

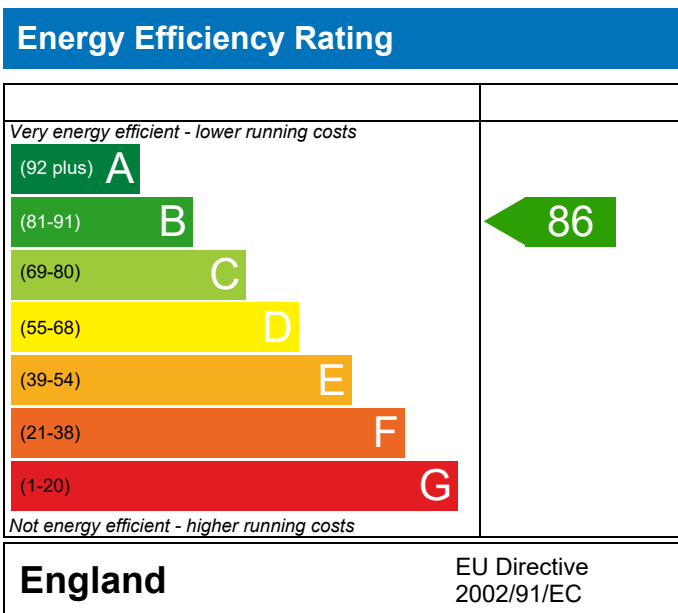
PREDICTED ENERGY ASSESSMENT

Land North of Grange Road,
SO31

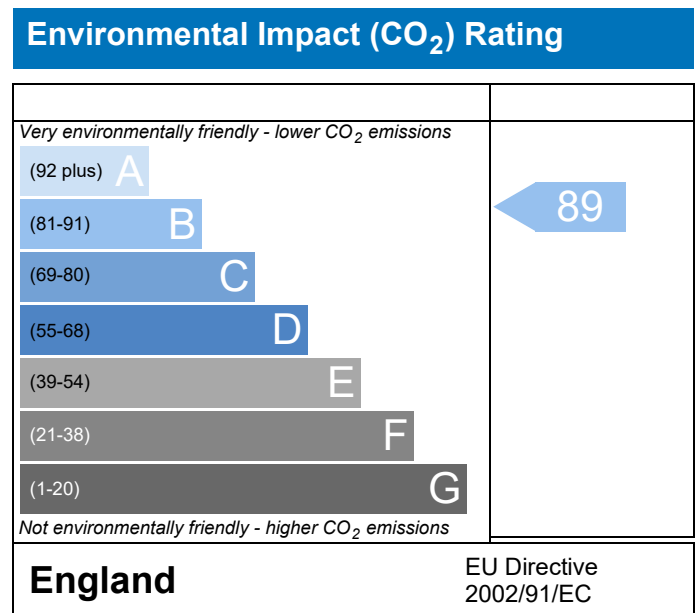
Dwelling type: House, Mid-Terrace
Date of assessment: 27/01/2023
Produced by: Scott Binstead
Total floor area: 81.82 m²

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	057 - PRJ013014			Issued on Date	27/01/2023
Assessment Reference	057	Prop Type Ref	2B		
Property	Land North of Grange Road, SO31				
SAP Rating	86 B	DER	13.79	TER	16.83
Environmental	89 B	% DER<TER	18.06		
CO ₂ Emissions (t/year)	0.94	DFEE	38.08	TFEE	42.86
General Requirements Compliance	Pass	% DFEE<TFEE	11.16		
Assessor Details	Chris Nicholls, , Tel: ,			Assessor ID	U903-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

DWELLING AS DESIGNED

Mid-Terrace House, total floor area 82 m²

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

1a TER and DER

Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 16.83 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 13.79 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 42.9 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 38.1 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	0.17 (max. 0.25)	0.17 (max. 0.70)	OK
Roof	0.08 (max. 0.20)	0.08 (max. 0.35)	OK
Openings	1.36 (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: Time and temperature zone control OK

Hot water controls:

No cylinder

Boiler interlock

Yes

OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Southern England): Slight OK

Based on:

Overshading:

Average

Windows facing East:

6.36 m², No overhang

Windows facing West:

2.72 m², No overhang

Air change rate:

4.66 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 0.08 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	40.9100 (1b)	2.3700 (2b)	96.9567 (1b) - (3b)
First floor	40.9100 (1c)	2.6200 (2c)	107.1842 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.8200		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 204.1409 (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) =	0.1470 (8)							
Pressure test				Yes								
Measured/design AP50				5.0000								
Infiltration rate				0.3970 (18)								
Number of sides sheltered				2 (19)								
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)							
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3374 (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	0.4302	0.4218	0.4133	0.3712	0.3627	0.3205	0.3205	0.3121	0.3374	0.3627	0.3796	0.3965 (22b)
Effective ac	0.5925	0.5889	0.5854	0.5689	0.5658	0.5514	0.5514	0.5487	0.5569	0.5658	0.5720	0.5786 (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			2.0900	1.2000	2.5080		(26)					
Windows (Uw = 1.40)			9.0800	1.3258	12.0379		(27)					
Flr - Ground			40.9120	0.1665	6.8116	75.6000	3092.9472 (28a)					
Wl - Brick (Timber Frame)	44.1670	11.1690	32.9980	0.2500	8.2495	7.4000	244.1852 (29a)					
RF - Ins Joist	40.9120		40.9120	0.0800	3.2730	7.4000	302.7488 (30)					
Total net area of external elements Aum(A, m ²)			125.9920				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 32.8800		(33)					
Party Wall			92.4080	0.0000	0.0000	7.4000	683.8192 (32)					
Stud			70.7018			7.4000	523.1936 (32c)					
Internal Floor			40.9120			7.4000	302.7488 (32d)					
Internal Ceiling			40.9120			7.4000	302.7488 (32e)					
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 5452.3916 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							66.6389 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.3173 (36)					
Total fabric heat loss							(33) + (36) = 42.1972 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 39.9171	Feb 39.6751	Mar 39.4378	Apr 38.3233	May 38.1148	Jun 37.1441	Jul 37.1441	Aug 36.9644	Sep 37.5180	Oct 38.1148	Nov 38.5366	Dec 38.9776 (38)
Heat transfer coeff	82.1144	81.8723	81.6350	80.5206	80.3120	79.3414	79.3414	79.1616	79.7153	80.3120	80.7339	81.1749 (39)
Average = Sum(39)m / 12 =												80.5196 (39)
HLP	Jan 1.0036	Feb 1.0006	Mar 0.9977	Apr 0.9841	May 0.9816	Jun 0.9697	Jul 0.9697	Aug 0.9675	Sep 0.9743	Oct 0.9816	Nov 0.9867	Dec 0.9921 (40)
HLP (average)												0.9841 (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												2.4965 (42)
Average daily hot water use (litres/day)												93.4916 (43)
Daily hot water use	102.8407	99.1011	95.3614	91.6217	87.8821	84.1424	84.1424	87.8821	91.6217	95.3614	99.1011	102.8407 (44)
Energy conte	152.5098	133.3861	137.6425	120.0000	115.1429	99.3596	92.0712	105.6531	106.9149	124.5990	136.0096	147.6976 (45)
Energy content (annual)												Total = Sum(45)m = 1470.9864 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Water storage loss:	22.8765	20.0079	20.6464	18.0000	17.2714	14.9039	13.8107	15.8480	16.0372	18.6899	20.4014	22.1546 (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	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	14.6744	13.2376	14.6107	14.0881	14.5205	14.0091	14.4493	14.4955	14.0522	14.5734	14.1627	14.6600 (61)
Total heat required for water heating calculated for each month	167.1843	146.6237	152.2532	134.0882	129.6634	113.3687	106.5206	120.1486	120.9671	139.1724	150.1723	162.3576 (62)
WWHRS	-54.9838	-48.3772	-49.3760	-40.6357	-37.7366	-31.1347	-26.3574	-31.9103	-32.8381	-40.5867	-47.0038	-53.1420 eq. (G10)
Total of WWHRS savings												-494.0823
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	112.2004	98.2466	102.8771	93.4524	91.9268	82.2340	80.1632	88.2382	88.1290	98.5857	103.1685	109.2156 (64)
Heat gains from water heating, kWh/month	54.3781	47.6603	49.4188	43.4220	41.9151	36.5393	34.2260	38.7535	39.0623	45.0725	48.7639	52.7745 (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	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.3323	19.8354	16.1312	12.2124	9.1289	7.7070	8.3277	10.8246	14.5288	18.4476	21.5311	22.9530 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	223.2022	225.5183	219.6817	207.2563	191.5714	176.8299	166.9816	164.6655	170.5021	182.9275	198.6124	213.3539 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824 (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)	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595 (71)
Water heating gains (Table 5)	73.0889	70.9230	66.4231	60.3084	56.3375	50.7491	46.0027	52.0881	54.2531	60.5814	67.7276	70.9334 (72)
Total internal gains	382.0707	379.7241	365.6834	343.2244	320.4852	298.7333	284.7593	291.0255	302.7313	325.4038	351.3184	370.6877 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data g or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W						
East	6.3550	19.6403	0.5000	0.7200	0.7700	31.1386 (76)						
West	2.7240	19.6403	0.5000	0.7200	0.7700	13.3472 (80)						
Solar gains	44.4858	87.0236	143.3155	209.0171	256.1583	262.2236	249.6475	214.4435	166.6818	103.2608	55.4685	36.5829 (83)
Total gains	426.5565	466.7477	508.9988	552.2415	576.6434	560.9568	534.4068	505.4690	469.4131	428.6646	406.7869	407.2706 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor for gains for living area, nil,m (see Table 9a)	0.9478	0.9341	0.9077	0.8570	0.7768	0.6592	0.5388	0.5754	0.7468	0.8781	0.9326	0.9525 (86)
MIT	18.1794	18.4234	18.8892	19.5252	20.1189	20.5910	20.8187	20.7825	20.4101	19.6479	18.8162	18.1384 (87)
Th 2	20.0803	20.0828	20.0852	20.0966	20.0987	20.1087	20.1087	20.1105	20.1048	20.0987	20.0944	20.0899 (88)
util rest of house	0.9421	0.9269	0.8969	0.8390	0.7453	0.6043	0.4566	0.4959	0.7006	0.8592	0.9239	0.9472 (89)
MIT 2	16.2652	16.6191	17.2926	18.2084	19.0429	19.6831	19.9596	19.9235	19.4564	18.3967	17.1974	16.2099 (90)
Living area fraction									fLA = Living area / (4) =			0.1678 (91)
MIT	16.5864	16.9218	17.5605	18.4294	19.2235	19.8354	20.1037	20.0677	19.6164	18.6067	17.4691	16.5335 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.4364	16.7718	17.4105	18.2794	19.0735	19.6854	19.9537	19.9177	19.4664	18.4567	17.3191	16.3835 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	387.2348	414.7479	434.4149	437.5175	404.8897	322.3057	235.5887	240.9338	310.3192	348.4690	360.1106	372.5999 (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	996.5768	971.9756	890.6830	755.2348	592.1792	403.4859	266.0902	278.4631	427.7844	630.9849	825.0246	988.9975 (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	453.3504	374.4570	339.4635	228.7565	139.3434	0.0000	0.0000	0.0000	0.0000	210.1918	334.7381	458.5998 (98)
Space heating												2538.9004 (98)
Space heating per m2												(98) / (4) = 31.0303 (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													2805.4149 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	453.3504	374.4570	339.4635	228.7565	139.3434	0.0000	0.0000	0.0000	0.0000	210.1918	334.7381	458.5998	(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)	500.9397	413.7646	375.0978	252.7696	153.9706	0.0000	0.0000	0.0000	0.0000	232.2562	369.8763	506.7401	(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	112.2004	98.2466	102.8771	93.4524	91.9268	82.2340	80.1632	88.2382	88.1290	98.5857	103.1685	109.2156	(64)
Efficiency of water heater (217)m	89.8466	89.8157	89.7350	89.5480	89.2004	87.3000	87.3000	87.3000	87.3000	89.4531	89.7252	87.3000	(216)
Fuel for water heating, kWh/month	124.8800	109.3868	114.6455	104.3602	103.0565	94.1970	91.8250	101.0747	100.9497	110.2093	114.9828	121.5311	(219)
Water heating fuel used													1291.0985 (219)
Annual totals kWh/year													
Space heating fuel - main system													2805.4149 (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)													394.3960 (232)
Total delivered energy for all uses													4565.9094 (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	2805.4149	0.2160	605.9696 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1291.0985	0.2160	278.8773 (264)
Space and water heating			884.8469 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	394.3960	0.5190	204.6915 (268)
Total CO2, kg/year			1128.4634 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			13.7900 (273)

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

	TFA	N	EF	
DER				13.7900 ZC1
Total Floor Area				81.8200
Assumed number of occupants				2.4965
CO2 emission factor in Table 12 for electricity displaced from grid				0.5190
CO2 emissions from appliances, equation (L14)				16.1654 ZC2
CO2 emissions from cooking, equation (L16)				2.1867 ZC3
Total CO2 emissions				32.1421 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				32.1421 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	40.9100 (1b)	2.3700 (2b)	96.9567 (1b) - (3b)
First floor	40.9100 (1c)	2.6200 (2c)	107.1842 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.8200		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 204.1409 (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) =	0.1470 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.3970 (18)							
Number of sides sheltered					2 (19)							
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)							
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3374 (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	0.4302	0.4218	0.4133	0.3712	0.3627	0.3205	0.3205	0.3121	0.3374	0.3627	0.3796	0.3965 (22b)
Effective ac	0.5925	0.5889	0.5854	0.5689	0.5658	0.5514	0.5514	0.5487	0.5569	0.5658	0.5720	0.5786 (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			2.0900	1.0000	2.0900		(26)					
TER Opening Type (Uw = 1.40)			9.0800	1.3258	12.0379		(27)					
Flr - Ground			40.9120	0.1300	5.3186		(28a)					
Wl - Brick (Timber Frame)	44.1670	11.1690	32.9980	0.1800	5.9396		(29a)					
RF - Ins Joist	40.9120		40.9120	0.1300	5.3186		(30)					
Total net area of external elements Aum(A, m ²)			125.9920				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 30.7046		(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)							8.3231 (36)					
Total fabric heat loss							(33) + (36) = 39.0277 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 39.9171	Feb 39.6751	Mar 39.4378	Apr 38.3233	May 38.1148	Jun 37.1441	Jul 37.1441	Aug 36.9644	Sep 37.5180	Oct 38.1148	Nov 38.5366	Dec 38.9776 (38)
Heat transfer coeff	78.9449	78.7028	78.4655	77.3511	77.1425	76.1719	76.1719	75.9921	76.5458	77.1425	77.5644	78.0054 (39)
Average = Sum(39)m / 12 =												77.3501 (39)
HLP	Jan 0.9649	Feb 0.9619	Mar 0.9590	Apr 0.9454	May 0.9428	Jun 0.9310	Jul 0.9310	Aug 0.9288	Sep 0.9355	Oct 0.9428	Nov 0.9480	Dec 0.9534 (40)
HLP (average)												0.9454 (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												2.4965 (42)
Average daily hot water use (litres/day)												93.4916 (43)
Daily hot water use	102.8407	99.1011	95.3614	91.6217	87.8821	84.1424	84.1424	87.8821	91.6217	95.3614	99.1011	102.8407 (44)
Energy conte	152.5098	133.3861	137.6425	120.0000	115.1429	99.3596	92.0712	105.6531	106.9149	124.5990	136.0096	147.6976 (45)
Energy content (annual)												Total = Sum(45)m = 1470.9864 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	22.8765	20.0079	20.6464	18.0000	17.2714	14.9039	13.8107	15.8480	16.0372	18.6899	20.4014	22.1546 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Total heat required for water heating calculated for each month	50.9589	45.6136	48.5951	45.1833	44.7837	41.4949	42.8781	44.7837	45.1833	48.5951	48.8718	50.9589	61										
Solar input	203.4687	178.9997	186.2376	165.1834	159.9266	140.8545	134.9493	150.4368	152.0983	173.1942	184.8814	198.6565	(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	203.4687	178.9997	186.2376	165.1834	159.9266	140.8545	134.9493	150.4368	152.0983	173.1942	184.8814	198.6565	(64)										
	63.4492	55.7543	57.9149	51.1958	49.4810	43.4108	41.3332	46.3256	46.8450	53.5780	57.4411	61.8492	(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	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.4705	19.9581	16.2310	12.2879	9.1854	7.7547	8.3792	10.8916	14.6187	18.5617	21.6643	23.0950	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	223.2022	225.5183	219.6817	207.2563	191.5714	176.8299	166.9816	164.6655	170.5021	182.9275	198.6124	213.3539	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	(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)	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	(71)
Water heating gains (Table 5)	85.2812	82.9677	77.8426	71.1053	66.5067	60.2927	55.5554	62.2656	65.0626	72.0134	79.7794	83.1306	(72)
Total internal gains	394.4012	391.8914	377.2027	354.0969	330.7108	308.3246	294.3635	301.2699	313.6306	336.9499	363.5033	383.0269	(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								
East	6.3550	19.6403	0.6300	0.7000	0.7700	38.1447	(76)						
West	2.7240	19.6403	0.6300	0.7000	0.7700	16.3503	(80)						
Solar gains	54.4951	106.6039	175.5614	256.0459	313.7939	321.2239	305.8182	262.6933	204.1852	126.4945	67.9489	44.8141	(83)
Total gains	448.8963	498.4953	552.7641	610.1428	644.5046	629.5484	600.1817	563.9633	517.8158	463.4444	431.4523	427.8409	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, T _{hl} (C)													21.0000	(85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
tau	71.9736	72.1949	72.4132	73.4566	73.6551	74.5937	74.5937	74.7702	74.2294	73.6551	73.2546	72.8404			
alpha	5.7982	5.8130	5.8275	5.8971	5.9103	5.9729	5.9729	5.9847	5.9486	5.9103	5.8836	5.8560			
util living area	0.9987	0.9973	0.9923	0.9705	0.8969	0.7288	0.5507	0.6059	0.8644	0.9831	0.9973	0.9990	(86)		
MIT	19.9665	20.0849	20.2993	20.5901	20.8338	20.9657	20.9945	20.9906	20.9038	20.5865	20.2279	19.9487	(87)		
Th 2	20.1127	20.1152	20.1176	20.1291	20.1312	20.1413	20.1413	20.1431	20.1374	20.1312	20.1269	20.1224	(88)		
util rest of house	0.9983	0.9964	0.9895	0.9594	0.8592	0.6488	0.4473	0.5002	0.8032	0.9748	0.9962	0.9987	(89)		
MIT 2	18.7205	18.8953	19.2092	19.6345	19.9623	20.1174	20.1391	20.1390	20.0565	19.6359	19.1135	18.7018	(90)		
Living area fraction													fLA = Living area / (4) =	0.1678	(91)
MIT	18.9296	19.0949	19.3921	19.7949	20.1086	20.2598	20.2826	20.2819	20.1987	19.7955	19.3005	18.9110	(92)		
Temperature adjustment													0.0000		
adjusted MIT	18.9296	19.0949	19.3921	19.7949	20.1086	20.2598	20.2826	20.2819	20.1987	19.7955	19.3005	18.9110	(93)		

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Useful gains	447.7495	495.9511	545.2353	582.0393	552.9994	415.8688	278.9129	292.0499	418.4999	449.7411	429.1317	427.0093	(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	1154.9302	1117.1791	1011.5890	842.7295	648.6587	431.1151	280.5105	294.9921	466.8293	709.3607	946.3231	1147.5391	(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	526.1424	417.4652	346.9672	187.6969	71.1705	0.0000	0.0000	0.0000	0.0000	193.1570	372.3778	536.0742	(98)		
Space heating													2651.0512	(98)	
Space heating per m2													(98) / (4) =	32.4010	(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													2838.3846 (211)
Space heating requirement	526.1424	417.4652	346.9672	187.6969	71.1705	0.0000	0.0000	0.0000	0.0000	193.1570	372.3778	536.0742	(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)	563.3216	446.9649	371.4852	200.9603	76.1997	0.0000	0.0000	0.0000	0.0000	206.8062	398.6915	573.9553	(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	203.4687	178.9997	186.2376	165.1834	159.9266	140.8545	134.9493	150.4368	152.0983	173.1942	184.8814	198.6565	(64)
Efficiency of water heater (217)m	87.3366	87.1119	86.5957	85.3735	83.1614	80.3000	80.3000	80.3000	80.3000	85.3263	86.7788	87.4268	(217)
Fuel for water heating, kWh/month	232.9708	205.4826	215.0657	193.4832	192.3087	175.4103	168.0564	187.3435	189.4125	202.9786	213.0491	227.2261	(219)
Water heating fuel used													2402.7876 (219)
Annual totals kWh/year													
Space heating fuel - main system													2838.3846 (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)													396.8354 (232)
Total delivered energy for all uses													5713.0076 (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	2838.3846	0.2160	613.0911 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2402.7876	0.2160	519.0021 (264)
Space and water heating			1132.0932 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	396.8354	0.5190	205.9576 (268)
Total CO2, kg/m2/year			1376.9758 (272)
Emissions per m2 for space and water heating			13.8364 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.5172 (272b)
Emissions per m2 for pumps and fans			0.4757 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.8364 * 1.00) + 2.5172 + 0.4757, rounded to 2 d.p.			16.8300 (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	40.9100 (1b)	2.3700 (2b)	96.9567 (1b) - (3b)
First floor	40.9100 (1c)	2.6200 (2c)	107.1842 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.8200		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 204.1409 (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) =	0.1470 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3970 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3374 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4302	0.4218	0.4133	0.3712	0.3627	0.3205	0.3205	0.3121	0.3374	0.3627	0.3796	0.3965 (22b)
	0.5925	0.5889	0.5854	0.5689	0.5658	0.5514	0.5514	0.5487	0.5569	0.5658	0.5720	0.5786 (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			2.0900	1.2000	2.5080		(26)
Windows (Uw = 1.40)			9.0800	1.3258	12.0379		(27)
Flr - Ground			40.9120	0.1665	6.8116	75.6000	3092.9472 (28a)
Wl - Brick (Timber Frame)	44.1670	11.1690	32.9980	0.2500	8.2495	7.4000	244.1852 (29a)
RF - Ins Joist	40.9120		40.9120	0.0800	3.2730	7.4000	302.7488 (30)
Total net area of external elements Aum(A, m ²)			125.9920				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	32.8800	(33)
Party Wall			92.4080	0.0000	0.0000	7.4000	683.8192 (32)
Stud			70.7018			7.4000	523.1936 (32c)
Internal Floor			40.9120			7.4000	302.7488 (32d)
Internal Ceiling			40.9120			7.4000	302.7488 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 5452.3916 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							66.6389 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.3173 (36)
Total fabric heat loss							(33) + (36) = 42.1972 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	39.9171	39.6751	39.4378	38.3233	38.1148	37.1441	37.1441	36.9644	37.5180	38.1148	38.5366	38.9776 (38)
Heat transfer coeff	82.1144	81.8723	81.6350	80.5206	80.3120	79.3414	79.3414	79.1616	79.7153	80.3120	80.7339	81.1749 (39)
Average = Sum(39)m / 12 =												80.5196 (39)
HLP	1.0036	1.0006	0.9977	0.9841	0.9816	0.9697	0.9697	0.9675	0.9743	0.9816	0.9867	0.9921 (40)
HLP (average)												0.9841 (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												2.4965 (42)
Average daily hot water use (litres/day)												93.4916 (43)
Daily hot water use	102.8407	99.1011	95.3614	91.6217	87.8821	84.1424	84.1424	87.8821	91.6217	95.3614	99.1011	102.8407 (44)
Energy conte	152.5098	133.3861	137.6425	120.0000	115.1429	99.3596	92.0712	105.6531	106.9149	124.5990	136.0096	147.6976 (45)
Energy content (annual)												Total = Sum(45)m = 1470.9864 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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	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	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	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Heat gains from water heating, kWh/month	32.4083	28.3445	29.2490	25.5000	24.4679	21.1139	19.5651	22.4513	22.7194	26.4773	28.9020	31.3857		(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	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.3323	19.8354	16.1312	12.2124	9.1289	7.7070	8.3277	10.8246	14.5288	18.4476	21.5311	22.9530	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	223.2022	225.5183	219.6817	207.2563	191.5714	176.8299	166.9816	164.6655	170.5021	182.9275	198.6124	213.3539	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	(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)	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	(71)
Water heating gains (Table 5)	43.5596	42.1794	39.3132	35.4167	32.8869	29.3249	26.2972	30.1765	31.5548	35.5878	40.1417	42.1851	(72)
Total internal gains	349.5414	347.9804	335.5735	315.3327	294.0346	274.3090	262.0538	266.1139	277.0329	297.4102	320.7325	338.9394	(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							
East	6.3550	19.6403	0.5000	0.7200	0.7700	31.1386 (76)							
West	2.7240	19.6403	0.5000	0.7200	0.7700	13.3472 (80)							
Solar gains	44.4858	87.0236	143.3155	209.0171	256.1583	262.2236	249.6475	214.4435	166.6818	103.2608	55.4685	36.5829	(83)
Total gains	394.0272	435.0040	478.8889	524.3497	550.1928	536.5326	511.7013	480.5574	443.7147	400.6710	376.2010	375.5223	(84)

7. Mean internal temperature (heating season)

Utilisation 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)	18.4444	18.4990	18.5527	18.8095	18.8584	19.0891	19.0891	19.1324	18.9995	18.8584	18.7598	18.6579	(85)
tau	2.2296	2.2333	2.2368	2.2540	2.2572	2.2726	2.2726	2.2755	2.2666	2.2572	2.2507	2.2439	
alpha	0.9550	0.9421	0.9169	0.8682	0.7905	0.6751	0.5549	0.5942	0.7644	0.8909	0.9415	0.9593	(86)
util living area	18.0977	18.3468	18.8222	19.4721	20.0806	20.5686	20.8069	20.7668	20.3765	19.5906	18.7422	18.0572	(87)
MIT	20.0803	20.0828	20.0852	20.0966	20.0987	20.1087	20.1087	20.1105	20.1048	20.0987	20.0944	20.0899	(88)
Th 2	0.9500	0.9355	0.9070	0.8512	0.7601	0.6207	0.4720	0.5144	0.7197	0.8735	0.9339	0.9547	(89)
util rest of house	17.3925	17.6407	18.1120	18.7566	19.3433	19.8004	19.9995	19.9725	19.6337	18.8820	18.0431	17.3588	(90)
MIT 2	17.5108	17.7592	18.2311	18.8767	19.4670	19.9293	20.1349	20.1058	19.7584	19.0009	18.1604	17.4760	(92)
Living area fraction	17.5108	17.7592	18.2311	18.8767	19.4670	19.9293	20.1349	20.1058	19.7584	19.0009	18.1604	17.4760	(91)
Temperature adjustment	17.5108	17.7592	18.2311	18.8767	19.4670	19.9293	20.1349	20.1058	19.7584	19.0009	18.1604	17.4760	(92)
adjusted MIT	17.5108	17.7592	18.2311	18.8767	19.4670	19.9293	20.1349	20.1058	19.7584	19.0009	18.1604	17.4760	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	366.7573	397.3846	422.0531	431.5873	404.5135	326.4870	242.8970	246.9745	310.4005	339.2272	343.0932	351.7720	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1084.8007	1052.8111	957.6724	803.3269	623.7864	422.8360	280.4676	293.3545	451.0584	674.6936	892.9497	1077.6765	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	534.2243	440.4466	398.5007	267.6525	163.1391	0.0000	0.0000	0.0000	0.0000	249.5870	395.8966	540.0729	(98)
Space heating												2989.5198	(98)
Space heating per m2												36.5378	(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	745.8089	587.1261	601.6283	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6828	0.7486	0.7242	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	509.2448	439.5007	435.6947	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	721.4178	690.5436	656.0608	0.0000	0.0000	0.0000	0.0000	(103)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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	152.7645	186.7760	163.9524	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling Cooled fraction												503.4929 (104)
Intermittency factor (Table 10b)												$fC = \text{cooled area} / (4) =$ 1.0000 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling												
Space cooling per m2	0.0000	0.0000	0.0000	0.0000	0.0000	38.1911	46.6940	40.9881	0.0000	0.0000	0.0000	0.0000 (107)
Energy for space heating												125.8732 (107)
Energy for space cooling												1.5384 (108)
Total												36.5378 (99)
Dwelling Fabric Energy Efficiency (DFEE)												1.5384 (108)
												38.0762 (109)
												38.1 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	40.9100 (1b)	2.3700 (2b)	96.9567 (1b) - (3b)
First floor	40.9100 (1c)	2.6200 (2c)	107.1842 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.8200		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 204.1409 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour							
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)							
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)							
Number of intermittent fans				3 * 10 =	30.0000 (7a)							
Number of passive vents				0 * 10 =	0.0000 (7b)							
Number of flueless gas fires				0 * 40 =	0.0000 (7c)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) =	0.1470 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.3970 (18)							
Number of sides sheltered					2 (19)							
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)							
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3374 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4302	0.4218	0.4133	0.3712	0.3627	0.3205	0.3205	0.3121	0.3374	0.3627	0.3796	0.3965 (22b)
	0.5925	0.5889	0.5854	0.5689	0.5658	0.5514	0.5514	0.5487	0.5569	0.5658	0.5720	0.5786 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			2.0900	1.0000	2.0900		(26)					
TER Opening Type (Uw = 1.40)			9.0800	1.3258	12.0379		(27)					
Flr - Ground			40.9120	0.1300	5.3186		(28a)					
Wl - Brick (Timber Frame)	44.1670	11.1690	32.9980	0.1800	5.9396		(29a)					
RF - Ins Joist	40.9120		40.9120	0.1300	5.3186		(30)					
Total net area of external elements Aum(A, m2)			125.9920				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 30.7046		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.3231 (36)					
Total fabric heat loss							(33) + (36) = 39.0277 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 39.9171	Feb 39.6751	Mar 39.4378	Apr 38.3233	May 38.1148	Jun 37.1441	Jul 37.1441	Aug 36.9644	Sep 37.5180	Oct 38.1148	Nov 38.5366	Dec 38.9776 (38)
Heat transfer coeff	78.9449	78.7028	78.4655	77.3511	77.1425	76.1719	76.1719	75.9921	76.5458	77.1425	77.5644	78.0054 (39)
Average = Sum(39)m / 12 =												77.3501 (39)
HLP	Jan 0.9649	Feb 0.9619	Mar 0.9590	Apr 0.9454	May 0.9428	Jun 0.9310	Jul 0.9310	Aug 0.9288	Sep 0.9355	Oct 0.9428	Nov 0.9480	Dec 0.9534 (40)
HLP (average)												0.9454 (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												2.4965 (42)
Average daily hot water use (litres/day)												93.4916 (43)
Daily hot water use	102.8407	99.1011	95.3614	91.6217	87.8821	84.1424	84.1424	87.8821	91.6217	95.3614	99.1011	102.8407 (44)
Energy conte	152.5098	133.3861	137.6425	120.0000	115.1429	99.3596	92.0712	105.6531	106.9149	124.5990	136.0096	147.6976 (45)
Energy content (annual)												Total = Sum(45)m = 1470.9864 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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)
	32.4083	28.3445	29.2490	25.5000	24.4679	21.1139	19.5651	22.4513	22.7194	26.4773	28.9020	31.3857	(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	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.4705	19.9581	16.2310	12.2879	9.1854	7.7547	8.3792	10.8916	14.6187	18.5617	21.6643	23.0950	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	223.2022	225.5183	219.6817	207.2563	191.5714	176.8299	166.9816	164.6655	170.5021	182.9275	198.6124	213.3539	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	(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)	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	(71)
Water heating gains (Table 5)	43.5596	42.1794	39.3132	35.4167	32.8869	29.3249	26.2972	30.1765	31.5548	35.5878	40.1417	42.1851	(72)
Total internal gains	349.6796	348.1031	335.6732	315.4082	294.0910	274.3567	262.1053	266.1808	277.1228	297.5243	320.8657	339.0814	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W						
East	6.3550	19.6403	0.6300		0.7000	0.7700	38.1447 (76)						
West	2.7240	19.6403	0.6300		0.7000	0.7700	16.3503 (80)						
Solar gains	54.4951	106.6039	175.5614	256.0459	313.7939	321.2239	305.8182	262.6933	204.1852	126.4945	67.9489	44.8141	(83)
Total gains	404.1746	454.7070	511.2347	571.4541	607.8849	595.5806	567.9235	528.8741	481.3080	424.0188	388.8146	383.8955	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area, nil,m (see Table 9a)													21.0000 (85)
tau	71.9736	72.1949	72.4132	73.4566	73.6551	74.5937	74.5937	74.7702	74.2294	73.6551	73.2546	72.8404	
alpha	5.7982	5.8130	5.8275	5.8971	5.9103	5.9729	5.9729	5.9847	5.9486	5.9103	5.8836	5.8560	
util living area	0.9993	0.9983	0.9948	0.9780	0.9159	0.7588	0.5795	0.6411	0.8927	0.9890	0.9984	0.9995	(86)
MIT	19.9137	20.0335	20.2518	20.5505	20.8083	20.9575	20.9928	20.9874	20.8823	20.5432	20.1778	19.8967	(87)
Th 2	20.1127	20.1152	20.1176	20.1291	20.1312	20.1413	20.1413	20.1431	20.1374	20.1312	20.1269	20.1224	(88)
util rest of house	0.9990	0.9978	0.9928	0.9693	0.8825	0.6797	0.4720	0.5317	0.8381	0.9833	0.9978	0.9993	(89)
MIT 2	19.1095	19.2312	19.4506	19.7539	19.9954	20.1206	20.1393	20.1392	20.0672	19.7515	19.3851	19.1005	(90)
Living area fraction													0.1678 (91)
MIT	19.2444	19.3658	19.5850	19.8876	20.1318	20.2610	20.2825	20.2816	20.2040	19.8844	19.5181	19.2341	(92)
Temperature adjustment													0.0000
adjusted MIT	19.2444	19.3658	19.5850	19.8876	20.1318	20.2610	20.2825	20.2816	20.2040	19.8844	19.5181	19.2341	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9987	0.9971	0.9913	0.9663	0.8826	0.6916	0.4902	0.5501	0.8431	0.9811	0.9971	0.9990	(94)
Useful gains	403.6411	453.3885	506.7848	552.1866	536.5017	411.8848	278.3860	290.9374	405.7813	415.9979	387.6976	383.5221	(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	1179.7861	1138.4998	1026.7228	849.9028	650.4490	431.2108	280.5020	294.9673	467.2359	716.2198	963.2041	1172.7379	(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	577.4519	460.3948	386.8338	214.3557	84.7768	0.0000	0.0000	0.0000	0.0000	223.3651	414.3647	587.1766	(98)
Space heating												2948.7194	(98)
Space heating per m2										(98) / (4) =		36.0391	(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	716.0156	563.6718	577.5401	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8953	0.9495	0.9300	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	641.0694	535.2073	537.1031	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	790.4983	756.3265	712.6241	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	107.5888	164.5127	130.5876	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												402.6891	(104)
Cooled fraction													1.0000 (105)

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Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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	26.8972	41.1282	32.6469	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling												100.6723 (107)
Space cooling per m2												1.2304 (108)
Energy for space heating												36.0391 (99)
Energy for space cooling												1.2304 (108)
Total												37.2695 (109)
Target Fabric Energy Efficiency (TFEE)												42.9 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	40.9100 (1b)	2.3700 (2b)	96.9567 (1b) - (3b)
First floor	40.9100 (1c)	2.6200 (2c)	107.1842 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.8200		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 204.1409 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour							
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)							
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)							
Number of intermittent fans				3 * 10 =	30.0000 (7a)							
Number of passive vents				0 * 10 =	0.0000 (7b)							
Number of flueless gas fires				0 * 40 =	0.0000 (7c)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) =	0.1470 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.3970 (18)							
Number of sides sheltered					2 (19)							
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)							
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3374 (21)							
Wind speed	Jan 4.9000	Feb 4.6000	Mar 4.5000	Apr 4.2000	May 4.2000	Jun 4.1000	Jul 4.1000	Aug 4.0000	Sep 4.0000	Oct 4.3000	Nov 4.3000	Dec 4.4000 (22)
Wind factor	1.2250	1.1500	1.1250	1.0500	1.0500	1.0250	1.0250	1.0000	1.0000	1.0750	1.0750	1.1000 (22a)
Adj infilt rate	0.4133	0.3880	0.3796	0.3543	0.3543	0.3458	0.3458	0.3374	0.3374	0.3627	0.3627	0.3712 (22b)
Effective ac	0.5854	0.5753	0.5720	0.5628	0.5628	0.5598	0.5598	0.5569	0.5569	0.5658	0.5658	0.5689 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Solid Door			2.0900	1.2000	2.5080		(26)					
Windows (Uw = 1.40)			9.0800	1.3258	12.0379		(27)					
Flr - Ground			40.9120	0.1665	6.8116	75.6000	3092.9472 (28a)					
Wl - Brick (Timber Frame)	44.1670	11.1690	32.9980	0.2500	8.2495	7.4000	244.1852 (29a)					
RF - Ins Joist	40.9120		40.9120	0.0800	3.2730	7.4000	302.7488 (30)					
Total net area of external elements Aum(A, m2)			125.9920				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 32.8800		(33)					
Party Wall			92.4080	0.0000	0.0000	7.4000	683.8192 (32)					
Stud			70.7018			7.4000	523.1936 (32c)					
Internal Floor			40.9120			7.4000	302.7488 (32d)					
Internal Ceiling			40.9120			7.4000	302.7488 (32e)					
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 5452.3916 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							66.6389 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.3173 (36)					
Total fabric heat loss							(33) + (36) = 42.1972 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 39.4378	Feb 38.7547	Mar 38.5366	Apr 37.9111	May 37.9111	Jun 37.7122	Jul 37.7122	Aug 37.5180	Sep 37.5180	Oct 38.1148	Nov 38.1148	Dec 38.3233 (38)
Heat transfer coeff	81.6350	80.9520	80.7339	80.1083	80.1083	79.9094	79.9094	79.7153	79.7153	80.3120	80.3120	80.5206 (39)
Average = Sum(39)m / 12 =												80.3276 (39)
HLP	Jan 0.9977	Feb 0.9894	Mar 0.9867	Apr 0.9791	May 0.9791	Jun 0.9766	Jul 0.9766	Aug 0.9743	Sep 0.9743	Oct 0.9816	Nov 0.9816	Dec 0.9841 (40)
HLP (average)												0.9818 (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												2.4965 (42)
Average daily hot water use (litres/day)												93.4916 (43)
Daily hot water use	102.8407	99.1011	95.3614	91.6217	87.8821	84.1424	84.1424	87.8821	91.6217	95.3614	99.1011	102.8407 (44)
Energy conte	152.5098	133.3861	137.6425	120.0000	115.1429	99.3596	92.0712	105.6531	106.9149	124.5990	136.0096	147.6976 (45)
Energy content (annual)												Total = Sum(45)m = 1470.9864 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Water storage loss:	22.8765	20.0079	20.6464	18.0000	17.2714	14.9039	13.8107	15.8480	16.0372	18.6899	20.4014	22.1546 (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	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	14.6744	13.2376	14.6107	14.0881	14.5205	14.0091	14.4493	14.4955	14.0522	14.5734	14.1627	14.6600 (61)
Total heat required for water heating calculated for each month	167.1843	146.6237	152.2532	134.0882	129.6634	113.3687	106.5206	120.1486	120.9671	139.1724	150.1723	162.3576 (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	167.1843	146.6237	152.2532	134.0882	129.6634	113.3687	106.5206	120.1486	120.9671	139.1724	150.1723	162.3576 (64)
RHI water heating demand	54.3781	47.6603	49.4188	43.4220	41.9151	36.5393	34.2260	38.7535	39.0623	45.0725	48.7639	52.7745 (65)
Heat gains from water heating, kWh/month												1643 (64)
												1643 (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	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.8308	49.5885	40.3280	30.5309	22.8222	19.2675	20.8192	27.0616	36.3220	46.1191	53.8278	57.3825 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	333.1376	336.5945	327.8832	309.3378	285.9275	263.9252	249.2263	245.7693	254.4807	273.0261	296.4364	318.4387 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754 (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)	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595 (71)
Water heating gains (Table 5)	73.0889	70.9230	66.4231	60.3084	56.3375	50.7491	46.0027	52.0881	54.2531	60.5814	67.7276	70.9334 (72)
Total internal gains	567.4625	562.5112	540.0395	505.5823	470.4924	439.3469	421.4533	430.3241	450.4610	485.1317	523.3969	552.1598 (73)

6. Solar gains

[Jan]		Area	Solar flux	g	FF	Access	Gains					
		m ²	Table 6a	Specific data	Specific data	factor	W					
			W/m ²	or Table 6b	or Table 6c	Table 6d						
East		6.3550	25.1733	0.5000	0.7200	0.7700	39.9108 (76)					
West		2.7240	25.1733	0.5000	0.7200	0.7700	17.1073 (80)					
Solar gains	57.0182	94.8824	158.5751	232.3325	267.9250	302.6183	278.5361	249.5843	194.1034	122.9158	70.8622	46.0892 (83)
Total gains	624.4806	657.3936	698.6146	737.9148	738.4174	741.9652	699.9895	679.9084	644.5644	608.0475	594.2591	598.2490 (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	18.5527	18.7093	18.7598	18.9063	18.9063	18.9534	18.9534	18.9995	18.9995	18.8584	18.8584	18.8095
alpha	2.2368	2.2473	2.2507	2.2604	2.2604	2.2636	2.2636	2.2666	2.2666	2.2572	2.2572	2.2540
util living area	0.8813	0.8649	0.8236	0.7493	0.6383	0.4750	0.3498	0.3487	0.5534	0.7396	0.8417	0.8872 (86)
MIT	18.9566	19.1278	19.5348	20.0551	20.5235	20.8372	20.9444	20.9468	20.7583	20.2662	19.5865	18.9598 (87)
Th 2	20.0852	20.0922	20.0944	20.1008	20.1008	20.1028	20.1028	20.1048	20.1048	20.0987	20.0987	20.0966 (88)
util rest of house	0.8690	0.8510	0.8049	0.7213	0.5939	0.4081	0.2635	0.2599	0.4881	0.7032	0.8226	0.8753 (89)
MIT 2	17.3818	17.6287	18.2082	18.9394	19.5726	19.9599	20.0701	20.0745	19.8778	19.2413	18.2930	17.3930 (90)
Living area fraction	17.6461	17.8802	18.4308	19.1266	19.7322	20.1071	20.2168	20.2209	20.0255	19.4133	18.5100	17.6559 (92)
Temperature adjustment												-0.1500
adjusted MIT	17.4961	17.7302	18.2808	18.9766	19.5822	19.9571	20.0668	20.0709	19.8755	19.2633	18.3600	17.5059 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.8230	0.8045	0.7586	0.6804	0.5653	0.3965	0.2599	0.2564	0.4698	0.6635	0.7760	0.8302 (94)
Ext temp.	513.9670	528.8603	529.9548	502.0461	417.4250	294.1692	181.8940	174.3180	302.8238	403.4556	461.1485	496.6707 (95)
Heat loss rate W	5.7000	6.1000	7.7000	10.1000	13.1000	15.9000	17.7000	17.8000	15.5000	12.3000	8.8000	5.8000 (96)
Month fracti	962.9746	941.4898	854.2275	711.0883	519.2755	324.2033	189.1325	181.0231	348.7973	559.2372	767.7852	942.5694 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
RHI space heating demand	334.0617	277.2871	241.2588	150.5104	75.7767	0.0000	0.0000	0.0000	0.0000	115.9015	220.7785	331.7486 (98)
												1747.3233 (98)
												1747 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	40.9100 (1b)	2.3700 (2b)	96.9567 (1b) - (3b)
First floor	40.9100 (1c)	2.6200 (2c)	107.1842 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.8200		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 204.1409 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				3 * 10 =	30.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) =	0.1470 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3970 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3374 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4302	0.4218	0.4133	0.3712	0.3627	0.3205	0.3205	0.3121	0.3374	0.3627	0.3796	0.3965 (22b)
	0.5925	0.5889	0.5854	0.5689	0.5658	0.5514	0.5514	0.5487	0.5569	0.5658	0.5720	0.5786 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Solid Door			2.0900	1.2000	2.5080		(26)
Windows (Uw = 1.40)			9.0800	1.3258	12.0379		(27)
Flr - Ground			40.9120	0.1665	6.8116	75.6000	3092.9472 (28a)
Wl - Brick (Timber Frame)	44.1670	11.1690	32.9980	0.2500	8.2495	7.4000	244.1852 (29a)
RF - Ins Joist	40.9120		40.9120	0.0800	3.2730	7.4000	302.7488 (30)
Total net area of external elements Aum(A, m2)			125.9920				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	32.8800	(33)
Party Wall			92.4080	0.0000	0.0000	7.4000	683.8192 (32)
Stud			70.7018			7.4000	523.1936 (32c)
Internal Floor			40.9120			7.4000	302.7488 (32d)
Internal Ceiling			40.9120			7.4000	302.7488 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 5452.3916 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							66.6389 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.3173 (36)
Total fabric heat loss							(33) + (36) = 42.1972 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	39.9171	39.6751	39.4378	38.3233	38.1148	37.1441	37.1441	36.9644	37.5180	38.1148	38.5366	38.9776 (38)
Heat transfer coeff	82.1144	81.8723	81.6350	80.5206	80.3120	79.3414	79.3414	79.1616	79.7153	80.3120	80.7339	81.1749 (39)
Average = Sum(39)m / 12 =												80.5196 (39)
HLP	1.0036	1.0006	0.9977	0.9841	0.9816	0.9697	0.9697	0.9675	0.9743	0.9816	0.9867	0.9921 (40)
HLP (average)												0.9841 (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												2.4965 (42)
Average daily hot water use (litres/day)												93.4916 (43)
Daily hot water use	102.8407	99.1011	95.3614	91.6217	87.8821	84.1424	84.1424	87.8821	91.6217	95.3614	99.1011	102.8407 (44)
Energy conte	152.5098	133.3861	137.6425	120.0000	115.1429	99.3596	92.0712	105.6531	106.9149	124.5990	136.0096	147.6976 (45)
Energy content (annual)												Total = Sum(45)m = 1470.9864 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Water storage loss:	22.8765	20.0079	20.6464	18.0000	17.2714	14.9039	13.8107	15.8480	16.0372	18.6899	20.4014	22.1546 (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	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	14.6744	13.2376	14.6107	14.0881	14.5205	14.0091	14.4493	14.4955	14.0522	14.5734	14.1627	14.6600 (61)
Total heat required for water heating calculated for each month	167.1843	146.6237	152.2532	134.0882	129.6634	113.3687	106.5206	120.1486	120.9671	139.1724	150.1723	162.3576 (62)
WWHRS	-54.9838	-48.3772	-49.3760	-40.6357	-37.7366	-31.1347	-26.3574	-31.9103	-32.8381	-40.5867	-47.0038	-53.1420 eq. (G10)
Total of WWHRS savings												-494.0823
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	112.2004	98.2466	102.8771	93.4524	91.9268	82.2340	80.1632	88.2382	88.1290	98.5857	103.1685	109.2156 (64)
Heat gains from water heating, kWh/month	54.3781	47.6603	49.4188	43.4220	41.9151	36.5393	34.2260	38.7535	39.0623	45.0725	48.7639	52.7745 (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	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.8308	49.5885	40.3280	30.5309	22.8222	19.2675	20.8192	27.0616	36.3220	46.1191	53.8278	57.3825 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	333.1376	336.5945	327.8832	309.3378	285.9275	263.9252	249.2263	245.7693	254.4807	273.0261	296.4364	318.4387 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754 (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)	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595 (71)
Water heating gains (Table 5)	73.0889	70.9230	66.4231	60.3084	56.3375	50.7491	46.0027	52.0881	54.2531	60.5814	67.7276	70.9334 (72)
Total internal gains	567.4625	562.5112	540.0395	505.5823	470.4924	439.3469	421.4533	430.3241	450.4610	485.1317	523.3969	552.1598 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data g or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W						
East	6.3550	19.6403	0.5000	0.7200	0.7700	31.1386 (76)						
West	2.7240	19.6403	0.5000	0.7200	0.7700	13.3472 (80)						
Solar gains	44.4858	87.0236	143.3155	209.0171	256.1583	262.2236	249.6475	214.4435	166.6818	103.2608	55.4685	36.5829 (83)
Total gains	611.9483	649.5348	683.3550	714.5993	726.6507	701.5705	671.1009	644.7677	617.1428	588.3925	578.8654	588.7427 (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)	18.4444	18.4990	18.5527	18.8095	18.8584	19.0891	19.0891	19.1324	18.9995	18.8584	18.7598	18.6579
tau	2.2296	2.2333	2.2368	2.2540	2.2572	2.2726	2.2726	2.2755	2.2666	2.2572	2.2507	2.2439
util living area	0.9011	0.8838	0.8512	0.7914	0.7025	0.5769	0.4561	0.4856	0.6531	0.8031	0.8765	0.9076 (86)
MIT	18.6085	18.8266	19.2391	19.7968	20.3032	20.6946	20.8726	20.8486	20.5653	19.9311	19.1925	18.5679 (87)
Th 2	20.0803	20.0828	20.0852	20.0966	20.0987	20.1087	20.1087	20.1105	20.1048	20.0987	20.0944	20.0899 (88)
util rest of house	0.8913	0.8723	0.8358	0.7685	0.6668	0.5212	0.3800	0.4107	0.6021	0.7770	0.8625	0.8985 (89)
MIT 2	16.8780	17.1917	17.7832	18.5784	19.2792	19.7989	20.0073	19.9849	19.6413	18.7802	17.7287	16.8245 (90)
Living area fraction	17.1684	17.4660	18.0275	18.7829	19.4510	19.9492	20.1525	20.1298	19.7964	18.9733	17.9743	17.1170 (92)
Temperature adjustment	17.0184	17.3160	17.8775	18.6329	19.3010	19.7992	20.0025	19.9798	19.6464	18.8233	17.8243	16.9670 (93)
adjusted MIT												

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.8470	0.8264	0.7887	0.7240	0.6308	0.5001	0.3703	0.3988	0.5726	0.7319	0.8165	0.8555 (94)
Ext temp.	518.3462	536.7957	538.9918	517.3585	458.3523	350.8232	248.4972	257.1426	353.4051	430.6712	472.6439	503.6610 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Month fracti	1044.3601	1016.5277	928.8019	783.6967	610.4558	412.5153	269.9580	283.3824	442.1307	660.4320	865.8153	1036.3632 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating	391.3544	322.3799	290.0187	191.7635	113.1650	0.0000	0.0000	0.0000	0.0000	170.9421	283.0834	396.3305 (98)
Space heating per m2												2159.0374 (98)
												(98) / (4) = 26.3876 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2385.6767 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	391.3544	322.3799	290.0187	191.7635	113.1650	0.0000	0.0000	0.0000	0.0000	170.9421	283.0834	396.3305	(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)	432.4358	356.2209	320.4627	211.8934	125.0442	0.0000	0.0000	0.0000	0.0000	188.8863	312.7994	437.9342	(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	112.2004	98.2466	102.8771	93.4524	91.9268	82.2340	80.1632	88.2382	88.1290	98.5857	103.1685	109.2156	(64)
Efficiency of water heater (217)m	89.7668	89.7317	89.6396	89.4260	89.0371	87.3000	87.3000	87.3000	87.3000	89.3027	89.6225	87.3000	(216)
Fuel for water heating, kWh/month	124.9910	109.4892	114.7675	104.5026	103.2454	94.1970	91.8250	101.0747	100.9497	110.3950	115.1144	121.6359	(219)
Water heating fuel used													1292.1873 (219)
Annual totals kWh/year													
Space heating fuel - main system													2385.6767 (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)													394.3960 (232)
Total delivered energy for all uses													4147.2600 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2385.6767	3.4800	83.0215 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1292.1873	3.4800	44.9681 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	394.3960	13.1900	52.0208 (250)
Additional standing charges			120.0000 (251)
Total energy cost			309.9030 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.0263 (257)
SAP value		85.6827
SAP rating (Section 12)		86 (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	2385.6767	0.2160	515.3062 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1292.1873	0.2160	279.1124 (264)
Space and water heating			794.4186 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	394.3960	0.5190	204.6915 (268)
Total kg/year			1038.0351 (272)
CO2 emissions per m2			12.6900 (273)
EI value			89.0320
EI rating			89 (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	$3.48 / 0.8879 = 3.919$, stars = 5
Water heating environmental impact	$0.216 / 0.8879 = 0.2433$, stars = 5

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	40.9100 (1b)	2.3700 (2b)	96.9567 (1b) - (3b)
First floor	40.9100 (1c)	2.6200 (2c)	107.1842 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.8200		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 204.1409 (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) =	0.1470 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3970 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3374 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.9000	4.6000	4.5000	4.2000	4.2000	4.1000	4.1000	4.0000	4.0000	4.3000	4.3000	4.4000 (22)
Wind factor	1.2250	1.1500	1.1250	1.0500	1.0500	1.0250	1.0250	1.0000	1.0000	1.0750	1.0750	1.1000 (22a)
Adj infilt rate	0.4133	0.3880	0.3796	0.3543	0.3543	0.3458	0.3458	0.3374	0.3374	0.3627	0.3627	0.3712 (22b)
Effective ac	0.5854	0.5753	0.5720	0.5628	0.5628	0.5598	0.5598	0.5569	0.5569	0.5658	0.5658	0.5689 (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			2.0900	1.2000	2.5080		(26)
Windows (Uw = 1.40)			9.0800	1.3258	12.0379		(27)
Flr - Ground			40.9120	0.1665	6.8116	75.6000	3092.9472 (28a)
Wl - Brick (Timber Frame)	44.1670	11.1690	32.9980	0.2500	8.2495	7.4000	244.1852 (29a)
RF - Ins Joist	40.9120		40.9120	0.0800	3.2730	7.4000	302.7488 (30)
Total net area of external elements Aum(A, m ²)			125.9920				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 32.8800		(33)
Party Wall			92.4080	0.0000	0.0000	7.4000	683.8192 (32)
Stud			70.7018			7.4000	523.1936 (32c)
Internal Floor			40.9120			7.4000	302.7488 (32d)
Internal Ceiling			40.9120			7.4000	302.7488 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 5452.3916 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 66.6389 (35)
 Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.3173 (36)
 Total fabric heat loss (33) + (36) = 42.1972 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	39.4378	38.7547	38.5366	37.9111	37.9111	37.7122	37.7122	37.5180	37.5180	38.1148	38.1148	38.3233 (38)
Average = Sum(39)m / 12 =	81.6350	80.9520	80.7339	80.1083	80.1083	79.9094	79.9094	79.7153	79.7153	80.3120	80.3120	80.5206 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9977	0.9894	0.9867	0.9791	0.9791	0.9766	0.9766	0.9743	0.9743	0.9816	0.9816	0.9841 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4965 (42)
 Average daily hot water use (litres/day) 93.4916 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	102.8407	99.1011	95.3614	91.6217	87.8821	84.1424	84.1424	87.8821	91.6217	95.3614	99.1011	102.8407 (44)
Energy content (annual)	152.5098	133.3861	137.6425	120.0000	115.1429	99.3596	92.0712	105.6531	106.9149	124.5990	136.0096	147.6976 (45)
Distribution loss (46)m = 0.15 x (45)m												1470.9864 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Water storage loss:	22.8765	20.0079	20.6464	18.0000	17.2714	14.9039	13.8107	15.8480	16.0372	18.6899	20.4014	22.1546 (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	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	14.6744	13.2376	14.6107	14.0881	14.5205	14.0091	14.4493	14.4955	14.0522	14.5734	14.1627	14.6600 (61)
Total heat required for water heating calculated for each month	167.1843	146.6237	152.2532	134.0882	129.6634	113.3687	106.5206	120.1486	120.9671	139.1724	150.1723	162.3576 (62)
WWHRS	-54.9838	-48.3772	-49.3760	-40.6357	-37.7366	-31.1347	-26.3574	-31.9103	-32.8381	-40.5867	-47.0038	-53.1420 eq. (G10)
Total of WWHRS savings												-494.0823
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	112.2004	98.2466	102.8771	93.4524	91.9268	82.2340	80.1632	88.2382	88.1290	98.5857	103.1685	109.2156 (64)
Heat gains from water heating, kWh/month	54.3781	47.6603	49.4188	43.4220	41.9151	36.5393	34.2260	38.7535	39.0623	45.0725	48.7639	52.7745 (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	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.8308	49.5885	40.3280	30.5309	22.8222	19.2675	20.8192	27.0616	36.3220	46.1191	53.8278	57.3825 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	333.1376	336.5945	327.8832	309.3378	285.9275	263.9252	249.2263	245.7693	254.4807	273.0261	296.4364	318.4387 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754 (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)	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595 (71)
Water heating gains (Table 5)	73.0889	70.9230	66.4231	60.3084	56.3375	50.7491	46.0027	52.0881	54.2531	60.5814	67.7276	70.9334 (72)
Total internal gains	567.4625	562.5112	540.0395	505.5823	470.4924	439.3469	421.4533	430.3241	450.4610	485.1317	523.3969	552.1598 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b g	Specific data or Table 6c FF	Access factor Table 6d	Gains W						
East	6.3550	25.1733	0.5000	0.7200	0.7700	39.9108 (76)						
West	2.7240	25.1733	0.5000	0.7200	0.7700	17.1073 (80)						
Solar gains	57.0182	94.8824	158.5751	232.3325	267.9250	302.6183	278.5361	249.5843	194.1034	122.9158	70.8622	46.0892 (83)
Total gains	624.4806	657.3936	698.6146	737.9148	738.4174	741.9652	699.9895	679.9084	644.5644	608.0475	594.2591	598.2490 (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)	18.5527	18.7093	18.7598	18.9063	18.9063	18.9534	18.9534	18.9995	18.9995	18.8584	18.8584	18.8095
alpha	2.2368	2.2473	2.2507	2.2604	2.2604	2.2636	2.2636	2.2666	2.2666	2.2572	2.2572	2.2540
util living area	0.8813	0.8649	0.8236	0.7493	0.6383	0.4750	0.3498	0.3487	0.5534	0.7396	0.8417	0.8872 (86)
MIT	18.9566	19.1278	19.5348	20.0551	20.5235	20.8372	20.9444	20.9468	20.7583	20.2662	19.5865	18.9598 (87)
Th 2	20.0852	20.0922	20.0944	20.1008	20.1008	20.1028	20.1028	20.1048	20.1048	20.0987	20.0987	20.0966 (88)
util rest of house	0.8690	0.8510	0.8049	0.7213	0.5939	0.4081	0.2635	0.2599	0.4881	0.7032	0.8226	0.8753 (89)
MIT 2	17.3818	17.6287	18.2082	18.9394	19.5726	19.9599	20.0701	20.0745	19.8778	19.2413	18.2930	17.3930 (90)
Living area fraction	17.6461	17.8802	18.4308	19.1266	19.7322	20.1071	20.2168	20.2209	20.0255	19.4133	18.5100	17.6559 (92)
Temperature adjustment												-0.1500
adjusted MIT	17.4961	17.7302	18.2808	18.9766	19.5822	19.9571	20.0668	20.0709	19.8755	19.2633	18.3600	17.5059 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	513.9670	528.8603	529.9548	502.0461	417.4250	294.1692	181.8940	174.3180	302.8238	403.4556	461.1485	496.6707 (95)
Ext temp.	5.7000	6.1000	7.7000	10.1000	13.1000	15.9000	17.7000	17.8000	15.5000	12.3000	8.8000	5.8000 (96)
Heat loss rate W	962.9746	941.4898	854.2275	711.0883	519.2755	324.2033	189.1325	181.0231	348.7973	559.2372	767.7852	942.5694 (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	334.0617	277.2871	241.2588	150.5104	75.7767	0.0000	0.0000	0.0000	0.0000	115.9015	220.7785	331.7486 (98)
Space heating per m2												1747.3233 (98)
												(98) / (4) = 21.3557 (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													1930.7440 (211)
Space heating requirement	334.0617	277.2871	241.2588	150.5104	75.7767	0.0000	0.0000	0.0000	0.0000	115.9015	220.7785	331.7486	(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)	369.1289	306.3945	266.5843	166.3099	83.7312	0.0000	0.0000	0.0000	0.0000	128.0680	243.9541	366.5730	(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	112.2004	98.2466	102.8771	93.4524	91.9268	82.2340	80.1632	88.2382	88.1290	98.5857	103.1685	109.2156	(64)
Efficiency of water heater (217)m	89.6736	89.6404	89.5191	89.2469	88.7174	87.3000	87.3000	87.3000	87.3000	89.0005	89.4557	87.3000	(216)
Fuel for water heating, kWh/month	125.1210	109.6008	114.9220	104.7123	103.6175	94.1970	91.8250	101.0747	100.9497	110.7698	115.3291	121.7759	(219)
Water heating fuel used													1293.8946 (219)
Annual totals kWh/year													
Space heating fuel - main system													1930.7440 (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)													394.3960 (232)
Total delivered energy for all uses													3694.0346 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1930.7440	3.6300	70.0860 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1293.8946	3.6300	46.9684 (247)
Pumps and fans for heating	75.0000	19.4400	14.5800 (249)
Energy for lighting	394.3960	19.4400	76.6706 (250)
Additional standing charges			95.0000 (251)
Total energy cost			303.3050 (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	1930.7440	0.2160	417.0407 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1293.8946	0.2160	279.4812 (264)
Space and water heating			696.5219 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	394.3960	0.5190	204.6915 (268)
Total kg/year			940.1385 (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	1930.7440	1.2200	2355.5077 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1293.8946	1.2200	1578.5515 (264)
Space and water heating			3934.0591 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	394.3960	3.0700	1210.7958 (268)
Primary energy kWh/year			5375.1049 (272)
Primary energy kWh/m2/year			65.6943 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 86
 Current environmental impact rating: B 89

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	SAP increase too small
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
U Solar photovoltaic panels	+ 10.5	-£ 378	-1010 kg (107.5%)

Measures omitted - SAP change or cost saving too small:

N Solar water heating	+ 0.8	-£ 17	-131 kg (13.9%)
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Recommended measures	Typical annual savings		Energy efficiency	Environmental impact
Solar photovoltaic panels	£378	12.35 kg/m ²	A 96	A 99
Total Savings	£378	12.35 kg/m²		
Potential energy efficiency rating:			A 96	
Potential environmental impact rating:				A 99

Fuel prices for cost data on this page from database revision number 495 TEST (29 Apr 2022)
 Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£91	£91	£0
Mains gas	£212	£212	£0
Space heating	£180	£180	£0
Water heating	£47	£47	£0
Lighting	£77	£77	£0
Generated (PV)	-£0	-£378	£378
Total cost of fuels	£303	-£75	£378
Total cost of uses	£304	-£74	£378
Delivered energy	45 kWh/m ²	21 kWh/m ²	24 kWh/m ²
Carbon dioxide emissions	0.9 tonnes	-0.1 tonnes	1.0 tonnes
CO2 emissions per m ²	11 kg/m ²	-1 kg/m ²	12 kg/m ²
Primary energy	66 kWh/m ²	-7 kWh/m ²	73 kWh/m ²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	40.9100 (1b)	2.3700 (2b)	96.9567 (1b) - (3b)
First floor	40.9100 (1c)	2.6200 (2c)	107.1842 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.8200		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 204.1409 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				3 * 10 =	30.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) =	0.1470 (8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate				0.3970 (18)	
Number of sides sheltered				2 (19)	
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3374 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4302	0.4218	0.4133	0.3712	0.3627	0.3205	0.3205	0.3121	0.3374	0.3627	0.3796	0.3965 (22b)
Effective ac	0.5925	0.5889	0.5854	0.5689	0.5658	0.5514	0.5514	0.5487	0.5569	0.5658	0.5720	0.5786 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Solid Door			2.0900	1.2000	2.5080		(26)
Windows (Uw = 1.40)			9.0800	1.3258	12.0379		(27)
Flr - Ground			40.9120	0.1665	6.8116	75.6000	3092.9472 (28a)
Wl - Brick (Timber Frame)	44.1670	11.1690	32.9980	0.2500	8.2495	7.4000	244.1852 (29a)
RF - Ins Joist	40.9120		40.9120	0.0800	3.2730	7.4000	302.7488 (30)
Total net area of external elements Aum(A, m2)			125.9920				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 32.8800		(33)
Party Wall			92.4080	0.0000	0.0000	7.4000	683.8192 (32)
Stud			70.7018			7.4000	523.1936 (32c)
Internal Floor			40.9120			7.4000	302.7488 (32d)
Internal Ceiling			40.9120			7.4000	302.7488 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 5452.3916 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							66.6389 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.3173 (36)
Total fabric heat loss							(33) + (36) = 42.1972 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	39.9171	39.6751	39.4378	38.3233	38.1148	37.1441	37.1441	36.9644	37.5180	38.1148	38.5366	38.9776 (38)
Heat transfer coeff	82.1144	81.8723	81.6350	80.5206	80.3120	79.3414	79.3414	79.1616	79.7153	80.3120	80.7339	81.1749 (39)
Average = Sum(39)m / 12 =												80.5196 (39)
HLP	1.0036	1.0006	0.9977	0.9841	0.9816	0.9697	0.9697	0.9675	0.9743	0.9816	0.9867	0.9921 (40)
HLP (average)												0.9841 (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												2.4965 (42)
Average daily hot water use (litres/day)												93.4916 (43)
Daily hot water use	102.8407	99.1011	95.3614	91.6217	87.8821	84.1424	84.1424	87.8821	91.6217	95.3614	99.1011	102.8407 (44)
Energy conte	152.5098	133.3861	137.6425	120.0000	115.1429	99.3596	92.0712	105.6531	106.9149	124.5990	136.0096	147.6976 (45)
Energy content (annual)												Total = Sum(45)m = 1470.9864 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Water storage loss:	22.8765	20.0079	20.6464	18.0000	17.2714	14.9039	13.8107	15.8480	16.0372	18.6899	20.4014	22.1546 (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	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	14.6744	13.2376	14.6107	14.0881	14.5205	14.0091	14.4493	14.4955	14.0522	14.5734	14.1627	14.6600 (61)
Total heat required for water heating calculated for each month	167.1843	146.6237	152.2532	134.0882	129.6634	113.3687	106.5206	120.1486	120.9671	139.1724	150.1723	162.3576 (62)
WWHRS	-54.9838	-48.3772	-49.3760	-40.6357	-37.7366	-31.1347	-26.3574	-31.9103	-32.8381	-40.5867	-47.0038	-53.1420 eq. (G10)
Total of WWHRS savings												-494.0823
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	112.2004	98.2466	102.8771	93.4524	91.9268	82.2340	80.1632	88.2382	88.1290	98.5857	103.1685	109.2156 (64)
Heat gains from water heating, kWh/month	54.3781	47.6603	49.4188	43.4220	41.9151	36.5393	34.2260	38.7535	39.0623	45.0725	48.7639	52.7745 (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	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.8308	49.5885	40.3280	30.5309	22.8222	19.2675	20.8192	27.0616	36.3220	46.1191	53.8278	57.3825 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	333.1376	336.5945	327.8832	309.3378	285.9275	263.9252	249.2263	245.7693	254.4807	273.0261	296.4364	318.4387 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754 (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)	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595 (71)
Water heating gains (Table 5)	73.0889	70.9230	66.4231	60.3084	56.3375	50.7491	46.0027	52.0881	54.2531	60.5814	67.7276	70.9334 (72)
Total internal gains	567.4625	562.5112	540.0395	505.5823	470.4924	439.3469	421.4533	430.3241	450.4610	485.1317	523.3969	552.1598 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data g or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W						
East	6.3550	19.6403	0.5000	0.7200	0.7700	31.1386 (76)						
West	2.7240	19.6403	0.5000	0.7200	0.7700	13.3472 (80)						
Solar gains	44.4858	87.0236	143.3155	209.0171	256.1583	262.2236	249.6475	214.4435	166.6818	103.2608	55.4685	36.5829 (83)
Total gains	611.9483	649.5348	683.3550	714.5993	726.6507	701.5705	671.1009	644.7677	617.1428	588.3925	578.8654	588.7427 (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)	18.4444	18.4990	18.5527	18.8095	18.8584	19.0891	19.0891	19.1324	18.9995	18.8584	18.7598	18.6579
tau	2.2296	2.2333	2.2368	2.2540	2.2572	2.2726	2.2726	2.2755	2.2666	2.2572	2.2507	2.2439
util living area	0.9011	0.8838	0.8512	0.7914	0.7025	0.5769	0.4561	0.4856	0.6531	0.8031	0.8765	0.9076 (86)
MIT	18.6085	18.8266	19.2391	19.7968	20.3032	20.6946	20.8726	20.8486	20.5653	19.9311	19.1925	18.5679 (87)
Th 2	20.0803	20.0828	20.0852	20.0966	20.0987	20.1087	20.1087	20.1105	20.1048	20.0987	20.0944	20.0899 (88)
util rest of house	0.8913	0.8723	0.8358	0.7685	0.6668	0.5212	0.3800	0.4107	0.6021	0.7770	0.8625	0.8985 (89)
MIT 2	16.8780	17.1917	17.7832	18.5784	19.2792	19.7989	20.0073	19.9849	19.6413	18.7802	17.7287	16.8245 (90)
Living area fraction	17.1684	17.4660	18.0275	18.7829	19.4510	19.9492	20.1525	20.1298	19.7964	18.9733	17.9743	17.1170 (92)
Temperature adjustment	17.0184	17.3160	17.8775	18.6329	19.3010	19.7992	20.0025	19.9798	19.6464	18.8233	17.8243	16.9670 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.8470	0.8264	0.7887	0.7240	0.6308	0.5001	0.3703	0.3988	0.5726	0.7319	0.8165	0.8555 (94)
Ext temp.	518.3462	536.7957	538.9918	517.3585	458.3523	350.8232	248.4972	257.1426	353.4051	430.6712	472.6439	503.6610 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Month fracti	1044.3601	1016.5277	928.8019	783.6967	610.4558	412.5153	269.9580	283.3824	442.1307	660.4320	865.8153	1036.3632 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating	391.3544	322.3799	290.0187	191.7635	113.1650	0.0000	0.0000	0.0000	0.0000	170.9421	283.0834	396.3305 (98)
Space heating per m2												2159.0374 (98)
												(98) / (4) = 26.3876 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 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													2385.6767 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	391.3544	322.3799	290.0187	191.7635	113.1650	0.0000	0.0000	0.0000	0.0000	170.9421	283.0834	396.3305	(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)	432.4358	356.2209	320.4627	211.8934	125.0442	0.0000	0.0000	0.0000	0.0000	188.8863	312.7994	437.9342	(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	112.2004	98.2466	102.8771	93.4524	91.9268	82.2340	80.1632	88.2382	88.1290	98.5857	103.1685	109.2156	(64)
Efficiency of water heater (217)m	89.7668	89.7317	89.6396	89.4260	89.0371	87.3000	87.3000	87.3000	87.3000	89.3027	89.6225	87.3000	(216)
Fuel for water heating, kWh/month	124.9910	109.4892	114.7675	104.5026	103.2454	94.1970	91.8250	101.0747	100.9497	110.3950	115.1144	121.6359	(219)
Water heating fuel used													1292.1873 (219)
Annual totals kWh/year													
Space heating fuel - main system													2385.6767 (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)													394.3960 (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													2420.0206 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2385.6767	3.4800	83.0215 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1292.1873	3.4800	44.9681 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	394.3960	13.1900	52.0208 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-1727.2394	13.1900	-227.8229 (252)
Total energy cost			82.0801 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.2718 (257)
SAP value		96.2080
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
Space heating - main system 1	2385.6767	0.2160	515.3062 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1292.1873	0.2160	279.1124 (264)
Space and water heating			794.4186 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	394.3960	0.5190	204.6915 (268)
Energy saving/generation technologies			
PV Unit	-1727.2394	0.5190	-896.4372 (269)
Total kg/year			141.5979 (272)
CO2 emissions per m2			1.7300 (273)
EI value			98.5039
EI rating			99 (274)
EI band			A

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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	40.9100 (1b)	2.3700 (2b)	96.9567 (1b) - (3b)
First floor	40.9100 (1c)	2.6200 (2c)	107.1842 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.8200		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 204.1409 (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) =	0.1470 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.3970 (18)							
Number of sides sheltered					2 (19)							
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)							
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3374 (21)							
Wind speed	Jan 4.9000	Feb 4.6000	Mar 4.5000	Apr 4.2000	May 4.2000	Jun 4.1000	Jul 4.1000	Aug 4.0000	Sep 4.0000	Oct 4.3000	Nov 4.3000	Dec 4.4000 (22)
Wind factor	1.2250	1.1500	1.1250	1.0500	1.0500	1.0250	1.0250	1.0000	1.0000	1.0750	1.0750	1.1000 (22a)
Adj infilt rate	0.4133	0.3880	0.3796	0.3543	0.3543	0.3458	0.3458	0.3374	0.3374	0.3627	0.3627	0.3712 (22b)
Effective ac	0.5854	0.5753	0.5720	0.5628	0.5628	0.5598	0.5598	0.5569	0.5569	0.5658	0.5658	0.5689 (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			2.0900	1.2000	2.5080		(26)					
Windows (Uw = 1.40)			9.0800	1.3258	12.0379		(27)					
Flr - Ground			40.9120	0.1665	6.8116	75.6000	3092.9472 (28a)					
Wl - Brick (Timber Frame)	44.1670	11.1690	32.9980	0.2500	8.2495	7.4000	244.1852 (29a)					
RF - Ins Joist	40.9120		40.9120	0.0800	3.2730	7.4000	302.7488 (30)					
Total net area of external elements Aum(A, m ²)			125.9920				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 32.8800		(33)					
Party Wall			92.4080	0.0000	0.0000	7.4000	683.8192 (32)					
Stud			70.7018			7.4000	523.1936 (32c)					
Internal Floor			40.9120			7.4000	302.7488 (32d)					
Internal Ceiling			40.9120			7.4000	302.7488 (32e)					
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 5452.3916 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							66.6389 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.3173 (36)					
Total fabric heat loss							(33) + (36) = 42.1972 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 39.4378	Feb 38.7547	Mar 38.5366	Apr 37.9111	May 37.9111	Jun 37.7122	Jul 37.7122	Aug 37.5180	Sep 37.5180	Oct 38.1148	Nov 38.1148	Dec 38.3233 (38)
Heat transfer coeff	81.6350	80.9520	80.7339	80.1083	80.1083	79.9094	79.9094	79.7153	79.7153	80.3120	80.3120	80.5206 (39)
Average = Sum(39)m / 12 =												80.3276 (39)
HLP	Jan 0.9977	Feb 0.9894	Mar 0.9867	Apr 0.9791	May 0.9791	Jun 0.9766	Jul 0.9766	Aug 0.9743	Sep 0.9743	Oct 0.9816	Nov 0.9816	Dec 0.9841 (40)
HLP (average)												0.9818 (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												2.4965 (42)
Average daily hot water use (litres/day)												93.4916 (43)
Daily hot water use	102.8407	99.1011	95.3614	91.6217	87.8821	84.1424	84.1424	87.8821	91.6217	95.3614	99.1011	102.8407 (44)
Energy conte	152.5098	133.3861	137.6425	120.0000	115.1429	99.3596	92.0712	105.6531	106.9149	124.5990	136.0096	147.6976 (45)
Energy content (annual)												Total = Sum(45)m = 1470.9864 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Water storage loss:	22.8765	20.0079	20.6464	18.0000	17.2714	14.9039	13.8107	15.8480	16.0372	18.6899	20.4014	22.1546 (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	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	14.6744	13.2376	14.6107	14.0881	14.5205	14.0091	14.4493	14.4955	14.0522	14.5734	14.1627	14.6600 (61)
Total heat required for water heating calculated for each month	167.1843	146.6237	152.2532	134.0882	129.6634	113.3687	106.5206	120.1486	120.9671	139.1724	150.1723	162.3576 (62)
WWHRS	-54.9838	-48.3772	-49.3760	-40.6357	-37.7366	-31.1347	-26.3574	-31.9103	-32.8381	-40.5867	-47.0038	-53.1420 eq. (G10)
Total of WWHRS savings												-494.0823
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	112.2004	98.2466	102.8771	93.4524	91.9268	82.2340	80.1632	88.2382	88.1290	98.5857	103.1685	109.2156 (64)
Heat gains from water heating, kWh/month	54.3781	47.6603	49.4188	43.4220	41.9151	36.5393	34.2260	38.7535	39.0623	45.0725	48.7639	52.7745 (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	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.8308	49.5885	40.3280	30.5309	22.8222	19.2675	20.8192	27.0616	36.3220	46.1191	53.8278	57.3825 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	333.1376	336.5945	327.8832	309.3378	285.9275	263.9252	249.2263	245.7693	254.4807	273.0261	296.4364	318.4387 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754 (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)	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595 (71)
Water heating gains (Table 5)	73.0889	70.9230	66.4231	60.3084	56.3375	50.7491	46.0027	52.0881	54.2531	60.5814	67.7276	70.9334 (72)
Total internal gains	567.4625	562.5112	540.0395	505.5823	470.4924	439.3469	421.4533	430.3241	450.4610	485.1317	523.3969	552.1598 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W						
East	6.3550	25.1733	0.5000	0.7200	0.7700	39.9108 (76)						
West	2.7240	25.1733	0.5000	0.7200	0.7700	17.1073 (80)						
Solar gains	57.0182	94.8824	158.5751	232.3325	267.9250	302.6183	278.5361	249.5843	194.1034	122.9158	70.8622	46.0892 (83)
Total gains	624.4806	657.3936	698.6146	737.9148	738.4174	741.9652	699.9895	679.9084	644.5644	608.0475	594.2591	598.2490 (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	18.5527	18.7093	18.7598	18.9063	18.9063	18.9534	18.9534	18.9995	18.9995	18.8584	18.8584	18.8095
alpha	2.2368	2.2473	2.2507	2.2604	2.2604	2.2636	2.2636	2.2666	2.2666	2.2572	2.2572	2.2540
util living area	0.8813	0.8649	0.8236	0.7493	0.6383	0.4750	0.3498	0.3487	0.5534	0.7396	0.8417	0.8872 (86)
MIT	18.9566	19.1278	19.5348	20.0551	20.5235	20.8372	20.9444	20.9468	20.7583	20.2662	19.5865	18.9598 (87)
Th 2	20.0852	20.0922	20.0944	20.1008	20.1008	20.1028	20.1028	20.1048	20.1048	20.0987	20.0987	20.0966 (88)
util rest of house	0.8690	0.8510	0.8049	0.7213	0.5939	0.4081	0.2635	0.2599	0.4881	0.7032	0.8226	0.8753 (89)
MIT 2	17.3818	17.6287	18.2082	18.9394	19.5726	19.9599	20.0701	20.0745	19.8778	19.2413	18.2930	17.3930 (90)
Living area fraction	17.6461	17.8802	18.4308	19.1266	19.7322	20.1071	20.2168	20.2209	20.0255	19.4133	18.5100	17.6559 (92)
Temperature adjustment												-0.1500
adjusted MIT	17.4961	17.7302	18.2808	18.9766	19.5822	19.9571	20.0668	20.0709	19.8755	19.2633	18.3600	17.5059 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.8230	0.8045	0.7586	0.6804	0.5653	0.3965	0.2599	0.2564	0.4698	0.6635	0.7760	0.8302 (94)
Ext temp.	513.9670	528.8603	529.9548	502.0461	417.4250	294.1692	181.8940	174.3180	302.8238	403.4556	461.1485	496.6707 (95)
Heat loss rate W	5.7000	6.1000	7.7000	10.1000	13.1000	15.9000	17.7000	17.8000	15.5000	12.3000	8.8000	5.8000 (96)
Month fracti	962.9746	941.4898	854.2275	711.0883	519.2755	324.2033	189.1325	181.0231	348.7973	559.2372	767.7852	942.5694 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating per m2	334.0617	277.2871	241.2588	150.5104	75.7767	0.0000	0.0000	0.0000	0.0000	115.9015	220.7785	331.7486 (98)
												1747.3233 (98)
												(98) / (4) = 21.3557 (99)

8c. Space cooling 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

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													1930.7440 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	334.0617	277.2871	241.2588	150.5104	75.7767	0.0000	0.0000	0.0000	0.0000	115.9015	220.7785	331.7486	(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)	369.1289	306.3945	266.5843	166.3099	83.7312	0.0000	0.0000	0.0000	0.0000	128.0680	243.9541	366.5730	(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	112.2004	98.2466	102.8771	93.4524	91.9268	82.2340	80.1632	88.2382	88.1290	98.5857	103.1685	109.2156	(64)
Efficiency of water heater (217)m	89.6736	89.6404	89.5191	89.2469	88.7174	87.3000	87.3000	87.3000	87.3000	89.0005	89.4557	87.3000	(216)
Fuel for water heating, kWh/month	125.1210	109.6008	114.9220	104.7123	103.6175	94.1970	91.8250	101.0747	100.9497	110.7698	115.3291	121.7759	(219)
Water heating fuel used													1293.8946 (219)
Annual totals kWh/year													
Space heating fuel - main system													1930.7440 (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)													394.3960 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 2.50 * 1217 * 0.80) =													-1946.4459 (233)
Total delivered energy for all uses													1747.5887 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1930.7440	3.6300	70.0860 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1293.8946	3.6300	46.9684 (247)
Pumps and fans for heating	75.0000	19.4400	14.5800 (249)
Energy for lighting	394.3960	19.4400	76.6706 (250)
Additional standing charges			95.0000 (251)
Energy saving/generation technologies			
PV Unit	-1946.4459	19.4400	-378.3891 (252)
Total energy cost			-75.0841 (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	1930.7440	0.2160	417.0407 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1293.8946	0.2160	279.4812 (264)
Space and water heating			696.5219 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	394.3960	0.5190	204.6915 (268)
Energy saving/generation technologies			
PV Unit	-1946.4459	0.5190	-1010.2054 (269)
Total kg/year			-70.0670 (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	1930.7440	1.2200	2355.5077 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1293.8946	1.2200	1578.5515 (264)
Space and water heating			3934.0591 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	394.3960	3.0700	1210.7958 (268)
Energy saving/generation technologies			
PV Unit	-1946.4459	3.0700	-5975.5890 (269)
Primary energy kWh/year			-600.4842 (272)
Primary energy kWh/m2/year			-7.3391 (273)

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 OVERHEATING ASSESSMENT FOR New Build (As Designed) 9.92

Overheating Calculation Input Data

Dwelling type	MidTerrace House
Number of storeys	2
Cross ventilation possible	Yes
SAP Region	Southern England
Front of dwelling faces	West
Overshading	Average or unknown
Thermal mass parameter	66.6 (calculated from construction elements)
Night ventilation	Yes
Ventilation rate during hot weather (ach)	4.66 (Calculated rate)

Overheating Calculation

Summer ventilation heat loss coefficient	313.93 (P1)
Transmission heat loss coefficient	42.20 (37)
Summer heat loss coefficient	356.13 (P2)

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

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

[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Shading	Gains W
East	6.3550	125.2818	0.5000	0.7200	0.7650	197.3376
West	2.7240	125.2818	0.5000	0.7200	0.7650	84.5866

total: 281.9242

	Jun	Jul	Aug	
Solar gains	303	282	248	(P3)
Internal gains	436	418	427	
Total summer gains	740	700	675	(P5)

	2.08	1.97	1.90	
Summer gain/loss ratio				(P6)
Summer external temperature	15.40	17.30	17.30	
Thermal mass temperature increment (TMP = 66.6)	1.53	1.53	1.53	
Threshold temperature	19.01	20.80	20.73	(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	057 - PRJ013014		Issued on Date	27/01/2023	
Assessment Reference	057	Prop Type Ref	2B		
Property	Land North of Grange Road, SO31				
SAP Rating	86 B	DER	13.79	TER	16.83
Environmental	89 B	% DER<TER	18.06		
CO₂ Emissions (t/year)	0.94	DFEE	38.08	TFEE	42.86
General Requirements Compliance	Pass	% DFEE<TFEE	11.16		
Assessor Details	Chris Nicholls, , Tel: ,			Assessor ID	U903-0001
Client					

SUMMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	16.83	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	13.79	kgCO ₂ /m ²	Pass
	-3.04 (-18.1%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	42.86	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	38.08	kWh/m ² /yr	
	-4.8 (-11.2%)	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	0.17 (max. 0.25)	0.17 (max. 0.70)	Pass
Roof	0.08 (max. 0.20)	0.08 (max. 0.35)	Pass
Openings	1.36 (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

Time and temperature zone control

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100

%

Minimum

75

%

Pass

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Southern England)

Slight

Pass

Based on:

Overshading

Average

Windows facing East

6.36 m², No overhang

Windows facing West

2.72 m², No overhang

Air change rate

4.66 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

0.08

W/m²K