

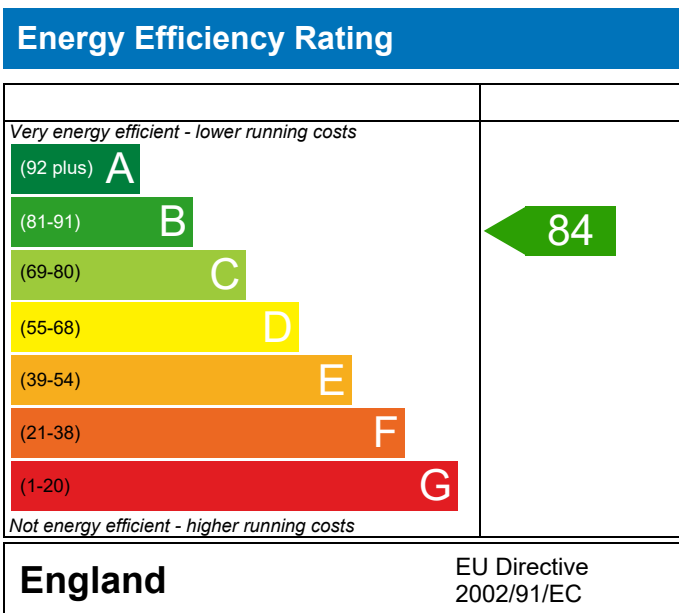
PREDICTED ENERGY ASSESSMENT

Lancing Phase 2,
BN15

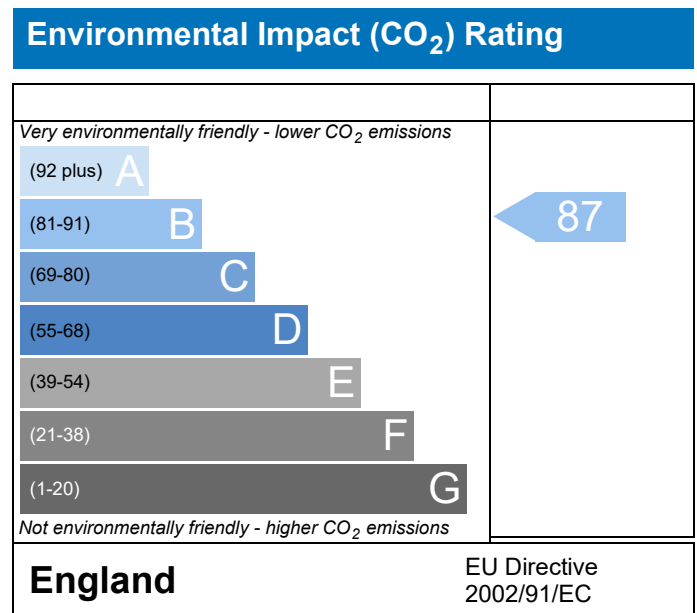
Dwelling type: House, Semi-Detached
Date of assessment: 01/02/2023
Produced by: Michael Juckes
Total floor area: 80.102 m²

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	634 - PRJ012992			Issued on Date	01/02/2023
Assessment Reference	634	Prop Type Ref	Bellflower		
Property	Lancing Phase 2, BN15				
SAP Rating	84 B	DER	17.23	TER	18.31
Environmental	87 B	% DER<TER	5.88		
CO ₂ Emissions (t/year)	1.16	DFEE	43.88	TFEE	50.15
General Requirements Compliance	Pass	% DFEE<TFEE	12.50		
Assessor Details	Chris Nicholls, , Tel: ,			Assessor ID	T850-0001
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 80 m²

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

1a TER and DER

Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 18.31 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 17.23 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 50.2 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 43.9 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.25 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.16 (max. 0.25)	0.16 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.35 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 5.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

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

Data from 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 (South East England): Slight OK

Based on:

Overshading:

Average

Windows facing North:

3.93 m², No overhang

Windows facing South:

6.11 m², No overhang

Air change rate:

4.62 ach

Blinds/curtains:

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

10 Key features

Party wall U-value 0.00 W/m²K

Roof U-value 0.10 W/m²K

Door U-value 1.09 W/m²K

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	40.0510 (1b)	2.3850 (2b)	95.5216 (1b) - (3b)
First floor	40.0510 (1c)	2.6830 (2c)	107.4568 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.1020		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 202.9785 (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				2 * 10 =	20.0000 (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) =				20.0000 / (5) =	0.0985 (8)							
Pressure test				Yes								
Measured/design AP50				5.0000								
Infiltration rate					0.3485 (18)							
Number of sides sheltered				1	1 (19)							
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)							
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3224 (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	0.4111	0.4030	0.3949	0.3546	0.3466	0.3063	0.3063	0.2982	0.3224	0.3466	0.3627	0.3788 (22b)
Effective ac	0.5845	0.5812	0.5780	0.5629	0.5601	0.5469	0.5469	0.5445	0.5520	0.5601	0.5658	0.5717 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K					
Solid Door			2.1200	1.0900	2.3108		(26)					
Windows (Uw = 1.40)			10.0400	1.3258	13.3106		(27)					
Flr - Ground			40.0510	0.1603	6.4188	75.6000	3027.8556 (28a)					
Brick	90.7890	12.1650	78.6240	0.2500	19.6560	51.1900	4024.7626 (29a)					
Rf - Ins Joist	40.0510		40.0510	0.1000	4.0051	7.4000	296.3774 (30)					
Total net area of external elements Aum(A, m ²)			170.8860				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	45.7013	(33)					
Party Wall			43.5950	0.0000	0.0000	7.4000	322.6030 (32)					
Stud			79.0151			7.4000	584.7114 (32c)					
Stud			75.7626			7.4000	560.6429 (32c)					
Internal Floor			40.0510			7.4000	296.3774 (32d)					
Internal Ceiling			40.0510			7.4000	296.3774 (32e)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		9409.7076 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							117.4716 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.3552 (36)					
Total fabric heat loss					(33) + (36) =		53.0565 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 39.1503	Feb 38.9305	Mar 38.7151	Apr 37.7035	May 37.5142	Jun 36.6331	Jul 36.6331	Aug 36.4699	Sep 36.9724	Oct 37.5142	Nov 37.8971	Dec 38.2974 (38)
Heat transfer coeff	92.2068	91.9870	91.7717	90.7600	90.5707	89.6896	89.6896	89.5264	90.0290	90.5707	90.9536	91.3539 (39)
Average = Sum(39)m / 12 =												90.7591 (39)
HLP	Jan 1.1511	Feb 1.1484	Mar 1.1457	Apr 1.1331	May 1.1307	Jun 1.1197	Jul 1.1197	Aug 1.1177	Sep 1.1239	Oct 1.1307	Nov 1.1355	Dec 1.1405 (40)
HLP (average)												1.1330 (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												2.4648 (42)
Average daily hot water use (litres/day)												92.7388 (43)
Daily hot water use	102.0127	98.3032	94.5936	90.8841	87.1745	83.4650	83.4650	87.1745	90.8841	94.5936	98.3032	102.0127 (44)
Energy conte	151.2819	132.3121	136.5343	119.0339	114.2159	98.5596	91.3300	104.8025	106.0541	123.5959	134.9146	146.5085 (45)
Energy content (annual)												Total = Sum(45)m = 1459.1432 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	22.6923	19.8468	20.4801	17.8551	17.1324	14.7839	13.6995	15.7204	15.9081	18.5394	20.2372	21.9763 (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	14.6708	13.2313	14.6044	14.0828	14.5156	14.0051	14.4456	14.4910	14.0475	14.5677	14.1562	14.6564 (61)
Total heat required for water heating calculated for each month	165.9527	145.5434	151.1387	133.1167	128.7315	112.5647	105.7756	119.2935	120.1016	138.1635	149.0707	161.1649 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	165.9527	145.5434	151.1387	133.1167	128.7315	112.5647	105.7756	119.2935	120.1016	138.1635	149.0707	161.1649 (64)
Heat gains from water heating, kWh/month	53.9689	47.3016	49.0487	43.0995	41.6057	36.2723	33.9786	38.4696	38.7749	44.7375	48.3981	52.3782 (65)
												1630.6175 (64)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	123.2397	123.2397	123.2397	123.2397	123.2397	123.2397	123.2397	123.2397	123.2397	123.2397	123.2397	123.2397 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.3908	18.9991	15.4511	11.6975	8.7440	7.3821	7.9766	10.3683	13.9163	17.6699	20.6234	21.9853 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.6536	221.9329	216.1891	203.9612	188.5257	174.0185	164.3268	162.0475	167.7913	180.0192	195.4547	209.9619 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3240	35.3240	35.3240	35.3240	35.3240	35.3240	35.3240	35.3240	35.3240	35.3240	35.3240	35.3240 (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)	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917 (71)
Water heating gains (Table 5)	72.5389	70.3893	65.9257	59.8604	55.9216	50.3782	45.6702	51.7064	53.8540	60.1311	67.2196	70.4008 (72)
Total internal gains	376.5552	374.2933	360.5379	338.4910	316.1633	294.7508	280.9455	287.0941	298.5335	320.7921	346.2696	365.3199 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
North	3.9300	10.6334	0.7300	0.7200	0.7700	15.2213 (74)						
South	6.1140	46.7521	0.7300	0.7200	0.7700	104.1154 (78)						
Solar gains	119.3367	199.6029	266.6337	324.8841	362.7673	360.6828	347.4361	318.4059	286.3256	218.5419	142.1897	102.6545 (83)
Total gains	495.8919	573.8962	627.1716	663.3751	678.9305	655.4336	628.3816	605.5000	584.8591	539.3340	488.4593	467.9744 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	28.3472	28.4150	28.4816	28.7991	28.8593	29.1428	29.1428	29.1959	29.0330	28.8593	28.7378	28.6119
alpha	2.8898	2.8943	2.8988	2.9199	2.9240	2.9429	2.9429	2.9464	2.9355	2.9240	2.9159	2.9075
util living area	0.9740	0.9596	0.9369	0.8945	0.8191	0.6950	0.5573	0.5907	0.7679	0.9057	0.9607	0.9778 (86)
MIT	18.8678	19.1215	19.4982	19.9757	20.4189	20.7585	20.9094	20.8896	20.6499	20.0792	19.3882	18.8195 (87)
Th 2	19.9593	19.9615	19.9637	19.9739	19.9758	19.9848	19.9848	19.9864	19.9813	19.9758	19.9720	19.9679 (88)
util rest of house	0.9696	0.9528	0.9257	0.8743	0.7808	0.6241	0.4520	0.4884	0.7077	0.8836	0.9529	0.9740 (89)
MIT 2	18.0163	18.2680	18.6400	19.1114	19.5302	19.8342	19.9449	19.9348	19.7462	19.2193	18.5420	17.9747 (90)
Living area fraction	18.2144	18.4666	18.8397	19.3125	19.7370	20.0493	20.1694	20.1569	19.9564	19.4194	18.7389	18.1712 (92)
Temperature adjustment	18.0644	18.3166	18.6897	19.1625	19.5870	19.8993	20.0194	20.0069	19.8064	19.2694	18.5889	-0.1500
adjusted MIT												18.0212 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	475.3733	538.6343	569.6594	567.0337	518.5483	404.6614	286.4707	297.1162	406.9109	466.2886	458.6149	451.1889 (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	1269.1693	1234.1529	1118.6669	931.4248	714.3314	475.2879	306.6808	322.9171	513.7437	785.1900	1044.9549	1262.6246 (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	590.5842	467.3885	408.4616	262.3616	145.6627	0.0000	0.0000	0.0000	0.0000	237.2627	422.1648	603.7082 (98)
Space heating												3137.5942 (98)
Space heating per m2												39.1700 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3466.9549 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	590.5842	467.3885	408.4616	262.3616	145.6627	0.0000	0.0000	0.0000	0.0000	237.2627	422.1648	603.7082	(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)	652.5793	516.4513	451.3388	289.9023	160.9532	0.0000	0.0000	0.0000	0.0000	262.1687	466.4805	667.0808	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	165.9527	145.5434	151.1387	133.1167	128.7315	112.5647	105.7756	119.2935	120.1016	138.1635	149.0707	161.1649	(64)
Efficiency of water heater (217)m	89.7781	89.7191	89.6128	89.3970	88.9700	87.3000	87.3000	87.3000	87.3000	89.2954	89.6425	89.8064	(217)
Fuel for water heating, kWh/month	184.8476	162.2212	168.6574	148.9051	144.6909	128.9401	121.1633	136.6477	137.5734	154.7263	166.2947	179.4582	(219)
Water heating fuel used													1834.1259 (219)
Annual totals kWh/year													
Space heating fuel - main system													3466.9549 (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)													377.7688 (232)
Total delivered energy for all uses													5753.8496 (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	3466.9549	0.2160	748.8623 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1834.1259	0.2160	396.1712 (264)
Space and water heating			1145.0335 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	377.7688	0.5190	196.0620 (268)
Total CO2, kg/year			1380.0205 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			17.2300 (273)

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

DER			17.2300 ZC1
Total Floor Area		TFA	80.1020
Assumed number of occupants		N	2.4648
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			16.2495 ZC2
CO2 emissions from cooking, equation (L16)			2.2241 ZC3
Total CO2 emissions			35.7036 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			35.7036 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	40.0510 (1b)	x 2.3850 (2b)	= 95.5216 (1b) - (3b)
First floor	40.0510 (1c)	x 2.6830 (2c)	= 107.4568 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.1020		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 202.9785 (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) =	0.1478 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.3978 (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) =		0.3680 (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	0.4692	0.4600	0.4508	0.4048	0.3956	0.3496	0.3496	0.3404	0.3680	0.3956	0.4140	0.4324 (22b)
Effective ac	0.6101	0.6058	0.6016	0.5819	0.5782	0.5611	0.5611	0.5579	0.5677	0.5782	0.5857	0.5935 (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			2.1200	1.0000	2.1200		(26)					
TER Opening Type (Uw = 1.40)			10.0400	1.3258	13.3106		(27)					
Flr - Ground			40.0510	0.1300	5.2066		(28a)					
Brick	90.7890	12.1650	78.6240	0.1800	14.1523		(29a)					
Rf - Ins Joist	40.0510		40.0510	0.1300	5.2066		(30)					
Total net area of external elements Aum(A, m ²)			170.8860				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =		39.9962 (33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.7052 (36)					
Total fabric heat loss						(33) + (36) =	48.7014 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 40.8631	Feb 40.5769	Mar 40.2963	Apr 38.9784	May 38.7318	Jun 37.5840	Jul 37.5840	Aug 37.3714	Sep 38.0261	Oct 38.7318	Nov 39.2306	Dec 39.7521 (38)
Heat transfer coeff	89.5645	89.2782	88.9976	87.6798	87.4332	86.2853	86.2853	86.0728	86.7275	87.4332	87.9320	88.4535 (39)
Average = Sum(39)m / 12 =												87.6786 (39)
HLP	Jan 1.1181	Feb 1.1146	Mar 1.1111	Apr 1.0946	May 1.0915	Jun 1.0772	Jul 1.0772	Aug 1.0745	Sep 1.0827	Oct 1.0915	Nov 1.0978	Dec 1.1043 (40)
HLP (average)												1.0946 (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												2.4648 (42)
Average daily hot water use (litres/day)												92.7388 (43)
Daily hot water use	102.0127	98.3032	94.5936	90.8841	87.1745	83.4650	83.4650	87.1745	90.8841	94.5936	98.3032	102.0127 (44)
Energy content (annual)	151.2819	132.3121	136.5343	119.0339	114.2159	98.5596	91.3300	104.8025	106.0541	123.5959	134.9146	146.5085 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1459.1432 (45)
Water storage loss:	22.6923	19.8468	20.4801	17.8551	17.1324	14.7839	13.6995	15.7204	15.9081	18.5394	20.2372	21.9763 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

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Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Total heat required for water heating calculated for each month	50.9589	45.2464	48.2039	44.8195	44.4232	41.1608	42.5328	44.4232	44.8195	48.2039	48.4783	50.9589	61							
Solar input	202.2408	177.5585	184.7382	163.8534	158.6390	139.7204	133.8628	149.2256	150.8737	171.7997	183.3928	197.4674	(62)							
Output from w/h	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)							
Heat gains from water heating, kWh/month	202.2408	177.5585	184.7382	163.8534	158.6390	139.7204	133.8628	149.2256	150.8737	171.7997	183.3928	197.4674	(64)							
	63.0410	55.3054	57.4486	50.7837	49.0826	43.0613	41.0004	45.9526	46.4679	53.1466	56.9787	61.4538	(65)							

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	123.2397	123.2397	123.2397	123.2397	123.2397	123.2397	123.2397	123.2397	123.2397	123.2397	123.2397	123.2397	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.5249	19.1182	15.5480	11.7708	8.7988	7.4283	8.0266	10.4333	14.0035	17.7807	20.7527	22.1231	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.6536	221.9329	216.1891	203.9612	188.5257	174.0185	164.3268	162.0475	167.7913	180.0192	195.4547	209.9619	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3240	35.3240	35.3240	35.3240	35.3240	35.3240	35.3240	35.3240	35.3240	35.3240	35.3240	35.3240	(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)	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	(71)
Water heating gains (Table 5)	84.7325	82.2997	77.2159	70.5329	65.9712	59.8073	55.1081	61.7643	64.5387	71.4336	79.1370	82.5992	(72)
Total internal gains	388.8829	386.3227	371.9249	349.2368	326.2676	304.2261	290.4334	297.2169	309.3054	332.2054	358.3163	377.6561	(73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data g or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W	(74)						
North	3.9300	10.6334	0.6300	0.7000	0.7700	12.7713	(74)						
South	6.1140	46.7521	0.6300	0.7000	0.7700	87.3571	(78)						
Solar gains	100.1284	167.4750	223.7166	272.5911	304.3767	302.6277	291.5132	267.1557	240.2389	183.3656	119.3030	86.1314	(83)
Total gains	489.0113	553.7978	595.6415	621.8279	630.6443	606.8538	581.9466	564.3726	549.5444	515.5710	477.6193	463.7875	(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	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	62.1077	62.3068	62.5032	63.4427	63.6216	64.4679	64.4679	64.6272	64.1393	63.6216	63.2607	62.8877	(85)
tau	5.1405	5.1538	5.1669	5.2295	5.2414	5.2979	5.2979	5.3085	5.2760	5.2414	5.2174	5.1925	(86)
alpha	0.9978	0.9955	0.9900	0.9737	0.9255	0.7990	0.6271	0.6658	0.8742	0.9772	0.9955	0.9984	(86)
util living area	19.8115	19.9544	20.1725	20.4606	20.7281	20.9200	20.9825	20.9760	20.8599	20.5195	20.1160	19.7905	(87)
MIT	19.9861	19.9890	19.9918	20.0052	20.0078	20.0195	20.0195	20.0217	20.0150	20.0078	20.0027	19.9974	(88)
Th 2	0.9971	0.9939	0.9864	0.9631	0.8928	0.7154	0.5001	0.5415	0.8104	0.9659	0.9936	0.9978	(89)
util rest of house	18.4016	18.6120	18.9312	19.3550	19.7242	19.9613	20.0125	20.0110	19.8974	19.4444	18.8584	18.3790	(90)
MIT 2	18.7297	18.9243	19.2201	19.6123	19.9578	20.1844	20.2382	20.2356	20.1213	19.6946	19.1510	18.7075	(92)
Living area fraction	18.7297	18.9243	19.2201	19.6123	19.9578	20.1844	20.2382	20.2356	20.1213	19.6946	19.1510	18.7075	(92)
Temperature adjustment	18.7297	18.9243	19.2201	19.6123	19.9578	20.1844	20.2382	20.2356	20.1213	19.6946	19.1510	18.7075	(93)
adjusted MIT	18.7297	18.9243	19.2201	19.6123	19.9578	20.1844	20.2382	20.2356	20.1213	19.6946	19.1510	18.7075	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(94)
Useful gains	486.9493	549.1552	585.2178	595.4965	561.7763	443.6723	308.3116	321.9040	449.7839	495.5187	473.4863	462.2833	(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	1292.3868	1252.0680	1132.0546	939.2495	722.0072	481.8483	313.9215	330.1377	522.2145	795.1660	1059.6724	1283.2344	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	599.2455	472.3574	406.8466	247.5022	119.2118	0.0000	0.0000	0.0000	0.0000	222.9376	422.0540	610.7876	(98)
Space heating												3100.9427	(98)
Space heating per m ²												38.7124	(99)

8c. Space cooling requirement

Not applicable

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3320.0671 (211)
Space heating requirement	599.2455	472.3574	406.8466	247.5022	119.2118	0.0000	0.0000	0.0000	0.0000	222.9376	422.0540	610.7876	(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)	641.5905	505.7360	435.5960	264.9916	127.6358	0.0000	0.0000	0.0000	0.0000	238.6912	451.8779	653.9482	(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	202.2408	177.5585	184.7382	163.8534	158.6390	139.7204	133.8628	149.2256	150.8737	171.7997	183.3928	197.4674	(64)
Efficiency of water heater (217)m	87.6191	87.3968	86.9835	86.0870	84.3431	80.3000	80.3000	80.3000	80.3000	85.7082	87.0823	87.7049	(216)
Fuel for water heating, kWh/month	230.8181	203.1637	212.3830	190.3348	188.0878	173.9980	166.7034	185.8352	187.8875	200.4473	210.5972	225.1498	(219)
Water heating fuel used													2375.4058 (219)
Annual totals kWh/year													
Space heating fuel - main system													3320.0671 (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)													380.1365 (232)
Total delivered energy for all uses													6150.6094 (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	3320.0671	0.2160	717.1345 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2375.4058	0.2160	513.0877 (264)
Space and water heating			1230.2222 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	380.1365	0.5190	197.2908 (268)
Total CO2, kg/m2/year			1466.4380 (272)
Emissions per m2 for space and water heating			15.3582 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4630 (272b)
Emissions per m2 for pumps and fans			0.4859 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.3582 * 1.00) + 2.4630 + 0.4859, rounded to 2 d.p.			18.3100 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	40.0510 (1b)	2.3850 (2b)	95.5216 (1b) - (3b)
First floor	40.0510 (1c)	2.6830 (2c)	107.4568 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.1020		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 202.9785 (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) =	0.1478 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.3978 (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) =		0.3680 (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	0.4692	0.4600	0.4508	0.4048	0.3956	0.3496	0.3496	0.3404	0.3680	0.3956	0.4140	0.4324 (22b)
Effective ac	0.6101	0.6058	0.6016	0.5819	0.5782	0.5611	0.5611	0.5579	0.5677	0.5782	0.5857	0.5935 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K					
Solid Door			2.1200	1.0900	2.3108		(26)					
Windows (Uw = 1.40)			10.0400	1.3258	13.3106		(27)					
Flr - Ground			40.0510	0.1603	6.4188	75.6000	3027.8556 (28a)					
Brick	90.7890	12.1650	78.6240	0.2500	19.6560	51.1900	4024.7626 (29a)					
Rf - Ins Joist	40.0510		40.0510	0.1000	4.0051	7.4000	296.3774 (30)					
Total net area of external elements Aum(A, m ²)			170.8860				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.7013		(33)					
Party Wall			43.5950	0.0000	0.0000	7.4000	322.6030 (32)					
Stud			79.0151			7.4000	584.7114 (32c)					
Stud			75.7626			7.4000	560.6429 (32c)					
Internal Floor			40.0510			7.4000	296.3774 (32d)					
Internal Ceiling			40.0510			7.4000	296.3774 (32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	9409.7076 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							117.4716 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.3552 (36)					
Total fabric heat loss						(33) + (36) =	53.0565 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 40.8631	Feb 40.5769	Mar 40.2963	Apr 38.9784	May 38.7318	Jun 37.5840	Jul 37.5840	Aug 37.3714	Sep 38.0261	Oct 38.7318	Nov 39.2306	Dec 39.7521 (38)
Heat transfer coeff	93.9196	93.6334	93.3528	92.0349	91.7883	90.6405	90.6405	90.4279	91.0826	91.7883	92.2871	92.8086 (39)
Average = Sum(39)m / 12 =												92.0337 (39)
HLP	Jan 1.1725	Feb 1.1689	Mar 1.1654	Apr 1.1490	May 1.1459	Jun 1.1316	Jul 1.1316	Aug 1.1289	Sep 1.1371	Oct 1.1459	Nov 1.1521	Dec 1.1586 (40)
HLP (average)												1.1490 (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												2.4648 (42)
Average daily hot water use (litres/day)												92.7388 (43)
Daily hot water use	102.0127	98.3032	94.5936	90.8841	87.1745	83.4650	83.4650	87.1745	90.8841	94.5936	98.3032	102.0127 (44)
Energy conte	151.2819	132.3121	136.5343	119.0339	114.2159	98.5596	91.3300	104.8025	106.0541	123.5959	134.9146	146.5085 (45)
Energy content (annual)												Total = Sum(45)m = 1459.1432 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	830.3998	798.9345	771.4283	0.0000	0.0000	0.0000	0.0000 (103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	146.7494	192.1258	171.6992	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												510.5744 (104)
Cooled fraction												1.0000 (105)
Intermittency factor (Table 10b)												
Intermittency factor	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	36.6873	48.0314	42.9248	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												127.6436 (107)
Space cooling per m2												1.5935 (108)
Energy for space heating												42.2890 (99)
Energy for space cooling												1.5935 (108)
Total												43.8825 (109)
Dwelling Fabric Energy Efficiency (DFEE)												43.9 (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	40.0510 (1b)	x 2.3850 (2b)	= 95.5216 (1b) - (3b)
First floor	40.0510 (1c)	x 2.6830 (2c)	= 107.4568 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.1020		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 202.9785 (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) =	0.1478 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.3978 (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) =		0.3680 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.4692	0.4600	0.4508	0.4048	0.3956	0.3496	0.3496	0.3404	0.3680	0.3956	0.4140	0.4324 (22b)
Effective ac	0.6101	0.6058	0.6016	0.5819	0.5782	0.5611	0.5611	0.5579	0.5677	0.5782	0.5857	0.5935 (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			2.1200	1.0000	2.1200		(26)					
TER Opening Type (Uw = 1.40)			10.0400	1.3258	13.3106		(27)					
Flr - Ground			40.0510	0.1300	5.2066		(28a)					
Brick	90.7890	12.1650	78.6240	0.1800	14.1523		(29a)					
Rf - Ins Joist	40.0510		40.0510	0.1300	5.2066		(30)					
Total net area of external elements Aum(A, m ²)			170.8860				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =		39.9962 (33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.7052 (36)					
Total fabric heat loss						(33) + (36) =	48.7014 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 40.8631	Feb 40.5769	Mar 40.2963	Apr 38.9784	May 38.7318	Jun 37.5840	Jul 37.5840	Aug 37.3714	Sep 38.0261	Oct 38.7318	Nov 39.2306	Dec 39.7521 (38)
Heat transfer coeff	89.5645	89.2782	88.9976	87.6798	87.4332	86.2853	86.2853	86.0728	86.7275	87.4332	87.9320	88.4535 (39)
Average = Sum(39)m / 12 =												87.6786 (39)
HLP	Jan 1.1181	Feb 1.1146	Mar 1.1111	Apr 1.0946	May 1.0915	Jun 1.0772	Jul 1.0772	Aug 1.0745	Sep 1.0827	Oct 1.0915	Nov 1.0978	Dec 1.1043 (40)
HLP (average)												1.0946 (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												2.4648 (42)
Average daily hot water use (litres/day)												92.7388 (43)
Daily hot water use	102.0127	98.3032	94.5936	90.8841	87.1745	83.4650	83.4650	87.1745	90.8841	94.5936	98.3032	102.0127 (44)
Energy content (annual)	151.2819	132.3121	136.5343	119.0339	114.2159	98.5596	91.3300	104.8025	106.0541	123.5959	134.9146	146.5085 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1459.1432 (45)
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
If cylinder contains dedicated solar storage												0.0000 (56)

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Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
	32.1474	28.1163	29.0135	25.2947	24.2709	20.9439	19.4076	22.2705	22.5365	26.2641	28.6693	31.1331	(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	123.2397	123.2397	123.2397	123.2397	123.2397	123.2397	123.2397	123.2397	123.2397	123.2397	123.2397	123.2397	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.5249	19.1182	15.5480	11.7708	8.7988	7.4283	8.0266	10.4333	14.0035	17.7807	20.7527	22.1231	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.6536	221.9329	216.1891	203.9612	188.5257	174.0185	164.3268	162.0475	167.7913	180.0192	195.4547	209.9619	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3240	35.3240	35.3240	35.3240	35.3240	35.3240	35.3240	35.3240	35.3240	35.3240	35.3240	35.3240	(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)	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	(71)
Water heating gains (Table 5)	43.2089	41.8398	38.9967	35.1315	32.6221	29.0888	26.0855	29.9335	31.3007	35.3012	39.8185	41.8455	(72)
Total internal gains	344.3593	342.8628	330.7057	310.8355	289.9186	270.5075	258.4108	262.3862	273.0674	293.0730	315.9978	333.9024	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W							
North	3.9300	10.6334	0.6300	0.7000	0.7700	12.7713 (74)							
South	6.1140	46.7521	0.6300	0.7000	0.7700	87.3571 (78)							
Solar gains	100.1284	167.4750	223.7166	272.5911	304.3767	302.6277	291.5132	267.1557	240.2389	183.3656	119.3030	86.1314	(83)
Total gains	444.4877	510.3379	554.4223	583.4266	594.2952	573.1352	549.9240	529.5418	513.3064	476.4386	435.3008	420.0338	(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)	62.1077	62.3068	62.5032	63.4427	63.6216	64.4679	64.4679	64.6272	64.1393	63.6216	63.2607	62.8877	21.0000 (85)
tau	5.1405	5.1538	5.1669	5.2295	5.2414	5.2979	5.2979	5.3085	5.2760	5.2414	5.2174	5.1925	
util living area	0.9986	0.9969	0.9927	0.9798	0.9394	0.8252	0.6571	0.6997	0.8976	0.9836	0.9970	0.9990	(86)
MIT	19.7596	19.9042	20.1261	20.4205	20.6980	20.9058	20.9783	20.9698	20.8366	20.4778	20.0669	19.7392	(87)
Th 2	19.9861	19.9890	19.9918	20.0052	20.0078	20.0195	20.0195	20.0217	20.0150	20.0078	20.0027	19.9974	(88)
util rest of house	0.9982	0.9958	0.9900	0.9713	0.9111	0.7451	0.5272	0.5736	0.8404	0.9751	0.9958	0.9986	(89)
MIT 2	18.8525	18.9990	19.2221	19.5232	19.7886	19.9713	20.0134	20.0122	19.9181	19.5836	19.1728	18.8412	(90)
Living area fraction	19.0635	19.2096	19.4324	19.7319	20.0002	20.1887	20.2379	20.2350	20.1318	19.7916	19.3808	19.0502	(91)
MIT	19.0635	19.2096	19.4324	19.7319	20.0002	20.1887	20.2379	20.2350	20.1318	19.7916	19.3808	19.0502	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0635	19.2096	19.4324	19.7319	20.0002	20.1887	20.2379	20.2350	20.1318	19.7916	19.3808	19.0502	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9976	0.9947	0.9880	0.9683	0.9108	0.7608	0.5579	0.6032	0.8485	0.9727	0.9948	0.9982	(94)
Useful gains	443.3997	507.6210	547.7508	564.9358	541.2948	436.0193	306.7807	319.4360	435.5489	463.4193	433.0230	419.2661	(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	1322.2867	1277.5352	1150.9541	949.7424	725.7133	482.2267	313.8966	330.0900	523.1241	803.6524	1079.8792	1313.5475	(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	653.8919	517.3824	448.7832	277.0608	137.2074	0.0000	0.0000	0.0000	0.0000	253.1334	465.7365	665.3454	(98)
Space heating												3418.5409	(98)
Space heating per m2										(98) / (4) =		42.6773	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	811.0822	638.5115	654.1531	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8142	0.8935	0.8747	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	660.4070	570.4817	572.1924	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	762.6589	733.6950	711.6879	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	73.6213	121.4307	103.7847	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												298.8367	(104)
Cooled fraction												1.0000	(105)
													fc = cooled area / (4) =

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Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	18.4053	30.3577	25.9462	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling												74.7092 (107)
Space cooling per m2												0.9327 (108)
Energy for space heating												42.6773 (99)
Energy for space cooling												0.9327 (108)
Total												43.6100 (109)
Target Fabric Energy Efficiency (TFEE)												50.2 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	40.0510 (1b)	2.3850 (2b)	95.5216 (1b) - (3b)
First floor	40.0510 (1c)	2.6830 (2c)	107.4568 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.1020		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 202.9785 (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				2 * 10 =	20.0000 (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) =				20.0000 / (5) =	0.0985 (8)							
Pressure test				Yes								
Measured/design AP50				5.0000								
Infiltration rate					0.3485 (18)							
Number of sides sheltered				1	1 (19)							
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)							
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3224 (21)							
Wind speed	Jan 5.7000	Feb 5.2000	Mar 4.9000	Apr 4.5000	May 4.6000	Jun 4.2000	Jul 4.3000	Aug 4.2000	Sep 4.5000	Oct 4.9000	Nov 4.9000	Dec 5.2000 (22)
Wind factor	1.4250	1.3000	1.2250	1.1250	1.1500	1.0500	1.0750	1.0500	1.1250	1.2250	1.2250	1.3000 (22a)
Adj infilt rate												
Effective ac	0.4594	0.4191	0.3949	0.3627	0.3708	0.3385	0.3466	0.3385	0.3627	0.3949	0.3949	0.4191 (22b)
	0.6055	0.5878	0.5780	0.5658	0.5687	0.5573	0.5601	0.5573	0.5658	0.5780	0.5780	0.5878 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K					
Solid Door			2.1200	1.0900	2.3108		(26)					
Windows (Uw = 1.40)			10.0400	1.3258	13.3106		(27)					
Flr - Ground			40.0510	0.1603	6.4188	75.6000	3027.8556 (28a)					
Brick	90.7890	12.1650	78.6240	0.2500	19.6560	51.1900	4024.7626 (29a)					
Rf - Ins Joist	40.0510		40.0510	0.1000	4.0051	7.4000	296.3774 (30)					
Total net area of external elements Aum(A, m ²)			170.8860				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	45.7013	(33)					
Party Wall			43.5950	0.0000	0.0000	7.4000	322.6030 (32)					
Stud			79.0151			7.4000	584.7114 (32c)					
Stud			75.7626			7.4000	560.6429 (32c)					
Internal Floor			40.0510			7.4000	296.3774 (32d)					
Internal Ceiling			40.0510			7.4000	296.3774 (32e)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		9409.7076 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							117.4716 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.3552 (36)					
Total fabric heat loss					(33) + (36) =		53.0565 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 40.5601	Feb 39.3743	Mar 38.7151	Apr 37.8971	May 38.0951	Jun 37.3293	Jul 37.5142	Aug 37.3293	Sep 37.8971	Oct 38.7151	Nov 38.7151	Dec 39.3743 (38)
Heat transfer coeff	93.6166	92.4309	91.7717	90.9536	91.1516	90.3858	90.5707	90.3858	90.9536	91.7717	91.7717	92.4309 (39)
Average = Sum(39)m / 12 =												91.5162 (39)
HLP	Jan 1.1687	Feb 1.1539	Mar 1.1457	Apr 1.1355	May 1.1379	Jun 1.1284	Jul 1.1307	Aug 1.1284	Sep 1.1355	Oct 1.1457	Nov 1.1457	Dec 1.1539 (40)
HLP (average)												1.1425 (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												2.4648 (42)
Average daily hot water use (litres/day)												92.7388 (43)
Daily hot water use	102.0127	98.3032	94.5936	90.8841	87.1745	83.4650	83.4650	87.1745	90.8841	94.5936	98.3032	102.0127 (44)
Energy conte	151.2819	132.3121	136.5343	119.0339	114.2159	98.5596	91.3300	104.8025	106.0541	123.5959	134.9146	146.5085 (45)
Energy content (annual)												Total = Sum(45)m = 1459.1432 (45)

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Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	22.6923	19.8468	20.4801	17.8551	17.1324	14.7839	13.6995	15.7204	15.9081	18.5394	20.2372	21.9763 (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	14.6708	13.2313	14.6044	14.0828	14.5156	14.0051	14.4456	14.4910	14.0475	14.5677	14.1562	14.6564 (61)
Total heat required for water heating calculated for each month	165.9527	145.5434	151.1387	133.1167	128.7315	112.5647	105.7756	119.2935	120.1016	138.1635	149.0707	161.1649 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	165.9527	145.5434	151.1387	133.1167	128.7315	112.5647	105.7756	119.2935	120.1016	138.1635	149.0707	161.1649 (64)
RHI water heating demand												1630.6175 (64)
Heat gains from water heating, kWh/month	53.9689	47.3016	49.0487	43.0995	41.6057	36.2723	33.9786	38.4696	38.7749	44.7375	48.3981	52.3782 (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	147.8876	147.8876	147.8876	147.8876	147.8876	147.8876	147.8876	147.8876	147.8876	147.8876	147.8876	147.8876 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	53.4771	47.4979	38.6279	29.2438	21.8601	18.4552	19.9415	25.9207	34.7907	44.1748	51.5585	54.9634 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.8412	331.2431	322.6703	304.4197	281.3817	259.7291	245.2639	241.8619	250.4348	268.6854	291.7234	313.3760 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.2536	52.2536	52.2536	52.2536	52.2536	52.2536	52.2536	52.2536	52.2536	52.2536	52.2536	52.2536 (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)	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917 (71)
Water heating gains (Table 5)	72.5389	70.3893	65.9257	59.8604	55.9216	50.3782	45.6702	51.7064	53.8540	60.1311	67.2196	70.4008 (72)
Total internal gains	558.4066	553.6797	531.7733	498.0733	463.7128	433.1120	415.4250	424.0385	443.6289	477.5407	515.0510	543.2895 (73)

6. Solar gains

[Jan]		Area m ²	Solar flux Table 6a W/m ²	Specific data g or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W					
North		3.9300	13.4530	0.7300	0.7200	0.7700	19.2576 (74)					
South		6.1140	56.4170	0.7300	0.7200	0.7700	125.6389 (78)					
Solar gains	144.8964	209.6485	283.9556	363.8481	395.8123	428.0424	402.7724	370.3568	324.2890	246.8620	172.0364	122.5730 (83)
Total gains	703.3030	763.3282	815.7289	861.9214	859.5251	861.1544	818.1974	794.3953	767.9179	724.4027	687.0873	665.8626 (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	27.9203	28.2785	28.4816	28.7378	28.6754	28.9184	28.8593	28.9184	28.7378	28.4816	28.4816	28.2785	28.2785
alpha	2.8614	2.8852	2.8988	2.9159	2.9117	2.9279	2.9240	2.9279	2.9159	2.8988	2.8988	2.8852	2.8852
util living area	0.9319	0.9157	0.8804	0.8116	0.6999	0.5367	0.4099	0.3913	0.6007	0.7901	0.8933	0.9373 (86)	
MIT	19.3847	19.5396	19.8734	20.2977	20.6675	20.8922	20.9637	20.9705	20.8472	20.4874	19.9406	19.3887 (87)	
Th 2	19.9451	19.9570	19.9637	19.9720	19.9700	19.9777	19.9758	19.9777	19.9720	19.9637	19.9637	19.9570 (88)	
util rest of house	0.9208	0.9025	0.8613	0.7805	0.6469	0.4578	0.3106	0.2875	0.5215	0.7468	0.8733	0.9269 (89)	
MIT 2	18.5124	18.6707	18.9979	19.4049	19.7355	19.9197	19.9630	19.9684	19.8855	19.5800	19.0688	18.5261 (90)	
Living area fraction									fLA = Living area / (4) =			0.2327 (91)	
MIT	18.7153	18.8729	19.2016	19.6126	19.9524	20.1460	20.1959	20.2016	20.1092	19.7911	19.2716	18.7268 (92)	
Temperature adjustment												-0.1500	
adjusted MIT	18.5653	18.7229	19.0516	19.4626	19.8024	19.9960	20.0459	20.0516	19.9592	19.6411	19.1216	18.5768 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9026	0.8833	0.8414	0.7629	0.6374	0.4593	0.3177	0.2953	0.5204	0.7313	0.8536	0.9094 (94)
Useful gains	634.8038	674.2187	686.3165	657.5985	547.8880	395.5312	259.9338	234.6094	399.6329	529.7604	586.4886	605.5122 (95)
Ext temp.	5.4000	5.6000	7.1000	9.5000	12.6000	15.3000	17.1000	17.4000	15.1000	12.0000	8.6000	5.6000 (96)
Heat loss rate W	1232.4949	1212.9585	1096.8183	906.1371	656.5071	424.4493	266.8078	239.6657	441.9643	701.2388	965.5873	1199.4572 (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	444.6822	362.0331	305.4133	178.9478	80.8126	0.0000	0.0000	0.0000	0.0000	127.5799	272.9511	441.8951 (98)
Space heating												2214.3151 (98)
RHI space heating demand												2214 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	40.0510 (1b)	2.3850 (2b)	95.5216 (1b) - (3b)
First floor	40.0510 (1c)	2.6830 (2c)	107.4568 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.1020		202.9785 (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				2 * 10 =	20.0000 (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) =				20.0000 / (5) =	0.0985 (8)							
Pressure test				Yes	5.0000							
Measured/design AP50					0.3485 (18)							
Infiltration rate					1 (19)							
Number of sides sheltered												
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)							
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3224 (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	0.4111	0.4030	0.3949	0.3546	0.3466	0.3063	0.3063	0.2982	0.3224	0.3466	0.3627	0.3788 (22b)
Effective ac	0.5845	0.5812	0.5780	0.5629	0.5601	0.5469	0.5469	0.5445	0.5520	0.5601	0.5658	0.5717 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K					
Solid Door			2.1200	1.0900	2.3108		(26)					
Windows (Uw = 1.40)			10.0400	1.3258	13.3106		(27)					
Flr - Ground			40.0510	0.1603	6.4188	75.6000	3027.8556 (28a)					
Brick	90.7890	12.1650	78.6240	0.2500	19.6560	51.1900	4024.7626 (29a)					
Rf - Ins Joist	40.0510		40.0510	0.1000	4.0051	7.4000	296.3774 (30)					
Total net area of external elements Aum(A, m ²)			170.8860				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	45.7013	(33)					
Party Wall			43.5950	0.0000	0.0000	7.4000	322.6030 (32)					
Stud			79.0151			7.4000	584.7114 (32c)					
Stud			75.7626			7.4000	560.6429 (32c)					
Internal Floor			40.0510			7.4000	296.3774 (32d)					
Internal Ceiling			40.0510			7.4000	296.3774 (32e)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		9409.7076 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							117.4716 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.3552 (36)					
Total fabric heat loss						(33) + (36) =	53.0565 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 39.1503	Feb 38.9305	Mar 38.7151	Apr 37.7035	May 37.5142	Jun 36.6331	Jul 36.6331	Aug 36.4699	Sep 36.9724	Oct 37.5142	Nov 37.8971	Dec 38.2974 (38)
Heat transfer coeff	92.2068	91.9870	91.7717	90.7600	90.5707	89.6896	89.6896	89.5264	90.0290	90.5707	90.9536	91.3539 (39)
Average = Sum(39)m / 12 =												90.7591 (39)
HLP	Jan 1.1511	Feb 1.1484	Mar 1.1457	Apr 1.1331	May 1.1307	Jun 1.1197	Jul 1.1197	Aug 1.1177	Sep 1.1239	Oct 1.1307	Nov 1.1355	Dec 1.1405 (40)
HLP (average)												1.1330 (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												2.4648 (42)
Average daily hot water use (litres/day)												92.7388 (43)
Daily hot water use	102.0127	98.3032	94.5936	90.8841	87.1745	83.4650	83.4650	87.1745	90.8841	94.5936	98.3032	102.0127 (44)
Energy conte	151.2819	132.3121	136.5343	119.0339	114.2159	98.5596	91.3300	104.8025	106.0541	123.5959	134.9146	146.5085 (45)
Energy content (annual)												Total = Sum(45)m = 1459.1432 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	22.6923	19.8468	20.4801	17.8551	17.1324	14.7839	13.6995	15.7204	15.9081	18.5394	20.2372	21.9763 (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	14.6708	13.2313	14.6044	14.0828	14.5156	14.0051	14.4456	14.4910	14.0475	14.5677	14.1562	14.6564 (61)
Total heat required for water heating calculated for each month	165.9527	145.5434	151.1387	133.1167	128.7315	112.5647	105.7756	119.2935	120.1016	138.1635	149.0707	161.1649 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	165.9527	145.5434	151.1387	133.1167	128.7315	112.5647	105.7756	119.2935	120.1016	138.1635	149.0707	161.1649 (64)
Heat gains from water heating, kWh/month	53.9689	47.3016	49.0487	43.0995	41.6057	36.2723	33.9786	38.4696	38.7749	44.7375	48.3981	52.3782 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1630.6175 (64)												

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	147.8876	147.8876	147.8876	147.8876	147.8876	147.8876	147.8876	147.8876	147.8876	147.8876	147.8876	147.8876 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	53.4771	47.4979	38.6279	29.2438	21.8601	18.4552	19.9415	25.9207	34.7907	44.1748	51.5585	54.9634 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.8412	331.2431	322.6703	304.4197	281.3817	259.7291	245.2639	241.8619	250.4348	268.6854	291.7234	313.3760 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.2536	52.2536	52.2536	52.2536	52.2536	52.2536	52.2536	52.2536	52.2536	52.2536	52.2536	52.2536 (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)	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917 (71)
Water heating gains (Table 5)	72.5389	70.3893	65.9257	59.8604	55.9216	50.3782	45.6702	51.7064	53.8540	60.1311	67.2196	70.4008 (72)
Total internal gains	558.4066	553.6797	531.7733	498.0733	463.7128	433.1120	415.4250	424.0385	443.6289	477.5407	515.0510	543.2895 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
North	3.9300	10.6334	0.7300	0.7200	0.7700	15.2213 (74)						
South	6.1140	46.7521	0.7300	0.7200	0.7700	104.1154 (78)						
Solar gains	119.3367	199.6029	266.6337	324.8841	362.7673	360.6828	347.4361	318.4059	286.3256	218.5419	142.1897	102.6545 (83)
Total gains	677.7433	753.2826	798.4070	822.9574	826.4800	793.7948	762.8611	742.4444	729.9545	696.0826	657.2407	645.9441 (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	28.3472	28.4150	28.4816	28.7991	28.8593	29.1428	29.1428	29.1959	29.0330	28.8593	28.7378	28.6119
alpha	2.8898	2.8943	2.8988	2.9199	2.9240	2.9429	2.9429	2.9464	2.9355	2.9240	2.9159	2.9075
util living area	0.9455	0.9252	0.8946	0.8406	0.7522	0.6162	0.4785	0.5065	0.6830	0.8449	0.9228	0.9516 (86)
MIT	19.1861	19.4167	19.7543	20.1754	20.5520	20.8271	20.9397	20.9270	20.7505	20.2815	19.6664	19.1375 (87)
Th 2	19.9593	19.9615	19.9637	19.9739	19.9758	19.9848	19.9848	19.9864	19.9813	19.9758	19.9720	19.9679 (88)
util rest of house	0.9370	0.9137	0.8780	0.8139	0.7077	0.5442	0.3816	0.4109	0.6172	0.8139	0.9091	0.9440 (89)
MIT 2	18.3275	18.5538	18.8833	19.2937	19.6415	19.8808	19.9594	19.9538	19.8206	19.4019	18.8096	18.2863 (90)
Living area fraction	18.5273	18.7546	19.0859	19.4989	19.8534	20.1010	20.1875	20.1803	20.0370	19.6066	19.0090	18.4844 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.3773	18.6046	18.9359	19.3489	19.7034	19.9510	20.0375	20.0303	19.8870	19.4566	18.8590	18.3344 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	623.9219	674.3597	685.1272	654.3143	573.9415	429.8852	295.1661	308.3419	445.5738	553.6320	585.2994	599.7733 (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	1298.0184	1260.6416	1141.2669	948.3414	724.8700	479.9303	308.3061	325.0037	520.9950	802.1458	1069.5217	1291.2311 (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	501.5278	393.9814	339.3680	211.6995	112.2908	0.0000	0.0000	0.0000	0.0000	184.8943	348.6400	514.4445 (98)
Space heating												2606.8463 (98)
Space heating per m2												32.5441 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Not applicable

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

	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													2880.4932 (211)
Space heating requirement	501.5278	393.9814	339.3680	211.6995	112.2908	0.0000	0.0000	0.0000	0.0000	184.8943	348.6400	514.4445	(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)	554.1744	435.3386	374.9922	233.9221	124.0782	0.0000	0.0000	0.0000	0.0000	204.3031	385.2376	568.4470	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	165.9527	145.5434	151.1387	133.1167	128.7315	112.5647	105.7756	119.2935	120.1016	138.1635	149.0707	161.1649	(64)
Efficiency of water heater (217)m	89.6827	89.6139	89.4893	89.2372	88.7622	87.3000	87.3000	87.3000	87.3000	89.1032	89.5172	89.7155	(217)
Fuel for water heating, kWh/month	185.0443	162.4117	168.8903	149.1718	145.0296	128.9401	121.1633	136.6477	137.5734	155.0602	166.5274	179.6399	(219)
Water heating fuel used													1836.0996 (219)
Annual totals kWh/year													
Space heating fuel - main system													2880.4932 (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)													377.7688 (232)
Total delivered energy for all uses													5169.3616 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2880.4932	3.4800	100.2412	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1836.0996	3.4800	63.8963	(247)
Pumps and fans for heating	75.0000	13.1900	9.8925	(249)
Energy for lighting	377.7688	13.1900	49.8277	(250)
Additional standing charges			120.0000	(251)
Total energy cost			343.8576	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.1544 (257)
SAP value		83.8958
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	2880.4932	0.2160	622.1865	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1836.0996	0.2160	396.5975	(264)
Space and water heating			1018.7840	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	377.7688	0.5190	196.0620	(268)
Total kg/year			1253.7710	(272)
CO2 emissions per m2			15.6500	(273)
EI value			86.5705	
EI rating			87	(274)
EI band			B	

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9050 = 3.845$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9050 = 0.2387$, stars = 4
Water heating energy efficiency	$3.48 / 0.8869 = 3.924$, stars = 4
Water heating environmental impact	$0.216 / 0.8869 = 0.2435$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	40.0510 (1b)	x 2.3850 (2b)	= 95.5216 (1b) - (3b)
First floor	40.0510 (1c)	x 2.6830 (2c)	= 107.4568 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.1020		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 202.9785 (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				2 * 10 =	20.0000 (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) =				20.0000 / (5) =	0.0985 (8)							
Pressure test				Yes								
Measured/design AP50				5.0000								
Infiltration rate					0.3485 (18)							
Number of sides sheltered				1	1 (19)							
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)							
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3224 (21)							
Wind speed	Jan 5.7000	Feb 5.2000	Mar 4.9000	Apr 4.5000	May 4.6000	Jun 4.2000	Jul 4.3000	Aug 4.2000	Sep 4.5000	Oct 4.9000	Nov 4.9000	Dec 5.2000 (22)
Wind factor	1.4250	1.3000	1.2250	1.1250	1.1500	1.0500	1.0750	1.0500	1.1250	1.2250	1.2250	1.3000 (22a)
Adj infilt rate												
Effective ac	0.4594	0.4191	0.3949	0.3627	0.3708	0.3385	0.3466	0.3385	0.3627	0.3949	0.3949	0.4191 (22b)
	0.6055	0.5878	0.5780	0.5658	0.5687	0.5573	0.5601	0.5573	0.5658	0.5780	0.5780	0.5878 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K					
Solid Door			2.1200	1.0900	2.3108		(26)					
Windows (Uw = 1.40)			10.0400	1.3258	13.3106		(27)					
Flr - Ground			40.0510	0.1603	6.4188	75.6000	3027.8556 (28a)					
Brick	90.7890	12.1650	78.6240	0.2500	19.6560	51.1900	4024.7626 (29a)					
Rf - Ins Joist	40.0510		40.0510	0.1000	4.0051	7.4000	296.3774 (30)					
Total net area of external elements Aum(A, m ²)			170.8860				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	45.7013	(33)					
Party Wall			43.5950	0.0000	0.0000	7.4000	322.6030 (32)					
Stud			79.0151			7.4000	584.7114 (32c)					
Stud			75.7626			7.4000	560.6429 (32c)					
Internal Floor			40.0510			7.4000	296.3774 (32d)					
Internal Ceiling			40.0510			7.4000	296.3774 (32e)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		9409.7076 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							117.4716 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.3552 (36)					
Total fabric heat loss					(33) + (36) =		53.0565 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 40.5601	Feb 39.3743	Mar 38.7151	Apr 37.8971	May 38.0951	Jun 37.3293	Jul 37.5142	Aug 37.3293	Sep 37.8971	Oct 38.7151	Nov 38.7151	Dec 39.3743 (38)
Heat transfer coeff	93.6166	92.4309	91.7717	90.9536	91.1516	90.3858	90.5707	90.3858	90.9536	91.7717	91.7717	92.4309 (39)
Average = Sum(39)m / 12 =												91.5162 (39)
HLP	Jan 1.1687	Feb 1.1539	Mar 1.1457	Apr 1.1355	May 1.1379	Jun 1.1284	Jul 1.1307	Aug 1.1284	Sep 1.1355	Oct 1.1457	Nov 1.1457	Dec 1.1539 (40)
HLP (average)												1.1425 (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												2.4648 (42)
Average daily hot water use (litres/day)												92.7388 (43)
Daily hot water use	102.0127	98.3032	94.5936	90.8841	87.1745	83.4650	83.4650	87.1745	90.8841	94.5936	98.3032	102.0127 (44)
Energy conte	151.2819	132.3121	136.5343	119.0339	114.2159	98.5596	91.3300	104.8025	106.0541	123.5959	134.9146	146.5085 (45)
Energy content (annual)												Total = Sum(45)m = 1459.1432 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Distribution loss (46)m = 0.15 x (45)m	22.6923	19.8468	20.4801	17.8551	17.1324	14.7839	13.6995	15.7204	15.9081	18.5394	20.2372	21.9763 (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	14.6708	13.2313	14.6044	14.0828	14.5156	14.0051	14.4456	14.4910	14.0475	14.5677	14.1562	14.6564 (61)
Total heat required for water heating calculated for each month	165.9527	145.5434	151.1387	133.1167	128.7315	112.5647	105.7756	119.2935	120.1016	138.1635	149.0707	161.1649 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	165.9527	145.5434	151.1387	133.1167	128.7315	112.5647	105.7756	119.2935	120.1016	138.1635	149.0707	161.1649 (64)
Heat gains from water heating, kWh/month	53.9689	47.3016	49.0487	43.0995	41.6057	36.2723	33.9786	38.4696	38.7749	44.7375	48.3981	52.3782 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1630.6175 (64)												

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	147.8876	147.8876	147.8876	147.8876	147.8876	147.8876	147.8876	147.8876	147.8876	147.8876	147.8876	147.8876 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	53.4771	47.4979	38.6279	29.2438	21.8601	18.4552	19.9415	25.9207	34.7907	44.1748	51.5585	54.9634 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.8412	331.2431	322.6703	304.4197	281.3817	259.7291	245.2639	241.8619	250.4348	268.6854	291.7234	313.3760 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.2536	52.2536	52.2536	52.2536	52.2536	52.2536	52.2536	52.2536	52.2536	52.2536	52.2536	52.2536 (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)	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917 (71)
Water heating gains (Table 5)	72.5389	70.3893	65.9257	59.8604	55.9216	50.3782	45.6702	51.7064	53.8540	60.1311	67.2196	70.4008 (72)
Total internal gains	558.4066	553.6797	531.7733	498.0733	463.7128	433.1120	415.4250	424.0385	443.6289	477.5407	515.0510	543.2895 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
North	3.9300	13.4530	0.7300	0.7200	0.7700	19.2576 (74)						
South	6.1140	56.4170	0.7300	0.7200	0.7700	125.6389 (78)						
Solar gains	144.8964	209.6485	283.9556	363.8481	395.8123	428.0424	402.7724	370.3568	324.2890	246.8620	172.0364	122.5730 (83)
Total gains	703.3030	763.3282	815.7289	861.9214	859.5251	861.1544	818.1974	794.3953	767.9179	724.4027	687.0873	665.8626 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)	21.0000 (85)											
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	27.9203	28.2785	28.4816	28.7378	28.6754	28.9184	28.8593	28.9184	28.7378	28.4816	28.4816	28.2785
alpha	2.8614	2.8852	2.8988	2.9159	2.9117	2.9279	2.9240	2.9279	2.9159	2.8988	2.8988	2.8852
util living area	0.9319	0.9157	0.8804	0.8116	0.6999	0.5367	0.4099	0.3913	0.6007	0.7901	0.8933	0.9373 (86)
MIT	19.3847	19.5396	19.8734	20.2977	20.6675	20.8922	20.9637	20.9705	20.8472	20.4874	19.9406	19.3887 (87)
Th 2	19.9451	19.9570	19.9637	19.9720	19.9700	19.9777	19.9758	19.9777	19.9720	19.9637	19.9637	19.9570 (88)
util rest of house	0.9208	0.9025	0.8613	0.7805	0.6469	0.4578	0.3106	0.2875	0.5215	0.7468	0.8733	0.9269 (89)
MIT 2	18.5124	18.6707	18.9979	19.4049	19.7355	19.9197	19.9630	19.9684	19.8855	19.5800	19.0688	18.5261 (90)
Living area fraction	18.7153	18.8729	19.2016	19.6126	19.9524	20.1460	20.1959	20.2016	20.1092	19.7911	19.2716	18.7268 (92)
Temperature adjustment	18.5653	18.7229	19.0516	19.4626	19.8024	19.9960	20.0459	20.0516	19.9592	19.6411	19.1216	-0.1500
adjusted MIT	18.5653	18.7229	19.0516	19.4626	19.8024	19.9960	20.0459	20.0516	19.9592	19.6411	19.1216	18.5768 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	634.8038	674.2187	686.3165	657.5985	547.8880	395.5312	259.9338	234.6094	399.6329	529.7604	586.4886	605.5122 (95)
Ext temp.	5.4000	5.6000	7.1000	9.5000	12.6000	15.3000	17.1000	17.4000	15.1000	12.0000	8.6000	5.6000 (96)
Heat loss rate W	1232.4949	1212.9585	1096.8183	906.1371	656.5071	424.4493	266.8078	239.6657	441.9643	701.2388	965.5873	1199.4572 (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	444.6822	362.0331	305.4133	178.9478	80.8126	0.0000	0.0000	0.0000	0.0000	127.5799	272.9511	441.8951 (98)
Space heating												2214.3151 (98)
Space heating per m2												(98) / (4) = 27.6437 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Not applicable

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2446.7570 (211)
Space heating requirement	444.6822	362.0331	305.4133	178.9478	80.8126	0.0000	0.0000	0.0000	0.0000	127.5799	272.9511	441.8951	(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)	491.3615	400.0366	337.4733	197.7323	89.2957	0.0000	0.0000	0.0000	0.0000	140.9723	301.6034	488.2818	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	165.9527	145.5434	151.1387	133.1167	128.7315	112.5647	105.7756	119.2935	120.1016	138.1635	149.0707	161.1649	(64)
Efficiency of water heater (217)m	89.6073	89.5587	89.4150	89.1067	88.5069	87.3000	87.3000	87.3000	87.3000	88.8075	89.3432	89.6221	(217)
Fuel for water heating, kWh/month	185.1999	162.5118	169.0305	149.3902	145.4479	128.9401	121.1633	136.6477	137.5734	155.5763	166.8518	179.8273	(219)
Water heating fuel used													1838.1602 (219)
Annual totals kWh/year													
Space heating fuel - main system													2446.7570 (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)													377.7688 (232)
Total delivered energy for all uses													4737.6860 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2446.7570	4.2600	104.2318 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1838.1602	4.2600	78.3056 (247)
Pumps and fans for heating	75.0000	22.5500	16.9125 (249)
Energy for lighting	377.7688	22.5500	85.1869 (250)
Additional standing charges			96.0000 (251)
Total energy cost			380.6368 (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	2446.7570	0.2160	528.4995 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1838.1602	0.2160	397.0426 (264)
Space and water heating			925.5421 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	377.7688	0.5190	196.0620 (268)
Total kg/year			1160.5291 (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	2446.7570	1.2200	2985.0435 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1838.1602	1.2200	2242.5555 (264)
Space and water heating			5227.5990 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	377.7688	3.0700	1159.7502 (268)
Primary energy kWh/year			6617.5991 (272)
Primary energy kWh/m2/year			82.6147 (273)

SAP 2012 EPC IMPROVEMENTS

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

(For testing purposes):

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

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.2	-£ 31	-186 kg (16.0%)
U Solar photovoltaic panels	+ 10.7	-£ 453	-1042 kg (106.9%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£31	2.32 kg/m ²	B 85 B 88
Solar photovoltaic panels	£453	13.00 kg/m ²	A 96 A 98
Total Savings	£483	15.32 kg/m ²	

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

Fuel prices for cost data on this page from database revision number 510 TEST (21 Dec 2022)
 Recommendation texts revision number 4.9c (22 Feb 2014)

Typical heating and lighting costs of this home (per year, South East England):

	Current	Potential	Saving
Electricity	£102	£113	-£11
Mains gas	£279	£237	£42
Space heating	£217	£217	£0
Water heating	£78	£48	£31
Lighting	£85	£85	£0
Generated (PV)	-£0	-£453	£453
Total cost of fuels	£381	-£103	£484
Total cost of uses	£380	-£103	£484
Delivered energy	59 kWh/m ²	22 kWh/m ²	37 kWh/m ²
Carbon dioxide emissions	1.2 tonnes	-0.1 tonnes	1.2 tonnes
CO2 emissions per m ²	14 kg/m ²	-1 kg/m ²	15 kg/m ²
Primary energy	83 kWh/m ²	-7 kWh/m ²	90 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	40.0510 (1b)	2.3850 (2b)	95.5216 (1b) - (3b)
First floor	40.0510 (1c)	2.6830 (2c)	107.4568 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.1020		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 202.9785 (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				2 * 10 =	20.0000 (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) =				20.0000 / (5) =	0.0985 (8)							
Pressure test				Yes								
Measured/design AP50				5.0000								
Infiltration rate					0.3485 (18)							
Number of sides sheltered				1	1 (19)							
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)							
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3224 (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	0.4111	0.4030	0.3949	0.3546	0.3466	0.3063	0.3063	0.2982	0.3224	0.3466	0.3627	0.3788 (22b)
Effective ac	0.5845	0.5812	0.5780	0.5629	0.5601	0.5469	0.5469	0.5445	0.5520	0.5601	0.5658	0.5717 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K					
Solid Door			2.1200	1.0900	2.3108		(26)					
Windows (Uw = 1.40)			10.0400	1.3258	13.3106		(27)					
Flr - Ground			40.0510	0.1603	6.4188	75.6000	3027.8556 (28a)					
Brick	90.7890	12.1650	78.6240	0.2500	19.6560	51.1900	4024.7626 (29a)					
Rf - Ins Joist	40.0510		40.0510	0.1000	4.0051	7.4000	296.3774 (30)					
Total net area of external elements Aum(A, m ²)			170.8860				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	45.7013	(33)					
Party Wall			43.5950	0.0000	0.0000	7.4000	322.6030 (32)					
Stud			79.0151			7.4000	584.7114 (32c)					
Stud			75.7626			7.4000	560.6429 (32c)					
Internal Floor			40.0510			7.4000	296.3774 (32d)					
Internal Ceiling			40.0510			7.4000	296.3774 (32e)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		9409.7076 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							117.4716 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.3552 (36)					
Total fabric heat loss						(33) + (36) =	53.0565 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 39.1503	Feb 38.9305	Mar 38.7151	Apr 37.7035	May 37.5142	Jun 36.6331	Jul 36.6331	Aug 36.4699	Sep 36.9724	Oct 37.5142	Nov 37.8971	Dec 38.2974 (38)
Heat transfer coeff	92.2068	91.9870	91.7717	90.7600	90.5707	89.6896	89.6896	89.5264	90.0290	90.5707	90.9536	91.3539 (39)
Average = Sum(39)m / 12 =												90.7591 (39)
HLP	Jan 1.1511	Feb 1.1484	Mar 1.1457	Apr 1.1331	May 1.1307	Jun 1.1197	Jul 1.1197	Aug 1.1177	Sep 1.1239	Oct 1.1307	Nov 1.1355	Dec 1.1405 (40)
HLP (average)												1.1330 (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												2.4648 (42)
Average daily hot water use (litres/day)												92.7388 (43)
Daily hot water use	102.0127	98.3032	94.5936	90.8841	87.1745	83.4650	83.4650	87.1745	90.8841	94.5936	98.3032	102.0127 (44)
Energy conte	151.2819	132.3121	136.5343	119.0339	114.2159	98.5596	91.3300	104.8025	106.0541	123.5959	134.9146	146.5085 (45)
Energy content (annual)												Total = Sum(45)m = 1459.1432 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	22.6923	19.8468	20.4801	17.8551	17.1324	14.7839	13.6995	15.7204	15.9081	18.5394	20.2372	21.9763 (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	14.6708	13.2313	14.6044	14.0828	14.5156	14.0051	14.4456	14.4910	14.0475	14.5677	14.1562	14.6564 (61)
Total heat required for water heating calculated for each month	165.9527	145.5434	151.1387	133.1167	128.7315	112.5647	105.7756	119.2935	120.1016	138.1635	149.0707	161.1649 (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												1.2429 (H8)
Utilisation factor												0.5527 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												92.7388 (H14)
Volume ratio Veff/V												0.8087 (H15)
Solar storage volume factor												0.9575 (H16)
Solar input												-843.9809 (H17)
Solar input	-24.4738	-40.8397	-69.5546	-93.2169	-115.1617	-113.2223	-111.7260	-97.6156	-76.4526	-52.2081	-29.0294	-20.4804 (63)
Solar input (sum of months) = Sum(63)m =												-843.9809 (63)
Output from w/h												
	141.4789	104.7038	81.5840	39.8998	13.5698	0.0000	0.0000	21.6779	43.6490	85.9554	120.0413	140.6846 (64)
Total per year (kWh/year) = Sum(64)m =												793.2446 (64)
Heat gains from water heating, kWh/month												
	53.9689	47.3016	49.0487	43.0995	41.6057	36.2723	33.9786	38.4696	38.7749	44.7375	48.3981	52.3782 (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	147.8876	147.8876	147.8876	147.8876	147.8876	147.8876	147.8876	147.8876	147.8876	147.8876	147.8876	147.8876 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	53.4771	47.4979	38.6279	29.2438	21.8601	18.4552	19.9415	25.9207	34.7907	44.1748	51.5585	54.9634 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.8412	331.2431	322.6703	304.4197	281.3817	259.7291	245.2639	241.8619	250.4348	268.6854	291.7234	313.3760 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.2536	52.2536	52.2536	52.2536	52.2536	52.2536	52.2536	52.2536	52.2536	52.2536	52.2536	52.2536 (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)	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917 (71)
Water heating gains (Table 5)	72.5389	70.3893	65.9257	59.8604	55.9216	50.3782	45.6702	51.7064	53.8540	60.1311	67.2196	70.4008 (72)
Total internal gains	558.4066	553.6797	531.7733	498.0733	463.7128	433.1120	415.4250	424.0385	443.6289	477.5407	515.0510	543.2895 (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	3.9300	10.6334	0.7300	0.7200	0.7700	15.2213 (74)						
South	6.1140	46.7521	0.7300	0.7200	0.7700	104.1154 (78)						
Solar gains	119.3367	199.6029	266.6337	324.8841	362.7673	360.6828	347.4361	318.4059	286.3256	218.5419	142.1897	102.6545 (83)
Total gains	677.7433	753.2826	798.4070	822.9574	826.4800	793.7948	762.8611	742.4444	729.9545	696.0826	657.2407	645.9441 (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, n _{il,m} (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	28.3472	28.4150	28.4816	28.7991	28.8593	29.1428	29.1428	29.1959	29.0330	28.8593	28.7378	28.6119
alpha	2.8898	2.8943	2.8988	2.9199	2.9240	2.9429	2.9429	2.9464	2.9355	2.9240	2.9159	2.9075
util living area	0.9455	0.9252	0.8946	0.8406	0.7522	0.6162	0.4785	0.5065	0.6830	0.8449	0.9228	0.9516 (86)
MIT	19.1861	19.4167	19.7543	20.1754	20.5520	20.8271	20.9397	20.9270	20.7505	20.2815	19.6664	19.1375 (87)
Th 2	19.9593	19.9615	19.9637	19.9739	19.9758	19.9848	19.9848	19.9864	19.9813	19.9758	19.9720	19.9679 (88)
util rest of house	0.9370	0.9137	0.8780	0.8139	0.7077	0.5442	0.3816	0.4109	0.6172	0.8139	0.9091	0.9440 (89)
MIT 2	18.3275	18.5538	18.8833	19.2937	19.6415	19.8808	19.9594	19.9538	19.8206	19.4019	18.8096	18.2863 (90)
Living area fraction									fLA = Living area / (4) =			0.2327 (91)
MIT	18.5273	18.7546	19.0859	19.4989	19.8534	20.1010	20.1875	20.1803	20.0370	19.6066	19.0090	18.4844 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.3773	18.6046	18.9359	19.3489	19.7034	19.9510	20.0375	20.0303	19.8870	19.4566	18.8590	18.3344 (93)

8. Space heating requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9206	0.8952	0.8581	0.7951	0.6944	0.5416	0.3869	0.4153	0.6104	0.7954	0.8905	0.9285	(94)
Useful gains	623.9219	674.3597	685.1272	654.3143	573.9415	429.8852	295.1661	308.3419	445.5738	553.6320	585.2994	599.7733	(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													
1298.0184	1260.6416	1141.2669	948.3414	724.8700	479.9303	308.3061	325.0037	520.9950	802.1458	1069.5217	1291.2311	(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													
501.5278	393.9814	339.3680	211.6995	112.2908	0.0000	0.0000	0.0000	0.0000	184.8943	348.6400	514.4445	(98)	
Space heating													
Space heating per m2											(98) / (4) =	32.5441	(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													2880.4932	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	501.5278	393.9814	339.3680	211.6995	112.2908	0.0000	0.0000	0.0000	0.0000	184.8943	348.6400	514.4445	(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)	554.1744	435.3386	374.9922	233.9221	124.0782	0.0000	0.0000	0.0000	0.0000	204.3031	385.2376	568.4470	(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	141.4789	104.7038	81.5840	39.8998	13.5698	0.0000	0.0000	21.6779	43.6490	85.9554	120.0413	140.6846	(64)	
Efficiency of water heater (217)m	89.7759	89.8088	89.8616	89.9770	90.1437	87.3000	87.3000	87.3000	87.3000	89.4593	89.6583	87.7932	(216)	
Fuel for water heating, kWh/month	157.5911	116.5852	90.7885	44.3445	15.0535	0.0000	0.0000	24.8315	49.9989	96.0832	133.8876	156.6762	(219)	
Water heating fuel used												885.8402	(219)	
Annual totals kWh/year														
Space heating fuel - main system													2880.4932	(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)													377.7688	(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													2541.8628	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year		
Space heating - main system 1	2880.4932	3.4800	100.2412	(240)	
Space heating - secondary	0.0000	0.0000	0.0000	(242)	
Water heating (other fuel)	885.8402	3.4800	30.8272	(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	377.7688	13.1900	49.8277	(250)	
Additional standing charges			120.0000	(251)	
Energy saving/generation technologies					
PV Unit		-1727.2394	13.1900	-227.8229	(252)
Total energy cost			89.5607	(255)	

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200	(256)
Energy cost factor (ECF)		0.3007	(257)
SAP value	$[(255) \times (256)] / [(4) + 45.0] =$	95.8055	
SAP rating (Section 12)		96	(258)
SAP band		A	

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

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

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Space heating - main system 1	2880.4932	0.2160	622.1865 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	885.8402	0.2160	191.3415 (264)
Space and water heating			813.5280 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	377.7688	0.5190	196.0620 (268)
Energy saving/generation technologies			
PV Unit			
Total kg/year	-1727.2394	0.5190	-896.4372 (269)
CO2 emissions per m2			178.0278 (272)
EI value			2.2200 (273)
EI rating			98.0931
EI band			98 (274)
			A

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	40.0510 (1b)	x 2.3850 (2b)	= 95.5216 (1b) - (3b)
First floor	40.0510 (1c)	x 2.6830 (2c)	= 107.4568 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.1020		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 202.9785 (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				2 * 10 =	20.0000 (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) =				20.0000 / (5) =	0.0985 (8)							
Pressure test				Yes								
Measured/design AP50				5.0000								
Infiltration rate					0.3485 (18)							
Number of sides sheltered				1	1 (19)							
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)							
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3224 (21)							
Wind speed	Jan 5.7000	Feb 5.2000	Mar 4.9000	Apr 4.5000	May 4.6000	Jun 4.2000	Jul 4.3000	Aug 4.2000	Sep 4.5000	Oct 4.9000	Nov 4.9000	Dec 5.2000 (22)
Wind factor	1.4250	1.3000	1.2250	1.1250	1.1500	1.0500	1.0750	1.0500	1.1250	1.2250	1.2250	1.3000 (22a)
Adj infilt rate												
Effective ac	0.4594	0.4191	0.3949	0.3627	0.3708	0.3385	0.3466	0.3385	0.3627	0.3949	0.3949	0.4191 (22b)
	0.6055	0.5878	0.5780	0.5658	0.5687	0.5573	0.5601	0.5573	0.5658	0.5780	0.5780	0.5878 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K					
Solid Door			2.1200	1.0900	2.3108		(26)					
Windows (Uw = 1.40)			10.0400	1.3258	13.3106		(27)					
Flr - Ground			40.0510	0.1603	6.4188	75.6000	3027.8556 (28a)					
Brick	90.7890	12.1650	78.6240	0.2500	19.6560	51.1900	4024.7626 (29a)					
Rf - Ins Joist	40.0510		40.0510	0.1000	4.0051	7.4000	296.3774 (30)					
Total net area of external elements Aum(A, m ²)			170.8860				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	45.7013	(33)					
Party Wall			43.5950	0.0000	0.0000	7.4000	322.6030 (32)					
Stud			79.0151			7.4000	584.7114 (32c)					
Stud			75.7626			7.4000	560.6429 (32c)					
Internal Floor			40.0510			7.4000	296.3774 (32d)					
Internal Ceiling			40.0510			7.4000	296.3774 (32e)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		9409.7076 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							117.4716 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.3552 (36)					
Total fabric heat loss					(33) + (36) =		53.0565 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 40.5601	Feb 39.3743	Mar 38.7151	Apr 37.8971	May 38.0951	Jun 37.3293	Jul 37.5142	Aug 37.3293	Sep 37.8971	Oct 38.7151	Nov 38.7151	Dec 39.3743 (38)
Heat transfer coeff	93.6166	92.4309	91.7717	90.9536	91.1516	90.3858	90.5707	90.3858	90.9536	91.7717	91.7717	92.4309 (39)
Average = Sum(39)m / 12 =												91.5162 (39)
HLP	Jan 1.1687	Feb 1.1539	Mar 1.1457	Apr 1.1355	May 1.1379	Jun 1.1284	Jul 1.1307	Aug 1.1284	Sep 1.1355	Oct 1.1457	Nov 1.1457	Dec 1.1539 (40)
HLP (average)												1.1425 (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												2.4648 (42)
Average daily hot water use (litres/day)												92.7388 (43)
Daily hot water use	102.0127	98.3032	94.5936	90.8841	87.1745	83.4650	83.4650	87.1745	90.8841	94.5936	98.3032	102.0127 (44)
Energy conte	151.2819	132.3121	136.5343	119.0339	114.2159	98.5596	91.3300	104.8025	106.0541	123.5959	134.9146	146.5085 (45)
Energy content (annual)												Total = Sum(45)m = 1459.1432 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Distribution loss (46)m = 0.15 x (45)m	22.6923	19.8468	20.4801	17.8551	17.1324	14.7839	13.6995	15.7204	15.9081	18.5394	20.2372	21.9763 (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	14.6708	13.2313	14.6044	14.0828	14.5156	14.0051	14.4456	14.4910	14.0475	14.5677	14.1562	14.6564 (61)
Total heat required for water heating calculated for each month	165.9527	145.5434	151.1387	133.1167	128.7315	112.5647	105.7756	119.2935	120.1016	138.1635	149.0707	161.1649 (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												1254.2188 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												2107.0876 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.4441 (H8)
Utilisation factor												0.4997 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												92.7388 (H14)
Volume ratio Veff/V												0.8087 (H15)
Solar storage volume factor												0.9575 (H16)
Solar input												-886.4599 (H17)
Solar input	-27.7728	-40.1592	-69.1963	-96.6491	-115.2358	-122.7106	-118.4977	-104.6922	-80.6533	-55.2070	-32.8499	-22.8361 (63)
Solar input (sum of months) = Sum(63)m =												-886.4599 (63)
Output from w/h	138.1799	105.3842	81.9424	36.4677	13.4957	0.0000	0.0000	14.6012	39.4483	82.9566	116.2209	138.3288 (64)
Total per year (kWh/year) = Sum(64)m =												767.0257 (64)
Heat gains from water heating, kWh/month	53.9689	47.3016	49.0487	43.0995	41.6057	36.2723	33.9786	38.4696	38.7749	44.7375	48.3981	52.3782 (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	147.8876	147.8876	147.8876	147.8876	147.8876	147.8876	147.8876	147.8876	147.8876	147.8876	147.8876	147.8876 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	53.4771	47.4979	38.6279	29.2438	21.8601	18.4552	19.9415	25.9207	34.7907	44.1748	51.5585	54.9634 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.8412	331.2431	322.6703	304.4197	281.3817	259.7291	245.2639	241.8619	250.4348	268.6854	291.7234	313.3760 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.2536	52.2536	52.2536	52.2536	52.2536	52.2536	52.2536	52.2536	52.2536	52.2536	52.2536	52.2536 (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)	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917	-98.5917 (71)
Water heating gains (Table 5)	72.5389	70.3893	65.9257	59.8604	55.9216	50.3782	45.6702	51.7064	53.8540	60.1311	67.2196	70.4008 (72)
Total internal gains	558.4066	553.6797	531.7733	498.0733	463.7128	433.1120	415.4250	424.0385	443.6289	477.5407	515.0510	543.2895 (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	3.9300	13.4530	0.7300	0.7200	0.7700	19.2576 (74)						
South	6.1140	56.4170	0.7300	0.7200	0.7700	125.6389 (78)						
Solar gains	144.8964	209.6485	283.9556	363.8481	395.8123	428.0424	402.7724	370.3568	324.2890	246.8620	172.0364	122.5730 (83)
Total gains	703.3030	763.3282	815.7289	861.9214	859.5251	861.1544	818.1974	794.3953	767.9179	724.4027	687.0873	665.8626 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	27.9203	28.2785	28.4816	28.7378	28.6754	28.9184	28.8593	28.9184	28.7378	28.4816	28.4816	28.2785
alpha	2.8614	2.8852	2.8988	2.9159	2.9117	2.9279	2.9240	2.9279	2.9159	2.8988	2.8988	2.8852
util living area	0.9319	0.9157	0.8804	0.8116	0.6999	0.5367	0.4099	0.3913	0.6007	0.7901	0.8933	0.9373 (86)
MIT	19.3847	19.5396	19.8734	20.2977	20.6675	20.8922	20.9637	20.9705	20.8472	20.4874	19.9406	19.3887 (87)
Th 2	19.9451	19.9570	19.9637	19.9720	19.9700	19.9777	19.9758	19.9777	19.9720	19.9637	19.9570	19.9570 (88)
util rest of house	0.9208	0.9025	0.8613	0.7805	0.6469	0.4578	0.3106	0.2875	0.5215	0.7468	0.8733	0.9269 (89)
MIT 2	18.5124	18.6707	18.9979	19.4049	19.7355	19.9197	19.9630	19.9684	19.8855	19.5800	19.0688	18.5261 (90)
Living area fraction									fLA = Living area / (4) =			0.2327 (91)
MIT	18.7153	18.8729	19.2016	19.6126	19.9524	20.1460	20.1959	20.2016	20.1092	19.7911	19.2716	18.7268 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.5653	18.7229	19.0516	19.4626	19.8024	19.9960	20.0459	20.0516	19.9592	19.6411	19.1216	18.5768 (93)

8. Space heating requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9026	0.8833	0.8414	0.7629	0.6374	0.4593	0.3177	0.2953	0.5204	0.7313	0.8536	0.9094	(94)
Useful gains	634.8038	674.2187	686.3165	657.5985	547.8880	395.5312	259.9338	234.6094	399.6329	529.7604	586.4886	605.5122	(95)
Ext temp.	5.4000	5.6000	7.1000	9.5000	12.6000	15.3000	17.1000	17.4000	15.1000	12.0000	8.6000	5.6000	(96)
Heat loss rate W	1232.4949	1212.9585	1096.8183	906.1371	656.5071	424.4493	266.8078	239.6657	441.9643	701.2388	965.5873	1199.4572	(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	444.6822	362.0331	305.4133	178.9478	80.8126	0.0000	0.0000	0.0000	0.0000	127.5799	272.9511	441.8951	(98)
Space heating												2214.3151	(98)
Space heating per m2											(98) / (4) =	27.6437	(99)

8c. Space cooling requirement

Not applicable

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													90.5000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													2446.7570	(211)
Space heating requirement	444.6822	362.0331	305.4133	178.9478	80.8126	0.0000	0.0000	0.0000	0.0000	127.5799	272.9511	441.8951	(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)	491.3615	400.0366	337.4733	197.7323	89.2957	0.0000	0.0000	0.0000	0.0000	140.9723	301.6034	488.2818	(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	138.1799	105.3842	81.9424	36.4677	13.4957	0.0000	0.0000	14.6012	39.4483	82.9566	116.2209	138.3288	(64)	
Efficiency of water heater (217)m	89.7203	89.7582	89.8036	89.9419	90.0278	87.3000	87.3000	87.3000	87.3000	89.2115	89.5201	87.3000	(216)	
Fuel for water heating, kWh/month	154.0118	117.4090	91.2462	40.5458	14.9906	0.0000	0.0000	16.7254	45.1871	92.9886	129.8266	154.1852	(219)	
Water heating fuel used												857.1163	(219)	
Annual totals kWh/year														
Space heating fuel - main system													2446.7570	(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)													377.7688	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 2.50 * 1254 * 0.80) =									-2006.7501				-2006.7501	(233)
Total delivered energy for all uses													1799.8919	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year		
Space heating - main system 1	2446.7570	4.2600	104.2318	(240)	
Space heating - secondary	0.0000	0.0000	0.0000	(242)	
Water heating (other fuel)	857.1163	4.2600	36.5132	(247)	
Pumps and fans for heating	75.0000	22.5500	16.9125	(249)	
Pump for solar water heating	50.0000	22.5500	11.2750	(249)	
Energy for lighting	377.7688	22.5500	85.1869	(250)	
Additional standing charges			96.0000	(251)	
Energy saving/generation technologies					
PV Unit		-2006.7501	22.5500	-452.5221	(252)
Total energy cost			-102.4028	(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	2446.7570	0.2160	528.4995	(261)	
Space heating - secondary	0.0000	0.0000	0.0000	(263)	
Water heating (other fuel)	857.1163	0.2160	185.1371	(264)	
Space and water heating			713.6366	(265)	
Pumps and fans	125.0000	0.5190	64.8750	(267)	
Energy for lighting	377.7688	0.5190	196.0620	(268)	
Energy saving/generation technologies					
PV Unit		-2006.7501	0.5190	-1041.5033	(269)
Total kg/year			-66.9297	(272)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2446.7570	1.2200	2985.0435 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	857.1163	1.2200	1045.6819 (264)
Space and water heating			4030.7254 (265)
Pumps and fans	125.0000	3.0700	383.7500 (267)
Energy for lighting	377.7688	3.0700	1159.7502 (268)
Energy saving/generation technologies			
PV Unit	-2006.7501	3.0700	-6160.7228 (269)
Primary energy kWh/year			-586.4973 (272)
Primary energy kWh/m2/year			-7.3219 (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	South East England
Front of dwelling faces	North
Overshading	Average or unknown
Thermal mass parameter	117.5 (calculated from construction elements)
Night ventilation	Yes
Ventilation rate during hot weather (ach)	4.62 (Calculated rate)

 Overheating Calculation

Summer ventilation heat loss coefficient	309.46 (P1)
Transmission heat loss coefficient	53.06 (37)
Summer heat loss coefficient	362.52 (P2)

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

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

[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Shading	Gains W
North	3.9300	86.6589	0.7300	0.7200	0.7650	123.2437
South	6.1140	118.3991	0.7300	0.7200	0.7650	261.9588

 total: 385.2025

Solar gains	Jun	Jul	Aug	
	405	385	354	(P3)
Internal gains	430	412	421	
Total summer gains	835	798	775	(P5)

Summer gain/loss ratio	2.30	2.20	2.14	(P6)
Summer external temperature	15.40	17.40	17.50	
Thermal mass temperature increment (TMP = 117.5)	1.18	1.18	1.18	
Threshold temperature	18.88	20.78	20.82	(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	634 - PRJ012992		Issued on Date	01/02/2023	
Assessment Reference	634	Prop Type Ref	Bellflower		
Property	Lancing Phase 2, BN15				
SAP Rating	84 B	DER	17.23	TER	18.31
Environmental	87 B	% DER<TER	5.88		
CO₂ Emissions (t/year)	1.16	DFEE	43.88	TFEE	50.15
General Requirements Compliance	Pass	% DFEE<TFEE	12.50		
Assessor Details	Chris Nicholls, , Tel: ,		Assessor ID	T850-0001	
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)	18.31	kgCO ₂ /m ²		
Dwelling Carbon Dioxide Emission Rate (DER)	17.23	kgCO ₂ /m ²		Pass
	-1.08 (-5.9%)	kgCO ₂ /m ²		

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	50.15	kWh/m ² /yr		
Dwelling Fabric Energy Efficiency (DFEE)	43.88	kWh/m ² /yr		
	-6.3 (-12.5%)	kWh/m ² /yr		Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.25 (max. 0.30)	0.25 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.16 (max. 0.25)	0.16 (max. 0.70)	Pass
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	Pass
Openings	1.35 (max. 2.00)	1.40 (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	5.00 (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 (South East England)

Slight

Pass

Based on:

Overshading

Average

Windows facing North

3.93 m², No overhang

Windows facing South

6.11 m², No overhang

Air change rate

4.62 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

5.00 (design value)

Maximum

10.0

Pass

10 Key features

Party wall U-value

0.00

W/m²K

Roof U-value

0.10

W/m²K

Door U-value

1.09

W/m²K