

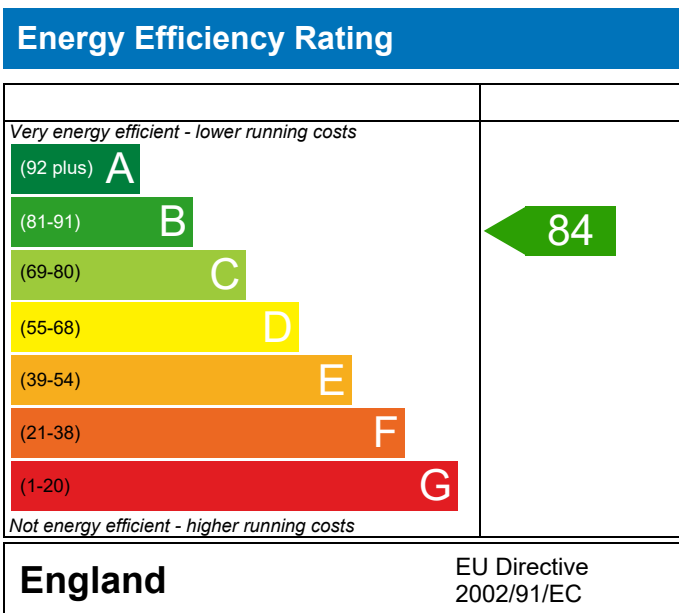
PREDICTED ENERGY ASSESSMENT

012 - PRJ012706

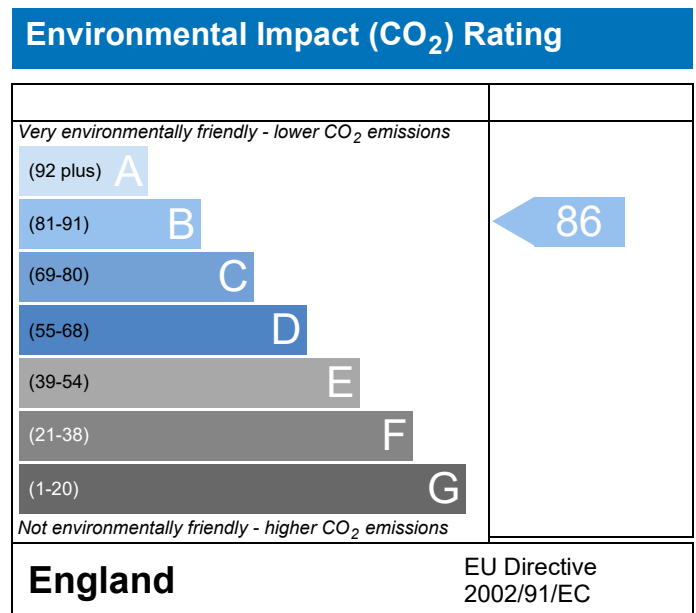
Dwelling type: House, Semi-Detached
 Date of assessment: 27/03/2023
 Produced by: Scott Binstead
 Total floor area: 94.66 m²

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.



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.



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	012 - PRJ012706			Issued on Date	27/03/2023
Assessment Reference	012 S	Prop Type Ref	C v1		
Property	012 - PRJ012706				
SAP Rating	84 B	DER	16.67	TER	17.40
Environmental	86 B	% DER<TER	4.18		
CO ₂ Emissions (t/year)	1.36	DFEE	44.13	TFEE	50.31
General Requirements Compliance	Pass	% DFEE<TFEE	12.28		
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

Semi-Detached House, total floor area 95 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) 17.40 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 16.67 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 50.3 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 44.1 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	0.15 (max. 0.25)	0.15 (max. 0.70)	OK
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.21 (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 (East Anglia): Slight OK

Based on:

Overshading:

Average

Windows facing North: 3.81 m², No overhang

Windows facing South: 8.76 m², No overhang

Windows facing West: 1.34 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 0.11 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 (m2)	Storey height (m)	Volume (m3)
Ground floor	47.3300 (1b)	2.4600 (2b)	116.4318 (1b) - (3b)
First floor	47.3300 (1c)	2.6900 (2c)	127.3177 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.6600		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 243.7495 (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) =	0.1231 (8)
Pressure test				Yes	
Measured/design AP50					5.0100
Infiltration rate					0.3736 (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) =	0.3456 (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	0.4406	0.4319	0.4233	0.3801	0.3715	0.3283	0.3283	0.3196	0.3456	0.3715	0.3888	0.4060 (22b)
	0.5971	0.5933	0.5896	0.5722	0.5690	0.5539	0.5539	0.5511	0.5597	0.5690	0.5756	0.5824 (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 = 1.20)			13.9200	1.1450	15.9275		(27)
Solid Door			2.1500	1.3000	2.7950		(26)
Flr - Ground			47.3300	0.1500	7.0995	75.6000	3578.1480 (28a)
Wl - Brick	86.8340	13.1490	73.6850	0.2400	17.6844	38.9400	2869.2939 (29a)
Wl - Render	13.4200	2.9140	10.5060	0.2300	2.4164	38.9400	409.1036 (29a)
Wl - Clad	3.4010		3.4010	0.2400	0.8162	38.9400	132.4349 (29a)
Rf - Ins Joist	47.3340		47.3340	0.1100	5.2067	5.8200	275.4839 (30)
Total net area of external elements Aum(A, m2)			198.3160				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	51.9457		(33)
Party Wall			46.8880	0.0000	0.0000	54.0300	2533.3586 (32)
Ground Floor Stud			67.2326			5.8200	391.2939 (32c)
1st Floor Stud			104.6559			5.8200	609.0975 (32c)
Internal Floor			47.3400			18.0000	852.1200 (32d)
Internal Ceiling			47.3400			5.8200	275.5188 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	11925.8532 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							125.9862 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.5083 (36)
Total fabric heat loss						(33) + (36) =	64.4541 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	48.0258	47.7227	47.4255	46.0298	45.7686	44.5530	44.5530	44.3278	45.0212	45.7686	46.2969	46.8492 (38)
Heat transfer coeff	112.4799	112.1767	111.8796	110.4838	110.2227	109.0070	109.0070	108.7819	109.4753	110.2227	110.7510	111.3032 (39)
Average = Sum(39)m / 12 =												110.4826 (39)
HLP	1.1883	1.1850	1.1819	1.1672	1.1644	1.1516	1.1516	1.1492	1.1565	1.1644	1.1700	1.1758 (40)
HLP (average)												1.1672 (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												2.6843 (42)
Average daily hot water use (litres/day)												97.9519 (43)
Daily hot water use	107.7471	103.8290	99.9109	95.9928	92.0748	88.1567	88.1567	92.0748	95.9928	99.9109	103.8290	107.7471 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy content (annual)	159.7858	139.7497	144.2091	125.7250	120.6362	104.0998	96.4638	110.6936	112.0156	130.5434	142.4984	154.7440 (45)
Distribution loss (46)m = 0.15 x (45)m	23.9679	20.9625	21.6314	18.8588	18.0954	15.6150	14.4696	16.6040	16.8023	19.5815	21.3748	23.2116 (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	14.6963	13.2603	14.6492	14.1204	14.5501	14.0336	14.4720	14.5227	14.0809	14.6082	14.1858	14.6811 (61)
Total heat required for water heating calculated for each month	174.4821	153.0100	158.8583	139.8454	135.1863	118.1334	110.9358	125.2163	126.0965	145.1516	156.6842	169.4251 (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	174.4821	153.0100	158.8583	139.8454	135.1863	118.1334	110.9358	125.2163	126.0965	145.1516	156.6842	169.4251 (64)
Heat gains from water heating, kWh/month	56.8028	49.7818	51.6118	45.3337	43.7491	38.1216	35.6922	40.4363	40.7654	47.0577	50.9272	55.1227 (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	134.2145	134.2145	134.2145	134.2145	134.2145	134.2145	134.2145	134.2145	134.2145	134.2145	134.2145	134.2145 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.4143	20.7964	16.9128	12.8040	9.5712	8.0804	8.7311	11.3491	15.2327	19.3414	22.5743	24.0651 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	247.3948	249.9620	243.4927	229.7205	212.3356	195.9962	185.0805	182.5133	188.9825	202.7547	220.1397	236.4791 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.4214	36.4214	36.4214	36.4214	36.4214	36.4214	36.4214	36.4214	36.4214	36.4214	36.4214	36.4214 (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)	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716 (71)
Water heating gains (Table 5)	76.3479	74.0801	69.3707	62.9634	58.8025	52.9467	47.9734	54.3499	56.6186	63.2497	70.7322	74.0896 (72)
Total internal gains	413.4213	411.1028	396.0406	371.7523	346.9736	323.2876	308.0494	314.4766	327.0982	351.6102	379.7105	400.8981 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W						
North	3.8120	10.6334	0.7600	0.7000	0.7700	14.9441 (74)						
South	8.7600	46.7521	0.7600	0.7000	0.7700	150.9906 (78)						
West	1.3430	19.6403	0.7600	0.7000	0.7700	9.7245 (80)						
Solar gains	175.6592	294.8658	394.8526	479.6534	531.9886	526.7579	508.3580	468.9090	423.8334	323.2869	209.5361	150.9248 (83)
Total gains	589.0805	705.9686	790.8932	851.4058	878.9622	850.0455	816.4074	783.3856	750.9317	674.8971	589.2466	551.8229 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	29.4518	29.5314	29.6099	29.9839	30.0550	30.3901	30.3901	30.4530	30.2601	30.0550	29.9116	29.7632
alpha	2.9635	2.9688	2.9740	2.9989	3.0037	3.0260	3.0260	3.0302	3.0173	3.0037	2.9941	2.9842
util living area	0.9777	0.9616	0.9358	0.8877	0.8046	0.6732	0.5326	0.5678	0.7533	0.9048	0.9644	0.9814 (86)
MIT	18.8982	19.1793	19.5738	20.0564	20.4835	20.7954	20.9269	20.9092	20.6910	20.1295	19.4243	18.8485 (87)
Th 2	19.9294	19.9320	19.9345	19.9464	19.9486	19.9589	19.9589	19.9609	19.9549	19.9486	19.9441	19.9394 (88)
util rest of house	0.9736	0.9547	0.9239	0.8654	0.7628	0.5985	0.4257	0.4630	0.6889	0.8814	0.9569	0.9780 (89)
MIT 2	18.0180	18.2970	18.6858	19.1610	19.5606	19.8360	19.9286	19.9207	19.7535	19.2407	18.5509	17.9761 (90)
Living area fraction									fLA = Living area / (4) =			0.2709 (91)
MIT	18.2564	18.5360	18.9263	19.4035	19.8106	20.0959	20.1990	20.1884	20.0074	19.4814	18.7875	18.2124 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.1064	18.3860	18.7763	19.2535	19.6606	19.9459	20.0490	20.0384	19.8574	19.3314	18.6375	18.0624 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9641	0.9417	0.9075	0.8478	0.7496	0.5975	0.4356	0.4715	0.6820	0.8643	0.9444	0.9696 (94)
Ext temp.	567.9509	664.7823	717.7548	721.8328	658.8486	507.9104	355.6588	369.3690	512.1270	583.3463	556.4780	535.0631 (95)
Heat loss rate W	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)
1552.9455	1512.8125	1373.4685	1143.8978	877.4339	582.7366	375.9673	395.7959	630.2924	962.4026	1277.7869	1542.9265 (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	732.8360	569.8763	487.8510	303.8868	162.6275	0.0000	0.0000	0.0000	0.0000	282.0179	519.3424	749.8504 (98)
Space heating												3808.2882 (98)
Space heating per m ²										(98) / (4) =		40.2312 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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													4208.0533 (211)
Space heating requirement	732.8360	569.8763	487.8510	303.8868	162.6275	0.0000	0.0000	0.0000	0.0000	282.0179	519.3424	749.8504	(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)	809.7635	629.6976	539.0619	335.7865	179.6989	0.0000	0.0000	0.0000	0.0000	311.6220	573.8590	828.5640	(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	174.4821	153.0100	158.8583	139.8454	135.1863	118.1334	110.9358	125.2163	126.0965	145.1516	156.6842	169.4251	(64)
Efficiency of water heater (217)m	89.8665	89.8032	89.6924	89.4665	89.0188	87.3000	87.3000	87.3000	87.3000	89.3867	89.7376	87.3000	(216)
Fuel for water heating, kWh/month	194.1569	170.3836	177.1145	156.3104	151.8626	135.3189	127.0743	143.4322	144.4405	162.3862	174.6025	188.4748	(219)
Water heating fuel used													1925.5574 (219)
Annual totals kWh/year													
Space heating fuel - main system													4208.0533 (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)													413.5042 (232)
Total delivered energy for all uses													6622.1149 (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	4208.0533	0.2160	908.9395	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1925.5574	0.2160	415.9204	(264)
Space and water heating			1324.8599	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	413.5042	0.5190	214.6087	(268)
Total CO2, kg/year			1578.3936	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			16.6700	(273)

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

	TFA	N	EF	
DER				16.6700 ZC1
Total Floor Area				94.6600
Assumed number of occupants				2.6843
CO2 emission factor in Table 12 for electricity displaced from grid				0.5190
CO2 emissions from appliances, equation (L14)				15.4871 ZC2
CO2 emissions from cooking, equation (L16)				1.9377 ZC3
Total CO2 emissions				34.0948 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				34.0948 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	47.3300 (1b)	2.4600 (2b)	116.4318 (1b) - (3b)
First floor	47.3300 (1c)	2.6900 (2c)	127.3177 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.6600		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 243.7495 (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) =	0.1231 (8)							
Pressure test				Yes								
Measured/design AP50				5.0000								
Infiltration rate				0.3731 (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) =		0.3451 (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	0.4400	0.4314	0.4227	0.3796	0.3710	0.3278	0.3278	0.3192	0.3451	0.3710	0.3882	0.4055 (22b)
Effective ac	0.5968	0.5930	0.5894	0.5721	0.5688	0.5537	0.5537	0.5509	0.5595	0.5688	0.5754	0.5822 (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			2.1500	1.0000	2.1500		(26)					
TER Opening Type (Uw = 1.40)			13.9200	1.3258	18.4413		(27)					
Flr - Ground			47.3300	0.1300	6.1529		(28a)					
Wl - Brick	86.8340	13.1490	73.6850	0.1800	13.2633		(29a)					
Wl - Render	13.4200	2.9140	10.5060	0.1800	1.8911		(29a)					
Wl - Clad	3.4010		3.4010	0.1800	0.6122		(29a)					
Rf - Ins Joist	47.3340		47.3340	0.1300	6.1534		(30)					
Total net area of external elements Aum(A, m ²)			198.3160				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	48.6642	(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)							10.3629 (36)					
Total fabric heat loss						(33) + (36) =	59.0271 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 48.0049	Feb 47.7026	Mar 47.4062	Apr 46.0142	May 45.7538	Jun 44.5414	Jul 44.5414	Aug 44.3169	Sep 45.0084	Oct 45.7538	Nov 46.2806	Dec 46.8314 (38)
Heat transfer coeff	107.0320	106.7296	106.4333	105.0413	104.7808	103.5684	103.5684	103.3439	104.0354	104.7808	105.3077	105.8585 (39)
Average = Sum(39)m / 12 =												105.0400 (39)
HLP	Jan 1.1307	Feb 1.1275	Mar 1.1244	Apr 1.1097	May 1.1069	Jun 1.0941	Jul 1.0941	Aug 1.0917	Sep 1.0990	Oct 1.1069	Nov 1.1125	Dec 1.1183 (40)
HLP (average)												1.1097 (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												2.6843 (42)
Average daily hot water use (litres/day)												97.9519 (43)
Daily hot water use	107.7471	103.8290	99.9109	95.9928	92.0748	88.1567	88.1567	92.0748	95.9928	99.9109	103.8290	107.7471 (44)
Energy conte	159.7858	139.7497	144.2091	125.7250	120.6362	104.0998	96.4638	110.6936	112.0156	130.5434	142.4984	154.7440 (45)
Energy content (annual)												Total = Sum(45)m = 1541.1645 (45)
Distribution loss (46)m = 0.15 x (45)m												
	23.9679	20.9625	21.6314	18.8588	18.0954	15.6150	14.4696	16.6040	16.8023	19.5815	21.3748	23.2116 (46)
Water storage loss:												
Total storage loss												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
Combi loss	50.9589	46.0274	50.9135	47.3389	46.9203	43.4745	44.9237	46.9203	47.3389	50.9135	49.3151	50.9589	0.0000	0.0000	(57)
Total heat required for water heating calculated for each month	210.7447	185.7771	195.1226	173.0640	167.5564	147.5744	141.3875	157.6139	159.3546	181.4569	191.8134	205.7029	0.0000	0.0000	(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	0.0000	0.0000	(63)
Output from w/h	210.7447	185.7771	195.1226	173.0640	167.5564	147.5744	141.3875	157.6139	159.3546	181.4569	191.8134	205.7029	0.0000	0.0000	(64)
Heat gains from water heating, kWh/month	65.8685	57.9736	60.6779	53.6383	51.8416	45.4818	43.3051	48.5357	49.0799	56.1341	59.7095	64.1921	0.0000	0.0000	(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	134.2145	134.2145	134.2145	134.2145	134.2145	134.2145	134.2145	134.2145	134.2145	134.2145	134.2145	134.2145	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.4143	20.7964	16.9128	12.8040	9.5712	8.0804	8.7311	11.3491	15.2327	19.3414	22.5743	24.0651	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	247.3948	249.9620	243.4927	229.7205	212.3356	195.9962	185.0805	182.5133	188.9825	202.7547	220.1397	236.4791	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.4214	36.4214	36.4214	36.4214	36.4214	36.4214	36.4214	36.4214	36.4214	36.4214	36.4214	36.4214	(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)	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	(71)
Water heating gains (Table 5)	88.5329	86.2703	81.5563	74.4976	69.6796	63.1692	58.2058	65.2362	68.1666	75.4490	82.9298	86.2797	(72)
Total internal gains	425.6064	423.2930	408.2262	383.2866	357.8507	333.5102	318.2818	325.3629	338.6462	363.8095	391.9081	413.0882	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g Specific data or Table 6c	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
North	3.8120	10.6334	0.6300	0.7000	0.7700	12.3879	(74)						
South	8.7600	46.7521	0.6300	0.7000	0.7700	125.1632	(78)						
West	1.3430	19.6403	0.6300	0.7000	0.7700	8.0611	(80)						
Solar gains	145.6122	244.4282	327.3120	397.6075	440.9905	436.6546	421.4020	388.7009	351.3356	267.9878	173.6944	125.1087	(83)
Total gains	571.2186	667.7212	735.5382	780.8940	798.8412	770.1647	739.6838	714.0638	689.9818	631.7974	565.6025	538.1969	(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)	0.9980	0.9951	0.9881	0.9673	0.9090	0.7706	0.5963	0.6371	0.8552	0.9742	0.9955	0.9985	(86)
MIT	19.7879	19.9501	20.1861	20.4847	20.7517	20.9305	20.9854	20.9795	20.8720	20.5258	20.1002	19.7616	(87)
Th 2	19.9758	19.9784	19.9810	19.9929	19.9952	20.0056	20.0056	20.0076	20.0016	19.9952	19.9907	19.9859	(88)
util rest of house	0.9973	0.9934	0.9838	0.9545	0.8714	0.6836	0.4716	0.5137	0.7864	0.9616	0.9936	0.9980	(89)
MIT 2	18.3599	18.5981	18.9426	19.3784	19.7418	19.9566	20.0000	19.9987	19.8969	19.4431	18.8267	18.3286	(90)
Living area fraction	18.7467	18.9643	19.2794	19.6780	20.0153	20.2204	20.2669	20.2644	20.1610	19.7364	19.1717	18.7167	(92)
MIT	18.7467	18.9643	19.2794	19.6780	20.0153	20.2204	20.2669	20.2644	20.1610	19.7364	19.1717	18.7167	(92)
Temperature adjustment													0.0000
adjusted MIT	18.7467	18.9643	19.2794	19.6780	20.0153	20.2204	20.2669	20.2644	20.1610	19.7364	19.1717	18.7167	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	568.9576	661.7541	720.6597	741.4249	696.8538	542.2815	374.0322	390.7585	551.3057	604.7958	560.7671	536.6033	(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	1546.2561	1501.0799	1360.1582	1132.1370	871.2861	582.0959	379.7725	399.3619	630.5630	957.3172	1271.2396	1536.7171	(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	727.1100	564.0269	475.7869	281.3127	129.7776	0.0000	0.0000	0.0000	0.0000	262.2759	511.5402	744.0847	(98)
Space heating												3695.9149	(98)
Space heating per m2												39.0441	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												93.4000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												3957.0823 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	727.1100	564.0269	475.7869	281.3127	129.7776	0.0000	0.0000	0.0000	0.0000	262.2759	511.5402	744.0847 (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)	778.4904	603.8832	509.4078	301.1914	138.9482	0.0000	0.0000	0.0000	0.0000	280.8093	547.6876	796.6645 (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	210.7447	185.7771	195.1226	173.0640	167.5564	147.5744	141.3875	157.6139	159.3546	181.4569	191.8134	205.7029 (64)
Efficiency of water heater (217)m	87.9152	87.6679	87.2098	86.2672	84.4166	80.3000	80.3000	80.3000	80.3000	85.9777	87.4020	88.0027 (217)
Fuel for water heating, kWh/month	239.7136	211.9099	223.7393	200.6138	198.4876	183.7788	176.0741	196.2813	198.4490	211.0511	219.4612	233.7460 (219)
Water heating fuel used												2493.3058 (219)
Annual totals kWh/year												3957.0823 (211)
Space heating fuel - main system												0.0000 (215)
Space heating fuel - secondary												
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)												413.5042 (232)
Total delivered energy for all uses												6938.8923 (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	3957.0823	0.2160	854.7298 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2493.3058	0.2160	538.5540 (264)
Space and water heating			1393.2838 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	413.5042	0.5190	214.6087 (268)
Total CO2, kg/m2/year			1646.8175 (272)
Emissions per m2 for space and water heating			14.7188 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.2672 (272b)
Emissions per m2 for pumps and fans			0.4112 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.7188 * 1.00) + 2.2672 + 0.4112, rounded to 2 d.p.			17.4000 (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	47.3300 (1b)	2.4600 (2b)	116.4318 (1b) - (3b)
First floor	47.3300 (1c)	2.6900 (2c)	127.3177 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.6600		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 243.7495 (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) =	0.1231 (8)
Pressure test				Yes	
Measured/design AP50				5.0100	
Infiltration rate				0.3736 (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) =		0.3456 (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	0.4406	0.4319	0.4233	0.3801	0.3715	0.3283	0.3283	0.3196	0.3456	0.3715	0.3888	0.4060 (22b)
	0.5971	0.5933	0.5896	0.5722	0.5690	0.5539	0.5539	0.5511	0.5597	0.5690	0.5756	0.5824 (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 = 1.20)			13.9200	1.1450	15.9275		(27)
Solid Door			2.1500	1.3000	2.7950		(26)
Flr - Ground			47.3300	0.1500	7.0995	75.6000	3578.1480 (28a)
Wl - Brick	86.8340	13.1490	73.6850	0.2400	17.6844	38.9400	2869.2939 (29a)
Wl - Render	13.4200	2.9140	10.5060	0.2300	2.4164	38.9400	409.1036 (29a)
Wl - Clad	3.4010		3.4010	0.2400	0.8162	38.9400	132.4349 (29a)
Rf - Ins Joist	47.3340		47.3340	0.1100	5.2067	5.8200	275.4839 (30)
Total net area of external elements Aum(A, m2)			198.3160				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	51.9457		(33)
Party Wall			46.8880	0.0000	0.0000	54.0300	2533.3586 (32)
Ground Floor Stud			67.2326			5.8200	391.2939 (32c)
1st Floor Stud			104.6559			5.8200	609.0975 (32c)
Internal Floor			47.3400			18.0000	852.1200 (32d)
Internal Ceiling			47.3400			5.8200	275.5188 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	11925.8532 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							125.9862 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.5083 (36)
Total fabric heat loss						(33) + (36) =	64.4541 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	48.0258	47.7227	47.4255	46.0298	45.7686	44.5530	44.5530	44.3278	45.0212	45.7686	46.2969	46.8492 (38)
Heat transfer coeff	112.4799	112.1767	111.8796	110.4838	110.2227	109.0070	109.0070	108.7819	109.4753	110.2227	110.7510	111.3032 (39)
Average = Sum(39)m / 12 =												110.4826 (39)
HLP	1.1883	1.1850	1.1819	1.1672	1.1644	1.1516	1.1516	1.1492	1.1565	1.1644	1.1700	1.1758 (40)
HLP (average)												1.1672 (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												2.6843 (42)
Average daily hot water use (litres/day)												97.9519 (43)
Daily hot water use	107.7471	103.8290	99.9109	95.9928	92.0748	88.1567	88.1567	92.0748	95.9928	99.9109	103.8290	107.7471 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Energy conte	159.7858	139.7497	144.2091	125.7250	120.6362	104.0998	96.4638	110.6936	112.0156	130.5434	142.4984	154.7440 (45)
Energy content (annual)	Total = Sum(45)m = 1541.1645 (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												
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 (57)
Heat gains from water heating, kWh/month	33.9545	29.6968	30.6444	26.7166	25.6352	22.1212	20.4986	23.5224	23.8033	27.7405	30.2809	32.8831 (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	134.2145	134.2145	134.2145	134.2145	134.2145	134.2145	134.2145	134.2145	134.2145	134.2145	134.2145	134.2145 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.4143	20.7964	16.9128	12.8040	9.5712	8.0804	8.7311	11.3491	15.2327	19.3414	22.5743	24.0651 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	247.3948	249.9620	243.4927	229.7205	212.3356	195.9962	185.0805	182.5133	188.9825	202.7547	220.1397	236.4791 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.4214	36.4214	36.4214	36.4214	36.4214	36.4214	36.4214	36.4214	36.4214	36.4214	36.4214	36.4214 (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)	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716 (71)
Water heating gains (Table 5)	45.6377	44.1917	41.1888	37.1063	34.4559	30.7239	27.5518	31.6161	33.0602	37.2856	42.0568	44.1977 (72)
Total internal gains	379.7112	378.2144	364.8586	342.8953	319.6270	298.0649	284.6278	288.7429	300.5398	322.6461	348.0351	368.0062 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b g	Specific data or Table 6c FF	Access factor Table 6d	Gains W						
North	3.8120	10.6334	0.7600	0.7000	0.7700	14.9441 (74)						
South	8.7600	46.7521	0.7600	0.7000	0.7700	150.9906 (78)						
West	1.3430	19.6403	0.7600	0.7000	0.7700	9.7245 (80)						
Solar gains	175.6592	294.8658	394.8526	479.6534	531.9886	526.7579	508.3580	468.9090	423.8334	323.2869	209.5361	150.9248 (83)
Total gains	555.3703	673.0801	759.7112	822.5487	851.6156	824.8227	792.9858	757.6518	724.3732	645.9330	557.5712	518.9310 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (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)												21.0000 (85)
tau	29.4518	29.5314	29.6099	29.9839	30.0550	30.3901	30.3901	30.4530	30.2601	30.0550	29.9116	29.7632
alpha	2.9635	2.9688	2.9740	2.9989	3.0037	3.0260	3.0260	3.0302	3.0173	3.0037	2.9941	2.9842
util living area	0.9808	0.9658	0.9414	0.8953	0.8149	0.6856	0.5447	0.5819	0.7666	0.9133	0.9690	0.9841 (86)
MIT	18.8478	19.1328	19.5335	20.0250	20.4620	20.7844	20.9222	20.9028	20.6741	20.0958	19.3789	18.7985 (87)
Th 2	19.9294	19.9320	19.9345	19.9464	19.9486	19.9589	19.9589	19.9609	19.9549	19.9486	19.9441	19.9394 (88)
util rest of house	0.9773	0.9596	0.9304	0.8742	0.7742	0.6113	0.4366	0.4762	0.7034	0.8915	0.9623	0.9812 (89)
MIT 2	17.9683	18.2516	18.6472	19.1322	19.5425	19.8285	19.9265	19.9175	19.7409	19.2098	18.5066	17.9267 (90)
Living area fraction	fLA = Living area / (4) = 0.2709 (91)											
MIT	18.2066	18.4903	18.8873	19.3740	19.7916	20.0874	20.1962	20.1844	19.9936	19.4498	18.7429	18.1628 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.2066	18.4903	18.8873	19.3740	19.7916	20.0874	20.1962	20.1844	19.9936	19.4498	18.7429	18.1628 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	538.4411	638.5457	696.4766	707.7813	653.4264	512.4995	367.0327	379.2956	511.4652	567.6379	530.9215	505.6700 (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	1564.2071	1524.5124	1385.8817	1157.2084	891.8732	598.1700	392.0088	411.6718	645.2068	975.4494	1289.4607	1554.1077 (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	763.1699	595.3696	512.9174	323.5875	177.4044	0.0000	0.0000	0.0000	0.0000	303.4118	546.1482	780.0377 (98)
Space heating	4002.0464 (98)											
Space heating per m2	(98) / (4) = 42.2781 (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												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	1024.6661	806.6520	826.7425	0.0000	0.0000	0.0000	0.0000	(100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.7665	0.8339	0.8143	0.0000	0.0000	0.0000	0.0000	(101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	785.3925	672.6882	673.2396	0.0000	0.0000	0.0000	0.0000	(102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1066.6234	1027.2797	987.9480	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	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	0.0000	0.0000	0.0000	0.0000	0.0000	202.4863	263.8161	234.1430	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction												700.4454	(104)
Intermittency factor (Table 10b)												1.0000	(105)
Space cooling kWh	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	0.0000	0.0000	0.0000	0.0000	0.0000	50.6216	65.9540	58.5358	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling per m2												175.1113	(107)
Energy for space heating												1.8499	(108)
Energy for space cooling												42.2781	(99)
Total												1.8499	(108)
Dwelling Fabric Energy Efficiency (DFEE)												44.1280	(109)
												44.1	(109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	47.3300 (1b)	2.4600 (2b)	116.4318 (1b) - (3b)
First floor	47.3300 (1c)	2.6900 (2c)	127.3177 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.6600		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 243.7495 (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) =	0.1231 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.3731 (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) =		0.3451 (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	0.4400	0.4314	0.4227	0.3796	0.3710	0.3278	0.3278	0.3192	0.3451	0.3710	0.3882	0.4055 (22b)
Effective ac	0.5968	0.5930	0.5894	0.5721	0.5688	0.5537	0.5537	0.5509	0.5595	0.5688	0.5754	0.5822 (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			2.1500	1.0000	2.1500		(26)					
TER Opening Type (Uw = 1.40)			13.9200	1.3258	18.4413		(27)					
Flr - Ground			47.3300	0.1300	6.1529		(28a)					
Wl - Brick	86.8340	13.1490	73.6850	0.1800	13.2633		(29a)					
Wl - Render	13.4200	2.9140	10.5060	0.1800	1.8911		(29a)					
Wl - Clad	3.4010		3.4010	0.1800	0.6122		(29a)					
Rf - Ins Joist	47.3340		47.3340	0.1300	6.1534		(30)					
Total net area of external elements Aum(A, m ²)			198.3160				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 48.6642		(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)							10.3629 (36)					
Total fabric heat loss							(33) + (36) = 59.0271 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 48.0049	Feb 47.7026	Mar 47.4062	Apr 46.0142	May 45.7538	Jun 44.5414	Jul 44.5414	Aug 44.3169	Sep 45.0084	Oct 45.7538	Nov 46.2806	Dec 46.8314 (38)
Heat transfer coeff	107.0320	106.7296	106.4333	105.0413	104.7808	103.5684	103.5684	103.3439	104.0354	104.7808	105.3077	105.8585 (39)
Average = Sum(39)m / 12 =												105.0400 (39)
HLP	Jan 1.1307	Feb 1.1275	Mar 1.1244	Apr 1.1097	May 1.1069	Jun 1.0941	Jul 1.0941	Aug 1.0917	Sep 1.0990	Oct 1.1069	Nov 1.1125	Dec 1.1183 (40)
HLP (average)												1.1097 (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												2.6843 (42)
Average daily hot water use (litres/day)												97.9519 (43)
Daily hot water use	107.7471	103.8290	99.9109	95.9928	92.0748	88.1567	88.1567	92.0748	95.9928	99.9109	103.8290	107.7471 (44)
Energy conte	159.7858	139.7497	144.2091	125.7250	120.6362	104.0998	96.4638	110.6936	112.0156	130.5434	142.4984	154.7440 (45)
Energy content (annual)												Total = Sum(45)m = 1541.1645 (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												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	107.4315	171.3025	145.8498	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction												424.5838 (104)
Intermittency factor (Table 10b)												1.0000 (105)
									FC = cooled area / (4) =			
Space cooling kWh	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	0.0000	0.0000	0.0000	0.0000	0.0000	26.8579	42.8256	36.4625	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling per m2												106.1459 (107)
Energy for space heating												1.1213 (108)
Energy for space cooling												42.6250 (99)
Total												1.1213 (108)
Target Fabric Energy Efficiency (TFEE)												43.7463 (109)
												50.3 (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	47.3300 (1b)	2.4600 (2b)	116.4318 (1b) - (3b)
First floor	47.3300 (1c)	2.6900 (2c)	127.3177 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.6600		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 243.7495 (5)
Dwelling volume			

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) =	0.1231 (8)
Pressure test					Yes
Measured/design AP50					5.0100
Infiltration rate					0.3736 (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) =		0.3456 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.9000	4.8000	4.7000	4.2000	4.2000	3.7000	3.8000	3.8000	4.0000	4.2000	4.3000	4.5000 (22)
Wind factor	1.2250	1.2000	1.1750	1.0500	1.0500	0.9250	0.9500	0.9500	1.0000	1.0500	1.0750	1.1250 (22a)
Adj infilt rate												
Effective ac	0.4233	0.4147	0.4060	0.3628	0.3628	0.3196	0.3283	0.3283	0.3456	0.3628	0.3715	0.3888 (22b)
	0.5896	0.5860	0.5824	0.5658	0.5658	0.5511	0.5539	0.5539	0.5597	0.5658	0.5690	0.5756 (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 = 1.20)			13.9200	1.1450	15.9275		(27)
Solid Door			2.1500	1.3000	2.7950		(26)
Flr - Ground			47.3300	0.1500	7.0995	75.6000	3578.1480 (28a)
Wl - Brick	86.8340	13.1490	73.6850	0.2400	17.6844	38.9400	2869.2939 (29a)
Wl - Render	13.4200	2.9140	10.5060	0.2300	2.4164	38.9400	409.1036 (29a)
Wl - Clad	3.4010		3.4010	0.2400	0.8162	38.9400	132.4349 (29a)
Rf - Ins Joist	47.3340		47.3340	0.1100	5.2067	5.8200	275.4839 (30)
Total net area of external elements Aum(A, m2)			198.3160				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	51.9457		(33)
Party Wall			46.8880	0.0000	0.0000	54.0300	2533.3586 (32)
Ground Floor Stud			67.2326			5.8200	391.2939 (32c)
1st Floor Stud			104.6559			5.8200	609.0975 (32c)
Internal Floor			47.3400			18.0000	852.1200 (32d)
Internal Ceiling			47.3400			5.8200	275.5188 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	11925.8532 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							125.9862 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.5083 (36)
Total fabric heat loss						(33) + (36) =	64.4541 (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	47.4255	47.1343	46.8492	45.5135	45.5135	44.3278	44.5530	44.5530	45.0212	45.5135	45.7686	46.2969 (38)
Average = Sum(39)m / 12 =	111.8796	111.5884	111.3032	109.9675	109.9675	108.7819	109.0070	109.0070	109.4753	109.9675	110.2227	110.7510 (39)
HLP	1.1819	1.1788	1.1758	1.1617	1.1617	1.1492	1.1516	1.1516	1.1565	1.1617	1.1644	1.1700 (40)
HLP (average)												1.1637 (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												2.6843 (42)
Average daily hot water use (litres/day)												97.9519 (43)
Daily hot water use	107.7471	103.8290	99.9109	95.9928	92.0748	88.1567	88.1567	92.0748	95.9928	99.9109	103.8290	107.7471 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Energy content (annual)	159.7858	139.7497	144.2091	125.7250	120.6362	104.0998	96.4638	110.6936	112.0156	130.5434	142.4984	154.7440 (45)
Distribution loss (46)m = 0.15 x (45)m	23.9679	20.9625	21.6314	18.8588	18.0954	15.6150	14.4696	16.6040	16.8023	19.5815	21.3748	23.2116 (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	14.6963	13.2603	14.6492	14.1204	14.5501	14.0336	14.4720	14.5227	14.0809	14.6082	14.1858	14.6811 (61)
Total heat required for water heating calculated for each month	174.4821	153.0100	158.8583	139.8454	135.1863	118.1334	110.9358	125.2163	126.0965	145.1516	156.6842	169.4251 (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	174.4821	153.0100	158.8583	139.8454	135.1863	118.1334	110.9358	125.2163	126.0965	145.1516	156.6842	169.4251 (64)
RHI water heating demand												1713 (64)
Heat gains from water heating, kWh/month	56.8028	49.7818	51.6118	45.3337	43.7491	38.1216	35.6922	40.4363	40.7654	47.0577	50.9272	55.1227 (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	161.0574	161.0574	161.0574	161.0574	161.0574	161.0574	161.0574	161.0574	161.0574	161.0574	161.0574	161.0574 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	58.5358	51.9910	42.2819	32.0101	23.9279	20.2010	21.8279	28.3727	38.0818	48.3535	56.4357	60.1627 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	369.2459	373.0776	363.4220	342.8665	316.9188	292.5317	276.2396	272.4079	282.0635	302.6190	328.5667	352.9538 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.7900	53.7900	53.7900	53.7900	53.7900	53.7900	53.7900	53.7900	53.7900	53.7900	53.7900	53.7900 (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)	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716 (71)
Water heating gains (Table 5)	76.3479	74.0801	69.3707	62.9634	58.8025	52.9467	47.9734	54.3499	56.6186	63.2497	70.7322	74.0896 (72)
Total internal gains	614.6055	609.6245	585.5505	548.3158	510.1251	476.1551	456.5167	465.6063	487.2397	524.6980	566.2104	597.6819 (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						
North	3.8120	12.0539	0.7600	0.7000	0.7700	16.9405 (74)						
South	8.7600	51.7504	0.7600	0.7000	0.7700	167.1332 (78)						
West	1.3430	22.4175	0.7600	0.7000	0.7700	11.0996 (80)						
Solar gains	195.1733	305.0924	401.6795	514.3015	552.5716	571.3091	545.4554	505.3397	457.4324	349.5016	238.4446	166.1232 (83)
Total gains	809.7787	914.7169	987.2299	1062.6173	1062.6967	1047.4642	1001.9720	970.9460	944.6721	874.1997	804.6550	763.8052 (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)												21.0000 (85)
tau	29.6099	29.6871	29.7632	30.1247	30.1247	30.4530	30.3901	30.3901	30.2601	30.1247	30.0550	29.9116
alpha	2.9740	2.9791	2.9842	3.0083	3.0083	3.0302	3.0260	3.0260	3.0173	3.0083	3.0037	2.9941
util living area	0.9482	0.9265	0.8880	0.8116	0.7005	0.5285	0.3582	0.3686	0.6031	0.8163	0.9181	0.9546 (86)
MIT	19.2931	19.5183	19.8960	20.3458	20.6905	20.9093	20.9809	20.9793	20.8581	20.4436	19.8182	19.2540 (87)
Th 2	19.9345	19.9370	19.9394	19.9508	19.9508	19.9609	19.9589	19.9589	19.9549	19.9508	19.9486	19.9441 (88)
util rest of house	0.9395	0.9144	0.8690	0.7791	0.6463	0.4464	0.2535	0.2613	0.5228	0.7772	0.9023	0.9468 (89)
MIT 2	18.4088	18.6293	18.9962	19.4281	19.7352	19.9143	19.9538	19.9534	19.8759	19.5264	18.9344	18.3782 (90)
Living area fraction										fLA = Living area / (4) =		0.2709 (91)
MIT	18.6483	18.8701	19.2399	19.6767	19.9939	20.1838	20.2320	20.2313	20.1419	19.7748	19.1738	18.6154 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.4983	18.7201	19.0899	19.5267	19.8439	20.0338	20.0820	20.0813	19.9919	19.6248	19.0238	18.4654 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9244	0.8973	0.8509	0.7642	0.6402	0.4525	0.2663	0.2743	0.5259	0.7631	0.8851	0.9327 (94)
Ext temp.	748.5551	820.7860	840.0372	812.0576	680.3659	473.9879	266.7799	266.3713	496.8071	667.1373	712.2330	712.4288 (95)
Heat loss rate W	4.7000	5.2000	7.0000	9.5000	12.5000	15.4000	17.6000	17.6000	15.0000	11.4000	7.7000	4.7000 (96)
Month fracti	1543.7504	1508.6886	1345.6506	1102.6064	807.5943	504.0719	270.5576	270.4754	546.4941	904.4638	1248.1420	1524.5342 (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	591.6253	462.2705	376.1764	209.1951	94.6579	0.0000	0.0000	0.0000	0.0000	176.5709	385.8545	604.2064 (98)
RHI space heating demand												2901.5571 (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	47.3300 (1b)	2.4600 (2b)	116.4318 (1b) - (3b)
First floor	47.3300 (1c)	2.6900 (2c)	127.3177 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.6600		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 243.7495 (5)
Dwelling volume			

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) =	0.1231 (8)
Pressure test				Yes	
Measured/design AP50					5.0100
Infiltration rate					0.3736 (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) =		0.3456 (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	0.4406	0.4319	0.4233	0.3801	0.3715	0.3283	0.3283	0.3196	0.3456	0.3715	0.3888	0.4060 (22b)
	0.5971	0.5933	0.5896	0.5722	0.5690	0.5539	0.5539	0.5511	0.5597	0.5690	0.5756	0.5824 (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 = 1.20)			13.9200	1.1450	15.9275		(27)
Solid Door			2.1500	1.3000	2.7950		(26)
Flr - Ground			47.3300	0.1500	7.0995	75.6000	3578.1480 (28a)
Wl - Brick	86.8340	13.1490	73.6850	0.2400	17.6844	38.9400	2869.2939 (29a)
Wl - Render	13.4200	2.9140	10.5060	0.2300	2.4164	38.9400	409.1036 (29a)
Wl - Clad	3.4010		3.4010	0.2400	0.8162	38.9400	132.4349 (29a)
Rf - Ins Joist	47.3340		47.3340	0.1100	5.2067	5.8200	275.4839 (30)
Total net area of external elements Aum(A, m2)			198.3160				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	51.9457		(33)
Party Wall			46.8880	0.0000	0.0000	54.0300	2533.3586 (32)
Ground Floor Stud			67.2326			5.8200	391.2939 (32c)
1st Floor Stud			104.6559			5.8200	609.0975 (32c)
Internal Floor			47.3400			18.0000	852.1200 (32d)
Internal Ceiling			47.3400			5.8200	275.5188 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	11925.8532 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							125.9862 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.5083 (36)
Total fabric heat loss						(33) + (36) =	64.4541 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	48.0258	47.7227	47.4255	46.0298	45.7686	44.5530	44.5530	44.3278	45.0212	45.7686	46.2969	46.8492 (38)
Heat transfer coeff	112.4799	112.1767	111.8796	110.4838	110.2227	109.0070	109.0070	108.7819	109.4753	110.2227	110.7510	111.3032 (39)
Average = Sum(39)m / 12 =												110.4826 (39)
HLP	1.1883	1.1850	1.1819	1.1672	1.1644	1.1516	1.1516	1.1492	1.1565	1.1644	1.1700	1.1758 (40)
HLP (average)												1.1672 (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												2.6843 (42)
Average daily hot water use (litres/day)												97.9519 (43)
Daily hot water use	107.7471	103.8290	99.9109	95.9928	92.0748	88.1567	88.1567	92.0748	95.9928	99.9109	103.8290	107.7471 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Energy content (annual)	159.7858	139.7497	144.2091	125.7250	120.6362	104.0998	96.4638	110.6936	112.0156	130.5434	142.4984	154.7440 (45)
Distribution loss (46)m = 0.15 x (45)m	23.9679	20.9625	21.6314	18.8588	18.0954	15.6150	14.4696	16.6040	16.8023	19.5815	21.3748	23.2116 (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	14.6963	13.2603	14.6492	14.1204	14.5501	14.0336	14.4720	14.5227	14.0809	14.6082	14.1858	14.6811 (61)
Total heat required for water heating calculated for each month	174.4821	153.0100	158.8583	139.8454	135.1863	118.1334	110.9358	125.2163	126.0965	145.1516	156.6842	169.4251 (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	174.4821	153.0100	158.8583	139.8454	135.1863	118.1334	110.9358	125.2163	126.0965	145.1516	156.6842	169.4251 (64)
Heat gains from water heating, kWh/month	56.8028	49.7818	51.6118	45.3337	43.7491	38.1216	35.6922	40.4363	40.7654	47.0577	50.9272	55.1227 (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	161.0574	161.0574	161.0574	161.0574	161.0574	161.0574	161.0574	161.0574	161.0574	161.0574	161.0574	161.0574 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	58.5358	51.9910	42.2819	32.0101	23.9279	20.2010	21.8279	28.3727	38.0818	48.3535	56.4357	60.1627 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	369.2459	373.0776	363.4220	342.8665	316.9188	292.5317	276.2396	272.4079	282.0635	302.6190	328.5667	352.9538 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.7900	53.7900	53.7900	53.7900	53.7900	53.7900	53.7900	53.7900	53.7900	53.7900	53.7900	53.7900 (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)	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716 (71)
Water heating gains (Table 5)	76.3479	74.0801	69.3707	62.9634	58.8025	52.9467	47.9734	54.3499	56.6186	63.2497	70.7322	74.0896 (72)
Total internal gains	614.6055	609.6245	585.5505	548.3158	510.1251	476.1551	456.5167	465.6063	487.2397	524.6980	566.2104	597.6819 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W						
North	3.8120	10.6334	0.7600	0.7000	0.7700	14.9441 (74)						
South	8.7600	46.7521	0.7600	0.7000	0.7700	150.9906 (78)						
West	1.3430	19.6403	0.7600	0.7000	0.7700	9.7245 (80)						
Solar gains	175.6592	294.8658	394.8526	479.6534	531.9886	526.7579	508.3580	468.9090	423.8334	323.2869	209.5361	150.9248 (83)
Total gains	790.2646	904.4903	980.4031	1027.9693	1042.1136	1002.9130	964.8746	934.5153	911.0732	847.9850	775.7465	748.6068 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	29.4518	29.5314	29.6099	29.9839	30.0550	30.3901	30.3901	30.4530	30.2601	30.0550	29.9116	29.7632
alpha	2.9635	2.9688	2.9740	2.9989	3.0037	3.0260	3.0260	3.0302	3.0173	3.0037	2.9941	2.9842
util living area	0.9540	0.9315	0.8977	0.8384	0.7440	0.6037	0.4650	0.4947	0.6769	0.8498	0.9319	0.9599 (86)
MIT	19.1854	19.4437	19.8001	20.2287	20.5941	20.8496	20.9495	20.9378	20.7742	20.3082	19.6751	19.1353 (87)
Th 2	19.9294	19.9320	19.9345	19.9464	19.9486	19.9589	19.9589	19.9609	19.9549	19.9486	19.9441	19.9394 (88)
util rest of house	0.9463	0.9203	0.8806	0.8102	0.6970	0.5290	0.3667	0.3972	0.6081	0.8180	0.9188	0.9531 (89)
MIT 2	18.2992	18.5528	18.9002	19.3170	19.6514	19.8715	19.9388	19.9344	19.8133	19.4012	18.7925	18.2576 (90)
Living area fraction									fLA = Living area / (4) =			0.2709 (91)
MIT	18.5392	18.7942	19.1439	19.5639	19.9067	20.1364	20.2126	20.2062	20.0736	19.6469	19.0316	18.4953 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.3892	18.6442	18.9939	19.4139	19.7567	19.9864	20.0626	20.0562	19.9236	19.4969	18.8816	18.3453 (93)

8. Space heating requirement

Utilisation	0.9319	0.9035	0.8624	0.7937	0.6874	0.5311	0.3769	0.4066	0.6058	0.8018	0.9023	0.9398 (94)
Useful gains	736.4585	817.2262	845.5039	815.9394	716.3707	532.6780	363.7049	379.9991	551.9622	679.9473	699.9461	703.5695 (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	1584.7568	1541.7741	1397.8171	1161.6161	888.0359	587.1575	377.4426	397.7293	637.5381	980.6377	1304.8225	1574.4232 (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	631.1339	486.8962	410.9211	248.8873	127.7189	0.0000	0.0000	0.0000	0.0000	223.7136	435.5110	647.9151 (98)
Space heating												3212.6971 (98)
Space heating per m2												(98) / (4) = 33.9393 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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													3549.9415 (211)
Space heating requirement	631.1339	486.8962	410.9211	248.8873	127.7189	0.0000	0.0000	0.0000	0.0000	223.7136	435.5110	647.9151	(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)	697.3856	538.0068	454.0564	275.0135	141.1258	0.0000	0.0000	0.0000	0.0000	247.1974	481.2276	715.9283	(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	174.4821	153.0100	158.8583	139.8454	135.1863	118.1334	110.9358	125.2163	126.0965	145.1516	156.6842	169.4251	(64)
Efficiency of water heater (217)m	89.7872	89.7137	89.5845	89.3221	88.8258	87.3000	87.3000	87.3000	87.3000	89.2132	89.6307	87.3000	(216)
Fuel for water heating, kWh/month	194.3284	170.5537	177.3279	156.5630	152.1926	135.3189	127.0743	143.4322	144.4405	162.7020	174.8108	188.6326	(219)
Water heating fuel used													1927.3768 (219)
Annual totals kWh/year													
Space heating fuel - main system													3549.9415 (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)													413.5042 (232)
Total delivered energy for all uses													5965.8225 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3549.9415	3.4800	123.5380 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1927.3768	3.4800	67.0727 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	413.5042	13.1900	54.5412 (250)
Additional standing charges			120.0000 (251)
Total energy cost			375.0444 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.1279 (257)
SAP value		84.2662
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	3549.9415	0.2160	766.7874 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1927.3768	0.2160	416.3134 (264)
Space and water heating			1183.1008 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	413.5042	0.5190	214.6087 (268)
Total kg/year			1436.6344 (272)
CO2 emissions per m2			15.1800 (273)
EI value			86.2159
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	$3.48 / 0.8876 = 3.921$, stars = 4
Water heating environmental impact	$0.216 / 0.8876 = 0.2434$, 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	47.3300 (1b)	2.4600 (2b)	116.4318 (1b) - (3b)
First floor	47.3300 (1c)	2.6900 (2c)	127.3177 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.6600		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 243.7495 (5)
Dwelling volume			

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) =	0.1231 (8)
Pressure test					Yes
Measured/design AP50					5.0100
Infiltration rate					0.3736 (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) =		0.3456 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.9000	4.8000	4.7000	4.2000	4.2000	3.7000	3.8000	3.8000	4.0000	4.2000	4.3000	4.5000 (22)
Wind factor	1.2250	1.2000	1.1750	1.0500	1.0500	0.9250	0.9500	0.9500	1.0000	1.0500	1.0750	1.1250 (22a)
Adj infilt rate												
Effective ac	0.4233	0.4147	0.4060	0.3628	0.3628	0.3196	0.3283	0.3283	0.3456	0.3628	0.3715	0.3888 (22b)
	0.5896	0.5860	0.5824	0.5658	0.5658	0.5511	0.5539	0.5539	0.5597	0.5658	0.5690	0.5756 (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 = 1.20)			13.9200	1.1450	15.9275		(27)
Solid Door			2.1500	1.3000	2.7950		(26)
Flr - Ground			47.3300	0.1500	7.0995	75.6000	3578.1480 (28a)
Wl - Brick	86.8340	13.1490	73.6850	0.2400	17.6844	38.9400	2869.2939 (29a)
Wl - Render	13.4200	2.9140	10.5060	0.2300	2.4164	38.9400	409.1036 (29a)
Wl - Clad	3.4010		3.4010	0.2400	0.8162	38.9400	132.4349 (29a)
Rf - Ins Joist	47.3340		47.3340	0.1100	5.2067	5.8200	275.4839 (30)
Total net area of external elements Aum(A, m2)			198.3160				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	51.9457		(33)
Party Wall			46.8880	0.0000	0.0000	54.0300	2533.3586 (32)
Ground Floor Stud			67.2326			5.8200	391.2939 (32c)
1st Floor Stud			104.6559			5.8200	609.0975 (32c)
Internal Floor			47.3400			18.0000	852.1200 (32d)
Internal Ceiling			47.3400			5.8200	275.5188 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	11925.8532 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							125.9862 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.5083 (36)
Total fabric heat loss						(33) + (36) =	64.4541 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	47.4255	47.1343	46.8492	45.5135	45.5135	44.3278	44.5530	44.5530	45.0212	45.5135	45.7686	46.2969 (38)
Heat transfer coeff	111.8796	111.5884	111.3032	109.9675	109.9675	108.7819	109.0070	109.0070	109.4753	109.9675	110.2227	110.7510 (39)
Average = Sum(39)m / 12 =												110.1599 (39)
HLP	1.1819	1.1788	1.1758	1.1617	1.1617	1.1492	1.1516	1.1516	1.1565	1.1617	1.1644	1.1700 (40)
HLP (average)												1.1637 (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												2.6843 (42)
Average daily hot water use (litres/day)												97.9519 (43)
Daily hot water use	107.7471	103.8290	99.9109	95.9928	92.0748	88.1567	88.1567	92.0748	95.9928	99.9109	103.8290	107.7471 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Energy content (annual)	159.7858	139.7497	144.2091	125.7250	120.6362	104.0998	96.4638	110.6936	112.0156	130.5434	142.4984	154.7440 (45)
Distribution loss (46)m = 0.15 x (45)m	23.9679	20.9625	21.6314	18.8588	18.0954	15.6150	14.4696	16.6040	16.8023	19.5815	21.3748	23.2116 (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	14.6963	13.2603	14.6492	14.1204	14.5501	14.0336	14.4720	14.5227	14.0809	14.6082	14.1858	14.6811 (61)
Total heat required for water heating calculated for each month	174.4821	153.0100	158.8583	139.8454	135.1863	118.1334	110.9358	125.2163	126.0965	145.1516	156.6842	169.4251 (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	174.4821	153.0100	158.8583	139.8454	135.1863	118.1334	110.9358	125.2163	126.0965	145.1516	156.6842	169.4251 (64)
Heat gains from water heating, kWh/month	56.8028	49.7818	51.6118	45.3337	43.7491	38.1216	35.6922	40.4363	40.7654	47.0577	50.9272	55.1227 (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	161.0574	161.0574	161.0574	161.0574	161.0574	161.0574	161.0574	161.0574	161.0574	161.0574	161.0574	161.0574 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	58.5358	51.9910	42.2819	32.0101	23.9279	20.2010	21.8279	28.3727	38.0818	48.3535	56.4357	60.1627 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	369.2459	373.0776	363.4220	342.8665	316.9188	292.5317	276.2396	272.4079	282.0635	302.6190	328.5667	352.9538 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.7900	53.7900	53.7900	53.7900	53.7900	53.7900	53.7900	53.7900	53.7900	53.7900	53.7900	53.7900 (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)	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716 (71)
Water heating gains (Table 5)	76.3479	74.0801	69.3707	62.9634	58.8025	52.9467	47.9734	54.3499	56.6186	63.2497	70.7322	74.0896 (72)
Total internal gains	614.6055	609.6245	585.5505	548.3158	510.1251	476.1551	456.5167	465.6063	487.2397	524.6980	566.2104	597.6819 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W						
North	3.8120	12.0539	0.7600	0.7000	0.7700	16.9405 (74)						
South	8.7600	51.7504	0.7600	0.7000	0.7700	167.1332 (78)						
West	1.3430	22.4175	0.7600	0.7000	0.7700	11.0996 (80)						
Solar gains	195.1733	305.0924	401.6795	514.3015	552.5716	571.3091	545.4554	505.3397	457.4324	349.5016	238.4446	166.1232 (83)
Total gains	809.7787	914.7169	987.2299	1062.6173	1062.6967	1047.4642	1001.9720	970.9460	944.6721	874.1997	804.6550	763.8052 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	29.6099	29.6871	29.7632	30.1247	30.1247	30.4530	30.3901	30.3901	30.2601	30.1247	30.0550	29.9116
alpha	2.9740	2.9791	2.9842	3.0083	3.0083	3.0302	3.0260	3.0260	3.0173	3.0083	3.0037	2.9941
util living area	0.9482	0.9265	0.8880	0.8116	0.7005	0.5285	0.3582	0.3686	0.6031	0.8163	0.9181	0.9546 (86)
MIT	19.2931	19.5183	19.8960	20.3458	20.6905	20.9093	20.9809	20.9793	20.8581	20.4436	19.8182	19.2540 (87)
Th 2	19.9345	19.9370	19.9394	19.9508	19.9508	19.9609	19.9589	19.9589	19.9549	19.9508	19.9486	19.9441 (88)
util rest of house	0.9395	0.9144	0.8690	0.7791	0.6463	0.4464	0.2535	0.2613	0.5228	0.7772	0.9023	0.9468 (89)
MIT 2	18.4088	18.6293	18.9962	19.4281	19.7352	19.9143	19.9538	19.9534	19.8759	19.5264	18.9344	18.3782 (90)
Living area fraction									fLA = Living area / (4) =			0.2709 (91)
MIT	18.6483	18.8701	19.2399	19.6767	19.9939	20.1838	20.2320	20.2313	20.1419	19.7748	19.1738	18.6154 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.4983	18.7201	19.0899	19.5267	19.8439	20.0338	20.0820	20.0813	19.9919	19.6248	19.0238	18.4654 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9244	0.8973	0.8509	0.7642	0.6402	0.4525	0.2663	0.2743	0.5259	0.7631	0.8851	0.9327 (94)
Ext temp.	748.5551	820.7860	840.0372	812.0576	680.3659	473.9879	266.7799	266.3713	496.8071	667.1373	712.2330	712.4288 (95)
Heat loss rate W	4.7000	5.2000	7.0000	9.5000	12.5000	15.4000	17.6000	17.6000	15.0000	11.4000	7.7000	4.7000 (96)
Month fracti	1543.7504	1508.6886	1345.6506	1102.6064	807.5943	504.0719	270.5576	270.4754	546.4941	904.4638	1248.1420	1524.5342 (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 per m2	591.6253	462.2705	376.1764	209.1951	94.6579	0.0000	0.0000	0.0000	0.0000	176.5709	385.8545	604.2064 (98)
												2900.5571 (98)
												(98) / (4) = 30.6418 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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													3205.0355 (211)
Space heating requirement	591.6253	462.2705	376.1764	209.1951	94.6579	0.0000	0.0000	0.0000	0.0000	176.5709	385.8545	604.2064	(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)	653.7296	510.7962	415.6645	231.1549	104.5944	0.0000	0.0000	0.0000	0.0000	195.1060	426.3586	667.6314	(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	174.4821	153.0100	158.8583	139.8454	135.1863	118.1334	110.9358	125.2163	126.0965	145.1516	156.6842	169.4251	(64)
Efficiency of water heater (217)m	89.7507	89.6825	89.5257	89.1901	88.5901	87.3000	87.3000	87.3000	87.3000	89.0277	89.5520	87.3000	(216)
Fuel for water heating, kWh/month	194.4074	170.6130	177.4444	156.7947	152.5976	135.3189	127.0743	143.4322	144.4405	163.0410	174.9644	188.7129	(219)
Water heating fuel used													1928.8413 (219)
Annual totals kWh/year													
Space heating fuel - main system													3205.0355 (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)													413.5042 (232)
Total delivered energy for all uses													5622.3810 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3205.0355	3.6300	116.3428 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1928.8413	3.6300	70.0169 (247)
Pumps and fans for heating	75.0000	19.4400	14.5800 (249)
Energy for lighting	413.5042	19.4400	80.3852 (250)
Additional standing charges			95.0000 (251)
Total energy cost			376.3249 (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	3205.0355	0.2160	692.2877 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1928.8413	0.2160	416.6297 (264)
Space and water heating			1108.9174 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	413.5042	0.5190	214.6087 (268)
Total kg/year			1362.4511 (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	3205.0355	1.2200	3910.1433 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1928.8413	1.2200	2353.1864 (264)
Space and water heating			6263.3296 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	413.5042	3.0700	1269.4579 (268)
Primary energy kWh/year			7763.0376 (272)
Primary energy kWh/m2/year			82.0097 (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	+ 1.1	-£ 27	-190 kg (13.9%)
U Solar photovoltaic panels	+ 9.6	-£ 363	-970 kg (82.7%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£27	2.00 kg/m ²	B 85 B 88
Solar photovoltaic panels	£363	10.25 kg/m ²	A 95 A 97
Total Savings	£390	12.25 kg/m²	

Potential energy efficiency rating: A 95
 Potential environmental impact rating: A 97

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, East Anglia):

	Current	Potential	Saving
Electricity	£95	£105	-£10
Mains gas	£281	£245	£36
Space heating	£226	£226	£0
Water heating	£70	£43	£27
Lighting	£80	£80	£0
Generated (PV)	-£0	-£363	£363
Total cost of fuels	£376	-£13	£389
Total cost of uses	£376	-£14	£390
Delivered energy	59 kWh/m ²	30 kWh/m ²	30 kWh/m ²
Carbon dioxide emissions	1.4 tonnes	0.2 tonnes	1.2 tonnes
CO2 emissions per m ²	14 kg/m ²	2 kg/m ²	12 kg/m ²
Primary energy	82 kWh/m ²	10 kWh/m ²	72 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 (m ²)	Storey height (m)	Volume (m ³)
Ground floor	47.3300 (1b)	2.4600 (2b)	116.4318 (1b) - (3b)
First floor	47.3300 (1c)	2.6900 (2c)	127.3177 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.6600		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 243.7495 (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) =	0.1231 (8)
Pressure test					Yes	
Measured/design AP50					5.0100	
Infiltration rate					0.3736 (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) =	0.3456 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4406	0.4319	0.4233	0.3801	0.3715	0.3283	0.3283	0.3196	0.3456	0.3715	0.3888	0.4060 (22b)
Effective ac	0.5971	0.5933	0.5896	0.5722	0.5690	0.5539	0.5539	0.5511	0.5597	0.5690	0.5756	0.5824 (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 = 1.20)			13.9200	1.1450	15.9275		(27)
Solid Door			2.1500	1.3000	2.7950		(26)
Flr - Ground			47.3300	0.1500	7.0995	75.6000	3578.1480 (28a)
Wl - Brick	86.8340	13.1490	73.6850	0.2400	17.6844	38.9400	2869.2939 (29a)
Wl - Render	13.4200	2.9140	10.5060	0.2300	2.4164	38.9400	409.1036 (29a)
Wl - Clad	3.4010		3.4010	0.2400	0.8162	38.9400	132.4349 (29a)
Rf - Ins Joist	47.3340		47.3340	0.1100	5.2067	5.8200	275.4839 (30)
Total net area of external elements Aum(A, m ²)	198.3160						(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	51.9457		(33)
Party Wall			46.8880	0.0000	0.0000	54.0300	2533.3586 (32)
Ground Floor Stud			67.2326			5.8200	391.2939 (32c)
1st Floor Stud			104.6559			5.8200	609.0975 (32c)
Internal Floor			47.3400			18.0000	852.1200 (32d)
Internal Ceiling			47.3400			5.8200	275.5188 (32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		11925.8532 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							125.9862 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.5083 (36)
Total fabric heat loss						(33) + (36) =	64.4541 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	48.0258	47.7227	47.4255	46.0298	45.7686	44.5530	44.5530	44.3278	45.0212	45.7686	46.2969	46.8492 (38)
Heat transfer coeff	112.4799	112.1767	111.8796	110.4838	110.2227	109.0070	109.0070	108.7819	109.4753	110.2227	110.7510	111.3032 (39)
Average = Sum(39)m / 12 =	110.4826 (39)											
HLP	1.1883	1.1850	1.1819	1.1672	1.1644	1.1516	1.1516	1.1492	1.1565	1.1644	1.1700	1.1758 (40)
HLP (average)	1.1672 (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	2.6843 (42)											
Average daily hot water use (litres/day)	97.9519 (43)											
Daily hot water use	107.7471	103.8290	99.9109	95.9928	92.0748	88.1567	88.1567	92.0748	95.9928	99.9109	103.8290	107.7471 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Energy content (annual)	159.7858	139.7497	144.2091	125.7250	120.6362	104.0998	96.4638	110.6936	112.0156	130.5434	142.4984	154.7440 (45)
Distribution loss (46)m = 0.15 x (45)m	23.9679	20.9625	21.6314	18.8588	18.0954	15.6150	14.4696	16.6040	16.8023	19.5815	21.3748	23.2116 (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	14.6963	13.2603	14.6492	14.1204	14.5501	14.0336	14.4720	14.5227	14.0809	14.6082	14.1858	14.6811 (61)
Total heat required for water heating calculated for each month	174.4821	153.0100	158.8583	139.8454	135.1863	118.1334	110.9358	125.2163	126.0965	145.1516	156.6842	169.4251 (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												1.1768 (H8)
Utilisation factor												0.5725 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												97.9519 (H14)
Volume ratio Veff/V												0.7657 (H15)
Solar storage volume factor												0.9466 (H16)
Solar input												-864.1962 (H17)
Solar input	-25.0600	-41.8179	-71.2206	-95.4497	-117.9201	-115.9342	-114.4021	-99.9537	-78.2838	-53.4586	-29.7247	-20.9709 (63)
Solar input (sum of months) = Sum(63)m =												-864.1962 (63)
Output from w/h	149.4221	111.1921	87.6377	44.3957	17.2662	2.1992	0.0000	25.2626	47.8128	91.6930	126.9594	148.4542 (64)
Total per year (kWh/year) = Sum(64)m =												852.2951 (64)
Heat gains from water heating, kWh/month	56.8028	49.7818	51.6118	45.3337	43.7491	38.1216	35.6922	40.4363	40.7654	47.0577	50.9272	55.1227 (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	161.0574	161.0574	161.0574	161.0574	161.0574	161.0574	161.0574	161.0574	161.0574	161.0574	161.0574	161.0574 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	58.5358	51.9910	42.2819	32.0101	23.9279	20.2010	21.8279	28.3727	38.0818	48.3535	56.4357	60.1627 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	369.2459	373.0776	363.4220	342.8665	316.9188	292.5317	276.2396	272.4079	282.0635	302.6190	328.5667	352.9538 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.7900	53.7900	53.7900	53.7900	53.7900	53.7900	53.7900	53.7900	53.7900	53.7900	53.7900	53.7900 (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)	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716 (71)
Water heating gains (Table 5)	76.3479	74.0801	69.3707	62.9634	58.8025	52.9467	47.9734	54.3499	56.6186	63.2497	70.7322	74.0896 (72)
Total internal gains	614.6055	609.6245	585.5505	548.3158	510.1251	476.1551	456.5167	465.6063	487.2397	524.6980	566.2104	597.6819 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b g	Specific data or Table 6c FF	Access factor Table 6d	Gains W						
North	3.8120	10.6334	0.7600	0.7000	0.7700	14.9441 (74)						
South	8.7600	46.7521	0.7600	0.7000	0.7700	150.9906 (78)						
West	1.3430	19.6403	0.7600	0.7000	0.7700	9.7245 (80)						
Solar gains	175.6592	294.8658	394.8526	479.6534	531.9886	526.7579	508.3580	468.9090	423.8334	323.2869	209.5361	150.9248 (83)
Total gains	790.2646	904.4903	980.4031	1027.9693	1042.1136	1002.9130	964.8746	934.5153	911.0732	847.9850	775.7465	748.6068 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, T _{hl} (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)	29.4518	29.5314	29.6099	29.9839	30.0550	30.3901	30.3901	30.4530	30.2601	30.0550	29.9116	29.7632
tau	2.9635	2.9688	2.9740	2.9989	3.0037	3.0260	3.0260	3.0302	3.0173	3.0037	2.9941	2.9842
util living area	0.9540	0.9315	0.8977	0.8384	0.7440	0.6037	0.4650	0.4947	0.6769	0.8498	0.9319	0.9599 (86)
MIT	19.1854	19.4437	19.8001	20.2287	20.5941	20.8496	20.9495	20.9378	20.7742	20.3082	19.6751	19.1353 (87)
Th 2	19.9294	19.9320	19.9345	19.9464	19.9486	19.9589	19.9589	19.9609	19.9549	19.9486	19.9441	19.9394 (88)
util rest of house	0.9463	0.9203	0.8806	0.8102	0.6970	0.5290	0.3667	0.3972	0.6081	0.8180	0.9188	0.9531 (89)
MIT 2	18.2992	18.5528	18.9002	19.3170	19.6514	19.8715	19.9388	19.9344	19.8133	19.4012	18.7925	18.2576 (90)
Living area fraction									fLA = Living area / (4) =			0.2709 (91)
MIT	18.5392	18.7942	19.1439	19.5639	19.9067	20.1364	20.2126	20.2062	20.0736	19.6469	19.0316	18.4953 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.3892	18.6442	18.9939	19.4139	19.7567	19.9864	20.0626	20.0562	19.9236	19.4969	18.8816	18.3453 (93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9319	0.9035	0.8624	0.7937	0.6874	0.5311	0.3769	0.4066	0.6058	0.8018	0.9023	0.9398	(94)
Useful gains	736.4585	817.2262	845.5039	815.9394	716.3707	532.6780	363.7049	379.9991	551.9622	679.9473	699.9461	703.5695	(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													
	1584.7568	1541.7741	1397.8171	1161.6161	888.0359	587.1575	377.4426	397.7293	637.5381	980.6377	1304.8225	1574.4232	(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													
	631.1339	486.8962	410.9211	248.8873	127.7189	0.0000	0.0000	0.0000	0.0000	223.7136	435.5110	647.9151	(98)
Space heating													
Space heating per m2													33.9393 (99)
													(98) / (4) =

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3549.9415 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	631.1339	486.8962	410.9211	248.8873	127.7189	0.0000	0.0000	0.0000	0.0000	223.7136	435.5110	647.9151	(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)	697.3856	538.0068	454.0564	275.0135	141.1258	0.0000	0.0000	0.0000	0.0000	247.1974	481.2276	715.9283	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	149.4221	111.1921	87.6377	44.3957	17.2662	2.1992	0.0000	25.2626	47.8128	91.6930	126.9594	148.4542	(64)
Efficiency of water heater	89.8694	89.8874	89.9206	90.0006	90.1067	87.3000	87.3000	87.3000	87.3000	89.5458	89.7574	89.8858	(216)
Fuel for water heating, kWh/month	166.2658	123.7015	97.4611	49.3282	19.1620	2.5192	0.0000	28.9377	54.7683	102.3979	141.4474	165.1587	(219)
													951.1479 (219)
Water heating fuel used													
Annual totals kWh/year													
Space heating fuel - main system													3549.9415 (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)													413.5042 (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													3312.3542 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3549.9415	3.4800	123.5380	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	951.1479	3.4800	33.0999	(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	413.5042	13.1900	54.5412	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	-1727.2394	13.1900	-227.8229	(252)
Total energy cost			119.8437	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.3604 (257)
SAP value		94.9723
SAP rating (Section 12)		95 (258)
SAP band		A

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3549.9415	0.2160	766.7874 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	951.1479	0.2160	205.4479 (264)
Space and water heating			972.2353 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	413.5042	0.5190	214.6087 (268)
Energy saving/generation technologies			
PV Unit	-1727.2394	0.5190	-896.4372 (269)
Total kg/year			355.2818 (272)
CO2 emissions per m2			3.7500 (273)
EI value			96.5912
EI rating			97 (274)
EI band			A

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	47.3300 (1b)	2.4600 (2b)	116.4318 (1b) - (3b)
First floor	47.3300 (1c)	2.6900 (2c)	127.3177 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.6600		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 243.7495 (5)
Dwelling volume			

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) =	0.1231 (8)
Pressure test					Yes
Measured/design AP50					5.0100
Infiltration rate					0.3736 (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) =	0.3456 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.9000	4.8000	4.7000	4.2000	4.2000	3.7000	3.8000	3.8000	4.0000	4.2000	4.3000	4.5000 (22)
Wind factor	1.2250	1.2000	1.1750	1.0500	1.0500	0.9250	0.9500	0.9500	1.0000	1.0500	1.0750	1.1250 (22a)
Adj infilt rate												
Effective ac	0.4233	0.4147	0.4060	0.3628	0.3628	0.3196	0.3283	0.3283	0.3456	0.3628	0.3715	0.3888 (22b)
	0.5896	0.5860	0.5824	0.5658	0.5658	0.5511	0.5539	0.5539	0.5597	0.5658	0.5690	0.5756 (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 = 1.20)			13.9200	1.1450	15.9275		(27)
Solid Door			2.1500	1.3000	2.7950		(26)
Flr - Ground			47.3300	0.1500	7.0995	75.6000	3578.1480 (28a)
Wl - Brick	86.8340	13.1490	73.6850	0.2400	17.6844	38.9400	2869.2939 (29a)
Wl - Render	13.4200	2.9140	10.5060	0.2300	2.4164	38.9400	409.1036 (29a)
Wl - Clad	3.4010		3.4010	0.2400	0.8162	38.9400	132.4349 (29a)
Rf - Ins Joist	47.3340		47.3340	0.1100	5.2067	5.8200	275.4839 (30)
Total net area of external elements Aum(A, m ²)			198.3160				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	51.9457		(33)
Party Wall			46.8880	0.0000	0.0000	54.0300	2533.3586 (32)
Ground Floor Stud			67.2326			5.8200	391.2939 (32c)
1st Floor Stud			104.6559			5.8200	609.0975 (32c)
Internal Floor			47.3400			18.0000	852.1200 (32d)
Internal Ceiling			47.3400			5.8200	275.5188 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	11925.8532 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							125.9862 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.5083 (36)
Total fabric heat loss						(33) + (36) =	64.4541 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	47.4255	47.1343	46.8492	45.5135	45.5135	44.3278	44.5530	44.5530	45.0212	45.5135	45.7686	46.2969 (38)
Heat transfer coeff	111.8796	111.5884	111.3032	109.9675	109.9675	108.7819	109.0070	109.0070	109.4753	109.9675	110.2227	110.7510 (39)
Average = Sum(39)m / 12 =												110.1599 (39)
HLP	1.1819	1.1788	1.1758	1.1617	1.1617	1.1492	1.1516	1.1516	1.1565	1.1617	1.1644	1.1700 (40)
HLP (average)												1.1637 (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												2.6843 (42)
Average daily hot water use (litres/day)												97.9519 (43)
Daily hot water use	107.7471	103.8290	99.9109	95.9928	92.0748	88.1567	88.1567	92.0748	95.9928	99.9109	103.8290	107.7471 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Energy content (annual)	159.7858	139.7497	144.2091	125.7250	120.6362	104.0998	96.4638	110.6936	112.0156	130.5434	142.4984	154.7440 (45)
Distribution loss (46)m = 0.15 x (45)m	23.9679	20.9625	21.6314	18.8588	18.0954	15.6150	14.4696	16.6040	16.8023	19.5815	21.3748	23.2116 (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	14.6963	13.2603	14.6492	14.1204	14.5501	14.0336	14.4720	14.5227	14.0809	14.6082	14.1858	14.6811 (61)
Total heat required for water heating calculated for each month	174.4821	153.0100	158.8583	139.8454	135.1863	118.1334	110.9358	125.2163	126.0965	145.1516	156.6842	169.4251 (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												1168.2835 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												1962.7164 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.2735 (H8)
Utilisation factor												0.5440 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												97.9519 (H14)
Volume ratio Veff/V												0.7657 (H15)
Solar storage volume factor												0.9466 (H16)
Solar input												-888.6740 (H17)
Solar input	-26.8957	-41.8433	-70.0368	-98.5681	-117.4452	-120.3127	-117.5610	-103.5547	-81.5827	-55.9000	-32.6878	-22.2859 (63)
Solar input (sum of months) = Sum(63)m =												-888.6740 (63)
Output from w/h	147.5863	111.1667	88.8215	41.2773	17.7411	0.0000	0.0000	21.6616	44.5138	89.2516	123.9964	147.1392 (64)
Total per year (kWh/year) = Sum(64)m =												833.1555 (64)
Heat gains from water heating, kWh/month	56.8028	49.7818	51.6118	45.3337	43.7491	38.1216	35.6922	40.4363	40.7654	47.0577	50.9272	55.1227 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	161.0574	161.0574	161.0574	161.0574	161.0574	161.0574	161.0574	161.0574	161.0574	161.0574	161.0574	161.0574 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	58.5358	51.9910	42.2819	32.0101	23.9279	20.2010	21.8279	28.3727	38.0818	48.3535	56.4357	60.1627 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	369.2459	373.0776	363.4220	342.8665	316.9188	292.5317	276.2396	272.4079	282.0635	302.6190	328.5667	352.9538 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.7900	53.7900	53.7900	53.7900	53.7900	53.7900	53.7900	53.7900	53.7900	53.7900	53.7900	53.7900 (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)	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716	-107.3716 (71)
Water heating gains (Table 5)	76.3479	74.0801	69.3707	62.9634	58.8025	52.9467	47.9734	54.3499	56.6186	63.2497	70.7322	74.0896 (72)
Total internal gains	614.6055	609.6245	585.5505	548.3158	510.1251	476.1551	456.5167	465.6063	487.2397	524.6980	566.2104	597.6819 (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					
North			3.8120	12.0539	0.7600	0.7000	0.7700	16.9405 (74)				
South			8.7600	51.7504	0.7600	0.7000	0.7700	167.1332 (78)				
West			1.3430	22.4175	0.7600	0.7000	0.7700	11.0996 (80)				
Solar gains	195.1733	305.0924	401.6795	514.3015	552.5716	571.3091	545.4554	505.3397	457.4324	349.5016	238.4446	166.1232 (83)
Total gains	809.7787	914.7169	987.2299	1062.6173	1062.6967	1047.4642	1001.9720	970.9460	944.6721	874.1997	804.6550	763.8052 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, T _{hl} (C)												21.0000 (85)
Utilisation factor for gains for living area, nil _m (see Table 9a)												
tau	29.6099	29.6871	29.7632	30.1247	30.1247	30.4530	30.3901	30.3901	30.2601	30.1247	30.0550	29.9116
alpha	2.9740	2.9791	2.9842	3.0083	3.0083	3.0302	3.0260	3.0260	3.0173	3.0083	3.0037	2.9941
util living area	0.9482	0.9265	0.8880	0.8116	0.7005	0.5285	0.3582	0.3686	0.6031	0.8163	0.9181	0.9546 (86)
MIT	19.2931	19.5183	19.8960	20.3458	20.6905	20.9093	20.9809	20.9793	20.8581	20.4436	19.8182	19.2540 (87)
Th 2	19.9345	19.9370	19.9394	19.9508	19.9508	19.9609	19.9589	19.9589	19.9549	19.9508	19.9486	19.9441 (88)
util rest of house	0.9395	0.9144	0.8690	0.7791	0.6463	0.4464	0.2535	0.2613	0.5228	0.7772	0.9023	0.9468 (89)
MIT 2	18.4088	18.6293	18.9962	19.4281	19.7352	19.9143	19.9538	19.9534	19.8759	19.5264	18.9344	18.3782 (90)
Living area fraction									fLA = Living area / (4) =			0.2709 (91)
MIT	18.6483	18.8701	19.2399	19.6767	19.9939	20.1838	20.2320	20.2313	20.1419	19.7748	19.1738	18.6154 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.4983	18.7201	19.0899	19.5267	19.8439	20.0338	20.0820	20.0813	19.9919	19.6248	19.0238	18.4654 (93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9244	0.8973	0.8509	0.7642	0.6402	0.4525	0.2663	0.2743	0.5259	0.7631	0.8851	0.9327	(94)
Useful gains	748.5551	820.7860	840.0372	812.0576	680.3659	473.9879	266.7799	266.3713	496.8071	667.1373	712.2330	712.4288	(95)
Ext temp.	4.7000	5.2000	7.0000	9.5000	12.5000	15.4000	17.6000	17.6000	15.0000	11.4000	7.7000	4.7000	(96)
Heat loss rate W													
	1543.7504	1508.6886	1345.6506	1102.6064	807.5943	504.0719	270.5576	270.4754	546.4941	904.4638	1248.1420	1524.5342	(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													
	591.6253	462.2705	376.1764	209.1951	94.6579	0.0000	0.0000	0.0000	0.0000	176.5709	385.8545	604.2064	(98)
Space heating													
Space heating per m2													(98) / (4) = 30.6418 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3205.0355 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	591.6253	462.2705	376.1764	209.1951	94.6579	0.0000	0.0000	0.0000	0.0000	176.5709	385.8545	604.2064	(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)	653.7296	510.7962	415.6645	231.1549	104.5944	0.0000	0.0000	0.0000	0.0000	195.1060	426.3586	667.6314	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	147.5863	111.1667	88.8215	41.2773	17.7411	0.0000	0.0000	21.6616	44.5138	89.2516	123.9964	147.1392	(64)
Efficiency of water heater	89.8425	89.8614	89.8708	89.9566	89.9794	87.3000	87.3000	87.3000	87.3000	89.3997	89.7004	87.3000	(216)
(217)m	89.8425	89.8614	89.8708	89.9566	89.9794	87.3000	87.3000	87.3000	87.3000	89.3997	89.7004	87.3000	(217)
Fuel for water heating, kWh/month	164.2723	123.7090	98.8324	45.8858	19.7168	0.0000	0.0000	24.8128	50.9895	99.8344	138.2340	163.7519	(219)
Water heating fuel used													
Annual totals kWh/year													930.0388 (219)
Space heating fuel - main system													3205.0355 (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)													413.5042 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 2.50 * 1168 * 0.80) =									-1869.2537				-1869.2537 (233)
Total delivered energy for all uses													2804.3248 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3205.0355	3.6300	116.3428	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	930.0388	3.6300	33.7604	(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	413.5042	19.4400	80.3852	(250)
Additional standing charges			95.0000	(251)
Energy saving/generation technologies				
PV Unit	-1869.2537	19.4400	-363.3829	(252)
Total energy cost			-13.5945	(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	3205.0355	0.2160	692.2877	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	930.0388	0.2160	200.8884	(264)
Space and water heating			893.1760	(265)
Pumps and fans	125.0000	0.5190	64.8750	(267)
Energy for lighting	413.5042	0.5190	214.6087	(268)
Energy saving/generation technologies				

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

PV Unit -1869.2537 0.5190 -970.1427 (269)
 Total kg/year 202.5171 (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	3205.0355	1.2200	3910.1433 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	930.0388	1.2200	1134.6474 (264)
Space and water heating			5044.7906 (265)
Pumps and fans	125.0000	3.0700	383.7500 (267)
Energy for lighting	413.5042	3.0700	1269.4579 (268)
Energy saving/generation technologies			
PV Unit	-1869.2537	3.0700	-5738.6088 (269)
Primary energy kWh/year			959.3898 (272)
Primary energy kWh/m2/year			10.1351 (273)

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

Overheating Calculation Input Data

Dwelling type	SemiDetached House
Number of storeys	2
Cross ventilation possible	Yes
SAP Region	East Anglia
Front of dwelling faces	North
Overshading	Average or unknown
Thermal mass parameter	126.0 (calculated from construction elements)
Night ventilation	Yes
Ventilation rate during hot weather (ach)	4.21 (Calculated rate)

Overheating Calculation

Summer ventilation heat loss coefficient	338.60 (P1)
Transmission heat loss coefficient	64.45 (37)
Summer heat loss coefficient	403.05 (P2)

Overhangs

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

Solar shading

Orientation	Z blinds	Solar access	Z overhangs	Z summer
North	0.850	0.90	1.000	0.765 (P8)
South	0.850	0.90	1.000	0.765 (P8)
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	3.8120	82.1233	0.7600	0.7000	0.7650	114.6660
South	8.7600	114.8394	0.7600	0.7000	0.7650	368.4773
West	1.3430	119.4717	0.7600	0.7000	0.7650	58.7701

total: 541.9134

Solar gains	568	542	502	(P3/P4)
Internal gains	473	454	463	
Total summer gains	1041	995	965	(P5)

Summer gain/loss ratio	2.58	2.47	2.39	(P6)
Summer external temperature	15.40	17.60	17.60	
Thermal mass temperature increment (TMP = 126.0)	1.12	1.12	1.12	
Threshold temperature	19.10	21.19	21.11	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	

Assessment of likelihood of high internal temperature: Slight

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Designed)

Property Reference	012 - PRJ012706		Issued on Date	27/03/2023	
Assessment Reference	012 S	Prop Type Ref	C v1		
Property	012 - PRJ012706				
SAP Rating	84 B	DER	16.67	TER	17.40
Environmental	86 B	% DER<TER	4.18		
CO₂ Emissions (t/year)	1.36	DFEE	44.13	TFEE	50.31
General Requirements Compliance	Pass	% DFEE<TFEE	12.28		
Assessor Details	Chris Nicholls, , Tel: ,			Assessor ID	U903-0001
Client					

SUMMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	17.40	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.67	kgCO ₂ /m ²	Pass
	-0.73 (-4.2%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	50.31	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	44.13	kWh/m ² /yr	
	-6.2 (-12.3%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.15 (max. 0.25)	0.15 (max. 0.70)	Pass
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	Pass
Openings	1.21 (max. 2.00)	1.30 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

Limiting System Efficiencies

4 Heating efficiency

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

Calculation Type: New Build (As Designed)

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Programmer, room thermostat and TRVs

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100

%

Minimum

75

%

Pass

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (East Anglia)

Slight

Pass

Based on:

Overshading

Average

Windows facing North

3.81 m², No overhang

Windows facing South

8.76 m², No overhang

Windows facing West

1.34 m², No overhang

Air change rate

4.21 ach

Blinds/curtains

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

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

5.01 (design value)

Maximum

10.0

Pass

10 Key features

Party wall U-value

0.00

W/m²K

Roof U-value

0.11

W/m²K