.4594 (44)
Energy conte	150.4613	131.5945	135.7937	118.3882	113.5963	98.0250	90.8346	104.2340	105.4789	122.9255	134.1828	145.7138 (45)
Energy content (annual)										Total = Sum(45)m =		1451.2285 (45)
Distribution loss (46)m = 0.15 x (45)m	22.5692	19.7392	20.3691	17.7582	17.0394	14.7037	13.6252	15.6351	15.8218	18.4388	20.1274	21.8571 (46)
Water storage loss:												
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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage	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)
Combi loss	50.9589	45.0010	47.9424	44.5764	44.1822	40.9375	42.3021	44.1822	44.5764	47.9424	48.2153	50.9589 (61)
Total heat required for water heating calculated for each month	201.4203	176.5954	183.7361	162.9647	157.7785	138.9625	133.1367	148.4162	150.0553	170.8679	182.3981	196.6727 (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)
Output from w/h	201.4203	176.5954	183.7361	162.9647	157.7785	138.9625	133.1367	148.4162	150.0553	170.8679	182.3981	196.6727 (64)
Heat gains from water heating, kWh/month	62.7681	55.0054	57.1370	50.5082	48.8163	42.8277	40.7780	45.7034	46.2158	52.8583	56.6696	61.1896 (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	122.1807	122.1807	122.1807	122.1807	122.1807	122.1807	122.1807	122.1807	122.1807	122.1807	122.1807	122.1807 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.0054	20.4332	16.6174	12.5804	9.4040	7.9393	8.5787	11.1509	14.9667	19.0036	22.1801	23.6448 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	217.3379	219.5931	213.9099	201.8109	186.5382	172.1839	162.5944	160.3391	166.0223	178.1213	193.3941	207.7483 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2181	35.2181	35.2181	35.2181	35.2181	35.2181	35.2181	35.2181	35.2181	35.2181	35.2181	35.2181 (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)	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445 (71)
Water heating gains (Table 5)	84.3658	81.8533	76.7970	70.1503	65.6133	59.4829	54.8092	61.4292	64.1887	71.0461	78.7078	82.2440 (72)
Total internal gains	387.3632	384.5338	369.9785	347.1958	324.2097	302.2603	288.6364	295.5734	307.8319	330.8253	356.9361	376.2914 (73)

6. Solar gains

[Jan]													
	Area				Solar flux		g		FF		Access		Gains
	m2				Table 6a		Table 6b		Table 6c		factor		W
					W/m2		or		or Table 6c		Table 6d		
North	3.3620				10.6334		0.6300		0.7000		0.7700		10.9255
South	3.5280				46.7521		0.6300		0.7000		0.7700		50.4082 (78)

Solar gains	61.3337	103.4348	140.6401	175.8432	200.6225	201.3756	193.1867	173.9715	152.5104	113.8980	73.2289	52.6654	(83)
Total gains	448.6969	487.9686	510.6186	523.0390	524.8323	503.6359	481.8232	469.5449	460.3423	444.7232	430.1650	428.9567	(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	64.5744	64.7898	65.0023	66.0192	66.2130	67.1305	67.1305	67.3032	66.7741	66.2130	65.8221	65.4183
alpha	5.3050	5.3193	5.3335	5.4013	5.4142	5.4754	5.4754	5.4869	5.4516	5.4142	5.3881	5.3612
util living area	0.9985	0.9973	0.9945	0.9857	0.9564	0.8611	0.7014	0.7376	0.9183	0.9863	0.9970	0.9988 (86)
MIT	19.8300	19.9428	20.1360	20.4070	20.6747	20.8915	20.9737	20.9652	20.8251	20.4876	20.1173	19.8154 (87)
Th 2	20.0210	20.0239	20.0268	20.0403	20.0429	20.0547	20.0547	20.0569	20.0501	20.0429	20.0377	20.0324 (88)
util rest of house	0.9980	0.9963	0.9924	0.9796	0.9346	0.7897	0.5725	0.6146	0.8692	0.9792	0.9957	0.9984 (89)
MIT 2	18.4538	18.6206	18.9046	19.3074	19.6868	19.9692	20.0432	20.0400	19.8925	19.4275	18.8860	18.4406 (90)
Living area fraction	18.7642	18.9189	19.1823	19.5554	19.9096	20.1773	20.2531	20.2487	20.1029	19.6666	19.1638	18.7507 (92)
MIT	18.7642	18.9189	19.1823	19.5554	19.9096	20.1773	20.2531	20.2487	20.1029	19.6666	19.1638	18.7507 (93)
Temperature adjustment												0.0000
adjusted MIT	18.7642	18.9189	19.1823	19.5554	19.9096	20.1773	20.2531	20.2487	20.1029	19.6666	19.1638	18.7507 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	447.3348	485.4197	505.4164	510.1307	488.5038	403.1328	289.8927	301.4316	401.6838	433.7236	427.6167	427.9318 (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	1228.8504	1187.0570	1070.3748	885.4535	680.2134	455.7912	298.5432	313.7211	493.1913	751.2168	1005.4858	1220.2506 (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	581.4477	471.5002	420.3290	270.2324	142.6319	0.0000	0.0000	0.0000	0.0000	236.2149	416.0658	589.4851 (98)
Space heating												3127.9070 (98)
Space heating per m2										(98) / (4) =		39.5938 (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 %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3348.9369 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	581.4477	471.5002	420.3290	270.2324	142.6319	0.0000	0.0000	0.0000	0.0000	236.2149	416.0658	589.4851	(98)
Space heating efficiency (main heating system 1)	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000	(210)
Space heating fuel (main heating system)	622.5350	504.8182	450.0311	289.3281	152.7108	0.0000	0.0000	0.0000	0.0000	252.9068	445.4665	631.1404	(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	201.4203	176.5954	183.7361	162.9647	157.7785	138.9625	133.1367	148.4162	150.0553	170.8679	182.3981	196.6727	(64)
Efficiency of water heater (217)m	87.5663	87.4044	87.0690	86.3158	84.7982	80.3000	80.3000	80.3000	80.3000	85.8668	87.0625	80.3000	(216)
Fuel for water heating, kWh/month	230.0203	202.0440	211.0236	188.8004	186.0635	173.0542	165.7991	184.8272	186.8684	198.9919	209.5024	224.4039	(219)
Water heating fuel used												2361.3990	(219)
Annual totals kWh/year													
Space heating fuel - main system												3348.9369	(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)												406.2828	(232)
Total delivered energy for all uses												6191.6187	(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	3348.9369	0.2160	723.3704 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2361.3990	0.2160	510.0622 (264)
Space and water heating			1233.4326 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	406.2828	0.5190	210.8608 (268)
Total CO2, kg/m2/year			1483.2183 (272)
Emissions per m2 for space and water heating			15.6131 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.6691 (272b)
Emissions per m2 for pumps and fans			0.4927 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.6131 * 1.00) + 2.6691 + 0.4927, rounded to 2 d.p.			18.7700 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	39.5000 (1b)	x 2.3300 (2b)	= 92.0350 (1b) - (3b)
First floor	39.5000 (1c)	x 2.5300 (2c)	= 99.9350 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 191.9700 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 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					3 * 10 = 30.0000 (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) =					30.0000 / (5) = 0.1563 (8)
Pressure test					Yes
Measured/design AP50					5.0100
Infiltration rate					0.4068 (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) =	0.3763 (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												
Effective ac	0.4797	0.4703	0.4609	0.4139	0.4045	0.3575	0.3575	0.3480	0.3763	0.4045	0.4233	0.4421 (22b)
	0.6151	0.6106	0.6062	0.5857	0.5818	0.5639	0.5639	0.5606	0.5708	0.5818	0.5896	0.5977 (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
Solid Door			4.2000	1.2000	5.0400		(26)
Windows (Uw = 1.30)			6.8900	1.2357	8.5143		(27)
Flr - Ground			39.5020	0.2273	8.9793	75.6000	2986.3512 (28a)
Brick	8.2800		8.2800	0.2400	1.9872	38.9500	322.5060 (29a)
Clad	78.4860	11.0940	67.3920	0.2300	15.5002	38.9500	2624.9184 (29a)
Rf - Ins Joist	39.5020		39.5020	0.1100	4.3452	9.0000	355.5180 (30)
Total net area of external elements Aum(A, m ²)			165.7660				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.3662		(33)
Party Wall			39.3810	0.0000	0.0000	39.3700	1550.4300 (32)
Stud			52.6653			7.4000	389.7232 (32c)
Stud			86.0394			7.4000	636.6918 (32c)
Internal Floor			39.5020			7.4000	292.3148 (32d)
Internal Ceiling			39.5020			7.4000	292.3148 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 9450.7682 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							119.6300 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.6652 (36)
Total fabric heat loss							(33) + (36) = 48.0313 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	38.9651	38.6820	38.4045	37.1012	36.8574	35.7223	35.7223	35.5120	36.1595	36.8574	37.3507	37.8664 (38)
Heat transfer coeff	86.9964	86.7133	86.4359	85.1326	84.8887	83.7536	83.7536	83.5434	84.1908	84.8887	85.3820	85.8977 (39)
Average = Sum(39)m / 12 =												85.1314 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1012	1.0976	1.0941	1.0776	1.0745	1.0602	1.0602	1.0575	1.0657	1.0745	1.0808	1.0873 (40)
HLP (average)												1.0776 (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	2.4436 (42)
Average daily hot water use (litres/day)	92.2358 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	101.4594	97.7700	94.0805	90.3911	86.7017	83.0122	83.0122	86.7017	90.3911	94.0805	97.7700	101.4594 (44)
Energy conte	150.4613	131.5945	135.7937	118.3882	113.5963	98.0250	90.8346	104.2340	105.4789	122.9255	134.1828	145.7138 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Energy content (annual)	Total = Sum(45)m = 1451.2285 (45)											
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
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)
If cylinder contains dedicated solar storage	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)
Heat gains from water heating, kWh/month	31.9730	27.9638	28.8562	25.1575	24.1392	20.8303	19.3023	22.1497	22.4143	26.1217	28.5138	30.9642 (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)
(66)m	122.1807	122.1807	122.1807	122.1807	122.1807	122.1807	122.1807	122.1807	122.1807	122.1807	122.1807	122.1807	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.0054	20.4332	16.6174	12.5804	9.4040	7.9393	8.5787	11.1509	14.9667	19.0036	22.1801	23.6448	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	217.3379	219.5931	213.9099	201.8109	186.5382	172.1839	162.5944	160.3391	166.0223	178.1213	193.3941	207.7483	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2181	35.2181	35.2181	35.2181	35.2181	35.2181	35.2181	35.2181	35.2181	35.2181	35.2181	35.2181	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	(71)
Water heating gains (Table 5)	42.9745	41.6128	38.7852	34.9410	32.4452	28.9310	25.9440	29.7711	31.1309	35.1098	39.6025	41.6185	(72)
Total internal gains	342.9720	341.2934	328.9666	308.9865	288.0416	268.7084	256.7713	260.9153	271.7741	291.8889	314.8309	332.6659	(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	
North				3.3620	10.6334		0.4700		0.0000		0.7700		12.9377 (74)	
South				3.5280	46.7521		0.4700		0.0000		0.7700		59.6923 (78)	
Solar gains	72.6300	122.4852	166.5428	208.2295	237.5727	238.4644	228.7674	206.0131	180.5994	134.8754	86.7160	62.3651	(83)	
Total gains	415.6020	463.7786	495.5095	517.2160	525.6142	507.1728	485.5386	466.9284	452.3735	426.7643	401.5469	395.0310	(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	30.1761	30.2746	30.3718	30.8368	30.9253	31.3445	31.3445	31.4234	31.1817	30.9253	30.7467	30.5621
alpha	3.0117	3.0183	3.0248	3.0558	3.0617	3.0896	3.0896	3.0949	3.0788	3.0617	3.0498	3.0375
util living area	0.9834	0.9757	0.9626	0.9354	0.8810	0.7760	0.6436	0.6780	0.8398	0.9411	0.9754	0.9857 (86)
MIT	18.8557	19.0600	19.4021	19.8697	20.3240	20.7036	20.8834	20.8590	20.5825	20.0034	19.3565	18.8265 (87)
Th 2	19.9998	20.0028	20.0056	20.0191	20.0217	20.0335	20.0335	20.0357	20.0289	20.0217	20.0166	20.0112 (88)
util rest of house	0.9805	0.9714	0.9555	0.9217	0.8519	0.7131	0.5380	0.5780	0.7906	0.9261	0.9703	0.9832 (89)
MIT 2	18.0317	18.2365	18.5774	19.0469	19.4860	19.8392	19.9787	19.9651	19.7350	19.1838	18.5424	18.0109 (90)
Living area fraction	18.2176	18.4222	18.7634	19.2325	19.6750	20.0342	20.1828	20.1668	19.9262	19.3686 / (4) =	18.7260	0.2256 (91)
MIT	18.2176	18.4222	18.7634	19.2325	19.6750	20.0342	20.1828	20.1668	19.9262	19.3686	18.7260	18.1949 (92)
Temperature adjustment												0.0000
adjusted MIT	18.2176	18.4222	18.7634	19.2325	19.6750	20.0342	20.1828	20.1668	19.9262	19.3686	18.7260	18.1949 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	404.5496	446.3035	467.7570	469.6397	441.3005	361.7005	269.9481	276.9301	354.8745	389.7406	386.0188	385.9020	(94)
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	1210.7798	1172.5579	1059.9963	879.6348	676.9907	455.1297	300.0711	314.6881	490.5128	744.3590	992.6507	1202.1288	(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	599.8353	488.0430	440.6260	295.1965	175.3536	0.0000	0.0000	0.0000	0.0000	263.8361	436.7750	607.2727	(98)
Space heating													
Space heating per m2	(98) / (4) = 41.8600 (99)												

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	787.2838	619.7766	634.9298	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7009	0.7778	0.7580	0.0000	0.0000	0.0000	0.0000	(101)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	551.8260	482.0831	481.3053	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	685.4723	658.4369	638.7324	0.0000	0.0000	0.0000	0.0000 (103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	96.2253	131.2072	117.1258	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												344.5582 (104)
Cooled fraction									FC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	24.0563	32.8018	29.2814	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												86.1396 (107)
Space cooling per m2												1.0904 (108)
Energy for space heating												41.8600 (99)
Energy for space cooling												1.0904 (108)
Total												42.9504 (109)
Dwelling Fabric Energy Efficiency (DFEE)												43.0 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	39.5000 (1b)	x 2.3300 (2b)	= 92.0350 (1b) - (3b)
First floor	39.5000 (1c)	x 2.5300 (2c)	= 99.9350 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 191.9700 (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) =	0.1563 (8)
Pressure test										Yes							
Measured/design AP50										5.0000							
Infiltration rate										0.4063 (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) =					0.3758 (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	0.4791	0.4698	0.4604	0.4134	0.4040	0.3570	0.3570	0.3476	0.3758	0.4040	0.4228	0.4416	(22b)				
Effective ac	0.6148	0.6103	0.6060	0.5854	0.5816	0.5637	0.5637	0.5604	0.5706	0.5816	0.5894	0.5975	(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 Opaque door			4.2000	1.0000	4.2000			(26)					
TER Opening Type (Uw = 1.40)			6.8900	1.3258	9.1345			(27)					
Flr - Ground			39.5020	0.1300	5.1353			(28a)					
Brick	8.2800		8.2800	0.1800	1.4904			(29a)					
Clad	78.4860	11.0940	67.3920	0.1800	12.1306			(29a)					
Rf - Ins Joist	39.5020		39.5020	0.1300	5.1353			(30)					
Total net area of external elements Aum(A, m2)			165.7660					(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	37.2259		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K									250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)									8.7849 (36)				
Total fabric heat loss						(33) + (36) =	46.0108	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 38.9472	Feb 38.6648	Mar 38.3880	Apr 37.0879	May 36.8446	Jun 35.7123	Jul 35.7123	Aug 35.5026	Sep 36.1485	Oct 36.8446	Nov 37.3367	Dec 37.8512	(38)
Heat transfer coeff	84.9580	84.6756	84.3988	83.0987	82.8555	81.7231	81.7231	81.5134	82.1593	82.8555	83.3475	83.8620	(39)
Average = Sum(39)m / 12 =												83.0975	(39)
HLP	Jan 1.0754	Feb 1.0718	Mar 1.0683	Apr 1.0519	May 1.0488	Jun 1.0345	Jul 1.0345	Aug 1.0318	Sep 1.0400	Oct 1.0488	Nov 1.0550	Dec 1.0615	(40)
HLP (average)												1.0519	(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												2.4436 (42)
Average daily hot water use (litres/day)												92.2358 (43)
Daily hot water use	Jan 101.4594	Feb 97.7700	Mar 94.0805	Apr 90.3911	May 86.7017	Jun 83.0122	Jul 83.0122	Aug 86.7017	Sep 90.3911	Oct 94.0805	Nov 97.7700	Dec 101.4594 (44)
Energy conte	150.4613	131.5945	135.7937	118.3882	113.5963	98.0250	90.8346	104.2340	105.4789	122.9255	134.1828	145.7138 (45)
Energy content (annual)										Total = Sum(45)m =		1451.2285 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water 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 (46)
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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

If cylinder contains dedicated solar storage	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	(59)
Heat gains from water heating, kWh/month	31.9730	27.9638	28.8562	25.1575	24.1392	20.8303	19.3023	22.1497	22.4143	26.1217	28.5138	30.9642 (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	122.1807	122.1807	122.1807	122.1807	122.1807	122.1807	122.1807	122.1807	122.1807	122.1807	122.1807	122.1807	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.0054	20.4332	16.6174	12.5804	9.4040	7.9393	8.5787	11.1509	14.9667	19.0036	22.1801	23.6448	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	217.3379	219.5931	213.9099	201.8109	186.5382	172.1839	162.5944	160.3391	166.0223	178.1213	193.3941	207.7483	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2181	35.2181	35.2181	35.2181	35.2181	35.2181	35.2181	35.2181	35.2181	35.2181	35.2181	35.2181	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	(71)
Water heating gains (Table 5)	42.9745	41.6128	38.7852	34.9410	32.4452	28.9310	25.9440	29.7711	31.1309	35.1098	39.6025	41.6185	(72)
Total internal gains	342.9720	341.2934	328.9666	308.9865	288.0416	268.7084	256.7713	260.9153	271.7741	291.8889	314.8309	332.6659	(73)

6. Solar gains

[Jan]												Gains
	Area				Solar flux	g		FF		Access		W
	m2				Table 6a	Specific data		Specific data		factor		
					W/m2	or Table 6b		or Table 6c		Table 6d		
North	3.3620				10.6334	0.6300		0.7000		0.7700		10.9255 (74)
South	3.5280				46.7521	0.6300		0.7000		0.7700		50.4082 (78)

Solar gains	61.3337	103.4348	140.6401	175.8432	200.6225	201.3756	193.1867	173.9715	152.5104	113.8980	73.2289	52.6654 (83)
Total gains	404.3057	444.7282	469.6067	484.8297	488.6641	470.0839	449.9580	434.8868	424.2845	405.7869	388.0598	385.3312 (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	64.5744	64.7898	65.0023	66.0192	66.2130	67.1305	67.1305	67.3032	66.7741	66.2130	65.8221	65.4183	
alpha	5.3050	5.3193	5.3335	5.4013	5.4142	5.4754	5.4754	5.4869	5.4516	5.4142	5.3881	5.3612	
util living area	0.9991	0.9983	0.9963	0.9898	0.9672	0.8869	0.7377	0.7770	0.9387	0.9910	0.9982	0.9993	(86)
MIT	19.7769	19.8913	20.0878	20.3638	20.6392	20.8711	20.9664	20.9550	20.7955	20.4434	20.0671	19.7629	(87)
Th 2	20.0210	20.0239	20.0268	20.0403	20.0429	20.0547	20.0547	20.0569	20.0501	20.0429	20.0377	20.0324	(88)
util rest of house	0.9988	0.9976	0.9948	0.9853	0.9497	0.8223	0.6083	0.6557	0.8981	0.9860	0.9974	0.9991	(89)
MIT 2	18.8980	19.0146	19.2129	19.4980	19.7678	19.9828	20.0442	20.0412	19.9194	19.5799	19.2015	18.8932	(90)
Living area fraction									fLA = Living area / (4) =			0.2256	(91)
MIT	19.0962	19.2123	19.4102	19.6933	19.9643	20.1832	20.2523	20.2473	20.1170	19.7747	19.3967	19.0894	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0962	19.2123	19.4102	19.6933	19.9643	20.1832	20.2523	20.2473	20.1170	19.7747	19.3967	19.0894	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	403.6372	443.3655	466.5910	476.6381	463.2174	391.4323	287.0563	297.0810	382.5956	399.3497	386.7701	384.8433	(94)
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	1257.0567	1211.9047	1089.6061	896.9081	684.7441	456.2730	298.4744	313.6084	494.3520	760.1705	1024.9011	1248.6563	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	634.9441	516.4584	463.5232	302.5944	164.8158	0.0000	0.0000	0.0000	0.0000	268.4507	459.4543	642.6769	(98)
Space heating												3452.9178	(98)
Space heating per m2												43.7078	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	768.1973	604.7511	619.5021	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7610	0.8538	0.8329	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	584.6208	516.3472	516.0084	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	642.1217	616.8491	601.2812	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	41.4007	74.7734	63.4430	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												179.6171	(104)

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Calculation Type: New Build (As Designed)

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Cooled fraction											FC = cooled area / (4) =	1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	10.3502	18.6934	15.8607	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												44.9043 (107)
Space cooling per m2												0.5684 (108)
Energy for space heating												43.7078 (99)
Energy for space cooling												0.5684 (108)
Total												44.2762 (109)
Target Fabric Energy Efficiency (TFEE)												50.9 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	39.5000 (1b)	x 2.3300 (2b)	= 92.0350 (1b) - (3b)
First floor	39.5000 (1c)	x 2.5300 (2c)	= 99.9350 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 191.9700 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 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					3 * 10 = 30.0000 (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)					30.0000 / (5) = 0.1563 (8)
Pressure test					Yes
Measured/design AP50					5.0100
Infiltration rate					0.4068 (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)	=	0.3763 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.5000	4.3000	4.3000	4.0000	3.9000	3.4000	3.4000	3.3000	3.5000	3.8000	3.8000	4.1000 (22)
Wind factor	1.1250	1.0750	1.0750	1.0000	0.9750	0.8500	0.8500	0.8250	0.8750	0.9500	0.9500	1.0250 (22a)
Adj infilt rate	0.4233	0.4045	0.4045	0.3763	0.3669	0.3198	0.3198	0.3104	0.3292	0.3575	0.3575	0.3857 (22b)
Effective ac	0.5896	0.5818	0.5818	0.5708	0.5673	0.5511	0.5511	0.5482	0.5542	0.5639	0.5639	0.5744 (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
Solid Door			4.2000	1.2000	5.0400		(26)
Windows (Uw = 1.30)			6.8900	1.2357	8.5143		(27)
Flr - Ground			39.5020	0.2273	8.9793	75.6000	2986.3512 (28a)
Brick	8.2800		8.2800	0.2400	1.9872	38.9500	322.5060 (29a)
Clad	78.4860	11.0940	67.3920	0.2300	15.5002	38.9500	2624.9184 (29a)
Rf - Ins Joist	39.5020		39.5020	0.1100	4.3452	9.0000	355.5180 (30)
Total net area of external elements Aum(A, m ²)			165.7660				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.3662		(33)
Party Wall			39.3810	0.0000	0.0000	39.3700	1550.4300 (32)
Stud			52.6653			7.4000	389.7232 (32c)
Stud			86.0394			7.4000	636.6918 (32c)
Internal Floor			39.5020			7.4000	292.3148 (32d)
Internal Ceiling			39.5020			7.4000	292.3148 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 9450.7682 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							119.6300 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.6652 (36)
Total fabric heat loss							(33) + (36) = 48.0313 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	37.3507	36.8574	36.8574	36.1595	35.9381	34.9151	34.9151	34.7273	35.1084	35.7223	35.7223	36.3865 (38)
Heat transfer coeff	85.3820	84.8887	84.8887	84.1908	83.9694	82.9464	82.9464	82.7586	83.1398	83.7536	83.7536	84.4179 (39)
Average = Sum(39)m / 12 =												83.9197 (39)
HLP	1.0808	1.0745	1.0745	1.0657	1.0629	1.0500	1.0500	1.0476	1.0524	1.0602	1.0602	1.0686 (40)
HLP (average)												1.0623 (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												2.4436 (42)
Average daily hot water use (litres/day)												92.2358 (43)
Daily hot water use	101.4594	97.7700	94.0805	90.3911	86.7017	83.0122	83.0122	86.7017	90.3911	94.0805	97.7700	101.4594 (44)
Energy conte	150.4613	131.5945	135.7937	118.3882	113.5963	98.0250	90.8346	104.2340	105.4789	122.9255	134.1828	145.7138 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Energy content (annual)												Total = Sum(45)m = 1451.2285 (45)
Distribution loss (46)m = 0.15 x (45)m												
	22.5692	19.7392	20.3691	17.7582	17.0394	14.7037	13.6252	15.6351	15.8218	18.4388	20.1274	21.8571 (46)
Water storage loss:												
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)
If cylinder contains dedicated solar storage	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)
Combi loss	14.6683	13.2271	14.6002	14.0793	14.5124	14.0024	14.4431	14.4880	14.0443	14.5639	14.1519	14.6541 (61)
Total heat required for water heating calculated for each month	165.1296	144.8215	150.3939	132.4676	128.1087	112.0274	105.2777	118.7220	119.5232	137.4893	148.3346	160.3678 (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	165.1296	144.8215	150.3939	132.4676	128.1087	112.0274	105.2777	118.7220	119.5232	137.4893	148.3346	160.3678 (64)
												Total per year (kWh/year) = Sum(64)m = 1622.6634 (64)
RHI water heating demand												1623 (64)
Heat gains from water heating, kWh/month	53.6955	47.0619	48.8014	42.8839	41.3989	36.0939	33.8133	38.2798	38.5828	44.5137	48.1537	52.1133 (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	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	57.5135	51.0830	41.5435	31.4511	23.5101	19.8482	21.4467	27.8772	37.4167	47.5091	55.4501	59.1120	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	324.3849	327.7510	319.2685	301.2103	278.4152	256.9909	242.6782	239.3121	247.7945	265.8527	288.6479	310.0721	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	(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)	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	(71)
Water heating gains (Table 5)	72.1713	70.0326	65.5933	59.5610	55.6436	50.1304	45.4479	51.4514	53.5872	59.8302	66.8802	70.0448	(72)
Total internal gains	558.0473	552.8441	530.3829	496.2000	461.5464	430.9471	413.5503	422.6182	442.7760	477.1696	514.9558	543.2065	(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	
North					3.3620	12.7802	0.4700	0.0000	0.7700		15.5498	
South					3.5280	54.3838	0.4700	0.0000	0.7700		69.4363 (74)	
Solar gains	84.9861	127.4494	169.7412	218.5299	240.6950	262.4304	243.2337	221.6631	195.2564	144.3072	99.9536	73.4074 (83)
Total gains	643.0334	680.2936	700.1241	714.7299	702.2414	693.3775	656.7840	644.2813	638.0325	621.4768	614.9094	616.6139 (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	30.7467	30.9253	30.9253	31.1817	31.2639	31.6495	31.6495	31.7213	31.5759	31.3445	31.3445	31.0978
alpha	3.0498	3.0617	3.0617	3.0788	3.0843	3.1100	3.1100	3.1148	3.1051	3.0896	3.0896	3.0732
util living area	0.9474	0.9351	0.9094	0.8622	0.7740	0.6135	0.4734	0.4902	0.6904	0.8544	0.9255	0.9527 (86)
MIT	19.3649	19.5221	19.8397	20.2166	20.5939	20.8664	20.9564	20.9510	20.7916	20.3622	19.8142	19.3287 (87)
Th 2	20.0166	20.0217	20.0217	20.0289	20.0312	20.0419	20.0419	20.0439	20.0399	20.0335	20.0335	20.0266 (88)
util rest of house	0.9391	0.9250	0.8943	0.8378	0.7298	0.5379	0.3719	0.3892	0.6229	0.8241	0.9122	0.9453 (89)
MIT 2	17.8598	18.0881	18.5422	19.0771	19.5895	19.9290	20.0172	20.0150	19.8470	19.2886	18.5183	17.8146 (90)
Living area fraction	18.1993	18.4116	18.8349	19.3341	19.8161	20.1404	20.2290	20.2261	20.0601	19.5307	18.8107	18.1561 (91)
MIT	18.1993	18.4116	18.8349	19.3341	19.8161	20.1404	20.2290	20.2261	20.0601	19.5307	18.8107	18.1561 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.0493	18.2616	18.6849	19.1841	19.6661	19.9904	20.0790	20.0761	19.9101	19.3807	18.6607	18.0061 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	589.6649	613.0803	608.0559	580.5230	499.1401	369.9241	246.9489	253.0742	390.9733	496.7747	545.8134	569.9842	(94)
Ext temp.	4.6000	5.1000	6.9000	9.2000	12.2000	15.1000	17.0000	16.9000	14.5000	11.0000	7.4000	4.5000	(96)
Heat loss rate W	1148.3271	1117.2697	1000.4017	840.5714	626.9218	405.6439	255.3951	262.8527	449.7950	701.9173	943.1200	1140.1572	(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	415.6447	338.8153	291.9052	187.2348	95.0696	0.0000	0.0000	0.0000	0.0000	152.6260	286.0607	424.2088	(98)
Space heating												2191.5652	(98)
RHI space heating demand												2192	(98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	39.5000 (1b)	x 2.3300 (2b)	= 92.0350 (1b) - (3b)
First floor	39.5000 (1c)	x 2.5300 (2c)	= 99.9350 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 191.9700 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 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					3 * 10 = 30.0000 (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) =					30.0000 / (5) = 0.1563 (8)
Pressure test					Yes
Measured/design AP50					5.0100
Infiltration rate					0.4068 (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) = 0.3763 (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	0.4797	0.4703	0.4609	0.4139	0.4045	0.3575	0.3575	0.3480	0.3763	0.4045	0.4233	0.4421 (22b)
Effective ac	0.6151	0.6106	0.6062	0.5857	0.5818	0.5639	0.5639	0.5606	0.5708	0.5818	0.5896	0.5977 (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
Solid Door			4.2000	1.2000	5.0400		(26)
Windows (Uw = 1.30)			6.8900	1.2357	8.5143		(27)
Flr - Ground			39.5020	0.2273	8.9793	75.6000	2986.3512 (28a)
Brick	8.2800		8.2800	0.2400	1.9872	38.9500	322.5060 (29a)
Clad	78.4860	11.0940	67.3920	0.2300	15.5002	38.9500	2624.9184 (29a)
Rf - Ins Joist	39.5020		39.5020	0.1100	4.3452	9.0000	355.5180 (30)
Total net area of external elements Aum(A, m ²)			165.7660				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.3662		(33)
Party Wall			39.3810	0.0000	0.0000	39.3700	1550.4300 (32)
Stud			52.6653			7.4000	389.7232 (32c)
Stud			86.0394			7.4000	636.6918 (32c)
Internal Floor			39.5020			7.4000	292.3148 (32d)
Internal Ceiling			39.5020			7.4000	292.3148 (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
(28)...(30) + (32) + (32a)...(32e) = 9450.7682 (34)
119.6300 (35)
3.6652 (36)
(33) + (36) = 48.0313 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	38.9651	38.6820	38.4045	37.1012	36.8574	35.7223	35.7223	35.5120	36.1595	36.8574	37.3507	37.8664 (38)
Heat transfer coeff	86.9964	86.7133	86.4359	85.1326	84.8887	83.7536	83.7536	83.5434	84.1908	84.8887	85.3820	85.8977 (39)
Average = Sum(39)m / 12 =												85.1314 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1012	1.0976	1.0941	1.0776	1.0745	1.0602	1.0602	1.0575	1.0657	1.0745	1.0808	1.0873 (40)
HLP (average)												1.0776 (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
Average daily hot water use (litres/day)
2.4436 (42)
92.2358 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	101.4594	97.7700	94.0805	90.3911	86.7017	83.0122	83.0122	86.7017	90.3911	94.0805	97.7700	101.4594 (44)
Energy conte	150.4613	131.5945	135.7937	118.3882	113.5963	98.0250	90.8346	104.2340	105.4789	122.9255	134.1828	145.7138 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Energy content (annual)	Total = Sum(45)m = 1451.2285 (45)										
Distribution loss (46)m = 0.15 x (45)m											
22.5692	19.7392	20.3691	17.7582	17.0394	14.7037	13.6252	15.6351	15.8218	18.4388	20.1274	21.8571 (46)
Water storage loss:											
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)
If cylinder contains dedicated solar storage											
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)
Combi loss	14.6683	13.2271	14.6002	14.0793	14.5124	14.0024	14.4431	14.4880	14.0443	14.5639	14.1519 (61)
Total heat required for water heating calculated for each month											
165.1296	144.8215	150.3939	132.4676	128.1087	112.0274	105.2777	118.7220	119.5232	137.4893	148.3346	160.3678 (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)
Solar input (sum of months) = Sum(63)m =	0.0000 (63)										
Output from w/h											
165.1296	144.8215	150.3939	132.4676	128.1087	112.0274	105.2777	118.7220	119.5232	137.4893	148.3346	160.3678 (64)
Heat gains from water heating, kWh/month											
53.6955	47.0619	48.8014	42.8839	41.3989	36.0939	33.8133	38.2798	38.5828	44.5137	48.1537	52.1133 (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	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	57.5135	51.0830	41.5435	31.4511	23.5101	19.8482	21.4467	27.8772	37.4167	47.5091	55.4501	59.1120	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	324.3849	327.7510	319.2685	301.2103	278.4152	256.9909	242.6782	239.3121	247.7945	265.8527	288.6479	310.0721	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	(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)	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	(71)
Water heating gains (Table 5)	72.1713	70.0326	65.5933	59.5610	55.6436	50.1304	45.4479	51.4514	53.5872	59.8302	66.8802	70.0448	(72)
Total internal gains	558.0473	552.8441	530.3829	496.2000	461.5464	430.9471	413.5503	422.6182	442.7760	477.1696	514.9558	543.2065	(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		
North				3.3620	10.6334	0.4700	0.0000	0.7700		12.9377 (74)		
South				3.5280	46.7521	0.4700	0.0000	0.7700		59.6923 (78)		
Solar gains	72.6300	122.4852	166.5428	208.2295	237.5727	238.4644	228.7674	206.0131	180.5994	134.8754	86.7160	62.3651 (83)
Total gains	630.6773	675.3293	696.9257	704.4295	699.1191	669.4115	642.3177	628.6312	623.3754	612.0450	601.6718	605.5717 (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	30.1761	30.2746	30.3718	30.8368	30.9253	31.3445	31.3445	31.4234	31.1817	30.9253	30.7467	30.5621
alpha	3.0117	3.0183	3.0248	3.0558	3.0617	3.0896	3.0896	3.0949	3.0788	3.0617	3.0498	3.0375
util living area	0.9525	0.9390	0.9169	0.8740	0.7975	0.6662	0.5247	0.5516	0.7276	0.8709	0.9337	0.9572 (86)
MIT	19.2500	19.4335	19.7356	20.1426	20.5197	20.8127	20.9345	20.9218	20.7355	20.2756	19.7080	19.2190 (87)
Th 2	19.9998	20.0028	20.0056	20.0191	20.0217	20.0335	20.0335	20.0357	20.0289	20.0217	20.0166	20.0112 (88)
util rest of house	0.9450	0.9295	0.9032	0.8515	0.7577	0.5966	0.4263	0.4555	0.6657	0.8438	0.9217	0.9504 (89)
MIT 2	17.6842	17.9493	18.3840	18.9682	19.4857	19.8637	19.9915	19.9826	19.7728	19.1623	18.3566	17.6469 (90)
Living area fraction	18.0374	18.2841	18.6889	19.2331	19.7189	20.0778	20.2042	20.1944	19.9900	19.4134	18.6615	18.0015 (91)
MIT	18.0374	18.2841	18.6889	19.2331	19.7189	20.0778	20.2042	20.1944	19.9900	19.4134	18.6615	18.0015 (92)
Temperature adjustment	17.8874	18.1341	18.5389	19.0831	19.5689	19.9278	20.0542	20.0444	19.8400	19.2634	18.5115	17.8515 (93)
adjusted MIT	17.8874	18.1341	18.5389	19.0831	19.5689	19.9278	20.0542	20.0444	19.8400	19.2634	18.5115	17.8515 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation	0.9235	0.9057	0.8773	0.8253	0.7364	0.5882	0.4285	0.4564	0.6521	0.8181	0.8975	0.9302	(94)	
Useful gains	582.4444	611.6781	611.4337	581.3828	514.8084	393.7345	275.2392	286.9140	406.4720	500.7247	540.0127	563.2933	(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	1182.0565	1147.5701	1040.5932	866.9167	667.9839	446.2192	289.3038	304.4678	483.2535	735.4232	974.3338	1172.6341	(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	446.1114	360.1195	319.2946	205.5844	113.9626	0.0000	0.0000	0.0000	0.0000	174.6157	312.7112	453.3495	(98)	
Space heating												2385.7489	(98)	
Space heating per m2												(98) / (4) =	30.1994	(99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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 %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2636.1867 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	446.1114	360.1195	319.2946	205.5844	113.9626	0.0000	0.0000	0.0000	0.0000	174.6157	312.7112	453.3495	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	492.9408	397.9221	352.8117	227.1651	125.9255	0.0000	0.0000	0.0000	0.0000	192.9455	345.5373	500.9387	(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	165.1296	144.8215	150.3939	132.4676	128.1087	112.0274	105.2777	118.7220	119.5232	137.4893	148.3346	160.3678	(64)
Efficiency of water heater (217)m	89.6126	89.5585	89.4501	89.2185	88.7778	87.3000	87.3000	87.3000	87.3000	89.0619	89.4451	87.3000	(216)
Fuel for water heating, kWh/month	184.2706	161.7061	168.1315	148.4754	144.3026	128.3246	120.5930	135.9931	136.9109	154.3750	165.8386	178.8993	(219)
Water heating fuel used												1827.8209	(219)
Annual totals kWh/year													
Space heating fuel - main system												2636.1867	(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)												406.2828	(232)
Total delivered energy for all uses												4945.2903	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2636.1867	3.4800	91.7393 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1827.8209	3.4800	63.6082 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	406.2828	13.1900	53.5887 (250)
Additional standing charges			120.0000 (251)
Total energy cost			338.8287 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.1476 (257)
SAP value		83.9903
SAP rating (Section 12)		84 (258)
SAP band		B

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	2636.1867	0.2160	569.4163 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1827.8209	0.2160	394.8093 (264)
Space and water heating			964.2256 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	406.2828	0.5190	210.8608 (268)
Total kg/year			1214.0114 (272)
CO2 emissions per m2			15.3700 (273)
EI value			86.8808
EI rating			87 (274)
EI band			B

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9050 = 3.845$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9050 = 0.2387$, stars = 4
Water heating energy efficiency	$3.48 / 0.8866 = 3.925$, stars = 4
Water heating environmental impact	$0.216 / 0.8866 = 0.2436$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	39.5000 (1b)	x 2.3300 (2b)	= 92.0350 (1b) - (3b)
First floor	39.5000 (1c)	x 2.5300 (2c)	= 99.9350 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 191.9700 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 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					3 * 10 = 30.0000 (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)					30.0000 / (5) = 0.1563 (8)
Pressure test					Yes
Measured/design AP50					5.0100
Infiltration rate					0.4068 (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)	=	0.3763 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.5000	4.3000	4.3000	4.0000	3.9000	3.4000	3.4000	3.3000	3.5000	3.8000	3.8000	4.1000 (22)
Wind factor	1.1250	1.0750	1.0750	1.0000	0.9750	0.8500	0.8500	0.8250	0.8750	0.9500	0.9500	1.0250 (22a)
Adj infilt rate	0.4233	0.4045	0.4045	0.3763	0.3669	0.3198	0.3198	0.3104	0.3292	0.3575	0.3575	0.3857 (22b)
Effective ac	0.5896	0.5818	0.5818	0.5708	0.5673	0.5511	0.5511	0.5482	0.5542	0.5639	0.5639	0.5744 (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
Solid Door			4.2000	1.2000	5.0400		(26)
Windows (Uw = 1.30)			6.8900	1.2357	8.5143		(27)
Flr - Ground			39.5020	0.2273	8.9793	75.6000	2986.3512 (28a)
Brick	8.2800		8.2800	0.2400	1.9872	38.9500	322.5060 (29a)
Clad	78.4860	11.0940	67.3920	0.2300	15.5002	38.9500	2624.9184 (29a)
Rf - Ins Joist	39.5020		39.5020	0.1100	4.3452	9.0000	355.5180 (30)
Total net area of external elements Aum(A, m ²)			165.7660				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.3662		(33)
Party Wall			39.3810	0.0000	0.0000	39.3700	1550.4300 (32)
Stud			52.6653			7.4000	389.7232 (32c)
Stud			86.0394			7.4000	636.6918 (32c)
Internal Floor			39.5020			7.4000	292.3148 (32d)
Internal Ceiling			39.5020			7.4000	292.3148 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	9450.7682 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							119.6300 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.6652 (36)
Total fabric heat loss						(33) + (36) =	48.0313 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	37.3507	36.8574	36.8574	36.1595	35.9381	34.9151	34.9151	34.7273	35.1084	35.7223	35.7223	36.3865 (38)
Heat transfer coeff	85.3820	84.8887	84.8887	84.1908	83.9694	82.9464	82.9464	82.7586	83.1398	83.7536	83.7536	84.4179 (39)
Average = Sum(39)m / 12 =												83.9197 (39)
HLP	1.0808	1.0745	1.0745	1.0657	1.0629	1.0500	1.0500	1.0476	1.0524	1.0602	1.0602	1.0686 (40)
HLP (average)												1.0623 (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												2.4436 (42)
Average daily hot water use (litres/day)												92.2358 (43)
Daily hot water use	101.4594	97.7700	94.0805	90.3911	86.7017	83.0122	83.0122	86.7017	90.3911	94.0805	97.7700	101.4594 (44)
Energy conte	150.4613	131.5945	135.7937	118.3882	113.5963	98.0250	90.8346	104.2340	105.4789	122.9255	134.1828	145.7138 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

Energy content (annual)	Total = Sum(45)m = 1451.2285 (45)										
Distribution loss (46)m = 0.15 x (45)m											
22.5692	19.7392	20.3691	17.7582	17.0394	14.7037	13.6252	15.6351	15.8218	18.4388	20.1274	21.8571 (46)
Water storage loss:											
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)
If cylinder contains dedicated solar storage											
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)
Combi loss	14.6683	13.2271	14.6002	14.0793	14.5124	14.0024	14.4431	14.4880	14.0443	14.5639	14.1519 (61)
Total heat required for water heating calculated for each month											
165.1296	144.8215	150.3939	132.4676	128.1087	112.0274	105.2777	118.7220	119.5232	137.4893	148.3346	160.3678 (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)
Solar input (sum of months) = Sum(63)m =	0.0000 (63)										
Output from w/h											
165.1296	144.8215	150.3939	132.4676	128.1087	112.0274	105.2777	118.7220	119.5232	137.4893	148.3346	160.3678 (64)
Total per year (kWh/year) = Sum(64)m =	1622.6634 (64)										
Heat gains from water heating, kWh/month											
53.6955	47.0619	48.8014	42.8839	41.3989	36.0939	33.8133	38.2798	38.5828	44.5137	48.1537	52.1133 (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	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	57.5135	51.0830	41.5435	31.4511	23.5101	19.8482	21.4467	27.8772	37.4167	47.5091	55.4501	59.1120	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	324.3849	327.7510	319.2685	301.2103	278.4152	256.9909	242.6782	239.3121	247.7945	265.8527	288.6479	310.0721	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	(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)	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	(71)
Water heating gains (Table 5)	72.1713	70.0326	65.5933	59.5610	55.6436	50.1304	45.4479	51.4514	53.5872	59.8302	66.8802	70.0448	(72)
Total internal gains	558.0473	552.8441	530.3829	496.2000	461.5464	430.9471	413.5503	422.6182	442.7760	477.1696	514.9558	543.2065	(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		
North				3.3620	12.7802	0.4700	0.0000	0.7700		15.5498 (74)		
South				3.5280	54.3838	0.4700	0.0000	0.7700		69.4363 (78)		

Solar gains	84.9861	127.4494	169.7412	218.5299	240.6950	262.4304	243.2337	221.6631	195.2564	144.3072	99.9536	73.4074 (83)
Total gains	643.0334	680.2936	700.1241	714.7299	702.2414	693.3775	656.7840	644.2813	638.0325	621.4768	614.9094	616.6139 (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	30.7467	30.9253	30.9253	31.1817	31.2639	31.6495	31.6495	31.7213	31.5759	31.3445	31.3445	31.0978	
alpha	3.0498	3.0617	3.0617	3.0788	3.0843	3.1100	3.1100	3.1148	3.1051	3.0896	3.0896	3.0732	
util living area	0.9474	0.9351	0.9094	0.8622	0.7740	0.6135	0.4734	0.4902	0.6904	0.8544	0.9255	0.9527	(86)
MIT	19.3649	19.5221	19.8397	20.2166	20.5939	20.8664	20.9564	20.9510	20.7916	20.3622	19.8142	19.3287	(87)
Th 2	20.0166	20.0217	20.0217	20.0289	20.0312	20.0419	20.0419	20.0439	20.0399	20.0335	20.0335	20.0266	(88)
util rest of house	0.9391	0.9250	0.8943	0.8378	0.7298	0.5379	0.3719	0.3892	0.6229	0.8241	0.9122	0.9453	(89)
MIT 2	17.8598	18.0881	18.5422	19.0771	19.5895	19.9290	20.0172	20.0150	19.8470	19.2886	18.5183	17.8146	(90)
Living area fraction	18.1993	18.4116	18.8349	19.3341	19.8161	20.1404	20.2290	20.2261	20.0601	19.5307	18.8107	18.1561	(91)
MIT	18.1993	18.4116	18.8349	19.3341	19.8161	20.1404	20.2290	20.2261	20.0601	19.5307	18.8107	18.1561	(92)
Temperature adjustment	18.0493	18.2616	18.6849	19.1841	19.6661	19.9904	20.0790	20.0761	19.9101	19.3807	18.6607	18.0061	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation	0.9170	0.9012	0.8685	0.8122	0.7108	0.5335	0.3760	0.3928	0.6128	0.7993	0.8876	0.9244	(94)	
Useful gains	589.6649	613.0803	608.0559	580.5230	499.1401	369.9241	246.9489	253.0742	390.9733	496.7747	545.8134	569.9842	(95)	
Ext temp.	4.6000	5.1000	6.9000	9.2000	12.2000	15.1000	17.0000	16.9000	14.5000	11.0000	7.4000	4.5000	(96)	
Heat loss rate W	1148.3271	1117.2697	1000.4017	840.5714	626.9218	405.6439	255.3951	262.8527	449.7950	701.9173	943.1200	1140.1572	(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	415.6447	338.8153	291.9052	187.2348	95.0696	0.0000	0.0000	0.0000	0.0000	152.6260	286.0607	424.2088	(98)	
Space heating												2191.5652	(98)	
Space heating per m2												(98) / (4) =	27.7413	(99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

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 %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2421.6190 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	415.6447	338.8153	291.9052	187.2348	95.0696	0.0000	0.0000	0.0000	0.0000	152.6260	286.0607	424.2088	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	459.2759	374.3815	322.5472	206.8893	105.0493	0.0000	0.0000	0.0000	0.0000	168.6476	316.0892	468.7390	(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	165.1296	144.8215	150.3939	132.4676	128.1087	112.0274	105.2777	118.7220	119.5232	137.4893	148.3346	160.3678	(64)
Efficiency of water heater (217)m	89.5665	89.5174	89.3859	89.1461	88.6350	87.3000	87.3000	87.3000	87.3000	88.9547	89.3812	87.3000	(216)
Fuel for water heating, kWh/month	184.3653	161.7802	168.2523	148.5961	144.5350	128.3246	120.5930	135.9931	136.9109	154.5610	165.9572	178.9839	(219)
Water heating fuel used												1828.8528	(219)
Annual totals kWh/year													
Space heating fuel - main system												2421.6190	(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)												406.2828	(232)
Total delivered energy for all uses												4731.7546	(238)

10a. Fuel costs - using BEDF prices (524)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2421.6190	10.2300	247.7316 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1828.8528	10.2300	187.0916 (247)
Pumps and fans for heating	75.0000	36.7200	27.5400 (249)
Energy for lighting	406.2828	36.7200	149.1870 (250)
Additional standing charges			103.0000 (251)
Total energy cost			714.5503 (255)

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	2421.6190	0.2160	523.0697 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1828.8528	0.2160	395.0322 (264)
Space and water heating			918.1019 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	406.2828	0.5190	210.8608 (268)
Total kg/year			1167.8877 (272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2421.6190	1.2200	2954.3752 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1828.8528	1.2200	2231.2004 (264)
Space and water heating			5185.5756 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	406.2828	3.0700	1247.2882 (268)
Primary energy kWh/year			6663.1138 (272)
Primary energy kWh/m2/year			84.3432 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 84
Current environmental impact rating: B 87

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

(For testing purposes):

A	Not considered
B	Not considered
C	Not considered
D	Not considered
E	Low energy lighting
F	Already installed
G	Not considered
H	Not considered
I	Not considered
J	Not considered
K	Not considered
M	Not considered
N	Solar water heating
O	Recommended
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U	Solar photovoltaic panels
A2	Recommended
A3	Not considered
T2	Not considered
W	Not considered
X	Not considered
Y	Not considered
J2	Not considered
Q2	Not considered
Z1	Not considered
Z2	Not considered
Z3	Not considered
Z4	Not considered
Z5	Not considered
V2	Wind turbine
L2	Not applicable
Q3	Not considered
O3	Not considered

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.2	-£ 80	-183 kg (15.6%)
U Solar photovoltaic panels	+ 10.8	-£ 685	-968 kg (98.3%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£80	2.31 kg/m²	B 85 B 89
Solar photovoltaic panels	£685	12.26 kg/m²	A 96 A 98
Total Savings	£766	14.57 kg/m²	

Potential energy efficiency rating: A 96
Potential environmental impact rating: A 98

Fuel prices for cost data on this page from database revision number 524 TEST (01 Aug 2023)
Recommendation texts revision number 4.9c (22 Feb 2014)

Typical heating and lighting costs of this home (per year, Severn Valley):			
	Current	Potential	Saving
Electricity	£177	£195	-£18
Mains gas	£538	£439	£99
Space heating	£378	£378	£0
Water heating	£187	£107	£80
Lighting	£149	£149	£0
Generated (PV)	-£0	-£685	£685
Total cost of fuels	£715	-£51	£766
Total cost of uses	£714	-£51	£765
Delivered energy	60 kWh/m²	25 kWh/m²	35 kWh/m²
Carbon dioxide emissions	1.2 tonnes	0.0 tonnes	1.2 tonnes
CO2 emissions per m²	15 kg/m²	0 kg/m²	15 kg/m²
Primary energy	84 kWh/m²	-1 kWh/m²	85 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	39.5000 (1b)	x 2.3300 (2b)	= 92.0350 (1b) - (3b)
First floor	39.5000 (1c)	x 2.5300 (2c)	= 99.9350 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 191.9700 (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					3 * 10 = 30.0000 (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)					30.0000 / (5) = 0.1563 (8)
Pressure test					Yes
Measured/design AP50					5.0100
Infiltration rate					0.4068 (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) =	0.3763 (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	0.4797	0.4703	0.4609	0.4139	0.4045	0.3575	0.3575	0.3480	0.3763	0.4045	0.4233	0.4421 (22b)
Effective ac	0.6151	0.6106	0.6062	0.5857	0.5818	0.5639	0.5639	0.5606	0.5708	0.5818	0.5896	0.5977 (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
Solid Door			4.2000	1.2000	5.0400		(26)
Windows (Uw = 1.30)			6.8900	1.2357	8.5143		(27)
Flr - Ground			39.5020	0.2273	8.9793	75.6000	2986.3512 (28a)
Brick	8.2800		8.2800	0.2400	1.9872	38.9500	322.5060 (29a)
Clad	78.4860	11.0940	67.3920	0.2300	15.5002	38.9500	2624.9184 (29a)
Rf - Ins Joist	39.5020		39.5020	0.1100	4.3452	9.0000	355.5180 (30)
Total net area of external elements Aum(A, m ²)			165.7660				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.3662		(33)
Party Wall			39.3810	0.0000	0.0000	39.3700	1550.4300 (32)
Stud			52.6653			7.4000	389.7232 (32c)
Stud			86.0394			7.4000	636.6918 (32c)
Internal Floor			39.5020			7.4000	292.3148 (32d)
Internal Ceiling			39.5020			7.4000	292.3148 (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
(28)...(30) + (32) + (32a)...(32e) = 9450.7682 (34)
119.6300 (35)
3.6652 (36)
(33) + (36) = 48.0313 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	38.9651	38.6820	38.4045	37.1012	36.8574	35.7223	35.7223	35.5120	36.1595	36.8574	37.3507	37.8664 (38)
Heat transfer coeff	86.9964	86.7133	86.4359	85.1326	84.8887	83.7536	83.7536	83.5434	84.1908	84.8887	85.3820	85.8977 (39)
Average = Sum(39)m / 12 =												85.1314 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1012	1.0976	1.0941	1.0776	1.0745	1.0602	1.0602	1.0575	1.0657	1.0745	1.0808	1.0873 (40)
HLP (average)												1.0776 (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
Average daily hot water use (litres/day)
2.4436 (42)
92.2358 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	101.4594	97.7700	94.0805	90.3911	86.7017	83.0122	83.0122	86.7017	90.3911	94.0805	97.7700	101.4594 (44)
Energy conte	150.4613	131.5945	135.7937	118.3882	113.5963	98.0250	90.8346	104.2340	105.4789	122.9255	134.1828	145.7138 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Energy content (annual)												Total = Sum(45)m =	1451.2285 (45)
Distribution loss (46)m = 0.15 x (45)m													
	22.5692	19.7392	20.3691	17.7582	17.0394	14.7037	13.6252	15.6351	15.8218	18.4388	20.1274	21.8571	(46)
Water storage loss:													
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)
If cylinder contains dedicated solar storage													
	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)
Combi loss	14.6683	13.2271	14.6002	14.0793	14.5124	14.0024	14.4431	14.4880	14.0443	14.5639	14.1519	14.6541	(61)
Total heat required for water heating calculated for each month													
	165.1296	144.8215	150.3939	132.4676	128.1087	112.0274	105.2777	118.7220	119.5232	137.4893	148.3346	160.3678	(62)
Aperture area of solar collector													
Zero-loss collector efficiency													
Collector heat loss coefficient													
Collector 2nd order heat loss coefficient													
Collector effective heat loss coefficient													
Collector performance ratio													
Annual solar radiation per m2													
Overshading factor													
Solar energy available													
Adjustment factor for showers													
Solar-to-load ratio													
Utilisation factor													
Collector performance factor													
Dedicated solar storage volume													
Effective solar volume													
Daily hot water demand													
Volume ratio Veff/V													
Solar storage volume factor													
Solar input													
Solar input	-24.4148	-40.7414	-69.3872	-92.9925	-114.8844	-112.9497	-111.4570	-97.3806	-76.2685	-52.0824	-28.9595	-841.9491	(H17)
Output from w/h													
	140.7148	104.0802	81.0067	39.4750	13.2243	0.0000	0.0000	21.3415	43.2547	85.4069	119.3751	139.9368	(64)
Heat gains from water heating, kWh/month													
	53.6955	47.0619	48.8014	42.8839	41.3989	36.0939	33.8133	38.2798	38.5828	44.5137	48.1537	52.1133	(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	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	57.5135	51.0830	41.5435	31.4511	23.5101	19.8482	21.4467	27.8772	37.4167	47.5091	55.4501	59.1120	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	324.3849	327.7510	319.2685	301.2103	278.4152	256.9909	242.6782	239.3121	247.7945	265.8527	288.6479	310.0721	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	(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)	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	(71)
Water heating gains (Table 5)	72.1713	70.0326	65.5933	59.5610	55.6436	50.1304	45.4479	51.4514	53.5872	59.8302	66.8802	70.0448	(72)
Total internal gains	558.0473	552.8441	530.3829	496.2000	461.5464	430.9471	413.5503	422.6182	442.7760	477.1696	514.9558	543.2065	(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
North				3.3620	10.6334		0.4700		0.0000		0.7700		12.9377 (74)
South				3.5280	46.7521		0.4700		0.0000		0.7700		59.6923 (78)

Solar gains	72.6300	122.4852	166.5428	208.2295	237.5727	238.4644	228.7674	206.0131	180.5994	134.8754	86.7160		62.3651 (83)
Total gains	630.6773	675.3293	696.9257	704.4295	699.1191	669.4115	642.3177	628.6312	623.3754	612.0450	601.6718		605.5717 (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	30.1761	30.2746	30.3718	30.8368	30.9253	31.3445	31.3445	31.4234	31.1817	30.9253	30.7467	30.5621	
alpha	3.0117	3.0183	3.0248	3.0558	3.0617	3.0896	3.0896	3.0949	3.0788	3.0617	3.0498	3.0375	
util living area	0.9525	0.9390	0.9169	0.8740	0.7975	0.6662	0.5247	0.5516	0.7276	0.8709	0.9337	0.9572	(86)
MIT	19.2500	19.4335	19.7356	20.1426	20.5197	20.8127	20.9345	20.9218	20.7355	20.2756	19.7080	19.2190	(87)
Th 2	19.9998	20.0028	20.0056	20.0191	20.0217	20.0335	20.0335	20.0357	20.0289	20.0217	20.0166	20.0112	(88)
util rest of house	0.9450	0.9295	0.9032	0.8515	0.7577	0.5966	0.4263	0.4555	0.6657	0.8438	0.9217	0.9504	(89)
MIT 2	17.6842	17.9493	18.3840	18.9682	19.4857	19.8637	19.9915	19.9826	19.7728	19.1623	18.3566	17.6469	(90)
Living area fraction	18.0374	18.2841	18.6889	19.2331	19.7189	20.0778	20.2042	20.1944	fLA = Living area / (4) =	19.4134	18.6615	18.0015	(91)
MIT	18.0374	18.2841	18.6889	19.2331	19.7189	20.0778	20.2042	20.1944	19.9900	19.4134	18.6615	18.0015	(92)
Temperature adjustment	17.8874	18.1341	18.5389	19.0831	19.5689	19.9278	20.0542	20.0444	19.8400	19.2634	18.5115	17.8515	(93)
adjusted MIT	17.8874	18.1341	18.5389	19.0831	19.5689	19.9278	20.0542	20.0444	19.8400	19.2634	18.5115	17.8515	(93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9235	0.9057	0.8773	0.8253	0.7364	0.5882	0.4285	0.4564	0.6521	0.8181	0.8975	0.9302	(94)
Useful gains	582.4444	611.6781	611.4337	581.3828	514.8084	393.7345	275.2392	286.9140	406.4720	500.7247	540.0127	563.2933	(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	1182.0565	1147.5701	1040.5932	866.9167	667.9839	446.2192	289.3038	304.4678	483.2535	735.4232	974.3338	1172.6341	(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	446.1114	360.1195	319.2946	205.5844	113.9626	0.0000	0.0000	0.0000	0.0000	174.6157	312.7112	453.3495	(98)
Space heating												2385.7489	(98)
Space heating per m2											(98) / (4) =	30.1994	(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 %)													90.5000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													2636.1867	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	446.1114	360.1195	319.2946	205.5844	113.9626	0.0000	0.0000	0.0000	0.0000	174.6157	312.7112	453.3495	(98)	
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)	
Space heating fuel (main heating system)	492.9408	397.9221	352.8117	227.1651	125.9255	0.0000	0.0000	0.0000	0.0000	192.9455	345.5373	500.9387	(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	140.7148	104.0802	81.0067	39.4750	13.2243	0.0000	0.0000	21.3415	43.2547	85.4069	119.3751	139.9368	(64)	
Efficiency of water heater	89.7115	89.7623	89.8336	89.9688	90.1564	87.3000	87.3000	87.3000	87.3000	89.4234	89.5927	89.7243	(217)	
Fuel for water heating, kWh/month	156.8526	115.9509	90.1741	43.8764	14.6682	0.0000	0.0000	24.4461	49.5472	95.5085	133.2420	155.9631	(219)	
Water heating fuel used												880.2291	(219)	
Annual totals kWh/year														
Space heating fuel - main system												2636.1867	(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)
pump for solar water heating													50.0000	(230g)
Total electricity for the above, kWh/year													125.0000	(231)
Electricity for lighting (calculated in Appendix L)													406.2828	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 2.50 * 1080 * 0.80) =										-1727.2394		-1727.2394	(233)	
Total delivered energy for all uses													2320.4591	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2636.1867	3.4800	91.7393	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	880.2291	3.4800	30.6320	(247)
Pumps and fans for heating	75.0000	13.1900	9.8925	(249)
Pump for solar water heating	50.0000	13.1900	6.5950	(249)
Energy for lighting	406.2828	13.1900	53.5887	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	-1727.2394	13.1900	-227.8229	(252)
Total energy cost			84.6246	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):			0.4200	(256)
Energy cost factor (ECF)			0.2866	(257)
SAP value			96.0015	
SAP rating (Section 12)			96	(258)
SAP band			A	

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

Energy	Emission factor	Emissions
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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

	kWh/year	kg CO2/kWh	kg CO2/year
Space heating - main system 1	2636.1867	0.2160	569.4163 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	880.2291	0.2160	190.1295 (264)
Space and water heating			759.5458 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	406.2828	0.5190	210.8608 (268)
Energy saving/generation technologies			
PV Unit	-1727.2394	0.5190	-896.4372 (269)
Total kg/year			138.8443 (272)
CO2 emissions per m2			1.7600 (273)
EI value			98.4996
EI rating			98 (274)
EI band			A

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	39.5000 (1b)	x 2.3300 (2b)	= 92.0350 (1b) - (3b)
First floor	39.5000 (1c)	x 2.5300 (2c)	= 99.9350 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 191.9700 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 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					3 * 10 = 30.0000 (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) =					30.0000 / (5) = 0.1563 (8)
Pressure test					Yes
Measured/design AP50					5.0100
Infiltration rate					0.4068 (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) =	0.3763 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.5000	4.3000	4.3000	4.0000	3.9000	3.4000	3.4000	3.3000	3.5000	3.8000	3.8000	4.1000 (22)
Wind factor	1.1250	1.0750	1.0750	1.0000	0.9750	0.8500	0.8500	0.8250	0.8750	0.9500	0.9500	1.0250 (22a)
Adj infilt rate	0.4233	0.4045	0.4045	0.3763	0.3669	0.3198	0.3198	0.3104	0.3292	0.3575	0.3575	0.3857 (22b)
Effective ac	0.5896	0.5818	0.5818	0.5708	0.5673	0.5511	0.5511	0.5482	0.5542	0.5639	0.5639	0.5744 (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
Solid Door			4.2000	1.2000	5.0400		(26)
Windows (Uw = 1.30)			6.8900	1.2357	8.5143		(27)
Flr - Ground			39.5020	0.2273	8.9793	75.6000	2986.3512 (28a)
Brick	8.2800		8.2800	0.2400	1.9872	38.9500	322.5060 (29a)
Clad	78.4860	11.0940	67.3920	0.2300	15.5002	38.9500	2624.9184 (29a)
Rf - Ins Joist	39.5020		39.5020	0.1100	4.3452	9.0000	355.5180 (30)
Total net area of external elements Aum(A, m ²)			165.7660				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.3662		(33)
Party Wall			39.3810	0.0000	0.0000	39.3700	1550.4300 (32)
Stud			52.6653			7.4000	389.7232 (32c)
Stud			86.0394			7.4000	636.6918 (32c)
Internal Floor			39.5020			7.4000	292.3148 (32d)
Internal Ceiling			39.5020			7.4000	292.3148 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 9450.7682 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							119.6300 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.6652 (36)
Total fabric heat loss							(33) + (36) = 48.0313 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	37.3507	36.8574	36.8574	36.1595	35.9381	34.9151	34.9151	34.7273	35.1084	35.7223	35.7223	36.3865 (38)
Heat transfer coeff	85.3820	84.8887	84.8887	84.1908	83.9694	82.9464	82.9464	82.7586	83.1398	83.7536	83.7536	84.4179 (39)
Average = Sum(39)m / 12 =												83.9197 (39)
HLP	1.0808	1.0745	1.0745	1.0657	1.0629	1.0500	1.0500	1.0476	1.0524	1.0602	1.0602	1.0686 (40)
HLP (average)												1.0623 (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												2.4436 (42)
Average daily hot water use (litres/day)												92.2358 (43)
Daily hot water use	101.4594	97.7700	94.0805	90.3911	86.7017	83.0122	83.0122	86.7017	90.3911	94.0805	97.7700	101.4594 (44)
Energy conte	150.4613	131.5945	135.7937	118.3882	113.5963	98.0250	90.8346	104.2340	105.4789	122.9255	134.1828	145.7138 (45)

Energy content (annual)											Total = Sum(45) m =		1451.2285 (45)
Distribution loss (46)m = 0.15 x (45)m													
	22.5692	19.7392	20.3691	17.7582	17.0394	14.7037	13.6252	15.6351	15.8218	18.4388	20.1274	21.8571 (46)	
Water storage loss:													
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)	
If cylinder contains dedicated solar storage													
	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)	
Combi loss	14.6683	13.2271	14.6002	14.0793	14.5124	14.0024	14.4431	14.4880	14.0443	14.5639	14.1519	14.6541 (61)	
Total heat required for water heating calculated for each month													
	165.1296	144.8215	150.3939	132.4676	128.1087	112.0274	105.2777	118.7220	119.5232	137.4893	148.3346	160.3678 (62)	
Aperture area of solar collector												3.0000 (H1)	
Zero-loss collector efficiency												0.7000 (H2)	
Collector heat loss coefficient												1.8000 (H3)	
Collector 2nd order heat loss coefficient												0.0050 (H3a)	
Collector effective heat loss coefficient												1.8063 (H3b)	
Collector performance ratio												2.5804 (H4)	
Annual solar radiation per m2												1166.2973 (H5)	
Overshading factor												0.8000 (H6)	
Solar energy available												1959.3794 (H7)	
Adjustment factor for showers												1.0000 (H7a)	
Solar-to-load ratio												1.3502 (H8)	
Utilisation factor												0.5232 (H9)	
Collector performance factor												0.8793 (H10)	
Dedicated solar storage volume												75.0000 (H11)	
Effective solar volume												75.0000 (H13)	
Daily hot water demand												92.2358 (H14)	
Volume ratio Veff/V												0.8131 (H15)	
Solar storage volume factor												0.9586 (H16)	
Solar input												-864.1115 (H17)	
Solar input	-27.7328	-41.1706	-68.4971	-93.8680	-111.2450	-118.4948	-113.0923	-100.4970	-79.6735	-54.0911	-32.4134	-23.3358 (63)	
												-864.1115 (63)	
Output from w/h													
	137.3968	103.6509	81.8968	38.5995	16.8637	0.0000	0.0000	18.2250	39.8497	83.3983	115.9212	137.0320 (64)	
												772.8339 (64)	
Heat gains from water heating, kWh/month													
	53.6955	47.0619	48.8014	42.8839	41.3989	36.0939	33.8133	38.2798	38.5828	44.5137	48.1537	52.1133 (65)	

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168	146.6168 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	57.5135	51.0830	41.5435	31.4511	23.5101	19.8482	21.4467	27.8772	37.4167	47.5091	55.4501	59.1120 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	324.3849	327.7510	319.2685	301.2103	278.4152	256.9909	242.6782	239.3121	247.7945	265.8527	288.6479	310.0721 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053	52.1053 (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)	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445	-97.7445 (71)
Water heating gains (Table 5)	72.1713	70.0326	65.5933	59.5610	55.6436	50.1304	45.4479	51.4514	53.5872	59.8302	66.8802	70.0448 (72)
Total internal gains	558.0473	552.8441	530.3829	496.2000	461.5464	430.9471	413.5503	422.6182	442.7760	477.1696	514.9558	543.2065 (73)

[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
North	3.3620	12.7802	0.4700	0.0000	0.7700	15.5498 (74)
South	3.5280	54.3838	0.4700	0.0000	0.7700	69.4363 (78)

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	30.7467	30.9253	30.9253	31.1817	31.2639	31.6495	31.6495	31.7213	31.5759	31.3445	31.3445	31.0978
alpha	3.0498	3.0617	3.0617	3.0788	3.0843	3.1100	3.1100	3.1148	3.1051	3.0896	3.0896	3.0732
util living area												
	0.9474	0.9351	0.9094	0.8622	0.7740	0.6135	0.4734	0.4902	0.6904	0.8544	0.9255	0.9527 (86)
MIT	19.3649	19.5221	19.8397	20.2166	20.5939	20.8664	20.9564	20.9510	20.7916	20.3622	19.8142	19.3287 (87)
Th 2	20.0166	20.0217	20.0217	20.0289	20.0312	20.0419	20.0419	20.0439	20.0399	20.0335	20.0335	20.0266 (88)
util rest of house												
	0.9391	0.9250	0.8943	0.8378	0.7298	0.5379	0.3719	0.3892	0.6229	0.8241	0.9122	0.9453 (89)
MIT 2	17.8598	18.0881	18.5422	19.0771	19.5895	19.9290	20.0172	20.0150	19.8470	19.2886	18.5183	17.8146 (90)
Living area fraction												
MIT	18.1993	18.4116	18.8349	19.3341	19.8161	20.1404	20.2290	20.2261	20.0601	19.5307	18.8107	18.1561 (91)
Temperature adjustment												-0.1500
adjusted MIT	18.0493	18.2616	18.6849	19.1841	19.6661	19.9904	20.0790	20.0761	19.9101	19.3807	18.6607	18.0061 (93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9170	0.9012	0.8685	0.8122	0.7108	0.5335	0.3760	0.3928	0.6128	0.7993	0.8876	0.9244	(94)
Useful gains	589.6649	613.0803	608.0559	580.5230	499.1401	369.9241	246.9489	253.0742	390.9733	496.7747	545.8134	569.9842	(95)
Ext temp.	4.6000	5.1000	6.9000	9.2000	12.2000	15.1000	17.0000	16.9000	14.5000	11.0000	7.4000	4.5000	(96)
Heat loss rate W	1148.3271	1117.2697	1000.4017	840.5714	626.9218	405.6439	255.3951	262.8527	449.7950	701.9173	943.1200	1140.1572	(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	415.6447	338.8153	291.9052	187.2348	95.0696	0.0000	0.0000	0.0000	0.0000	152.6260	286.0607	424.2088	(98)
Space heating												2191.5652	(98)
Space heating per m2												27.7413	(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 %)													90.5000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													2421.6190	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	415.6447	338.8153	291.9052	187.2348	95.0696	0.0000	0.0000	0.0000	0.0000	152.6260	286.0607	424.2088	(98)	
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)	
Space heating fuel (main heating system)	459.2759	374.3815	322.5472	206.8893	105.0493	0.0000	0.0000	0.0000	0.0000	168.6476	316.0892	468.7390	(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	137.3968	103.6509	81.8968	38.5995	16.8637	0.0000	0.0000	18.2250	39.8497	83.3983	115.9212	137.0320	(64)	
Efficiency of water heater	89.6833	89.7295	89.7790	89.9365	90.0030	87.3000	87.3000	87.3000	87.3000	89.3428	89.5534	89.6972	(217)	
Fuel for water heating, kWh/month	153.2023	115.5148	91.2204	42.9186	18.7368	0.0000	0.0000	20.8763	45.6468	93.3463	129.4437	152.7717	(219)	
Water heating fuel used												863.6778	(219)	
Annual totals kWh/year														
Space heating fuel - main system													2421.6190	(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)
pump for solar water heating													50.0000	(230g)
Total electricity for the above, kWh/year													125.0000	(231)
Electricity for lighting (calculated in Appendix L)													406.2828	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 2.50 * 1166 * 0.80) =									-1866.0756				-1866.0756	(233)
Total delivered energy for all uses													1950.5040	(238)

10a. Fuel costs - using BEDF prices (524)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2421.6190	10.2300	247.7316	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	863.6778	10.2300	88.3542	(247)
Pumps and fans for heating	75.0000	36.7200	27.5400	(249)
Pump for solar water heating	50.0000	36.7200	18.3600	(249)
Energy for lighting	406.2828	36.7200	149.1870	(250)
Additional standing charges			103.0000	(251)
Energy saving/generation technologies				
PV Unit	-1866.0756	36.7200	-685.2230	(252)
Total energy cost			-51.0501	(255)

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	2421.6190	0.2160	523.0697	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	863.6778	0.2160	186.5544	(264)
Space and water heating			709.6241	(265)
Pumps and fans	125.0000	0.5190	64.8750	(267)
Energy for lighting	406.2828	0.5190	210.8608	(268)
Energy saving/generation technologies				
PV Unit	-1866.0756	0.5190	-968.4932	(269)
Total kg/year			16.8666	(272)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2421.6190	1.2200	2954.3752 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	863.6778	1.2200	1053.6869 (264)
Space and water heating			4008.0621 (265)
Pumps and fans	125.0000	3.0700	383.7500 (267)
Energy for lighting	406.2828	3.0700	1247.2882 (268)
Energy saving/generation technologies			
PV Unit	-1866.0756	3.0700	-5728.8521 (269)
Primary energy kWh/year			-89.7519 (272)
Primary energy kWh/m2/year			-1.1361 (273)

SAP 2012 OVERHEATING ASSESSMENT FOR New Build (As Designed) 9.92

Overheating Calculation Input Data

Dwelling type	SemiDetached House
Number of storeys	2
Cross ventilation possible	Yes
SAP Region	Severn Valley
Front of dwelling faces	South
Overshading	Average or unknown
Thermal mass parameter	119.6 (calculated from construction elements)
Night ventilation	Yes
Ventilation rate during hot weather (ach)	4.68 (Calculated rate)

Overheating Calculation

Summer ventilation heat loss coefficient	296.48 (P1)
Transmission heat loss coefficient	48.03 (37)
Summer heat loss coefficient	344.51 (P2)

Overhangs

Orientation	Ratio	Z_overhangs	Overhang type
North	0.000	1.000	None
South	0.000	1.000	None

Solar shading

Orientation	Z blinds	Solar access	Z overhangs	Z summer
North	0.850	0.90	1.000	0.765 (P8)
South	0.850	0.90	1.000	0.765 (P8)

[Jul]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	FF Specific data or Table 6c	Shading	Gains W
North	3.3620	82.4373	0.4700	0.0000	0.7650	99.6508
South	3.5280	113.6726	0.4700	0.0000	0.7650	144.1929
total:						243.8437

	Jun	Jul	Aug	
Solar gains	264	244	223	(P3/P4)
Internal gains	428	411	420	
Total summer gains	692	654	642	(P5)
Summer gain/loss ratio	2.01	1.90	1.86	(P6)
Summer external temperature	15.00	16.70	16.70	
Thermal mass temperature increment (TMP = 119.6)	1.16	1.16	1.16	
Threshold temperature	18.17	19.76	19.73	(P7)
Likelihood of high internal temperature	Not significant	Not significant	Not significant	
Assessment of likelihood of high internal temperature:	Not significant			

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Designed)

Property Reference	375 - PRJ012557			Issued on Date	03/08/2023
Assessment Reference	375	Prop Type Ref	VW0052.V2 SAN SD CL 4.6		
Property	Shrivenham, SN6				
SAP Rating	84 B	DER	16.93	TER	18.77
Environmental	87 B	% DER<TER	9.83		
CO ₂ Emissions (t/year)	1.17	DFEE	42.95	TFEE	50.92
General Requirements Compliance	Pass	% DFEE<TFEE	15.65		
Assessor Details	Mr. Christopher Nicholls, Briary Energy Limited, Tel: 0203 397 1373, chris@briaryenergy.co.uk			Assessor ID	4299-0004
Client					

SUMMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TfEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	18.77	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.93	kgCO ₂ /m ²	Pass
	-1.84 (-9.8%)	kgCO ₂ /m ²	

1b TfEE and DfEE

Target Fabric Energy Efficiency (TfEE)	50.92	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DfEE)	42.95	kWh/m ² /yr	
	-7.9 (-15.5%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.23 (max. 0.30)	0.24 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.23 (max. 0.25)	0.23 (max. 0.70)	Pass
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	Pass
Openings	1.26 (max. 2.00)	1.30 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	5.01 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Designed)

Main heating system

Boiler system with radiators or underfloor - Mains gas
Data from database
Ideal LOGIC COMBI ESP1 30
Combi boiler
Efficiency: 89.6% SEDBUK2009
Minimum: 88.0%

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Time and temperature zone control

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100 %

Minimum

75 %

Pass

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Severn Valley)

Not significant

Pass

Based on:

Overshading

Average

Windows facing North

3.36 m², No overhang

Windows facing South

3.53 m², No overhang

Air change rate

4.68 ach

Blinds/curtains

Dark-coloured curtain or roller blind, closed 100% of daylight hours

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

5.01 (design value)

Maximum

10.0

Pass

10 Key features

Party wall U-value

0.00

W/m²K

Roof U-value

0.11

W/m²K

Thermal bridging y-value

0.022

W/m²K