

PREDICTED ENERGY ASSESSMENT

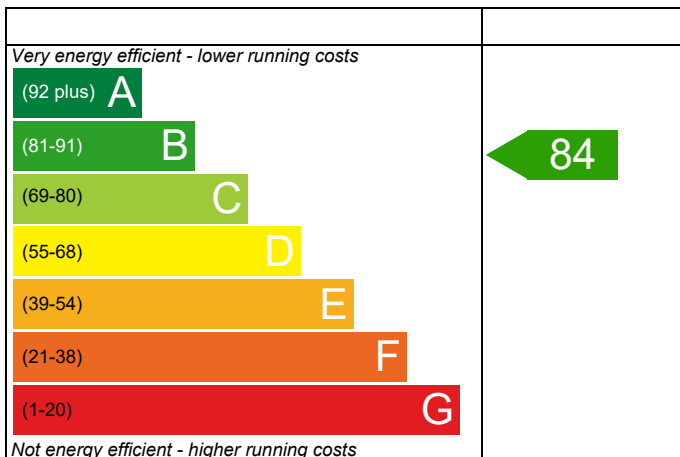
308 - PRJ012557

Dwelling type: House, End-Terrace
Date of assessment: 08/08/2022
Produced by: Scott Binstead
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

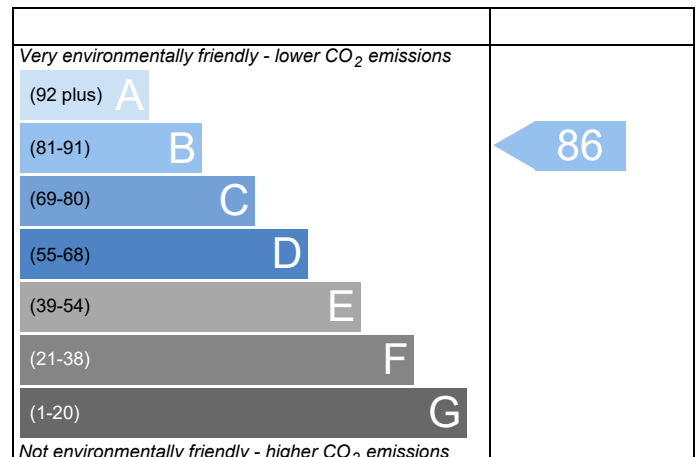


England

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	308 - PRJ012557			Issued on Date	08/08/2022
Assessment Reference	308 E	Prop Type Ref	VW0052.NSS.CLM817.3 SAN BR ET		
Property	308 - PRJ012557				
SAP Rating	84 B	DER	17.72	TER	18.86
Environmental	86 B	% DER<TER	6.04		
CO₂ Emissions (t/year)	1.21	DFEE	43.70	TFEE	51.44
General Requirements Compliance	Pass	% DFEE<TFEE	15.05		
Assessor Details	Chris Nicholls, , Tel: ,			Assessor ID	U903-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

DWELLING AS DESIGNED

End-Terrace 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) 18.86 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 17.72 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)51.4 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)43.7 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.22 (max. 0.25)	0.22 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (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: Programmer, room thermostat and TRVs 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 East: 3.53 m², No overhang

Windows facing South West: 3.36 m², No overhang

Air change rate: 4.21 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 0.10 W/m²K

Thermal bridging y-value 0.025 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)	2.3300 (2b)	92.0350 (1b) - (3b)
First floor	39.5000 (1c)	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	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)							
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)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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
Windows (Uw = 1.30)			6.8900	1.2357	8.5143		(27)
Solid Door			4.2000	1.2000	5.0400		(26)
Flr - Ground			39.5020	0.2200	8.6904	75.6000	2986.3512 (28a)
Wl - Brick	86.7660	11.0940	75.6720	0.2400	18.1613	38.9400	2946.6677 (29a)
RF - Ins Joist	39.5020		39.5020	0.1000	3.9502	5.8200	229.9016 (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) =	44.3562		(33)
Party Wall			39.3810	0.0000	0.0000	54.0300	2127.7554 (32)
Ground Floor Stud			52.6653			5.8200	306.5120 (32c)
1st Floor Stud			86.0394			5.8200	500.7495 (32c)
Internal Floor			39.5000			18.0000	711.0000 (32d)
Internal Ceiling			39.5000			5.8200	229.8900 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	10038.8275 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							127.0738 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.1637 (36)
Total fabric heat loss						(33) + (36) =	48.5198 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	87.4849	87.2018	86.9244	85.6211	85.3772	84.2421	84.2421	84.0319	84.6793	85.3772	85.8705	86.3862 (39)
Average = Sum(39)m / 12 =												85.6199 (39)
HLP	1.1074	1.1038	1.1003	1.0838	1.0807	1.0664	1.0664	1.0637	1.0719	1.0807	1.0870	1.0935 (40)
HLP (average)												1.0838 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	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)
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)
												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	22.8776	20.3197	16.5251	12.5105	9.3518	7.8952	8.5310	11.0889	14.8835	18.8980	22.0568	23.5134 (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	375.0410	372.5996	358.6825	336.5366	314.1878	292.8637	279.2275	285.5336	297.1473	319.5038	344.9853	363.9608 (73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	Specific data	Specific data	factor	W						
		W/m2	or Table 6b	or Table 6c	Table 6d							
Northeast	3.5280	11.2829	0.7600	0.7200	0.7700	15.0949 (75)						
Southwest	3.3620	36.7938	0.7600	0.7200	0.7700	46.9086 (79)						
Solar gains	62.0035	110.6287	164.6849	226.3754	273.9345	280.9159	267.1032	230.2517	185.8326	125.8592	75.1789	52.4712 (83)
Total gains	437.0444	483.2283	523.3674	562.9120	588.1222	573.7796	546.3307	515.7853	482.9799	445.3629	420.1642	416.4320 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (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	31.8748	31.9783	32.0803	32.5687	32.6617	33.1018	33.1018	33.1846	32.9309	32.6617	32.4740	32.2802
alpha	3.1250	3.1319	3.1387	3.1712	3.1774	3.2068	3.2068	3.2123	3.1954	3.1774	3.1649	3.1520
util living area	0.9838	0.9765	0.9619	0.9284	0.8602	0.7380	0.6003	0.6437	0.8285	0.9411	0.9759	0.9860 (86)
MIT	18.9691	19.1620	19.5058	19.9814	20.4279	20.7693	20.9148	20.8912	20.6334	20.0691	19.4470	18.9414 (87)
Th 2	19.9948	19.9977	20.0006	20.0141	20.0166	20.0284	20.0284	20.0306	20.0239	20.0166	20.0115	20.0061 (88)
util rest of house	0.9808	0.9721	0.9545	0.9130	0.8268	0.6699	0.4940	0.5413	0.7759	0.9254	0.9707	0.9834 (89)
MIT 2	18.1345	18.3279	18.6701	19.1458	19.5722	19.8830	19.9907	19.9789	19.7712	19.2385	18.6224	18.1153 (90)
Living area fraction	18.3228	18.5161	18.8586	19.3343	19.7652	20.0829	20.1991	20.1847	19.9657	19.4259	18.8084	18.3017 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.1728	18.3661	18.7086	19.1843	19.6152	19.9329	20.0491	20.0347	19.8157	19.2759	18.6584	18.1517 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	425.3774	465.1395	492.8867	504.7838	476.7008	380.0305	271.2467	279.4248	368.2456	405.3126	403.7552	406.7491 (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	1213.6579	1174.2673	1061.2258	880.5517	675.7790	449.2550	290.5615	305.4276	483.9986	740.7221	992.5243	1205.2309 (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	586.4806	476.5339	422.8443	270.5529	148.1142	0.0000	0.0000	0.0000	0.0000	249.5446	423.9138	594.0705 (98)
Space heating												3172.0547 (98)
Space heating per m2												(98) / (4) = 40.1526 (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																			3505.0329 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec							
Space heating requirement	586.4806	476.5339	422.8443	270.5529	148.1142	0.0000	0.0000	0.0000	0.0000	249.5446	423.9138	594.0705	(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)	648.0449	526.5568	467.2312	298.9535	163.6621	0.0000	0.0000	0.0000	0.0000	275.7399	468.4130	656.4315	(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	89.7770	89.7334	89.6380	89.4226	88.9872	87.3000	87.3000	87.3000	87.3000	89.3367	89.6482	89.8003	(217)						
Fuel for water heating, kWh/month	183.9331	161.3909	167.7792	148.1365	143.9631	128.3246	120.5930	135.9931	136.9109	153.9001	165.4630	178.5827	(219)						
Water heating fuel used												1824.9703	(219)						
Annual totals kWh/year																			
Space heating fuel - main system																			3505.0329 (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)																			404.0250 (232)
Total delivered energy for all uses																			5809.0282 (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	3505.0329	0.2160	757.0871 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1824.9703	0.2160	394.1936 (264)
Space and water heating			1151.2807 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	404.0250	0.5190	209.6890 (268)
Total CO2, kg/year			1399.8947 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			17.7200 (273)

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

DER			17.7200 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			36.2712 ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000 ZC5
Additional allowable electricity generation, kWh/m ² /year			0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000 ZC7
Net CO2 emissions			36.2712 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 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					5.0000							
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)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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 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					
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)					
Wl - Brick	86.7660	11.0940	75.6720	0.1800	13.6210		(29a)					
RF - Ins Joist	39.5020		39.5020	0.1300	5.1353		(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) = 37.2259		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.7835 (36)					
Total fabric heat loss							(33) + (36) = 46.0094 (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	84.9566	84.6742	84.3974	83.0973	82.8541	81.7218	81.7218	81.5121	82.1579	82.8541	83.3462	83.8606 (39)
Average = Sum(39)m / 12 =												83.0962 (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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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												
Water storage loss:	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)
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												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
	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																		
Solar input	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)					
	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																		
	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)					
Total per year (kWh/year) = Sum(64)m =													2003.0043	(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													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	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)
	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
	m ²	Table 6a	Specific data	Specific data	factor	W
		W/m ²	or Table 6b	or Table 6c	Table 6d	
Northeast	3.5280	11.2829	0.6300	0.7000	0.7700	12.1653
Southwest	3.3620	36.7938	0.6300	0.7000	0.7700	37.8046

Solar gains	49.9699	89.1580	132.7230	182.4407	220.7695	226.3960	215.2641	185.5647	149.7664	101.4325	60.5883	42.2876	(83)
Total gains	437.3331	473.6918	502.7016	529.6365	544.9793	528.6563	503.9005	481.1381	457.5983	432.2578	417.5244	418.5790	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)														
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	64.5755	64.7908	65.0033	66.0203	66.2141	67.1316	67.1316	67.3043	66.7752	66.2141	65.8232	65.4194		
alpha	5.3050	5.3194	5.3336	5.4014	5.4143	5.4754	5.4754	5.4870	5.4517	5.4143	5.3882	5.3613		
util living area														
	0.9987	0.9976	0.9949	0.9849	0.9497	0.8410	0.6773	0.7247	0.9199	0.9880	0.9974	0.9989	(86)	
MIT	19.8165	19.9259	20.1267	20.4143	20.6936	20.9048	20.9778	20.9681	20.8230	20.4736	20.1023	19.8029	(87)	
Th 2	20.0210	20.0239	20.0268	20.0403	20.0429	20.0547	20.0547	20.0569	20.0502	20.0429	20.0377	20.0324	(88)	
util rest of house														
	0.9982	0.9968	0.9929	0.9784	0.9253	0.7655	0.5497	0.6017	0.8715	0.9816	0.9963	0.9986	(89)	
MIT 2	18.4340	18.5960	18.8912	19.3179	19.7113	19.9816	20.0452	20.0416	19.8901	19.4077	18.8642	18.4224	(90)	
Living area fraction														
									fLA = Living area / (4) =				0.2256	(91)
MIT	18.7458	18.8959	19.1699	19.5652	19.9328	20.1899	20.2556	20.2506	20.1006	19.6481	19.1435	18.7338	(92)	
Temperature adjustment														
													0.0000	
adjusted MIT	18.7458	18.8959	19.1699	19.5652	19.9328	20.1899	20.2556	20.2506	20.1006	19.6481	19.1435	18.7338	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	0.9973	0.9954	0.9905	0.9741	0.9218	0.7778	0.5786	0.6291	0.8747	0.9779	0.9948	0.9979	(94)	
Useful gains	436.1507	471.5207	497.9059	515.9153	502.3842	411.1972	291.5505	302.7023	400.2474	422.6929	415.3564	417.6856	(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														
	1227.2689	1185.0960	1069.3070	886.2490	682.1241	456.8137	298.7419	313.8719	492.9933	749.6730	1003.7770	1218.8163	(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														
	588.5920	479.5226	425.1225	266.6403	133.7265	0.0000	0.0000	0.0000	0.0000	243.2732	423.6628	596.0412	(98)	
Space heating														
												3156.5811	(98)	
Space heating per m ²													39.9567	(99)
(98) / (4) =														

8c. Space cooling requirement

Not applicable

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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													3379.6372 (211)
Space heating requirement	588.5920	479.5226	425.1225	266.6403	133.7265	0.0000	0.0000	0.0000	0.0000	243.2732	423.6628	596.0412	(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)	630.1841	513.4075	455.1632	285.4821	143.1761	0.0000	0.0000	0.0000	0.0000	260.4639	453.6005	638.1598	(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	87.5911	87.4399	87.0942	86.2832	84.6380	80.3000	80.3000	80.3000	80.3000	85.9402	87.1028	87.6644	(216)
Fuel for water heating, kWh/month	229.9551	201.9622	210.9624	188.8718	186.4157	173.0542	165.7991	184.8272	186.8684	198.8218	209.4055	224.3473	(219)
Water heating fuel used													2361.2906 (219)
Annual totals kWh/year													
Space heating fuel - main system													3379.6372 (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													6222.2106 (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	3379.6372	0.2160	730.0016 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2361.2906	0.2160	510.0388 (264)
Space and water heating			1240.0404 (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			1489.8262 (272)
Emissions per m2 for space and water heating			15.6967 (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) = (15.6967 * 1.00) + 2.6691 + 0.4927, rounded to 2 d.p.			18.8600 (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 (m2)	Storey height (m)	Volume (m3)
Ground floor	39.5000 (1b)	2.3300 (2b)	92.0350 (1b) - (3b)
First floor	39.5000 (1c)	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	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)
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 m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Windows (Uw = 1.30)			6.8900	1.2357	8.5143		(27)
Solid Door			4.2000	1.2000	5.0400		(26)
Flr - Ground			39.5020	0.2200	8.6904	75.6000	2986.3512 (28a)
Wl - Brick	86.7660	11.0940	75.6720	0.2400	18.1613	38.9400	2946.6677 (29a)
RF - Ins Joist	39.5020		39.5020	0.1000	3.9502	5.8200	229.9016 (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) =	44.3562		(33)
Party Wall			39.3810	0.0000	0.0000	54.0300	2127.7554 (32)
Ground Floor Stud			52.6653			5.8200	306.5120 (32c)
1st Floor Stud			86.0394			5.8200	500.7495 (32c)
Internal Floor			39.5000			18.0000	711.0000 (32d)
Internal Ceiling			39.5000			5.8200	229.8900 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	10038.8275 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							127.0738 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.1637 (36)
Total fabric heat loss						(33) + (36) =	48.5198 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	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)
Average = Sum(39)m / 12 =	87.4849	87.2018	86.9244	85.6211	85.3772	84.2421	84.2421	84.0319	84.6793	85.3772	85.8705	86.3862 (39)
												85.6199 (39)
HLP	1.1074	1.1038	1.1003	1.0838	1.0807	1.0664	1.0664	1.0637	1.0719	1.0807	1.0870	1.0935 (40)
HLP (average)												1.0838 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
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								

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
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.8776	20.3197	16.5251	12.5105	9.3518	7.8952	8.5310	11.0889	14.8835	18.8980	22.0568	23.5134
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
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
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
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
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
Total internal gains	342.8441	341.1798	328.8743	308.9166	287.9893	268.6642	256.7236	260.8533	271.6910	291.7833	314.7076	332.5345

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	g	FF	Access factor Table 6d	Gains W
Northeast	3.5280	11.2829	0.7600	0.7200	0.7700	15.0949	
Southwest	3.3620	36.7938	0.7600	0.7200	0.7700	46.9086	

Solar gains	62.0035	110.6287	164.6849	226.3754	273.9345	280.9159	267.1032	230.2517	185.8326	125.8592	75.1789	52.4712
Total gains	404.8476	451.8086	493.5592	535.2920	561.9238	549.5801	523.8267	491.1051	457.5236	417.6425	389.8865	385.0057

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	31.8748	31.9783	32.0803	32.5687	32.6617	33.1018	33.1018	33.1846	32.9309	32.6617	32.4740	32.2802
alpha	3.1250	3.1319	3.1387	3.1712	3.1774	3.2068	3.2068	3.2123	3.1954	3.1774	3.1649	3.1520
util living area	0.9868	0.9804	0.9672	0.9364	0.8725	0.7549	0.6186	0.6648	0.8452	0.9496	0.9803	0.9887
MIT	18.9091	19.1050	19.4543	19.9391	20.3968	20.7522	20.9070	20.8801	20.6066	20.0244	19.3918	18.8823
Th 2	19.9948	19.9977	20.0006	20.0141	20.0166	20.0284	20.0284	20.0306	20.0239	20.0166	20.0115	20.0061
util rest of house	0.9844	0.9767	0.9607	0.9224	0.8410	0.6882	0.5114	0.5623	0.7954	0.9359	0.9760	0.9867
MIT 2	18.0752	18.2717	18.6200	19.1058	19.5450	19.8707	19.9867	19.9728	19.7497	19.1963	18.5682	18.0566
Living area fraction	fLA = Living area / (4) =											
MIT	18.2633	18.4597	18.8082	19.2937	19.7372	20.0695	20.1943	20.1775	19.9430	19.3831	18.7540	18.2429
Temperature adjustment	0.0000											
adjusted MIT	18.2633	18.4597	18.8082	19.2937	19.7372	20.0695	20.1943	20.1775	19.9430	19.3831	18.7540	18.2429

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	396.1740	437.8276	469.1184	486.9372	466.6205	379.9579	278.3190	284.5716	361.6977	386.0923	377.5969	377.8886
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	1221.5785	1182.4306	1069.8841	889.9225	686.1900	460.7632	302.7903	317.4301	494.7795	749.8745	1000.7339	1213.1103
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
Space heating kWh	614.1010	500.3732	446.9697	290.1494	163.3597	0.0000	0.0000	0.0000	0.0000	270.6540	448.6587	621.4049
Space heating per m ²	(98) / (4) = 42.4768 (99)											

8c. Space cooling requirement

Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	791.8758	623.3916	638.6424	0.0000	0.0000	0.0000	0.0000
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7331	0.8060	0.7788	0.0000	0.0000	0.0000	0.0000
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	580.5520	502.4346	497.4015	0.0000	0.0000	0.0000	0.0000

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Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	734.9806	703.1257	666.9085	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												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	111.1885	149.3142	126.1132	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												
Cooled fraction												386.6159 (104)
Intermittency factor (Table 10b)												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												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	27.7971	37.3285	31.5283	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												96.6540 (107)
Space cooling per m2												1.2235 (108)
Energy for space heating												42.4768 (99)
Energy for space cooling												1.2235 (108)
Total												43.7003 (109)
Dwelling Fabric Energy Efficiency (DFEE)												43.7 (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 (m2)	Storey height (m)	Volume (m3)
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					5.0000							
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)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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 infiltr 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)					
Wl - Brick	86.7660	11.0940	75.6720	0.1800	13.6210		(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)							8.7835 (36)					
Total fabric heat loss							(33) + (36) = 46.0094 (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	84.9566	84.6742	84.3974	83.0973	82.8541	81.7218	81.7218	81.5121	82.1579	82.8541	83.3462	83.8606 (39)
Average = Sum(39)m / 12 =												83.0962 (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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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	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												

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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	0.0000	(57)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
	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]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W						
Northeast	3.5280	11.2829	0.6300	0.7000	0.7700	12.1653	(75)						
Southwest	3.3620	36.7938	0.6300	0.7000	0.7700	37.8046	(79)						
Solar gains	49.9699	89.1580	132.7230	182.4407	220.7695	226.3960	215.2641	185.5647	149.7664	101.4325	60.5883	42.2876	(83)
Total gains	392.9419	430.4514	461.6897	491.4272	508.8111	495.1044	472.0353	446.4800	421.5406	393.3214	375.4192	374.9535	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area, nil,m (see Table 9a)	64.5755	64.7908	65.0033	66.0203	66.2141	67.1316	67.1316	67.3043	66.7752	66.2141	65.8232	65.4194	(85)
tau	5.3050	5.3194	5.3336	5.4014	5.4143	5.4754	5.4754	5.4870	5.4517	5.4143	5.3882	5.3613	
alpha	0.9992	0.9985	0.9966	0.9892	0.9614	0.8678	0.7124	0.7636	0.9402	0.9922	0.9984	0.9994	(86)
util living area	19.7633	19.8743	20.0784	20.3713	20.6592	20.8866	20.9717	20.9587	20.7931	20.4290	20.0520	19.7505	(87)
MIT	20.0210	20.0239	20.0268	20.0403	20.0429	20.0547	20.0547	20.0569	20.0502	20.0429	20.0377	20.0324	(88)
util rest of house	0.9989	0.9980	0.9952	0.9844	0.9416	0.7980	0.5832	0.6416	0.9002	0.9878	0.9978	0.9992	(89)
MIT 2	18.8844	18.9976	19.2036	19.5053	19.7859	19.9932	20.0462	20.0428	19.9175	19.5659	19.1864	18.8808	(90)
Living area fraction	19.0826	19.1953	19.4009	19.7007	19.9829	20.1947	20.2549	20.2494	20.1150	19.7606	19.3817	19.0770	(92)
MIT	19.0826	19.1953	19.4009	19.7007	19.9829	20.1947	20.2549	20.2494	20.1150	19.7606	19.3817	19.0770	(93)
Temperature adjustment												0.0000	
adjusted MIT												19.0770	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9986	0.9974	0.9940	0.9821	0.9400	0.8100	0.6128	0.6692	0.9037	0.9861	0.9971	0.9989	(94)
Useful gains	392.3735	429.3159	458.9395	482.6483	478.2939	401.0415	289.2488	298.7868	380.9388	387.8470	374.3487	374.5368	(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	1255.8832	1210.4475	1088.8061	897.5086	686.2737	457.2087	298.6872	313.7707	494.1791	758.9914	1023.6290	1247.5924	(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	642.4512	524.9204	468.6207	298.6994	154.7370	0.0000	0.0000	0.0000	0.0000	276.1314	467.4818	649.5534	(98)
Space heating												3482.5954	(98)
Space heating per m2										(98) / (4) =		44.0835	(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	768.1846	604.7410	619.4917	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation		0.0000	0.0000	0.0000	0.0000	0.0000	0.7835	0.8701	0.8426	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss		0.0000	0.0000	0.0000	0.0000	0.0000	601.8380	526.1689	522.0043	0.0000	0.0000	0.0000	0.0000	(102)
Total gains		0.0000	0.0000	0.0000	0.0000	0.0000	671.3663	642.6537	614.8318	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	50.0604	86.6647	69.0637	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling													205.7888	(104)
Cooled fraction													1.0000	(105)
													fc = cooled area / (4) =	

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Intermittency factor (Table 10b)	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	12.5151	21.6662	17.2659	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling												51.4472 (107)
Space cooling per m2												0.6512 (108)
Energy for space heating												44.0835 (99)
Energy for space cooling												0.6512 (108)
Total												44.7347 (109)
Target Fabric Energy Efficiency (TFEE)												51.4 (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 (m2)	Storey height (m)	Volume (m3)
Ground floor	39.5000 (1b)	2.3300 (2b)	92.0350 (1b) - (3b)
First floor	39.5000 (1c)	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	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)							
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)							
Wind speed	Jan 4.9000	Feb 4.6000	Mar 4.7000	Apr 4.3000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 3.8000	Oct 4.3000	Nov 4.3000	Dec 4.6000 (22)
Wind factor	1.2250	1.1500	1.1750	1.0750	1.0750	0.9500	0.9500	0.9250	0.9500	1.0750	1.0750	1.1500 (22a)
Adj infilt rate												
Effective ac	0.4609	0.4327	0.4421	0.4045	0.4045	0.3575	0.3575	0.3480	0.3575	0.4045	0.4045	0.4327 (22b)
	0.6062	0.5936	0.5977	0.5818	0.5818	0.5639	0.5639	0.5606	0.5639	0.5818	0.5818	0.5936 (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					
Windows (Uw = 1.30)			6.8900	1.2357	8.5143		(27)					
Solid Door			4.2000	1.2000	5.0400		(26)					
Flr - Ground			39.5020	0.2200	8.6904	75.6000	2986.3512 (28a)					
Wl - Brick	86.7660	11.0940	75.6720	0.2400	18.1613	38.9400	2946.6677 (29a)					
RF - Ins Joist	39.5020		39.5020	0.1000	3.9502	5.8200	229.9016 (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) =	44.3562		(33)					
Party Wall			39.3810	0.0000	0.0000	54.0300	2127.7554 (32)					
Ground Floor Stud			52.6653			5.8200	306.5120 (32c)					
1st Floor Stud			86.0394			5.8200	500.7495 (32c)					
Internal Floor			39.5000			18.0000	711.0000 (32d)					
Internal Ceiling			39.5000			5.8200	229.8900 (32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	10038.8275 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							127.0738 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.1637 (36)					
Total fabric heat loss						(33) + (36) =	48.5198 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 38.4045	Feb 37.6057	Mar 37.8664	Apr 36.8574	May 36.8574	Jun 35.7223	Jul 35.7223	Aug 35.5120	Sep 35.7223	Oct 36.8574	Nov 36.8574	Dec 37.6057 (38)
Heat transfer coeff	86.9244	86.1256	86.3862	85.3772	85.3772	84.2421	84.2421	84.0319	84.2421	85.3772	85.3772	86.1256 (39)
Average = Sum(39)m / 12 =												85.3191 (39)
HLP	Jan 1.1003	Feb 1.0902	Mar 1.0935	Apr 1.0807	May 1.0807	Jun 1.0664	Jul 1.0664	Aug 1.0637	Sep 1.0664	Oct 1.0807	Nov 1.0807	Dec 1.0902 (40)
HLP (average)												1.0800 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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)
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)
RHI water heating demand												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	57.1939	50.7991	41.3126	31.2763	23.3794	19.7379	21.3275	27.7223	37.2088	47.2451	55.1420	58.7835 (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	557.7277	552.5603	530.1520	496.0252	461.4158	430.8368	413.4312	422.4633	442.5681	476.9055	514.6476	542.8780 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W					
Northeast	3.5280	13.7804	0.7600	0.7200	0.7700	18.4362 (75)						
Southwest	3.3620	43.0593	0.7600	0.7200	0.7700	54.8964 (79)						
Solar gains	73.3325	116.6334	175.3748	248.1424	284.4728	315.7592	289.2588	253.5721	205.4597	136.5715	8.7654	59.9797 (83)
Total gains	631.0602	669.1937	705.5268	744.1676	745.8885	746.5959	702.6899	676.0353	648.0278	613.4771	523.4130	602.8577 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	32.0803	32.3779	32.2802	32.6617	32.6617	33.1018	33.1018	33.1846	33.1018	32.6617	32.6617	32.3779
alpha	3.1387	3.1585	3.1520	3.1774	3.1774	3.2068	3.2068	3.2123	3.2068	3.1774	3.1774	3.1585
util living area	0.9532	0.9421	0.9147	0.8586	0.7634	0.5994	0.4837	0.4987	0.7010	0.8658	0.9512	0.9580 (86)
MIT	19.4248	19.5710	19.8842	20.2852	20.6387	20.8844	20.9554	20.9517	20.7971	20.3763	19.7507	19.3980 (87)
Th 2	20.0006	20.0088	20.0061	20.0166	20.0166	20.0284	20.0284	20.0306	20.0284	20.0166	20.0166	20.0088 (88)
util rest of house	0.9452	0.9324	0.8996	0.8325	0.7168	0.5235	0.3862	0.3994	0.6331	0.8354	0.9410	0.9508 (89)
MIT 2	18.5870	18.7360	19.0392	19.4300	19.7530	19.9630	20.0104	20.0108	19.9010	19.5226	18.9235	18.5672 (90)
Living area fraction												0.2256 (91)
MIT	18.7760	18.9243	19.2298	19.6229	19.9528	20.1708	20.2235	20.2231	20.1031	19.7152	19.1101	18.7546 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.6260	18.7743	19.0798	19.4729	19.8028	20.0208	20.0735	20.0731	19.9531	19.5652	18.9601	18.6046 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	587.6842	613.7963	622.6691	607.0645	526.1417	390.3359	274.6986	273.0915	406.4847	502.3451	485.1179	565.2264 (95)
Ext temp.	4.9000	5.3000	7.0000	9.3000	12.2000	15.0000	16.7000	16.7000	14.4000	11.1000	7.8000	4.9000 (96)
Heat loss rate W	1193.1218	1160.4835	1043.5288	868.5343	649.1061	422.9657	284.1948	283.4453	467.8079	722.7331	952.8154	1180.3154 (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	450.4456	367.3738	313.1196	188.2583	91.4855	0.0000	0.0000	0.0000	0.0000	163.9687	336.7422	457.6263 (98)
Space heating												2369.0199 (98)
RHI space heating demand												2369 (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 (m2)	Storey height (m)	Volume (m3)
Ground floor	39.5000 (1b)	2.3300 (2b)	92.0350 (1b) - (3b)
First floor	39.5000 (1c)	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	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)							
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)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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 m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Windows (Uw = 1.30)			6.8900	1.2357	8.5143		(27)
Solid Door			4.2000	1.2000	5.0400		(26)
Flr - Ground			39.5020	0.2200	8.6904	75.6000	2986.3512 (28a)
Wl - Brick	86.7660	11.0940	75.6720	0.2400	18.1613	38.9400	2946.6677 (29a)
RF - Ins Joist	39.5020		39.5020	0.1000	3.9502	5.8200	229.9016 (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) =	44.3562		(33)
Party Wall			39.3810	0.0000	0.0000	54.0300	2127.7554 (32)
Ground Floor Stud			52.6653			5.8200	306.5120 (32c)
1st Floor Stud			86.0394			5.8200	500.7495 (32c)
Internal Floor			39.5000			18.0000	711.0000 (32d)
Internal Ceiling			39.5000			5.8200	229.8900 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	10038.8275 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							127.0738 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.1637 (36)
Total fabric heat loss						(33) + (36) =	48.5198 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	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)
Average = Sum(39)m / 12 =	87.4849	87.2018	86.9244	85.6211	85.3772	84.2421	84.2421	84.0319	84.6793	85.3772	85.8705	86.3862 (39)
HLP	1.1074	1.1038	1.1003	1.0838	1.0807	1.0664	1.0664	1.0637	1.0719	1.0807	1.0870	1.0935 (40)
HLP (average)												1.0838 (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	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	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 content (annual)	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)	
												Total = Sum(45)m = 1451.2285 (45)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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)
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)
Solar input (sum of months) = Sum(63)m =											0.0000 (63)	
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	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	57.1939	50.7991	41.3126	31.2763	23.3794	19.7379	21.3275	27.7223	37.2088	47.2451	55.1420	58.7835 (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	557.7277	552.5603	530.1520	496.0252	461.4158	430.8368	413.4312	422.4633	442.5681	476.9055	514.6476	542.8780 (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						
Northeast	3.5280	11.2829	0.7600	0.7200	0.7700	15.0949 (75)						
Southwest	3.3620	36.7938	0.7600	0.7200	0.7700	46.9086 (79)						
Solar gains	62.0035	110.6287	164.6849	226.3754	273.9345	280.9159	267.1032	230.2517	185.8326	125.8592	75.1789	52.4712 (83)
Total gains	619.7311	663.1890	694.8369	722.4006	735.3502	711.7526	680.5343	652.7150	628.4007	602.7647	589.8265	595.3492 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (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	31.8748	31.9783	32.0803	32.5687	32.6617	33.1018	33.1018	33.1846	32.9309	32.6617	32.4740	32.2802
alpha	3.1250	3.1319	3.1387	3.1712	3.1774	3.2068	3.2068	3.2123	3.1954	3.1774	3.1649	3.1520
util living area	0.9593	0.9472	0.9243	0.8759	0.7890	0.6481	0.5064	0.5418	0.7332	0.8830	0.9426	0.9635 (86)
MIT	19.2933	19.4703	19.7798	20.2000	20.5753	20.8447	20.9480	20.9343	20.7540	20.2937	19.7362	19.2640 (87)
Th 2	19.9948	19.9977	20.0006	20.0141	20.0166	20.0284	20.0284	20.0306	20.0239	20.0166	20.0115	20.0061 (88)
util rest of house	0.9525	0.9384	0.9111	0.8529	0.7471	0.5767	0.4083	0.4449	0.6701	0.8568	0.9316	0.9574 (89)
MIT 2	18.4530	18.6288	18.9337	19.3485	19.6976	19.9349	20.0066	20.0012	19.8634	19.4457	18.9031	18.4327 (90)
Living area fraction	18.6425	18.8186	19.1246	19.5406	19.8956	20.1402	20.2189	20.2117	20.0643	19.6370	19.0910	18.6202 (92)
Temperature adjustment	18.4925	18.6686	18.9746	19.3906	19.7456	19.9902	20.0689	20.0617	19.9143	19.4870	18.9410	-0.1500
adjusted MIT	18.4925	18.6686	18.9746	19.3906	19.7456	19.9902	20.0689	20.0617	19.9143	19.4870	18.9410	18.4702 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	582.2091	612.5689	621.4662	603.6792	539.8181	408.2662	280.8191	292.5358	416.0595	506.2022	540.5314	562.7183 (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	1241.6321	1200.6515	1084.3444	898.2156	686.9113	454.0787	292.2305	307.6989	492.3544	758.7438	1016.7923	1232.7525 (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	490.6107	395.1915	344.3813	212.0662	109.4373	0.0000	0.0000	0.0000	0.0000	187.8909	342.9079	498.5054 (98)
Space heating												2580.9913 (98)
Space heating per m2												(98) / (4) = 32.6708 (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													2851.9241 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	490.6107	395.1915	344.3813	212.0662	109.4373	0.0000	0.0000	0.0000	0.0000	187.8909	342.9079	498.5054	(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)	542.1113	436.6757	380.5319	234.3273	120.9252	0.0000	0.0000	0.0000	0.0000	207.6143	378.9038	550.8348	(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	89.6723	89.6190	89.5028	89.2423	88.7457	87.3000	87.3000	87.3000	87.3000	89.1197	89.5093	89.6997	(217)
Fuel for water heating, kWh/month	184.1479	161.5968	168.0326	148.4359	144.3549	128.3246	120.5930	135.9931	136.9109	154.2750	165.7198	178.7830	(219)
Water heating fuel used													1827.1676 (219)
Annual totals kWh/year													
Space heating fuel - main system													2851.9241 (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)													404.0250 (232)
Total delivered energy for all uses													5158.1167 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2851.9241	3.4800	99.2470 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1827.1676	3.4800	63.5854 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	404.0250	13.1900	53.2909 (250)
Additional standing charges			120.0000 (251)
Total energy cost			346.0158 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.1720 (257)
SAP value		83.6508
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	2851.9241	0.2160	616.0156 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1827.1676	0.2160	394.6682 (264)
Space and water heating			1010.6838 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	404.0250	0.5190	209.6890 (268)
Total kg/year			1259.2978 (272)
CO2 emissions per m2			15.9400 (273)
EI value			86.3915
EI rating			86 (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	$3.48 / 0.8869 = 3.924$, stars = 4
Water heating environmental impact	$0.216 / 0.8869 = 0.2435$, 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 (m2)	Storey height (m)	Volume (m3)
Ground floor	39.5000 (1b)	2.3300 (2b)	92.0350 (1b) - (3b)
First floor	39.5000 (1c)	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	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)							
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)							
Wind speed	Jan 4.9000	Feb 4.6000	Mar 4.7000	Apr 4.3000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 3.8000	Oct 4.3000	Nov 4.3000	Dec 4.6000 (22)
Wind factor	1.2250	1.1500	1.1750	1.0750	1.0750	0.9500	0.9500	0.9250	0.9500	1.0750	1.0750	1.1500 (22a)
Adj infilt rate												
Effective ac	0.4609	0.4327	0.4421	0.4045	0.4045	0.3575	0.3575	0.3480	0.3575	0.4045	0.4045	0.4327 (22b)
	0.6062	0.5936	0.5977	0.5818	0.5818	0.5639	0.5639	0.5606	0.5639	0.5818	0.5818	0.5936 (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					
Windows (Uw = 1.30)			6.8900	1.2357	8.5143		(27)					
Solid Door			4.2000	1.2000	5.0400		(26)					
Flr - Ground			39.5020	0.2200	8.6904	75.6000	2986.3512 (28a)					
Wl - Brick	86.7660	11.0940	75.6720	0.2400	18.1613	38.9400	2946.6677 (29a)					
RF - Ins Joist	39.5020		39.5020	0.1000	3.9502	5.8200	229.9016 (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) =	44.3562		(33)					
Party Wall			39.3810	0.0000	0.0000	54.0300	2127.7554 (32)					
Ground Floor Stud			52.6653			5.8200	306.5120 (32c)					
1st Floor Stud			86.0394			5.8200	500.7495 (32c)					
Internal Floor			39.5000			18.0000	711.0000 (32d)					
Internal Ceiling			39.5000			5.8200	229.8900 (32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	10038.8275 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							127.0738 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.1637 (36)					
Total fabric heat loss						(33) + (36) =	48.5198 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 38.4045	Feb 37.6057	Mar 37.8664	Apr 36.8574	May 36.8574	Jun 35.7223	Jul 35.7223	Aug 35.5120	Sep 35.7223	Oct 36.8574	Nov 36.8574	Dec 37.6057 (38)
Heat transfer coeff	86.9244	86.1256	86.3862	85.3772	85.3772	84.2421	84.2421	84.0319	84.2421	85.3772	85.3772	86.1256 (39)
Average = Sum(39)m / 12 =												85.3191 (39)
HLP	Jan 1.1003	Feb 1.0902	Mar 1.0935	Apr 1.0807	May 1.0807	Jun 1.0664	Jul 1.0664	Aug 1.0637	Sep 1.0664	Oct 1.0807	Nov 1.0807	Dec 1.0902 (40)
HLP (average)												1.0800 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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)	
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)	
									Solar input (sum of months) = Sum(63)m =				0.0000 (63)
									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	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	57.1939	50.7991	41.3126	31.2763	23.3794	19.7379	21.3275	27.7223	37.2088	47.2451	55.1420	58.7835 (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	557.7277	552.5603	530.1520	496.0252	461.4158	430.8368	413.4312	422.4633	442.5681	476.9055	514.6476	542.8780 (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						
Northeast	3.5280	13.7804	0.7600	0.7200	0.7700	18.4362 (75)						
Southwest	3.3620	43.0593	0.7600	0.7200	0.7700	54.8964 (79)						
Solar gains	73.3325	116.6334	175.3748	248.1424	284.4728	315.7592	289.2588	253.5721	205.4597	136.5715	8.7654	59.9797 (83)
Total gains	631.0602	669.1937	705.5268	744.1676	745.8885	746.5959	702.6899	676.0353	648.0278	613.4771	523.4130	602.8577 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (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	32.0803	32.3779	32.2802	32.6617	32.6617	33.1018	33.1018	33.1846	33.1018	32.6617	32.6617	32.3779	
alpha	3.1387	3.1585	3.1520	3.1774	3.1774	3.2068	3.2068	3.2123	3.2068	3.1774	3.1774	3.1585	
util living area	0.9532	0.9421	0.9147	0.8586	0.7634	0.5994	0.4837	0.4987	0.7010	0.8658	0.9512	0.9580 (86)	
MIT	19.4248	19.5710	19.8842	20.2852	20.6387	20.8844	20.9554	20.9517	20.7971	20.3763	19.7507	19.3980 (87)	
Th 2	20.0006	20.0088	20.0061	20.0166	20.0166	20.0284	20.0284	20.0306	20.0284	20.0166	20.0166	20.0088 (88)	
util rest of house	0.9452	0.9324	0.8996	0.8325	0.7168	0.5235	0.3862	0.3994	0.6331	0.8354	0.9410	0.9508 (89)	
MIT 2	18.5870	18.7360	19.0392	19.4300	19.7530	19.9630	20.0104	20.0108	19.9010	19.5226	18.9235	18.5672 (90)	
Living area fraction	18.7760	18.9243	19.2298	19.6229	19.9528	20.1708	20.2235	20.2231	20.1031	19.7152	19.1101	18.7546 (91)	
Temperature adjustment	18.7760	18.9243	19.2298	19.6229	19.9528	20.1708	20.2235	20.2231	20.1031	19.7152	19.1101	18.7546 (92)	
adjusted MIT	18.6260	18.7743	19.0798	19.4729	19.8028	20.0208	20.0735	20.0731	19.9531	19.5652	18.9601	18.6046 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9313	0.9172	0.8826	0.8158	0.7054	0.5228	0.3909	0.4040	0.6273	0.8188	0.9268	0.9376 (94)
Ext temp.	587.6842	613.7963	622.6691	607.0645	526.1417	390.3359	274.6986	273.0915	406.4847	502.3451	485.1179	565.2264 (95)
Heat loss rate W	4.9000	5.3000	7.0000	9.3000	12.2000	15.0000	16.7000	16.7000	14.4000	11.1000	7.8000	4.9000 (96)
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	1193.1218	1160.4835	1043.5288	868.5343	649.1061	422.9657	284.1948	283.4453	467.8079	722.7331	952.8154	1180.3154 (97)
Space heating	450.4456	367.3738	313.1196	188.2583	91.4855	0.0000	0.0000	0.0000	0.0000	163.9687	336.7422	457.6263 (98)
Space heating per m2												2369.0199 (98)
											(98) / (4) =	29.9876 (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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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													2617.7015 (211)
Space heating requirement	450.4456	367.3738	313.1196	188.2583	91.4855	0.0000	0.0000	0.0000	0.0000	163.9687	336.7422	457.6263	(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)	497.7300	405.9379	345.9885	208.0202	101.0890	0.0000	0.0000	0.0000	0.0000	181.1809	372.0908	505.6644	(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	89.6188	89.5717	89.4363	89.1503	88.6052	87.3000	87.3000	87.3000	87.3000	89.0119	89.4968	89.6473	(217)
Fuel for water heating, kWh/month	184.2578	161.6823	168.1575	148.5890	144.5837	128.3246	120.5930	135.9931	136.9109	154.4617	165.7429	178.8876	(219)
Water heating fuel used													1828.1841 (219)
Annual totals kWh/year													
Space heating fuel - main system													2617.7015 (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)													404.0250 (232)
Total delivered energy for all uses													4924.9106 (238)

10a. Fuel costs - using BEDF prices (495)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2617.7015	3.6300	95.0226 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1828.1841	3.6300	66.3631 (247)
Pumps and fans for heating	75.0000	19.4400	14.5800 (249)
Energy for lighting	404.0250	19.4400	78.5425 (250)
Additional standing charges			95.0000 (251)
Total energy cost			349.5081 (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	2617.7015	0.2160	565.4235 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1828.1841	0.2160	394.8878 (264)
Space and water heating			960.3113 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	404.0250	0.5190	209.6890 (268)
Total kg/year			1208.9253 (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	2617.7015	1.2200	3193.5959 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1828.1841	1.2200	2230.3846 (264)
Space and water heating			5423.9805 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	404.0250	3.0700	1240.3567 (268)
Primary energy kWh/year			6894.5872 (272)
Primary energy kWh/m2/year			87.2733 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 84
 Current environmental impact rating: B 86

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	Already installed
F	Not considered
G	Not considered
H	Not considered
I	Not considered
J	Not considered
K	Not considered
M	Not considered
N Solar water heating	Recommended
O	Not considered
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U Solar photovoltaic panels	Recommended
A2	Not considered
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	Not applicable
L2	Not considered
Q3	Not considered
O3	Not considered

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.2	-£ 25	-179 kg (14.8%)
U Solar photovoltaic panels	+ 10.8	-£ 354	-946 kg (91.9%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£25	2.27 kg/m ²	B 85 B 88
Solar photovoltaic panels	£354	11.98 kg/m ²	A 96 A 98
Total Savings	£379	14.25 kg/m ²	

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

Fuel prices for cost data on this page from database revision number 495 TEST (29 Apr 2022)
 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	£93	£103	-£10
Mains gas	£256	£222	£35
Space heating	£205	£205	£0
Water heating	£66	£42	£25
Lighting	£79	£79	£0
Generated (PV)	-£0	-£354	£354
Total cost of fuels	£349	-£29	£379
Total cost of uses	£350	-£28	£379
Delivered energy	62 kWh/m ²	28 kWh/m ²	34 kWh/m ²
Carbon dioxide emissions	1.2 tonnes	0.1 tonnes	1.1 tonnes
CO2 emissions per m ²	15 kg/m ²	1 kg/m ²	14 kg/m ²
Primary energy	87 kWh/m ²	4 kWh/m ²	84 kWh/m ²

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 (m2)	Storey height (m)	Volume (m3)
Ground floor	39.5000 (1b)	2.3300 (2b)	92.0350 (1b) - (3b)
First floor	39.5000 (1c)	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	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)							
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)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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 m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Windows (Uw = 1.30)			6.8900	1.2357	8.5143		(27)
Solid Door			4.2000	1.2000	5.0400		(26)
Flr - Ground			39.5020	0.2200	8.6904	75.6000	2986.3512 (28a)
Wl - Brick	86.7660	11.0940	75.6720	0.2400	18.1613	38.9400	2946.6677 (29a)
RF - Ins Joist	39.5020		39.5020	0.1000	3.9502	5.8200	229.9016 (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) =	44.3562		(33)
Party Wall			39.3810	0.0000	0.0000	54.0300	2127.7554 (32)
Ground Floor Stud			52.6653			5.8200	306.5120 (32c)
1st Floor Stud			86.0394			5.8200	500.7495 (32c)
Internal Floor			39.5000			18.0000	711.0000 (32d)
Internal Ceiling			39.5000			5.8200	229.8900 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	10038.8275 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							127.0738 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.1637 (36)
Total fabric heat loss						(33) + (36) =	48.5198 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	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)
Average = Sum(39)m / 12 =	87.4849	87.2018	86.9244	85.6211	85.3772	84.2421	84.2421	84.0319	84.6793	85.3772	85.8705	86.3862 (39)
HLP	1.1074	1.1038	1.1003	1.0838	1.0807	1.0664	1.0664	1.0637	1.0719	1.0807	1.0870	1.0935 (40)
HLP (average)												1.0838 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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												1079.5246 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												1813.6014 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.2497 (H8)
Utilisation factor												0.5508 (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												-841.9491 (H17)
Solar input	-24.4148	-40.7414	-69.3872	-92.9925	-114.8844	-112.9497	-111.4570	-97.3806	-76.2685	-52.0824	-28.9595	-20.4311 (63)
Solar input (sum of months) = Sum(63)m =												-841.9491 (63)
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)
Total per year (kWh/year) = Sum(64)m =												787.8159 (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)
(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	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	57.1939	50.7991	41.3126	31.2763	23.3794	19.7379	21.3275	27.7223	37.2088	47.2451	55.1420	58.7835	(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	557.7277	552.5603	530.1520	496.0252	461.4158	430.8368	413.4312	422.4633	442.5681	476.9055	514.6476	542.8780	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	Specific data	Specific data	factor	W						
		W/m2	or Table 6b	or Table 6c	Table 6d							
Northeast	3.5280	11.2829	0.7600	0.7200	0.7700	15.0949 (75)						
Southwest	3.3620	36.7938	0.7600	0.7200	0.7700	46.9086 (79)						
Solar gains	62.0035	110.6287	164.6849	226.3754	273.9345	280.9159	267.1032	230.2517	185.8326	125.8592	75.1789	52.4712 (83)
Total gains	619.7311	663.1890	694.8369	722.4006	735.3502	711.7526	680.5343	652.7150	628.4007	602.7647	589.8265	595.3492 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (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	31.8748	31.9783	32.0803	32.5687	32.6617	33.1018	33.1018	33.1846	32.9309	32.6617	32.4740	32.2802	
alpha	3.1250	3.1319	3.1387	3.1712	3.1774	3.2068	3.2068	3.2123	3.1954	3.1774	3.1649	3.1520	
util living area	0.9593	0.9472	0.9243	0.8759	0.7890	0.6481	0.5064	0.5418	0.7332	0.8830	0.9426	0.9635	(86)
MIT	19.2933	19.4703	19.7798	20.2000	20.5753	20.8447	20.9480	20.9343	20.7540	20.2937	19.7362	19.2640	(87)
Th 2	19.9948	19.9977	20.0006	20.0141	20.0166	20.0284	20.0284	20.0306	20.0239	20.0166	20.0115	20.0061	(88)
util rest of house	0.9525	0.9384	0.9111	0.8529	0.7471	0.5767	0.4083	0.4449	0.6701	0.8568	0.9316	0.9574	(89)
MIT 2	18.4530	18.6288	18.9337	19.3485	19.6976	19.9349	20.0066	20.0012	19.8634	19.4457	18.9031	18.4327	(90)
Living area fraction									fLA = Living area / (4) =			0.2256	(91)
MIT	18.6425	18.8186	19.1246	19.5406	19.8956	20.1402	20.2189	20.2117	20.0643	19.6370	19.0910	18.6202	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.4925	18.6686	18.9746	19.3906	19.7456	19.9902	20.0689	20.0617	19.9143	19.4870	18.9410	18.4702	(93)

8. Space heating requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9395	0.9237	0.8944	0.8357	0.7341	0.5736	0.4126	0.4482	0.6621	0.8398	0.9164	0.9452	(94)
Useful gains	582.2091	612.5689	621.4662	603.6792	539.8181	408.2662	280.8191	292.5358	416.0595	506.2022	540.5314	562.7183	(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													
Month fracti	1241.6321	1200.6515	1084.3444	898.2156	686.9113	454.0787	292.2305	307.6989	492.3544	758.7438	1016.7923	1232.7525	(97)
Space heating kWh	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	490.6107	395.1915	344.3813	212.0662	109.4373	0.0000	0.0000	0.0000	0.0000	187.8909	342.9079	498.5054	(98)
Space heating per m2											(98) / (4) =	32.6708	(99)

8c. Space cooling requirement

Not applicable

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
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													2851.9241	(211)
Space heating requirement	490.6107	395.1915	344.3813	212.0662	109.4373	0.0000	0.0000	0.0000	0.0000	187.8909	342.9079	498.5054	(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)	542.1113	436.6757	380.5319	234.3273	120.9252	0.0000	0.0000	0.0000	0.0000	207.6143	378.9038	550.8348	(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	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 (217)m	89.7666	89.8137	89.8727	89.9824	90.1438	87.3000	87.3000	87.3000	87.3000	89.4751	89.6514	87.7787	(216)	
Fuel for water heating, kWh/month	156.7563	115.8845	90.1349	43.8697	14.6702	0.0000	0.0000	24.4461	49.5472	95.4533	133.1547	155.8686	(219)	
Water heating fuel used												879.7856	(219)	
Annual totals kWh/year														
Space heating fuel - main system													2851.9241	(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)													404.0250	(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													2533.4953	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year		
Space heating - main system 1	2851.9241	3.4800	99.2470	(240)	
Space heating - secondary	0.0000	0.0000	0.0000	(242)	
Water heating (other fuel)	879.7856	3.4800	30.6165	(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	404.0250	13.1900	53.2909	(250)	
Additional standing charges			120.0000	(251)	
Energy saving/generation technologies					
PV Unit		-1727.2394	13.1900	-227.8229	(252)
Total energy cost			91.8190	(255)	

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200	(256)
Energy cost factor (ECF)		0.3110	(257)
SAP value	$[(255) \times (256)] / [(4) + 45.0] =$	95.6616	
SAP rating (Section 12)		96	(258)
SAP band		A	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Space heating - main system 1	2851.9241	0.2160	616.0156 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	879.7856	0.2160	190.0337 (264)
Space and water heating			806.0493 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	404.0250	0.5190	209.6890 (268)
Energy saving/generation technologies			
PV Unit			
Total kg/year	-1727.2394	0.5190	-896.4372 (269)
CO2 emissions per m2			184.1760 (272)
EI value			2.3300 (273)
EI rating			98.0097
EI band			98 (274)
			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 (m2)	Storey height (m)	Volume (m3)
Ground floor	39.5000 (1b)	2.3300 (2b)	92.0350 (1b) - (3b)
First floor	39.5000 (1c)	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	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)							
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)							
Wind speed	Jan 4.9000	Feb 4.6000	Mar 4.7000	Apr 4.3000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 3.8000	Oct 4.3000	Nov 4.3000	Dec 4.6000 (22)
Wind factor	1.2250	1.1500	1.1750	1.0750	1.0750	0.9500	0.9500	0.9250	0.9500	1.0750	1.0750	1.1500 (22a)
Adj infilt rate												
Effective ac	0.4609	0.4327	0.4421	0.4045	0.4045	0.3575	0.3575	0.3480	0.3575	0.4045	0.4045	0.4327 (22b)
	0.6062	0.5936	0.5977	0.5818	0.5818	0.5639	0.5639	0.5606	0.5639	0.5818	0.5818	0.5936 (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					
Windows (Uw = 1.30)			6.8900	1.2357	8.5143		(27)					
Solid Door			4.2000	1.2000	5.0400		(26)					
Flr - Ground			39.5020	0.2200	8.6904	75.6000	2986.3512 (28a)					
Wl - Brick	86.7660	11.0940	75.6720	0.2400	18.1613	38.9400	2946.6677 (29a)					
RF - Ins Joist	39.5020		39.5020	0.1000	3.9502	5.8200	229.9016 (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) =	44.3562		(33)					
Party Wall			39.3810	0.0000	0.0000	54.0300	2127.7554 (32)					
Ground Floor Stud			52.6653			5.8200	306.5120 (32c)					
1st Floor Stud			86.0394			5.8200	500.7495 (32c)					
Internal Floor			39.5000			18.0000	711.0000 (32d)					
Internal Ceiling			39.5000			5.8200	229.8900 (32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	10038.8275 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							127.0738 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.1637 (36)					
Total fabric heat loss						(33) + (36) =	48.5198 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 38.4045	Feb 37.6057	Mar 37.8664	Apr 36.8574	May 36.8574	Jun 35.7223	Jul 35.7223	Aug 35.5120	Sep 35.7223	Oct 36.8574	Nov 36.8574	Dec 37.6057 (38)
Heat transfer coeff	86.9244	86.1256	86.3862	85.3772	85.3772	84.2421	84.2421	84.0319	84.2421	85.3772	85.3772	86.1256 (39)
Average = Sum(39)m / 12 =												85.3191 (39)
HLP	Jan 1.1003	Feb 1.0902	Mar 1.0935	Apr 1.0807	May 1.0807	Jun 1.0664	Jul 1.0664	Aug 1.0637	Sep 1.0664	Oct 1.0807	Nov 1.0807	Dec 1.0902 (40)
HLP (average)												1.0800 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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												1139.7099 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												1914.7126 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.3194 (H8)
Utilisation factor												0.5314 (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												-857.5947 (H17)
Solar input	-28.1233	-41.7553	-71.5306	-98.1944	-114.6262	-121.9049	-115.9227	-103.1714	-81.4615	-54.8637	-3.2871	-22.7536 (63)
Solar input (sum of months) = Sum(63)m =												-857.5947 (63)
Output from w/h												
	137.0064	103.0663	78.8632	34.2731	13.4825	0.0000	0.0000	15.5506	38.0617	82.6256	145.0476	137.6142 (64)
Total per year (kWh/year) = Sum(64)m =												785.5912 (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												
(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	57.1939	50.7991	41.3126	31.2763	23.3794	19.7379	21.3275	27.7223	37.2088	47.2451	55.1420	58.7835 (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	557.7277	552.5603	530.1520	496.0252	461.4158	430.8368	413.4312	422.4633	442.5681	476.9055	514.6476	542.8780 (73)

6. Solar gains

[Jan]		Area	Solar flux	g	FF	Access	Gains					
		m2	Table 6a	Specific data	Specific data	factor	W					
			W/m2	or Table 6b	or Table 6c	Table 6d						
Northeast		3.5280	13.7804	0.7600	0.7200	0.7700	18.4362 (75)					
Southwest		3.3620	43.0593	0.7600	0.7200	0.7700	54.8964 (79)					
Solar gains	73.3325	116.6334	175.3748	248.1424	284.4728	315.7592	289.2588	253.5721	205.4597	136.5715	8.7654	59.9797 (83)
Total gains	631.0602	669.1937	705.5268	744.1676	745.8885	746.5959	702.6899	676.0353	648.0278	613.4771	523.4130	602.8577 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	32.0803	32.3779	32.2802	32.6617	32.6617	33.1018	33.1018	33.1846	33.1018	32.6617	32.6617	32.3779
alpha	3.1387	3.1585	3.1520	3.1774	3.1774	3.2068	3.2068	3.2123	3.2068	3.1774	3.1774	3.1585
util living area	0.9532	0.9421	0.9147	0.8586	0.7634	0.5994	0.4837	0.4987	0.7010	0.8658	0.9512	0.9580 (86)
MIT	19.4248	19.5710	19.8842	20.2852	20.6387	20.8844	20.9554	20.9517	20.7971	20.3763	19.7507	19.3980 (87)
Th 2	20.0006	20.0088	20.0061	20.0166	20.0166	20.0284	20.0284	20.0306	20.0284	20.0166	20.0166	20.0088 (88)
util rest of house	0.9452	0.9324	0.8996	0.8325	0.7168	0.5235	0.3862	0.3994	0.6331	0.8354	0.9410	0.9508 (89)
MIT 2	18.5870	18.7360	19.0392	19.4300	19.7530	19.9630	20.0104	20.0108	19.9010	19.5226	18.9235	18.5672 (90)
Living area fraction										fLA = Living area / (4) =		0.2256 (91)
MIT	18.7760	18.9243	19.2298	19.6229	19.9528	20.1708	20.2235	20.2231	20.1031	19.7152	19.1101	18.7546 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.6260	18.7743	19.0798	19.4729	19.8028	20.0208	20.0735	20.0731	19.9531	19.5652	18.9601	18.6046 (93)

8. Space heating requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation	0.9313	0.9172	0.8826	0.8158	0.7054	0.5228	0.3909	0.4040	0.6273	0.8188	0.9268	0.9376	(94)	
Useful gains	587.6842	613.7963	622.6691	607.0645	526.1417	390.3359	274.6986	273.0915	406.4847	502.3451	485.1179	565.2264	(95)	
Ext temp.	4.9000	5.3000	7.0000	9.3000	12.2000	15.0000	16.7000	16.7000	14.4000	11.1000	7.8000	4.9000	(96)	
Heat loss rate W	1193.1218	1160.4835	1043.5288	868.5343	649.1061	422.9657	284.1948	283.4453	467.8079	722.7331	952.8154	1180.3154	(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	450.4456	367.3738	313.1196	188.2583	91.4855	0.0000	0.0000	0.0000	0.0000	163.9687	336.7422	457.6263	(98)	
Space heating												2369.0199	(98)	
Space heating per m2												(98) / (4) =	29.9876	(99)

8c. Space cooling requirement

Not applicable

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
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													2617.7015	(211)
Space heating requirement	450.4456	367.3738	313.1196	188.2583	91.4855	0.0000	0.0000	0.0000	0.0000	163.9687	336.7422	457.6263	(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)	497.7300	405.9379	345.9885	208.0202	101.0890	0.0000	0.0000	0.0000	0.0000	181.1809	372.0908	505.6644	(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	137.0064	103.0663	78.8632	34.2731	13.4825	0.0000	0.0000	15.5506	38.0617	82.6256	145.0476	137.6142	(64)	
Efficiency of water heater (217)m	89.7329	89.7790	89.8375	89.9920	90.0759	87.3000	87.3000	87.3000	87.3000	89.4020	89.5122	87.3000	(216)	
Fuel for water heating, kWh/month	152.6825	114.7999	87.7843	38.0847	14.9679	0.0000	0.0000	17.8128	43.5987	92.4204	162.0422	153.3485	(219)	
Water heating fuel used												877.5419	(219)	
Annual totals kWh/year														
Space heating fuel - main system													2617.7015	(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)													404.0250	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 2.50 * 1140 * 0.80) =										-1823.5358			-1823.5358	(233)
Total delivered energy for all uses													2200.7327	(238)

10a. Fuel costs - using BEDF prices (495)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year		
Space heating - main system 1	2617.7015	3.6300	95.0226	(240)	
Space heating - secondary	0.0000	0.0000	0.0000	(242)	
Water heating (other fuel)	877.5419	3.6300	31.8548	(247)	
Pumps and fans for heating	75.0000	19.4400	14.5800	(249)	
Pump for solar water heating	50.0000	19.4400	9.7200	(249)	
Energy for lighting	404.0250	19.4400	78.5425	(250)	
Additional standing charges			95.0000	(251)	
Energy saving/generation technologies					
PV Unit		-1823.5358	19.4400	-354.4954	(252)
Total energy cost			-29.7756	(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	2617.7015	0.2160	565.4235	(261)	
Space heating - secondary	0.0000	0.0000	0.0000	(263)	
Water heating (other fuel)	877.5419	0.2160	189.5491	(264)	
Space and water heating			754.9726	(265)	
Pumps and fans	125.0000	0.5190	64.8750	(267)	
Energy for lighting	404.0250	0.5190	209.6890	(268)	
Energy saving/generation technologies					
PV Unit		-1823.5358	0.5190	-946.4151	(269)
Total kg/year			83.1215	(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	2617.7015	1.2200	3193.5959 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	877.5419	1.2200	1070.6012 (264)
Space and water heating			4264.1971 (265)
Pumps and fans	125.0000	3.0700	383.7500 (267)
Energy for lighting	404.0250	3.0700	1240.3567 (268)
Energy saving/generation technologies			
PV Unit	-1823.5358	3.0700	-5598.2549 (269)
Primary energy kWh/year			290.0489 (272)
Primary energy kWh/m2/year			3.6715 (273)

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

Overheating Calculation Input Data

Dwelling type	EndTerrace House
Number of storeys	2
Cross ventilation possible	Yes
SAP Region	Severn Valley
Front of dwelling faces	North East
Overshading	Average or unknown
Thermal mass parameter	127.1 (calculated from construction elements)
Night ventilation	Yes
Ventilation rate during hot weather (ach)	4.21 (Calculated rate)

Overheating Calculation

Summer ventilation heat loss coefficient	266.67 (P1)
Transmission heat loss coefficient	48.52 (37)
Summer heat loss coefficient	315.19 (P2)

Overhangs Orientation	Ratio	Z_overhangs	Overhang type
North East	0.000	1.000	None
South West	0.000	1.000	None

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

[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Shading	Gains W
North East	3.5280	100.3588	0.7600	0.7200	0.7650	133.3933
South West	3.3620	121.5729	0.7600	0.7200	0.7650	153.9871

total: 287.3805

Solar gains	Jun 314	Jul 287	Aug 252	(P3/P4)
Internal gains	428	410	419	
Total summer gains	742	698	671	(P5)

Summer gain/loss ratio	2.35	2.21	2.13	(P6)
Summer external temperature	15.00	16.70	16.70	
Thermal mass temperature increment (TMP = 127.1)	1.11	1.11	1.11	
Threshold temperature	18.46	20.02	19.94	(P7)
Likelihood of high internal temperature	Not significant	Not significant	Not significant	

Assessment of likelihood of high internal temperature: Not significant

DWELLING SIGN OFF REPORT

Section 1: Dwelling Information

Dwelling Address (Please confirm final postal address and post code of the dwelling.)

House Name	308 - PRJ012557	
House Number		
Postcode		
Street		
Locality		
Town		
County		

Dwelling Orientation North East (Please confirm orientation of main entrance door of the dwelling.)

Comments

Terrain Type Suburban

Property Type House, End-Terrace

Comments

Overshading (called Sunlight/shade in assessment) Average or unknown

Comments

Section 2: Dwelling Construction Details

Thermal Mass Parameter Precise calculation

Thermal Mass 127.07 kJ/m²K

Comments

External Walls

Type Cavity Wall

Construction Other

U-value 0.24 W/m²K

Gross Area 86.77 m²

Layer Name	Thickness (mm)	Conductivity (W/m.K)	Resistance (m ² K/W)	Bridging
Brick, outer leaf	102.5	0.7700	0.1331	82.81 Mortar
Insulation - 0.034	100	0.0340	2.9412	100.00
Internal Block	100	0.1100	0.9091	93.43 Mortar
Plaster Dabs	15	0.0882	0.1700	80.00 Mortar
Plasterboard	12.5	0.2100	0.0595	100.00

Comments

Party Walls

Type	Construction	U-Value (W/m ² K)	Area (m ²)
Filled Cavity with Edge Sealing	Other	0.00	39.38

DWELLING SIGN OFF REPORT

Comments

External Roofs

Type	External Plane Roof		
Construction	Other		
U-value	0.10	W/m ² K	
Gross Area	39.50	m ²	

Layer Name	Thickness (mm)	Conductivity (W/m.K)	Resistance (m ² K/W)	Bridging
Roof space	0	0.3000	0.3000	100.00
Insulation - 0.044	300	0.0440	6.8182	100.00
Insulation - 0.044	150	0.0440	3.4091	87.20 Timber
Plasterboard	12.5	0.2100	0.0595	100.00

Comments

Heat Loss Floors

Type	Ground Floor - Solid		
Construction	Other		
U-value	0.22	W/m ² K	
Area	39.50	m ²	

Layer Name	Thickness (mm)	Conductivity (W/m.K)	Resistance (m ² K/W)	Bridging
Concrete, medium density	150	1.3500	0.1111	100.00
Floor Insulation - EPS	100	0.0380	2.6316	100.00
Screed	75	1.1500	0.0652	100.00

Comments

Opening Types

Description	Type	Glazing	Frame Type	U Value (W/m ² K)
Windows	Window	Double Low-E Soft 0.05		1.30
Solid Door	Solid Door			1.20
Half Glazed Door	Half Glazed Door	Double glazed		1.30
Roof Window	Roof Window	Double glazed		1.40
Door to Corridor	Door to Corridor			1.40

Comments

DWELLING SIGN OFF REPORT

Openings

Name	Opening Type	Location	Orientation	Area (m ²)
Rear	Solid Door	[1] WI - Brick	South West	2.10
Front	Solid Door	[1] WI - Brick	North East	2.10
Front	Window	[1] WI - Brick	North East	3.53
Rear	Window	[1] WI - Brick	South West	3.36

Comments

Thermal Bridging

Calculate Bridges

List of Bridges

Bridge Type	Source Type	Length (m)	Psi (W/mK)	Reference
E2 Other lintels (including other steel lintels)	Independently assessed	8.06	0.057	
E3 Sill	Independently assessed	6.06	0.009	
E4 Jamb	Independently assessed	21.45	0.014	
E5 Ground floor (normal)	Independently assessed	17.85	0.044	
E6 Intermediate floor within a dwelling	Independently assessed	17.85	0.005	
E10 Eaves (insulation at ceiling level)	Independently assessed	9.75	0.034	
E12 Gable (insulation at ceiling level)	Independently assessed	8.10	0.052	
E16 Corner (normal)	Independently assessed	9.72	0.032	
E18 Party wall between dwellings	Independently assessed	9.72	0.041	
P1 Party wall - Ground floor	Independently assessed	8.10	0.053	
P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	8.10	0.000	
P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	8.10	0.072	

Y-value

0.025

W/m²K

Comments

Where specific construction details have been used documentary evidence should be provided to the SAP assessor, usually in the form of signed checklists.

Pressure Testing

Yes

As Built AP₅₀

m³/(h.m²) @ 50 Pa

Where an air pressure test has been carried out a copy of the test certificate should be forwarded to the SAP assessor.

Comments

Section 3: Dwelling Systems

Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				3
Number of passive vents				0
Number of flueless gas fires				0

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Comments

Internal Lighting

Total number of light fittings

Total number of L.E.L. fittings

Percentage of L.E.L. fittings %

Comments

External Lighting

External lights fitted

Comments

Electricity Tariff

Comments

Main Heating 1

Fuel Type

Main Heating

Efficiency (Split Efficiencies) %

Brand, Model

Flue Type

Fan Assisted Flue

Heat Emitter

Flow Temperature

Comments

Heating Controls

Description

Boiler Interlock

Delayed Start Stat

Compensator

Comments

Main Heating 2

Comments

Water Heating System

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Water Heating

Main Heating 1

Supplementary Immersion

Comments

Section 4: Dwelling Renewable Energy

Section 5: Declaration

I confirm that all details provided above are accurate to the best of my knowledge.

Signed

Date