

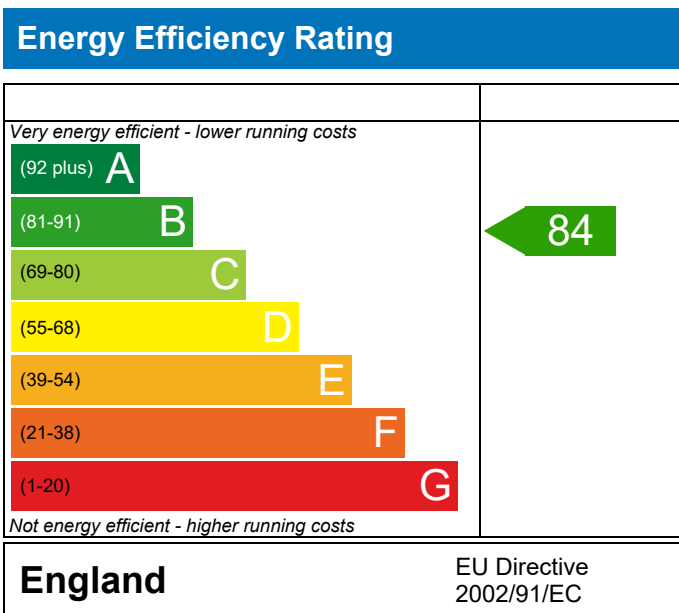
PREDICTED ENERGY ASSESSMENT

Plot 220

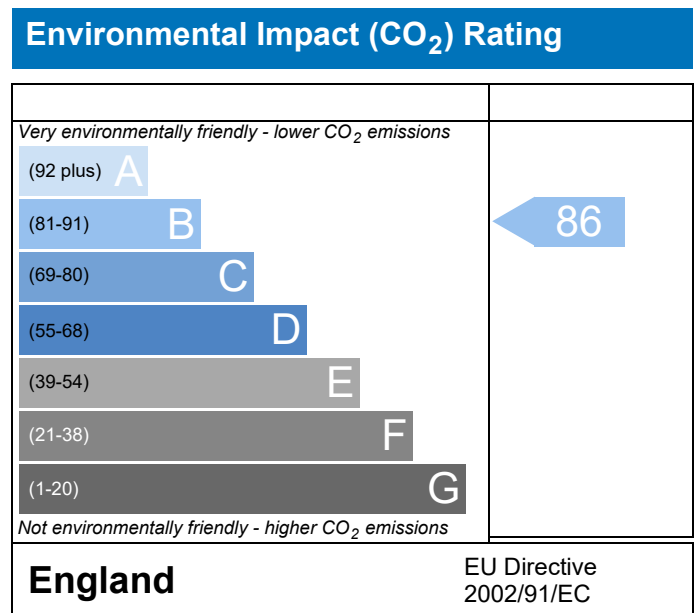
Dwelling type: House, Semi-Detached
 Date of assessment: 16/05/2022
 Produced by: Scott Binstead
 Total floor area: 85.3 m²

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	220			Issued on Date	16/05/2022
Assessment Reference	220 E	Prop Type Ref	3B5P		
Property	Plot 220				
SAP Rating	84 B	DER	17.91	TER	18.59
Environmental	86 B	% DER<TER	3.68		
CO ₂ Emissions (t/year)	1.26	DFEE	45.98	TFEE	52.29
General Requirements Compliance	Pass	% DFEE<TFEE	12.07		
Assessor Details	Chris Nicholls, , Tel: ,			Assessor ID	U903-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

DWELLING AS DESIGNED

Semi-Detached House, total floor area 85 m²

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

1a TER and DER

Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 18.59 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 17.91 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 52.3 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 46.0 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.15 (max. 0.25)	0.15 (max. 0.70)	OK
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.26 (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: 5.01 (design value)
Maximum 10.0 OK

4 Heating efficiency

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

Data from database

Ideal LOGIC COMBI ESP1 30

Combi boiler

Efficiency: 89.6% SEDBUK2009

Minimum: 88.0% OK

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls:

No cylinder

Boiler interlock

Yes

OK

7 Low energy lights

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

Minimum 75% OK

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames Valley): Slight OK

Based on:

Overshading:

Average

Windows facing North:

3.55 m², No overhang

Windows facing South:

4.68 m², No overhang

Air change rate:

3.87 ach

Blinds/curtains:

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

10 Key features

Party wall U-value 0.00 W/m²K

Roof U-value 0.11 W/m²K

Roof U-value 0.11 W/m²K

Door U-value 1.00 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	42.6500 (1b)	2.4200 (2b)	103.2130 (1b) - (3b)
First floor	42.6500 (1c)	2.7000 (2c)	115.1550 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.3000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 218.3680 (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) =	0.1374 (8)							
Pressure test					Yes							
Measured/design AP50					5.0100							
Infiltration rate					0.3879 (18)							
Number of sides sheltered					1 (19)							
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)							
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3588 (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	0.4575	0.4485	0.4395	0.3947	0.3857	0.3409	0.3409	0.3319	0.3588	0.3857	0.4036	0.4216 (22b)
Effective ac	0.6046	0.6006	0.5966	0.5779	0.5744	0.5581	0.5581	0.5551	0.5644	0.5744	0.5815	0.5889 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.40)			8.2300	1.3258	10.9110		(27)
Solid Door			4.3000	1.0000	4.3000		(26)
Flr - Ground			42.6470	0.1500	6.3971	75.6000	3224.1132 (28a)
Wl - Brick	95.1070	12.5240	82.5830	0.2400	19.8199	38.9400	3215.7820 (29a)
RF - Ins Joist	42.6470		42.6470	0.1100	4.6912	5.8200	248.2055 (30)
RF - Joist over Bay	1.5700		1.5700	0.1100	0.1727	5.8200	9.1374 (30)
Total net area of external elements Aum(A, m ²)			181.9770				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.2918		(33)
Party Wall			42.8730	0.0000	0.0000	54.0300	2316.4282 (32)
Ground Floor Stud			79.6720			5.8200	463.6912 (32c)
1st Floor Stud			100.1106			5.8200	582.6437 (32c)
Internal Floor			42.6400			18.0000	767.5200 (32d)
Internal Ceiling			42.6400			5.8200	248.1648 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 11075.6861 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							129.8439 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.9713 (36)
Total fabric heat loss							(33) + (36) = 56.2632 (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	43.5708	43.2780	42.9910	41.6430	41.3908	40.2168	40.2168	39.9994	40.6690	41.3908	41.9010	42.4345 (38)
Average = Sum(39)m / 12 =	99.8340	99.5412	99.2542	97.9062	97.6540	96.4799	96.4799	96.2625	96.9322	97.6540	98.1642	98.6976 (39)
HLP	1.1704	1.1670	1.1636	1.1478	1.1448	1.1311	1.1311	1.1285	1.1364	1.1448	1.1508	1.1571 (40)
HLP (average)												1.1478 (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												2.5558 (42)
Average daily hot water use (litres/day)												94.8997 (43)
Daily hot water use	104.3896	100.5937	96.7977	93.0017	89.2057	85.4097	85.4097	89.2057	93.0017	96.7977	100.5937	104.3896 (44)
Energy conte	154.8068	135.3950	139.7155	121.8074	116.8771	100.8561	93.4580	107.2444	108.5252	126.4757	138.0581	149.9221 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy content (annual)													Total = Sum(45)m =	1493.1414 (45)
Distribution loss (46)m = 0.15 x (45)m														
	23.2210	20.3093	20.9573	18.2711	17.5316	15.1284	14.0187	16.0867	16.2788	18.9714	20.7087	22.4883	(46)	
Water storage loss:														
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)	
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)	
Combi loss	14.6813	13.2473	14.6226	14.0981	14.5297	14.0167	14.4564	14.5039	14.0611	14.5842	14.1725	14.6667	(61)	
Total heat required for water heating calculated for each month	169.4882	148.6423	154.3382	135.9056	131.4068	114.8728	107.9143	121.7483	122.5863	141.0599	152.2306	164.5888	(62)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)	
Solar input (sum of months) = Sum(63)m =	0.0000 (63)													
Output from w/h	169.4882	148.6423	154.3382	135.9056	131.4068	114.8728	107.9143	121.7483	122.5863	141.0599	152.2306	164.5888	(64)	
Total per year (kWh/year) = Sum(64)m =	1664.7819 (64)													
Heat gains from water heating, kWh/month	55.1436	48.3307	50.1111	44.0255	42.4941	37.0388	34.6889	39.2847	39.5999	45.6992	49.4474	53.5158	(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	127.7888	127.7888	127.7888	127.7888	127.7888	127.7888	127.7888	127.7888	127.7888	127.7888	127.7888	127.7888	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.7330	21.0794	17.1429	12.9783	9.7014	8.1904	8.8500	11.5035	15.4400	19.6047	22.8815	24.3926	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	230.1606	232.5490	226.5304	213.7176	197.5438	182.3426	172.1873	169.7990	175.8176	188.6303	204.8042	220.0053	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7789	35.7789	35.7789	35.7789	35.7789	35.7789	35.7789	35.7789	35.7789	35.7789	35.7789	35.7789	(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)	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	(71)
Water heating gains (Table 5)	74.1177	71.9206	67.3536	61.1465	57.1157	51.4428	46.6248	52.8021	54.9999	61.4237	68.6770	71.9298	(72)
Total internal gains	392.3480	389.8857	375.3636	352.1791	328.6975	306.3124	291.9988	298.4412	310.5941	333.9953	360.6994	380.6644	(73)

6. Solar gains

[Jan]		Area m ²	Solar flux Table 6a W/m ²	Specific data g or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W						
North		3.5470	10.6334	0.7600	0.7200	0.7700	14.3025 (74)						
South		4.6810	46.7521	0.7600	0.7200	0.7700	82.9887 (78)						
Solar gains	97.2912	163.2469	219.5755	270.2778	304.4022	303.8160	292.1740	265.8859	236.6973	179.1322	116.0139	83.6331	(83)
Total gains	489.6392	553.1326	594.9392	622.4569	633.0998	610.1285	584.1728	564.3271	547.2913	513.1275	476.7132	464.2975	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	30.8170	30.9076	30.9970	31.4237	31.5049	31.8883	31.8883	31.9603	31.7395	31.5049	31.3412	31.1718	
alpha	3.0545	3.0605	3.0665	3.0949	3.1003	3.1259	3.1259	3.1307	3.1160	3.1003	3.0894	3.0781	
util living area	0.9831	0.9744	0.9598	0.9302	0.8719	0.7621	0.6267	0.6597	0.8269	0.9366	0.9744	0.9856	(86)
MIT	18.9069	19.1207	19.4646	19.9239	20.3665	20.7278	20.8957	20.8740	20.6144	20.0485	19.4023	18.8727	(87)
Th 2	19.9438	19.9465	19.9492	19.9620	19.9644	19.9755	19.9755	19.9776	19.9712	19.9644	19.9596	19.9545	(88)
util rest of house	0.9800	0.9696	0.9517	0.9146	0.8389	0.6930	0.5139	0.5520	0.7716	0.9193	0.9687	0.9829	(89)
MIT 2	18.0340	18.2477	18.5897	19.0491	19.4737	19.8045	19.9300	19.9189	19.7095	19.1770	18.5384	18.0078	(90)
Living area fraction	fLA = Living area / (4) =												0.2243 (91)
MIT	18.2297	18.4435	18.7859	19.2453	19.6739	20.0115	20.1466	20.1331	19.9125	19.3724	18.7321	18.2018	(92)
Temperature adjustment													-0.1500
adjusted MIT	18.0797	18.2935	18.6359	19.0953	19.5239	19.8615	19.9966	19.9831	19.7625	19.2224	18.5821	18.0518	(93)

8. Space heating requirement

Utilisation	0.9721	0.9592	0.9383	0.8980	0.8219	0.6841	0.5164	0.5527	0.7581	0.9032	0.9583	0.9759	(94)
Useful gains	475.9906	530.5839	558.2380	558.9495	520.3707	417.3834	301.6935	311.8818	414.9211	463.4471	456.8536	453.1224	(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	1375.6873	1333.2068	1204.5396	998.1830	764.0367	507.6310	327.7035	344.9148	548.8742	842.0158	1127.1322	1367.1373	(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	669.3744	539.3626	480.8484	316.2481	181.2874	0.0000	0.0000	0.0000	0.0000	281.6551	482.6006	680.0270	(98)
Space heating	3631.4037 (98)												
Space heating per m ²	(98) / (4) = 42.5721 (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

	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													4012.6008 (211)
Space heating requirement	669.3744	539.3626	480.8484	316.2481	181.2874	0.0000	0.0000	0.0000	0.0000	281.6551	482.6006	680.0270	(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)	739.6402	595.9808	531.3242	349.4455	200.3176	0.0000	0.0000	0.0000	0.0000	311.2211	533.2603	751.4111	(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	169.4882	148.6423	154.3382	135.9056	131.4068	114.8728	107.9143	121.7483	122.5863	141.0599	152.2306	164.5888	(64)
Efficiency of water heater (217)m	89.8347	89.7889	89.7011	89.5138	89.1271	87.3000	87.3000	87.3000	87.3000	89.4064	89.7115	87.3000	(216)
Fuel for water heating, kWh/month	188.6667	165.5463	172.0583	151.8264	147.4376	131.5839	123.6132	139.4597	140.4196	157.7738	169.6891	183.1652	(219)
Water heating fuel used													1871.2398 (219)
Annual totals kWh/year													
Space heating fuel - main system													4012.6008 (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)													419.1320 (232)
Total delivered energy for all uses													6377.9726 (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	4012.6008	0.2160	866.7218	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1871.2398	0.2160	404.1878	(264)
Space and water heating			1270.9096	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	419.1320	0.5190	217.5295	(268)
Total CO2, kg/year			1527.3641	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			17.9100	(273)

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

DER			17.9100	ZC1
Total Floor Area		TFA	85.3000	
Assumed number of occupants		N	2.5558	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			15.9893	ZC2
CO2 emissions from cooking, equation (L16)			2.1142	ZC3
Total CO2 emissions			36.0134	ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000	ZC5
Additional allowable electricity generation, kWh/m ² /year			0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000	ZC7
Net CO2 emissions			36.0134	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	42.6500 (1b)	2.4200 (2b)	103.2130 (1b) - (3b)
First floor	42.6500 (1c)	2.7000 (2c)	115.1550 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.3000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 218.3680 (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) =	0.1374 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.3874 (18)							
Number of sides sheltered					1 (19)							
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)							
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3583 (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	0.4569	0.4479	0.4390	0.3942	0.3852	0.3404	0.3404	0.3315	0.3583	0.3852	0.4031	0.4210 (22b)
Effective ac	0.6044	0.6003	0.5963	0.5777	0.5742	0.5579	0.5579	0.5549	0.5642	0.5742	0.5813	0.5886 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K					
TER Opaque door			4.3000	1.0000	4.3000		(26)					
TER Opening Type (Uw = 1.40)			8.2300	1.3258	10.9110		(27)					
Flr - Ground			42.6470	0.1300	5.5441		(28a)					
Wl - Brick	95.1070	12.5240	82.5830	0.1800	14.8649		(29a)					
RF - Ins Joist	42.6470		42.6470	0.1300	5.5441		(30)					
RF - Joist over Bay	1.5700		1.5700	0.1300	0.2041		(30)					
Total net area of external elements Aum(A, m ²)			181.9770				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	41.3682	(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)							9.2162 (36)					
Total fabric heat loss							(33) + (36) = 50.5844 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 43.5514	Feb 43.2594	Mar 42.9731	Apr 41.6286	May 41.3770	Jun 40.2060	Jul 40.2060	Aug 39.9891	Sep 40.6571	Oct 41.3770	Nov 41.8859	Dec 42.4180 (38)
Heat transfer coeff	94.1358	93.8438	93.5576	92.2130	91.9615	90.7904	90.7904	90.5736	91.2415	91.9615	92.4704	93.0024 (39)
Average = Sum(39)m / 12 =												92.2118 (39)
HLP	Jan 1.1036	Feb 1.1002	Mar 1.0968	Apr 1.0810	May 1.0781	Jun 1.0644	Jul 1.0644	Aug 1.0618	Sep 1.0697	Oct 1.0781	Nov 1.0841	Dec 1.0903 (40)
HLP (average)												1.0810 (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												2.5558 (42)
Average daily hot water use (litres/day)												94.8997 (43)
Daily hot water use	104.3896	100.5937	96.7977	93.0017	89.2057	85.4097	85.4097	89.2057	93.0017	96.7977	100.5937	104.3896 (44)
Energy conte	154.8068	135.3950	139.7155	121.8074	116.8771	100.8561	93.4580	107.2444	108.5252	126.4757	138.0581	149.9221 (45)
Energy content (annual)												Total = Sum(45)m = 1493.1414 (45)
Distribution loss (46)m = 0.15 x (45)m	23.2210	20.3093	20.9573	18.2711	17.5316	15.1284	14.0187	16.0867	16.2788	18.9714	20.7087	22.4883 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)	
Combi loss	50.9589	46.0274	49.3270	45.8638	45.4582	42.1199	43.5239	45.4582	45.8638	49.3270	49.3151	50.9589	50.9589	50.9589	50.9589	50.9589	50.9589	50.9589	50.9589	50.9589	50.9589	50.9589	50.9589	(61)
Total heat required for water heating calculated for each month	205.7657	181.4224	189.0426	167.6712	162.3353	142.9759	136.9818	152.7026	154.3891	175.8027	187.3732	200.8810	200.8810	200.8810	200.8810	200.8810	200.8810	200.8810	200.8810	200.8810	200.8810	200.8810	200.8810	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Output from w/h	205.7657	181.4224	189.0426	167.6712	162.3353	142.9759	136.9818	152.7026	154.3891	175.8027	187.3732	200.8810	200.8810	200.8810	200.8810	200.8810	200.8810	200.8810	200.8810	200.8810	200.8810	200.8810	200.8810	(64)
Heat gains from water heating, kWh/month	64.2130	56.5257	58.7872	51.9669	50.2262	44.0646	41.9557	47.0233	47.5506	54.3849	58.2331	62.5888	62.5888	62.5888	62.5888	62.5888	62.5888	62.5888	62.5888	62.5888	62.5888	62.5888	62.5888	(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	127.7888	127.7888	127.7888	127.7888	127.7888	127.7888	127.7888	127.7888	127.7888	127.7888	127.7888	127.7888	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.8726	21.2035	17.2438	13.0547	9.7585	8.2386	8.9021	11.5712	15.5309	19.7200	23.0162	24.5361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	230.1606	232.5490	226.5304	213.7176	197.5438	182.3426	172.1873	169.7990	175.8176	188.6303	204.8042	220.0053	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7789	35.7789	35.7789	35.7789	35.7789	35.7789	35.7789	35.7789	35.7789	35.7789	35.7789	35.7789	(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)	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	(71)
Water heating gains (Table 5)	86.3078	84.1156	79.0150	72.1763	67.5083	61.2008	56.3921	63.2034	66.0425	73.0980	80.8793	84.1248	(72)
Total internal gains	404.6777	402.2047	387.1259	363.2852	339.1473	316.1187	301.8181	308.9102	321.7276	345.7850	373.0363	393.0029	(73)

6. Solar gains

[Jan]		Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W				
North		3.5470	10.6334	0.6300		0.7000	0.7700	11.5267	(74)				
South		4.6810	46.7521	0.6300		0.7000	0.7700	66.8823	(78)				
Solar gains	78.4090	131.5641	176.9606	217.8225	245.3242	244.8517	235.4692	214.2830	190.7593	144.3664	93.4980	67.4017	(83)
Total gains	483.0867	533.7688	564.0865	581.1078	584.4714	560.9704	537.2873	523.1933	512.4869	490.1514	466.5343	460.4046	(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	62.9262	63.1220	63.3152	64.2383	64.4141	65.2449	65.2449	65.4011	64.9223	64.4141	64.0596	63.6931		
alpha	5.1951	5.2081	5.2210	5.2826	5.2943	5.3497	5.3497	5.3601	5.3282	5.2943	5.2706	5.2462		
util living area	0.9985	0.9971	0.9940	0.9845	0.9536	0.8569	0.6974	0.7338	0.9147	0.9856	0.9969	0.9988	(86)	
MIT	19.7900	19.9126	20.1151	20.3938	20.6677	20.8878	20.9723	20.9634	20.8203	20.4720	20.0859	19.7727	(87)	
Th 2	19.9979	20.0007	20.0034	20.0163	20.0188	20.0300	20.0300	20.0321	20.0257	20.0188	20.0139	20.0088	(88)	
util rest of house	0.9980	0.9961	0.9917	0.9778	0.9305	0.7835	0.5660	0.6083	0.8636	0.9781	0.9957	0.9984	(89)	
MIT 2	18.3787	18.5598	18.8572	19.2702	19.6574	19.9424	20.0181	20.0146	19.8652	19.3868	18.8230	18.3612	(90)	
Living area fraction										fLA = Living area / (4) =		0.2243	(91)	
MIT	18.6952	18.8632	19.1393	19.5222	19.8839	20.1544	20.2321	20.2274	20.0794	19.6302	19.1062	18.6778	(92)	
Temperature adjustment												0.0000		
adjusted MIT	18.6952	18.8632	19.1393	19.5222	19.8839	20.1544	20.2321	20.2274	20.0794	19.6302	19.1062	18.6778	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9970	0.9945	0.9889	0.9732	0.9264	0.7944	0.5955	0.6360	0.8671	0.9739	0.9940	0.9976	(94)
Useful gains	481.6205	530.8147	557.8367	565.5337	541.4777	445.6554	319.9650	332.7644	444.3674	477.3683	463.7191	459.3159	(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	1355.1037	1310.3619	1182.5027	979.5043	752.6077	504.2895	329.7578	346.6573	545.5684	830.4288	1110.2197	1346.4679	(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	649.8715	523.8557	464.7515	298.0589	157.0807	0.0000	0.0000	0.0000	0.0000	262.6770	465.4804	660.0411	(98)
Space heating												3481.8168	(98)
Space heating per m2										(98) / (4) =		40.8185	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3727.8553 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	649.8715	523.8557	464.7515	298.0589	157.0807	0.0000	0.0000	0.0000	0.0000	262.6770	465.4804	660.0411	(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)	695.7939	560.8734	497.5926	319.1208	168.1806	0.0000	0.0000	0.0000	0.0000	281.2388	498.3731	706.6821	(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	205.7657	181.4224	189.0426	167.6712	162.3353	142.9759	136.9818	152.7026	154.3891	175.8027	187.3732	200.8810	(64)
Efficiency of water heater (217)m	87.7459	87.5668	87.2277	86.4838	84.9685	80.3000	80.3000	80.3000	80.3000	86.0601	87.2503	80.3000	(216)
Fuel for water heating, kWh/month	234.5018	207.1817	216.7232	193.8759	191.0536	178.0522	170.5876	190.1652	192.2653	204.2791	214.7535	228.7351	(219)
Water heating fuel used													2422.1741 (219)
Annual totals kWh/year													
Space heating fuel - main system													3727.8553 (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)													421.5982 (232)
Total delivered energy for all uses													6646.6276 (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	3727.8553	0.2160	805.2167 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2422.1741	0.2160	523.1896 (264)
Space and water heating			1328.4063 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	421.5982	0.5190	218.8095 (268)
Total CO2, kg/m2/year			1586.1408 (272)
Emissions per m2 for space and water heating			15.5733 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.5652 (272b)
Emissions per m2 for pumps and fans			0.4563 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.5733 * 1.00) + 2.5652 + 0.4563, rounded to 2 d.p.			18.5900 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	42.6500 (1b)	2.4200 (2b)	103.2130 (1b) - (3b)
First floor	42.6500 (1c)	2.7000 (2c)	115.1550 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.3000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 218.3680 (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) =	0.1374 (8)							
Pressure test					Yes							
Measured/design AP50					5.0100							
Infiltration rate					0.3879 (18)							
Number of sides sheltered					1 (19)							
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)							
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3588 (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	0.4575	0.4485	0.4395	0.3947	0.3857	0.3409	0.3409	0.3319	0.3588	0.3857	0.4036	0.4216 (22b)
Effective ac	0.6046	0.6006	0.5966	0.5779	0.5744	0.5581	0.5581	0.5551	0.5644	0.5744	0.5815	0.5889 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Windows (Uw = 1.40)			8.2300	1.3258	10.9110		(27)
Solid Door			4.3000	1.0000	4.3000		(26)
Flr - Ground			42.6470	0.1500	6.3971	75.6000	3224.1132 (28a)
Wl - Brick	95.1070	12.5240	82.5830	0.2400	19.8199	38.9400	3215.7820 (29a)
RF - Ins Joist	42.6470		42.6470	0.1100	4.6912	5.8200	248.2055 (30)
RF - Joist over Bay	1.5700		1.5700	0.1100	0.1727	5.8200	9.1374 (30)
Total net area of external elements Aum(A, m2)			181.9770				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.2918		(33)
Party Wall			42.8730	0.0000	0.0000	54.0300	2316.4282 (32)
Ground Floor Stud			79.6720			5.8200	463.6912 (32c)
1st Floor Stud			100.1106			5.8200	582.6437 (32c)
Internal Floor			42.6400			18.0000	767.5200 (32d)
Internal Ceiling			42.6400			5.8200	248.1648 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 11075.6861 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							129.8439 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.9713 (36)
Total fabric heat loss							(33) + (36) = 56.2632 (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	43.5708	43.2780	42.9910	41.6430	41.3908	40.2168	40.2168	39.9994	40.6690	41.3908	41.9010	42.4345 (38)
Average = Sum(39)m / 12 =	99.8340	99.5412	99.2542	97.9062	97.6540	96.4799	96.4799	96.2625	96.9322	97.6540	98.1642	98.6976 (39)
HLP	1.1704	1.1670	1.1636	1.1478	1.1448	1.1311	1.1311	1.1285	1.1364	1.1448	1.1508	1.1571 (40)
HLP (average)												1.1478 (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												2.5558 (42)
Average daily hot water use (litres/day)												94.8997 (43)
Daily hot water use	104.3896	100.5937	96.7977	93.0017	89.2057	85.4097	85.4097	89.2057	93.0017	96.7977	100.5937	104.3896 (44)
Energy conte	154.8068	135.3950	139.7155	121.8074	116.8771	100.8561	93.4580	107.2444	108.5252	126.4757	138.0581	149.9221 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Energy content (annual)													Total = Sum(45)m =	1493.1414 (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	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	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage															
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Heat gains from water heating, kWh/month	32.8964	28.7714	29.6896	25.8841	24.8364	21.4319	19.8598	22.7894	23.0616	26.8761	29.3373	31.8585	65)		

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

Metabolic gains (Table 5), Watts														
(66)m	127.7888	127.7888	127.7888	127.7888	127.7888	127.7888	127.7888	127.7888	127.7888	127.7888	127.7888	127.7888	127.7888	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.7330	21.0794	17.1429	12.9783	9.7014	8.1904	8.8500	11.5035	15.4400	19.6047	22.8815	24.3926	(67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	230.1606	232.5490	226.5304	213.7176	197.5438	182.3426	172.1873	169.7990	175.8176	188.6303	204.8042	220.0053	(68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7789	35.7789	35.7789	35.7789	35.7789	35.7789	35.7789	35.7789	35.7789	35.7789	35.7789	35.7789	(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)	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	(71)	
Water heating gains (Table 5)	44.2157	42.8147	39.9053	35.9501	33.3822	29.7665	26.6933	30.6310	32.0300	36.1238	40.7463	42.8205	(72)	
Total internal gains	359.4459	357.7797	344.9153	323.9827	301.9641	281.6362	269.0673	273.2701	284.6242	305.6954	329.7687	348.5551	(73)	

6. Solar gains

[Jan]		Area	Solar flux	g	FF	Access	Gains					
		m2	Table 6a	Specific data	Specific data	factor	W					
			W/m2	or Table 6b	or Table 6c	Table 6d						
North		3.5470	10.6334	0.7600	0.7200	0.7700	14.3025 (74)					
South		4.6810	46.7521	0.7600	0.7200	0.7700	82.9887 (78)					
Solar gains	97.2912	163.2469	219.5755	270.2778	304.4022	303.8160	292.1740	265.8859	236.6973	179.1322	116.0139	83.6331 (83)
Total gains	456.7371	521.0266	564.4909	594.2604	606.3663	585.4522	561.2413	539.1560	521.3215	484.8276	445.7825	432.1882 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, T _{hl} (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	30.8170	30.9076	30.9970	31.4237	31.5049	31.8883	31.8883	31.9603	31.7395	31.5049	31.3412	31.1718	
alpha	3.0545	3.0605	3.0665	3.0949	3.1003	3.1259	3.1259	3.1307	3.1160	3.1003	3.0894	3.0781	
util living area	0.9860	0.9781	0.9648	0.9374	0.8826	0.7774	0.6438	0.6789	0.8418	0.9445	0.9785	0.9882 (86)	
MIT	18.8521	19.0688	19.4178	19.8848	20.3367	20.7101	20.8872	20.8628	20.5900	20.0083	19.3521	18.8186 (87)	
Th 2	19.9438	19.9465	19.9492	19.9620	19.9644	19.9755	19.9755	19.9776	19.9712	19.9644	19.9596	19.9545 (88)	
util rest of house	0.9833	0.9739	0.9575	0.9230	0.8515	0.7099	0.5306	0.5715	0.7892	0.9290	0.9737	0.9859 (89)	
MIT 2	17.9798	18.1967	18.5443	19.0122	19.4474	19.7916	19.9257	19.9128	19.6901	19.1391	18.4891	17.9542 (90)	
Living area fraction	fLA = Living area / (4) = 0.2243 (91)												
MIT	18.1754	18.3923	18.7402	19.2079	19.6468	19.9976	20.1414	20.1259	19.8919	19.3341	18.6826	18.1480 (92)	
Temperature adjustment	0.0000												
adjusted MIT	18.1754	18.3923	18.7402	19.2079	19.6468	19.9976	20.1414	20.1259	19.8919	19.3341	18.6826	18.1480 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	446.2908	503.0598	534.3460	540.6962	509.4148	416.6078	309.1415	317.5067	408.8842	444.5398	430.4276	423.7324 (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	1385.2391	1343.0407	1214.8879	1009.2067	776.0409	520.7616	341.6705	358.6601	561.4210	852.9154	1137.0006	1376.6387 (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	698.5776	564.4672	506.3231	337.3275	198.3698	0.0000	0.0000	0.0000	0.0000	303.8314	508.7326	708.9623 (98)
Space heating	3826.5915 (98)											
Space heating per m2	(98) / (4) = 44.8604 (99)											

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	906.9113	713.9515	731.5951	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6986	0.7766	0.7558	0.0000	0.0000	0.0000	0.0000 (101)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	633.5984	554.4495	552.9629	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	781.5113	751.3223	727.6028	0.0000	0.0000	0.0000	0.0000 (103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	106.4972	146.4734	129.9321	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction												382.9027 (104)
Intermittency factor (Table 10b)									FC = cooled area / (4) =			1.0000 (105)
Intermittency factor	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	26.6243	36.6183	32.4830	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling per m2												95.7257 (107)
Energy for space heating												1.1222 (108)
Energy for space cooling												44.8604 (99)
Total												1.1222 (108)
Dwelling Fabric Energy Efficiency (DFEE)												45.9826 (109)
												46.0 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.6500 (1b)	2.4200 (2b)	103.2130 (1b) - (3b)
First floor	42.6500 (1c)	2.7000 (2c)	115.1550 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.3000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 218.3680 (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) =	0.1374 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.3874 (18)							
Number of sides sheltered					1 (19)							
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)							
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3583 (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	0.4569	0.4479	0.4390	0.3942	0.3852	0.3404	0.3404	0.3315	0.3583	0.3852	0.4031	0.4210 (22b)
Effective ac	0.6044	0.6003	0.5963	0.5777	0.5742	0.5579	0.5579	0.5549	0.5642	0.5742	0.5813	0.5886 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K					
TER Opaque door			4.3000	1.0000	4.3000		(26)					
TER Opening Type (Uw = 1.40)			8.2300	1.3258	10.9110		(27)					
Flr - Ground			42.6470	0.1300	5.5441		(28a)					
Wl - Brick	95.1070	12.5240	82.5830	0.1800	14.8649		(29a)					
RF - Ins Joist	42.6470		42.6470	0.1300	5.5441		(30)					
RF - Joist over Bay	1.5700		1.5700	0.1300	0.2041		(30)					
Total net area of external elements Aum(A, m ²)			181.9770				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	41.3682	(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)							9.2162 (36)					
Total fabric heat loss							(33) + (36) = 50.5844 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 43.5514	Feb 43.2594	Mar 42.9731	Apr 41.6286	May 41.3770	Jun 40.2060	Jul 40.2060	Aug 39.9891	Sep 40.6571	Oct 41.3770	Nov 41.8859	Dec 42.4180 (38)
Heat transfer coeff	94.1358	93.8438	93.5576	92.2130	91.9615	90.7904	90.7904	90.5736	91.2415	91.9615	92.4704	93.0024 (39)
Average = Sum(39)m / 12 =												92.2118 (39)
HLP	Jan 1.1036	Feb 1.1002	Mar 1.0968	Apr 1.0810	May 1.0781	Jun 1.0644	Jul 1.0644	Aug 1.0618	Sep 1.0697	Oct 1.0781	Nov 1.0841	Dec 1.0903 (40)
HLP (average)												1.0810 (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												2.5558 (42)
Average daily hot water use (litres/day)												94.8997 (43)
Daily hot water use	104.3896	100.5937	96.7977	93.0017	89.2057	85.4097	85.4097	89.2057	93.0017	96.7977	100.5937	104.3896 (44)
Energy conte	154.8068	135.3950	139.7155	121.8074	116.8771	100.8561	93.4580	107.2444	108.5252	126.4757	138.0581	149.9221 (45)
Energy content (annual)												Total = Sum(45)m = 1493.1414 (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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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	0.0000	0.0000	0.0000	0.0000	(59)
Heat gains from water heating, kWh/month	32.8964	28.7714	29.6896	25.8841	24.8364	21.4319	19.8598	22.7894	23.0616	26.8761	29.3373	31.8585	65)					

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.8726	21.2035	17.2438	13.0547	9.7585	8.2386	8.9021	11.5712	15.5309	19.7200	23.0162	24.5361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	230.1606	232.5490	226.5304	213.7176	197.5438	182.3426	172.1873	169.7990	175.8176	188.6303	204.8042	220.0053	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7789	35.7789	35.7789	35.7789	35.7789	35.7789	35.7789	35.7789	35.7789	35.7789	35.7789	35.7789	(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)	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	(71)
Water heating gains (Table 5)	44.2157	42.8147	39.9053	35.9501	33.3822	29.7665	26.6933	30.6310	32.0300	36.1238	40.7463	42.8205	(72)
Total internal gains	359.5856	357.9037	345.0162	324.0591	302.0212	281.6844	269.1193	273.3378	284.7151	305.8108	329.9033	348.6986	(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								
North	3.5470	10.6334	0.6300	0.7000	0.7700	11.5267	(74)						
South	4.6810	46.7521	0.6300	0.7000	0.7700	66.8823	(78)						
Solar gains	78.4090	131.5641	176.9606	217.8225	245.3242	244.8517	235.4692	214.2830	190.7593	144.3664	93.4980	67.4017	(83)
Total gains	437.9946	489.4678	521.9768	541.8816	547.3453	526.5361	504.5885	487.6208	475.4744	450.1772	423.4013	416.1003	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													
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	62.9262	63.1220	63.3152	64.2383	64.4141	65.2449	65.2449	65.4011	64.9223	64.4141	64.0596	63.6931	(85)
alpha	5.1951	5.2081	5.2210	5.2826	5.2943	5.3497	5.3497	5.3601	5.3282	5.2943	5.2706	5.2462	
util living area	0.9991	0.9981	0.9958	0.9885	0.9639	0.8809	0.7305	0.7698	0.9340	0.9901	0.9981	0.9993	(86)
MIT	19.7403	19.8641	20.0697	20.3532	20.6345	20.8689	20.9655	20.9538	20.7927	20.4303	20.0386	19.7237	(87)
Th 2	19.9979	20.0007	20.0034	20.0163	20.0188	20.0300	20.0300	20.0321	20.0257	20.0188	20.0139	20.0088	(88)
util rest of house	0.9987	0.9974	0.9942	0.9834	0.9450	0.8135	0.5984	0.6457	0.8907	0.9847	0.9973	0.9990	(89)
MIT 2	18.8428	18.9686	19.1758	19.4676	19.7423	19.9577	20.0195	20.0163	19.8948	19.5470	19.1537	18.8349	(90)
Living area fraction	fLA = Living area / (4) =												
MIT	19.0440	19.1694	19.3763	19.6662	19.9424	20.1621	20.2316	20.2266	20.0962	19.7451	19.3521	19.0342	(92)
Temperature adjustment	0.0000												
adjusted MIT	19.0440	19.1694	19.3763	19.6662	19.9424	20.1621	20.2316	20.2266	20.0962	19.7451	19.3521	19.0342	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9983	0.9966	0.9928	0.9810	0.9431	0.8244	0.6285	0.6735	0.8947	0.9827	0.9965	0.9987	(94)
Useful gains	437.2448	487.8213	518.2007	531.6045	516.1973	434.0690	317.1425	328.4351	425.3924	442.3748	421.9173	415.5601	(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	1387.9433	1339.0973	1204.6726	992.7830	757.9844	504.9832	329.7168	346.5854	547.1005	840.9969	1132.9577	1379.6204	(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	707.3196	572.0575	510.7351	332.0486	179.8896	0.0000	0.0000	0.0000	0.0000	296.5748	511.9491	717.2609	(98)
Space heating per m ²												44.8750	(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	853.4301	671.8492	688.3591	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7581	0.8507	0.8295	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	646.9463	571.5187	570.9870	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	712.7124	685.1741	667.4570	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	47.3516	84.5597	71.7736	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												203.6849	(104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Cooled fraction											FC = cooled area / (4) =	1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	11.8379	21.1399	17.9434	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											50.9212 (107)	
Space cooling per m2											0.5970 (108)	
Energy for space heating											44.8750 (99)	
Energy for space cooling											0.5970 (108)	
Total											45.4719 (109)	
Target Fabric Energy Efficiency (TFEE)											52.3 (109)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.6500 (1b)	2.4200 (2b)	103.2130 (1b) - (3b)
First floor	42.6500 (1c)	2.7000 (2c)	115.1550 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.3000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 218.3680 (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) =	0.1374 (8)							
Pressure test					Yes							
Measured/design AP50					5.0100							
Infiltration rate					0.3879 (18)							
Number of sides sheltered					1 (19)							
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)							
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3588 (21)							
Wind speed	Jan 4.2000	Feb 4.0000	Mar 4.0000	Apr 3.7000	May 3.7000	Jun 3.3000	Jul 3.4000	Aug 3.2000	Sep 3.3000	Oct 3.5000	Nov 3.5000	Dec 3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.3767	0.3588	0.3588	0.3319	0.3319	0.2960	0.3050	0.2870	0.2960	0.3139	0.3139	0.3409 (22b)
Effective ac	0.5710	0.5644	0.5644	0.5551	0.5551	0.5438	0.5465	0.5412	0.5438	0.5493	0.5493	0.5581 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.40)			8.2300	1.3258	10.9110		(27)
Solid Door			4.3000	1.0000	4.3000		(26)
Flr - Ground			42.6470	0.1500	6.3971	75.6000	3224.1132 (28a)
Wl - Brick	95.1070	12.5240	82.5830	0.2400	19.8199	38.9400	3215.7820 (29a)
RF - Ins Joist	42.6470		42.6470	0.1100	4.6912	5.8200	248.2055 (30)
RF - Joist over Bay	1.5700		1.5700	0.1100	0.1727	5.8200	9.1374 (30)
Total net area of external elements Aum(A, m ²)			181.9770				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.2918		(33)
Party Wall			42.8730	0.0000	0.0000	54.0300	2316.4282 (32)
Ground Floor Stud			79.6720			5.8200	463.6912 (32c)
1st Floor Stud			100.1106			5.8200	582.6437 (32c)
Internal Floor			42.6400			18.0000	767.5200 (32d)
Internal Ceiling			42.6400			5.8200	248.1648 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 11075.6861 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							129.8439 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.9713 (36)
Total fabric heat loss							(33) + (36) = 56.2632 (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	41.1444	40.6690	40.6690	39.9994	39.9994	39.1877	39.3819	38.9992	39.1877	39.5819	39.5819	40.2168 (38)
Average = Sum(39)m / 12 =	97.4076	96.9322	96.9322	96.2625	96.2625	95.4508	95.6450	95.2624	95.4508	95.8451	95.8451	96.4799 (39)
HLP	1.1419	1.1364	1.1364	1.1285	1.1285	1.1190	1.1213	1.1168	1.1190	1.1236	1.1236	1.1311 (40)
HLP (average)												1.1272 (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												2.5558 (42)
Average daily hot water use (litres/day)												94.8997 (43)
Daily hot water use	104.3896	100.5937	96.7977	93.0017	89.2057	85.4097	85.4097	89.2057	93.0017	96.7977	100.5937	104.3896 (44)
Energy conte	154.8068	135.3950	139.7155	121.8074	116.8771	100.8561	93.4580	107.2444	108.5252	126.4757	138.0581	149.9221 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Energy content (annual)													Total = Sum(45)m =	1493.1414 (45)
Distribution loss (46)m = 0.15 x (45)m														
	23.2210	20.3093	20.9573	18.2711	17.5316	15.1284	14.0187	16.0867	16.2788	18.9714	20.7087	22.4883	(46)	
Water storage loss:														
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)	
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)	
Combi loss	14.6813	13.2473	14.6226	14.0981	14.5297	14.0167	14.4564	14.5039	14.0611	14.5842	14.1725	14.6667	(61)	
Total heat required for water heating calculated for each month	169.4882	148.6423	154.3382	135.9056	131.4068	114.8728	107.9143	121.7483	122.5863	141.0599	152.2306	164.5888	(62)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)	
Solar input (sum of months) = Sum(63)m =													0.0000 (63)	
Output from w/h	169.4882	148.6423	154.3382	135.9056	131.4068	114.8728	107.9143	121.7483	122.5863	141.0599	152.2306	164.5888	(64)	
Total per year (kWh/year) = Sum(64)m =													1664.7819 (64)	
RHI water heating demand													1665 (64)	
Heat gains from water heating, kWh/month	55.1436	48.3307	50.1111	44.0255	42.4941	37.0388	34.6889	39.2847	39.5999	45.6992	49.4474	53.5158	(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	153.3465	153.3465	153.3465	153.3465	153.3465	153.3465	153.3465	153.3465	153.3465	153.3465	153.3465	153.3465	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	59.3325	52.6986	42.8574	32.4458	24.2536	20.4759	22.1249	28.7588	38.6001	49.0116	57.2038	60.9815	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	343.5234	347.0881	338.1051	318.9815	294.8415	272.1532	256.9960	253.4313	262.4143	281.5378	305.6779	328.3662	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8904	52.8904	52.8904	52.8904	52.8904	52.8904	52.8904	52.8904	52.8904	52.8904	52.8904	52.8904	(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)	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	(71)
Water heating gains (Table 5)	74.1177	71.9206	67.3536	61.1465	57.1157	51.4428	46.6248	52.8021	54.9999	61.4237	68.6770	71.9298	(72)
Total internal gains	583.9795	578.7132	555.3220	519.5798	483.2167	451.0779	432.7517	441.9982	463.0201	498.9791	538.5647	568.2835	(73)

6. Solar gains

[Jan]		Area	Solar flux	Specific data	Specific data	Access	Gains						
		m ²	Table 6a	g	FF	factor	W						
			W/m ²	or Table 6b	or Table 6c	Table 6d							
North		3.5470	11.9814	0.7600	0.7200	0.7700	16.1157 (74)						
South		4.6810	50.9848	0.7600	0.7200	0.7700	90.5021 (78)						
Solar gains	106.6179	160.9774	214.5181	274.1332	302.9500	324.5999	308.3733	285.3001	251.2905	188.7216	130.2287	90.7869	(83)
Total gains	690.5974	739.6906	769.8401	793.7130	786.1667	775.6777	741.1250	727.2983	714.3106	687.7006	668.7933	659.0703	(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	31.5846	31.7395	31.7395	31.9603	31.9603	32.2321	32.1666	32.2959	32.2321	32.0995	32.0995	31.8883	
alpha	3.1056	3.1160	3.1160	3.1307	3.1307	3.1488	3.1444	3.1531	3.1488	3.1400	3.1400	3.1259	
util living area	0.9532	0.9401	0.9126	0.8566	0.7500	0.5561	0.3863	0.4030	0.6553	0.8494	0.9289	0.9580	(86)
MIT	19.4150	19.5784	19.9023	20.3056	20.6775	20.9177	20.9817	20.9790	20.8467	20.4331	19.8820	19.3883	(87)
Th 2	19.9667	19.9712	19.9712	19.9776	19.9776	19.9853	19.9835	19.9871	19.9853	19.9816	19.9816	19.9755	(88)
util rest of house	0.9449	0.9295	0.8963	0.8278	0.6954	0.4624	0.2657	0.2825	0.5726	0.8138	0.9144	0.9505	(89)
MIT 2	18.5507	18.7135	19.0289	19.4182	19.7542	19.9465	19.9793	19.9819	19.8998	19.5455	19.0209	18.5315	(90)
Living area fraction	18.7445	18.9075	19.2248	19.6172	19.9613	20.1643	20.2041	20.2055	20.1121	19.7445	19.2140	18.7236	(91)
Temperature adjustment	18.5945	18.7575	19.0748	19.4672	19.8113	20.0143	20.0541	20.0555	19.9621	19.5945	19.0640	-0.1500	(92)
adjusted MIT	18.5945	18.7575	19.0748	19.4672	19.8113	20.0143	20.0541	20.0555	19.9621	19.5945	19.0640	18.5736	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	642.7856	676.0281	676.6543	643.6947	538.7908	360.9330	203.3590	211.6083	407.5152	548.6220	600.5863	617.6847	(95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000	(96)
Heat loss rate W	1314.4671	1275.3850	1131.6636	920.9671	655.6710	383.1678	206.0285	214.8680	454.5493	766.2378	1060.4312	1299.9338	(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	499.7311	402.7678	338.5269	199.6361	86.9588	0.0000	0.0000	0.0000	0.0000	161.9062	331.0883	507.5934	(98)
Space heating													2528.2086 (98)
RHI space heating demand													2528 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.6500 (1b)	2.4200 (2b)	103.2130 (1b) - (3b)
First floor	42.6500 (1c)	2.7000 (2c)	115.1550 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.3000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 218.3680 (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) =	0.1374 (8)							
Pressure test					Yes							
Measured/design AP50					5.0100							
Infiltration rate					0.3879 (18)							
Number of sides sheltered					1 (19)							
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)							
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3588 (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	0.4575	0.4485	0.4395	0.3947	0.3857	0.3409	0.3409	0.3319	0.3588	0.3857	0.4036	0.4216 (22b)
Effective ac	0.6046	0.6006	0.5966	0.5779	0.5744	0.5581	0.5581	0.5551	0.5644	0.5744	0.5815	0.5889 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.40)			8.2300	1.3258	10.9110		(27)
Solid Door			4.3000	1.0000	4.3000		(26)
Flr - Ground			42.6470	0.1500	6.3971	75.6000	3224.1132 (28a)
Wl - Brick	95.1070	12.5240	82.5830	0.2400	19.8199	38.9400	3215.7820 (29a)
RF - Ins Joist	42.6470		42.6470	0.1100	4.6912	5.8200	248.2055 (30)
RF - Joist over Bay	1.5700		1.5700	0.1100	0.1727	5.8200	9.1374 (30)
Total net area of external elements Aum(A, m ²)			181.9770				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.2918		(33)
Party Wall			42.8730	0.0000	0.0000	54.0300	2316.4282 (32)
Ground Floor Stud			79.6720			5.8200	463.6912 (32c)
1st Floor Stud			100.1106			5.8200	582.6437 (32c)
Internal Floor			42.6400			18.0000	767.5200 (32d)
Internal Ceiling			42.6400			5.8200	248.1648 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 11075.6861 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							129.8439 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.9713 (36)
Total fabric heat loss							(33) + (36) = 56.2632 (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	43.5708	43.2780	42.9910	41.6430	41.3908	40.2168	40.2168	39.9994	40.6690	41.3908	41.9010	42.4345 (38)
Average = Sum(39)m / 12 =	99.8340	99.5412	99.2542	97.9062	97.6540	96.4799	96.4799	96.2625	96.9322	97.6540	98.1642	98.6976 (39)
HLP	1.1704	1.1670	1.1636	1.1478	1.1448	1.1311	1.1311	1.1285	1.1364	1.1448	1.1508	1.1571 (40)
HLP (average)												1.1478 (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												2.5558 (42)
Average daily hot water use (litres/day)												94.8997 (43)
Daily hot water use	104.3896	100.5937	96.7977	93.0017	89.2057	85.4097	85.4097	89.2057	93.0017	96.7977	100.5937	104.3896 (44)
Energy conte	154.8068	135.3950	139.7155	121.8074	116.8771	100.8561	93.4580	107.2444	108.5252	126.4757	138.0581	149.9221 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Energy content (annual)													Total = Sum(45)m =	1493.1414 (45)
Distribution loss (46)m = 0.15 x (45)m														
	23.2210	20.3093	20.9573	18.2711	17.5316	15.1284	14.0187	16.0867	16.2788	18.9714	20.7087	22.4883	(46)	
Water storage loss:														
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)	
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)	
Combi loss	14.6813	13.2473	14.6226	14.0981	14.5297	14.0167	14.4564	14.5039	14.0611	14.5842	14.1725	14.6667	(61)	
Total heat required for water heating calculated for each month	169.4882	148.6423	154.3382	135.9056	131.4068	114.8728	107.9143	121.7483	122.5863	141.0599	152.2306	164.5888	(62)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)	
Solar input (sum of months) = Sum(63)m =	0.0000 (63)													
Output from w/h	169.4882	148.6423	154.3382	135.9056	131.4068	114.8728	107.9143	121.7483	122.5863	141.0599	152.2306	164.5888	(64)	
Total per year (kWh/year) = Sum(64)m =	1664.7819 (64)													
Heat gains from water heating, kWh/month	55.1436	48.3307	50.1111	44.0255	42.4941	37.0388	34.6889	39.2847	39.5999	45.6992	49.4474	53.5158	(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	153.3465	153.3465	153.3465	153.3465	153.3465	153.3465	153.3465	153.3465	153.3465	153.3465	153.3465	153.3465	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	59.3325	52.6986	42.8574	32.4458	24.2536	20.4759	22.1249	28.7588	38.6001	49.0116	57.2038	60.9815	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	343.5234	347.0881	338.1051	318.9815	294.8415	272.1532	256.9960	253.4313	262.4143	281.5378	305.6779	328.3662	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8904	52.8904	52.8904	52.8904	52.8904	52.8904	52.8904	52.8904	52.8904	52.8904	52.8904	52.8904	(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)	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	(71)
Water heating gains (Table 5)	74.1177	71.9206	67.3536	61.1465	57.1157	51.4428	46.6248	52.8021	54.9999	61.4237	68.6770	71.9298	(72)
Total internal gains	583.9795	578.7132	555.3220	519.5798	483.2167	451.0779	432.7517	441.9982	463.0201	498.9791	538.5647	568.2835	(73)

6. Solar gains

[Jan]		Area	Solar flux	Specific data	FF	Access	Gains					
		m ²	Table 6a	g	Specific data	factor	W					
			W/m ²	or Table 6b	or Table 6c	Table 6d						
North		3.5470	10.6334	0.7600	0.7200	0.7700	14.3025 (74)					
South		4.6810	46.7521	0.7600	0.7200	0.7700	82.9887 (78)					
Solar gains	97.2912	163.2469	219.5755	270.2778	304.4022	303.8160	292.1740	265.8859	236.6973	179.1322	116.0139	83.6331 (83)
Total gains	681.2707	741.9601	774.8976	789.8576	787.6189	754.8939	724.9258	707.8841	699.7174	678.1113	654.5785	651.9166 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	30.8170	30.9076	30.9970	31.4237	31.5049	31.8883	31.8883	31.9603	31.7395	31.5049	31.3412	31.1718	
alpha	3.0545	3.0605	3.0665	3.0949	3.1003	3.1259	3.1259	3.1307	3.1160	3.1003	3.0894	3.0781	
util living area	0.9605	0.9468	0.9248	0.8826	0.8070	0.6770	0.5344	0.5625	0.7397	0.8826	0.9434	0.9649	(86)
MIT	19.2122	19.4096	19.7220	20.1338	20.5153	20.8100	20.9337	20.9203	20.7303	20.2582	19.6740	19.1765	(87)
Th 2	19.9438	19.9465	19.9492	19.9620	19.9644	19.9755	19.9755	19.9776	19.9712	19.9644	19.9596	19.9545	(88)
util rest of house	0.9537	0.9376	0.9111	0.8595	0.7653	0.6026	0.4282	0.4589	0.6741	0.8553	0.9321	0.9588	(89)
MIT 2	18.3339	18.5293	18.8370	19.2439	19.6010	19.8617	19.9483	19.9427	19.7975	19.3695	18.8017	18.3068	(90)
Living area fraction													fLA = Living area / (4) = 0.2243 (91)
MIT	18.5308	18.7268	19.0355	19.4435	19.8061	20.0744	20.1693	20.1620	20.0067	19.5688	18.9973	18.5018	(92)
Temperature adjustment													-0.1500
adjusted MIT	18.3808	18.5768	18.8855	19.2935	19.6561	19.9244	20.0193	20.0120	19.8567	19.4188	18.8473	18.3518	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9404	0.9224	0.8940	0.8417	0.7509	0.5985	0.4331	0.4627	0.6658	0.8378	0.9166	0.9465	(94)
Useful gains	640.7007	684.3860	692.7426	664.8586	591.4485	451.7720	313.9299	327.5218	465.8840	568.1176	599.9824	617.0535	(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	1405.7460	1361.4000	1229.3121	1017.5868	776.9413	513.6942	329.8928	347.6960	558.0128	861.1923	1153.1637	1396.7521	(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	569.1937	454.9534	399.2077	253.9643	138.0067	0.0000	0.0000	0.0000	0.0000	218.0476	398.2906	580.0958	(98)
Space heating													3011.7599 (98)
Space heating per m2													(98) / (4) = 35.3079 (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													3327.9115 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	569.1937	454.9534	399.2077	253.9643	138.0067	0.0000	0.0000	0.0000	0.0000	218.0476	398.2906	580.0958	(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)	628.9434	502.7110	441.1135	280.6236	152.4936	0.0000	0.0000	0.0000	0.0000	240.9366	440.1001	640.9898	(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	169.4882	148.6423	154.3382	135.9056	131.4068	114.8728	107.9143	121.7483	122.5863	141.0599	152.2306	164.5888	(64)
Efficiency of water heater (217)m	89.7452	89.6904	89.5844	89.3582	88.9104	87.3000	87.3000	87.3000	87.3000	89.2154	89.5919	87.3000	(216)
Fuel for water heating, kWh/month	188.8548	165.7282	172.2824	152.0907	147.7969	131.5839	123.6132	139.4597	140.4196	158.1115	169.9155	183.3395	(219)
Water heating fuel used													1873.1959 (219)
Annual totals kWh/year													
Space heating fuel - main system													3327.9115 (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)													419.1320 (232)
Total delivered energy for all uses													5695.2394 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3327.9115	3.4800	115.8113 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1873.1959	3.4800	65.1872 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	419.1320	13.1900	55.2835 (250)
Additional standing charges			120.0000 (251)
Total energy cost			366.1745 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.1803 (257)
SAP value		83.5348
SAP rating (Section 12)		84 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3327.9115	0.2160	718.8289 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1873.1959	0.2160	404.6103 (264)
Space and water heating			1123.4392 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	419.1320	0.5190	217.5295 (268)
Total kg/year			1379.8937 (272)
CO2 emissions per m2			16.1800 (273)
EI value			85.8092
EI rating			86 (274)
EI band			B

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9050 = 3.845$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9050 = 0.2387$, stars = 4
Water heating energy efficiency	$3.48 / 0.8876 = 3.921$, stars = 4
Water heating environmental impact	$0.216 / 0.8876 = 0.2434$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.6500 (1b)	2.4200 (2b)	103.2130 (1b) - (3b)
First floor	42.6500 (1c)	2.7000 (2c)	115.1550 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.3000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 218.3680 (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) =	0.1374 (8)							
Pressure test					Yes							
Measured/design AP50					5.0100							
Infiltration rate					0.3879 (18)							
Number of sides sheltered					1 (19)							
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)							
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3588 (21)							
Wind speed	Jan 4.2000	Feb 4.0000	Mar 4.0000	Apr 3.7000	May 3.7000	Jun 3.3000	Jul 3.4000	Aug 3.2000	Sep 3.3000	Oct 3.5000	Nov 3.5000	Dec 3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.3767	0.3588	0.3588	0.3319	0.3319	0.2960	0.3050	0.2870	0.2960	0.3139	0.3139	0.3409 (22b)
Effective ac	0.5710	0.5644	0.5644	0.5551	0.5551	0.5438	0.5465	0.5412	0.5438	0.5493	0.5493	0.5581 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.40)			8.2300	1.3258	10.9110		(27)
Solid Door			4.3000	1.0000	4.3000		(26)
Flr - Ground			42.6470	0.1500	6.3971	75.6000	3224.1132 (28a)
Wl - Brick	95.1070	12.5240	82.5830	0.2400	19.8199	38.9400	3215.7820 (29a)
RF - Ins Joist	42.6470		42.6470	0.1100	4.6912	5.8200	248.2055 (30)
RF - Joist over Bay	1.5700		1.5700	0.1100	0.1727	5.8200	9.1374 (30)
Total net area of external elements Aum(A, m ²)			181.9770				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.2918		(33)
Party Wall			42.8730	0.0000	0.0000	54.0300	2316.4282 (32)
Ground Floor Stud			79.6720			5.8200	463.6912 (32c)
1st Floor Stud			100.1106			5.8200	582.6437 (32c)
Internal Floor			42.6400			18.0000	767.5200 (32d)
Internal Ceiling			42.6400			5.8200	248.1648 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 11075.6861 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							129.8439 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.9713 (36)
Total fabric heat loss							(33) + (36) = 56.2632 (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	41.1444	40.6690	40.6690	39.9994	39.9994	39.1877	39.3819	38.9992	39.1877	39.5819	39.5819	40.2168 (38)
Average = Sum(39)m / 12 =	97.4076	96.9322	96.9322	96.2625	96.2625	95.4508	95.6450	95.2624	95.4508	95.8451	95.8451	96.4799 (39)
HLP	1.1419	1.1364	1.1364	1.1285	1.1285	1.1190	1.1213	1.1168	1.1190	1.1236	1.1236	1.1311 (40)
HLP (average)												1.1272 (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												2.5558 (42)
Average daily hot water use (litres/day)												94.8997 (43)
Daily hot water use	104.3896	100.5937	96.7977	93.0017	89.2057	85.4097	85.4097	89.2057	93.0017	96.7977	100.5937	104.3896 (44)
Energy conte	154.8068	135.3950	139.7155	121.8074	116.8771	100.8561	93.4580	107.2444	108.5252	126.4757	138.0581	149.9221 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Energy content (annual)													Total = Sum(45)m =	1493.1414 (45)
Distribution loss (46)m = 0.15 x (45)m														
	23.2210	20.3093	20.9573	18.2711	17.5316	15.1284	14.0187	16.0867	16.2788	18.9714	20.7087	22.4883	(46)	
Water storage loss:														
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)	
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)	
Combi loss	14.6813	13.2473	14.6226	14.0981	14.5297	14.0167	14.4564	14.5039	14.0611	14.5842	14.1725	14.6667	(61)	
Total heat required for water heating calculated for each month	169.4882	148.6423	154.3382	135.9056	131.4068	114.8728	107.9143	121.7483	122.5863	141.0599	152.2306	164.5888	(62)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)	
Solar input (sum of months) = Sum(63)m =	0.0000 (63)													
Output from w/h	169.4882	148.6423	154.3382	135.9056	131.4068	114.8728	107.9143	121.7483	122.5863	141.0599	152.2306	164.5888	(64)	
Total per year (kWh/year) = Sum(64)m =	1664.7819 (64)													
Heat gains from water heating, kWh/month	55.1436	48.3307	50.1111	44.0255	42.4941	37.0388	34.6889	39.2847	39.5999	45.6992	49.4474	53.5158	(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	153.3465	153.3465	153.3465	153.3465	153.3465	153.3465	153.3465	153.3465	153.3465	153.3465	153.3465	153.3465	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	59.3325	52.6986	42.8574	32.4458	24.2536	20.4759	22.1249	28.7588	38.6001	49.0116	57.2038	60.9815	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	343.5234	347.0881	338.1051	318.9815	294.8415	272.1532	256.9960	253.4313	262.4143	281.5378	305.6779	328.3662	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8904	52.8904	52.8904	52.8904	52.8904	52.8904	52.8904	52.8904	52.8904	52.8904	52.8904	52.8904	(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)	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	(71)
Water heating gains (Table 5)	74.1177	71.9206	67.3536	61.1465	57.1157	51.4428	46.6248	52.8021	54.9999	61.4237	68.6770	71.9298	(72)
Total internal gains	583.9795	578.7132	555.3220	519.5798	483.2167	451.0779	432.7517	441.9982	463.0201	498.9791	538.5647	568.2835	(73)

6. Solar gains

[Jan]			Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W			
North			3.5470	11.9814	0.7600		0.7200	0.7700		16.1157 (74)			
South			4.6810	50.9848	0.7600		0.7200	0.7700		90.5021 (78)			
Solar gains	106.6179	160.9774	214.5181	274.1332	302.9500	324.5999	308.3733	285.3001	251.2905	188.7216	130.2287	90.7869	(83)
Total gains	690.5974	739.6906	769.8401	793.7130	786.1667	775.6777	741.1250	727.2983	714.3106	687.7006	668.7933	659.0703	(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	31.5846	31.7395	31.7395	31.9603	31.9603	32.2321	32.1666	32.2959	32.2321	32.0995	32.0995	31.8883	
alpha	3.1056	3.1160	3.1160	3.1307	3.1307	3.1488	3.1444	3.1531	3.1488	3.1400	3.1400	3.1259	
util living area	0.9532	0.9401	0.9126	0.8566	0.7500	0.5561	0.3863	0.4030	0.6553	0.8494	0.9289	0.9580	(86)
MIT	19.4150	19.5784	19.9023	20.3056	20.6775	20.9177	20.9817	20.9790	20.8467	20.4331	19.8820	19.3883	(87)
Th 2	19.9667	19.9712	19.9712	19.9776	19.9776	19.9853	19.9835	19.9871	19.9853	19.9816	19.9816	19.9755	(88)
util rest of house	0.9449	0.9295	0.8963	0.8278	0.6954	0.4624	0.2657	0.2825	0.5726	0.8138	0.9144	0.9505	(89)
MIT 2	18.5507	18.7135	19.0289	19.4182	19.7542	19.9465	19.9793	19.9819	19.8998	19.5455	19.0209	18.5315	(90)
Living area fraction	fLA = Living area / (4) =												0.2243 (91)
MIT	18.7445	18.9075	19.2248	19.6172	19.9613	20.1643	20.2041	20.2055	20.1121	19.7445	19.2140	18.7236	(92)
Temperature adjustment													-0.1500
adjusted MIT	18.5945	18.7575	19.0748	19.4672	19.8113	20.0143	20.0541	20.0555	19.9621	19.5945	19.0640	18.5736	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9308	0.9139	0.8790	0.8110	0.6853	0.4653	0.2744	0.2910	0.5705	0.7978	0.8980	0.9372	(94)
Useful gains	642.7856	676.0281	676.6543	643.6947	538.7908	360.9330	203.3590	211.6083	407.5152	548.6220	600.5863	617.6847	(95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000	(96)
Heat loss rate W	1314.4671	1275.3850	1131.6636	920.9671	655.6710	383.1678	206.0285	214.8680	454.5493	766.2378	1060.4312	1299.9338	(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	499.7311	402.7678	338.5269	199.6361	86.9588	0.0000	0.0000	0.0000	0.0000	161.9062	331.0883	507.5934	(98)
Space heating													2528.2086 (98)
Space heating per m2													(98) / (4) = 29.6390 (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													2793.6007 (211)
Space heating requirement	499.7311	402.7678	338.5269	199.6361	86.9588	0.0000	0.0000	0.0000	0.0000	161.9062	331.0883	507.5934	(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)	552.1890	445.0473	374.0628	220.5924	96.0871	0.0000	0.0000	0.0000	0.0000	178.9018	365.8435	560.8767	(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	169.4882	148.6423	154.3382	135.9056	131.4068	114.8728	107.9143	121.7483	122.5863	141.0599	152.2306	164.5888	(64)
Efficiency of water heater (217)m	89.6676	89.6145	89.4730	89.1760	88.5468	87.3000	87.3000	87.3000	87.3000	88.9814	89.4671		87.3000 (216)
Fuel for water heating, kWh/month	189.0183	165.8686	172.4969	152.4014	148.4037	131.5839	123.6132	139.4597	140.4196	158.5274	170.1526	183.4984	(219)
Water heating fuel used													1875.4437 (219)
Annual totals kWh/year													
Space heating fuel - main system													2793.6007 (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)													419.1320 (232)
Total delivered energy for all uses													5163.1764 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2793.6007	3.6300	101.4077 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1875.4437	3.6300	68.0786 (247)
Pumps and fans for heating	75.0000	19.4400	14.5800 (249)
Energy for lighting	419.1320	19.4400	81.4793 (250)
Additional standing charges			95.0000 (251)
Total energy cost			360.5456 (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	2793.6007	0.2160	603.4177 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1875.4437	0.2160	405.0958 (264)
Space and water heating			1008.5136 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	419.1320	0.5190	217.5295 (268)
Total kg/year			1264.9681 (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	2793.6007	1.2200	3408.1928 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1875.4437	1.2200	2288.0414 (264)
Space and water heating			5696.2342 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	419.1320	3.0700	1286.7352 (268)
Primary energy kWh/year			7213.2193 (272)
Primary energy kWh/m2/year			84.5629 (273)

SAP 2012 EPC IMPROVEMENTS

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

(For testing purposes):

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

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.2	-£ 26	-184 kg (14.6%)
U Solar photovoltaic panels	+ 10.2	-£ 355	-947 kg (87.6%)

Recommended measures	Typical annual savings		Energy efficiency	Environmental impact
Solar water heating	£26	2.16 kg/m ²	B 85	B 88
Solar photovoltaic panels	£355	11.10 kg/m ²	A 95	A 97
Total Savings	£380	13.26 kg/m²		

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

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

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£96	£106	-£10
Mains gas	£264	£229	£35
Space heating	£211	£211	£0
Water heating	£68	£42	£26
Lighting	£81	£81	£0
Generated (PV)	-£0	-£355	£355
Total cost of fuels	£360	-£20	£380
Total cost of uses	£360	-£21	£381
Delivered energy	61 kWh/m ²	28 kWh/m ²	32 kWh/m ²
Carbon dioxide emissions	1.3 tonnes	0.1 tonnes	1.1 tonnes
CO2 emissions per m ²	15 kg/m ²	2 kg/m ²	13 kg/m ²
Primary energy	85 kWh/m ²	7 kWh/m ²	78 kWh/m ²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.6500 (1b)	2.4200 (2b)	103.2130 (1b) - (3b)
First floor	42.6500 (1c)	2.7000 (2c)	115.1550 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.3000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 218.3680 (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) =	0.1374 (8)							
Pressure test					Yes							
Measured/design AP50					5.0100							
Infiltration rate					0.3879 (18)							
Number of sides sheltered					1 (19)							
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)							
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3588 (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	0.4575	0.4485	0.4395	0.3947	0.3857	0.3409	0.3409	0.3319	0.3588	0.3857	0.4036	0.4216 (22b)
Effective ac	0.6046	0.6006	0.5966	0.5779	0.5744	0.5581	0.5581	0.5551	0.5644	0.5744	0.5815	0.5889 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.40)			8.2300	1.3258	10.9110		(27)
Solid Door			4.3000	1.0000	4.3000		(26)
Flr - Ground			42.6470	0.1500	6.3971	75.6000	3224.1132 (28a)
Wl - Brick	95.1070	12.5240	82.5830	0.2400	19.8199	38.9400	3215.7820 (29a)
RF - Ins Joist	42.6470		42.6470	0.1100	4.6912	5.8200	248.2055 (30)
RF - Joist over Bay	1.5700		1.5700	0.1100	0.1727	5.8200	9.1374 (30)
Total net area of external elements Aum(A, m ²)			181.9770				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.2918		(33)
Party Wall			42.8730	0.0000	0.0000	54.0300	2316.4282 (32)
Ground Floor Stud			79.6720			5.8200	463.6912 (32c)
1st Floor Stud			100.1106			5.8200	582.6437 (32c)
Internal Floor			42.6400			18.0000	767.5200 (32d)
Internal Ceiling			42.6400			5.8200	248.1648 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 11075.6861 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							129.8439 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.9713 (36)
Total fabric heat loss							(33) + (36) = 56.2632 (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	43.5708	43.2780	42.9910	41.6430	41.3908	40.2168	40.2168	39.9994	40.6690	41.3908	41.9010	42.4345 (38)
Average = Sum(39)m / 12 =	99.8340	99.5412	99.2542	97.9062	97.6540	96.4799	96.4799	96.2625	96.9322	97.6540	98.1642	98.6976 (39)
HLP	1.1704	1.1670	1.1636	1.1478	1.1448	1.1311	1.1311	1.1285	1.1364	1.1448	1.1508	1.1571 (40)
HLP (average)												1.1478 (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												2.5558 (42)
Average daily hot water use (litres/day)												94.8997 (43)
Daily hot water use	104.3896	100.5937	96.7977	93.0017	89.2057	85.4097	85.4097	89.2057	93.0017	96.7977	100.5937	104.3896 (44)
Energy conte	154.8068	135.3950	139.7155	121.8074	116.8771	100.8561	93.4580	107.2444	108.5252	126.4757	138.0581	149.9221 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Energy content (annual)													Total = Sum(45)m =	1493.1414 (45)
Distribution loss (46)m = 0.15 x (45)m														
	23.2210	20.3093	20.9573	18.2711	17.5316	15.1284	14.0187	16.0867	16.2788	18.9714	20.7087	22.4883	(46)	
Water storage loss:														
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)	
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)	
Combi loss	14.6813	13.2473	14.6226	14.0981	14.5297	14.0167	14.4564	14.5039	14.0611	14.5842	14.1725	14.6667	(61)	
Total heat required for water heating calculated for each month	169.4882	148.6423	154.3382	135.9056	131.4068	114.8728	107.9143	121.7483	122.5863	141.0599	152.2306	164.5888	(62)	
Aperture area of solar collector													3.0000 (H1)	
Zero-loss collector efficiency													0.7000 (H2)	
Collector heat loss coefficient													1.8000 (H3)	
Collector 2nd order heat loss coefficient													0.0050 (H3a)	
Collector effective heat loss coefficient													1.8063 (H3b)	
Collector performance ratio													2.5804 (H4)	
Annual solar radiation per m2													1079.5246 (H5)	
Overshading factor													0.8000 (H6)	
Solar energy available													1813.6014 (H7)	
Adjustment factor for showers													1.0000 (H7a)	
Solar-to-load ratio													1.2146 (H8)	
Utilisation factor													0.5610 (H9)	
Collector performance factor													0.8793 (H10)	
Dedicated solar storage volume													75.0000 (H11)	
Effective solar volume													75.0000 (H13)	
Daily hot water demand													94.8997 (H14)	
Volume ratio Veff/V													0.7903 (H15)	
Solar storage volume factor													0.9529 (H16)	
Solar input	-24.7221	-41.2540	-70.2603	-94.1627	-116.3301	-114.3710	-112.8596	-98.6060	-77.2282	-52.7378	-29.3239	-852.5440	(H17)	
Solar input (sum of months) = Sum(63)m =													-852.5440 (63)	
Output from w/h	144.7661	107.3883	84.0778	41.7428	15.0767	0.5018	0.0000	23.1423	45.3581	88.3221	122.9066	143.9007	(64)	
Total per year (kWh/year) = Sum(64)m =													817.1832 (64)	
Heat gains from water heating, kWh/month	55.1436	48.3307	50.1111	44.0255	42.4941	37.0388	34.6889	39.2847	39.5999	45.6992	49.4474	53.5158	(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	153.3465	153.3465	153.3465	153.3465	153.3465	153.3465	153.3465	153.3465	153.3465	153.3465	153.3465	153.3465	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	59.3325	52.6986	42.8574	32.4458	24.2536	20.4759	22.1249	28.7588	38.6001	49.0116	57.2038	60.9815	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	343.5234	347.0881	338.1051	318.9815	294.8415	272.1532	256.9960	253.4313	262.4143	281.5378	305.6779	328.3662	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8904	52.8904	52.8904	52.8904	52.8904	52.8904	52.8904	52.8904	52.8904	52.8904	52.8904	52.8904	(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)	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	(71)
Water heating gains (Table 5)	74.1177	71.9206	67.3536	61.1465	57.1157	51.4428	46.6248	52.8021	54.9999	61.4237	68.6770	71.9298	(72)
Total internal gains	583.9795	578.7132	555.3220	519.5798	483.2167	451.0779	432.7517	441.9982	463.0201	498.9791	538.5647	568.2835	(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							
North	3.5470	10.6334	0.7600	0.7200	0.7700	14.3025 (74)							
South	4.6810	46.7521	0.7600	0.7200	0.7700	82.9887 (78)							
Solar gains	97.2912	163.2469	219.5755	270.2778	304.4022	303.8160	292.1740	265.9859	236.6973	179.1322	116.0139	83.6331	(83)
Total gains	681.2707	741.9601	774.8976	789.8576	787.6189	754.8939	724.9258	707.8841	699.7174	678.1113	654.5785	651.9166	(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	30.8170	30.9076	30.9970	31.4237	31.5049	31.8883	31.8883	31.9603	31.7395	31.5049	31.3412	31.1718	
alpha	3.0545	3.0605	3.0665	3.0949	3.1003	3.1259	3.1259	3.1307	3.1160	3.1003	3.0894	3.0781	
util living area	0.9605	0.9468	0.9248	0.8826	0.8070	0.6770	0.5344	0.5625	0.7397	0.8826	0.9434	0.9649	(86)
MIT	19.2122	19.4096	19.7220	20.1338	20.5153	20.8100	20.9337	20.9203	20.7303	20.2582	19.6740	19.1765	(87)
Th 2	19.9438	19.9465	19.9492	19.9620	19.9644	19.9755	19.9755	19.9776	19.9712	19.9644	19.9596	19.9545	(88)
util rest of house	0.9537	0.9376	0.9111	0.8595	0.7653	0.6026	0.4282	0.4589	0.6741	0.8553	0.9321	0.9588	(89)
MIT 2	18.3339	18.5293	18.8370	19.2439	19.6010	19.8617	19.9483	19.9427	19.7975	19.3695	18.8017	18.3068	(90)
Living area fraction													f _{LA} = Living area / (4) =
MIT	18.5308	18.7268	19.0355	19.4435	19.8061	20.0744	20.1693	20.1620	20.0067	19.5688	18.9973	18.5018	(92)
Temperature adjustment													-0.1500
adjusted MIT	18.3808	18.5768	18.8855	19.2935	19.6561	19.9244	20.0193	20.0120	19.8567	19.4188	18.8473	18.3518	(93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9404	0.9224	0.8940	0.8417	0.7509	0.5985	0.4331	0.4627	0.6658	0.8378	0.9166	0.9465	(94)
Useful gains	640.7007	684.3860	692.7426	664.8586	591.4485	451.7720	313.9299	327.5218	465.8840	568.1176	599.9824	617.0535	(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													
	1405.7460	1361.4000	1229.3121	1017.5868	776.9413	513.6942	329.8928	347.6960	558.0128	861.1923	1153.1637	1396.7521	(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													
	569.1937	454.9534	399.2077	253.9643	138.0067	0.0000	0.0000	0.0000	0.0000	218.0476	398.2906	580.0958	(98)
Space heating												3011.7599	(98)
Space heating per m2												(98) / (4) =	35.3079 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3327.9115 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	569.1937	454.9534	399.2077	253.9643	138.0067	0.0000	0.0000	0.0000	0.0000	218.0476	398.2906	580.0958	(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)	628.9434	502.7110	441.1135	280.6236	152.4936	0.0000	0.0000	0.0000	0.0000	240.9366	440.1001	640.9898	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	144.7661	107.3883	84.0778	41.7428	15.0767	0.5018	0.0000	23.1423	45.3581	88.3221	122.9066	143.9007	(64)
Efficiency of water heater													87.3000 (216)
(217)m	89.8323	89.8709	89.9265	90.0341	90.1745	87.3000	87.3000	87.3000	87.3000	89.5537	89.7244	89.8454	(217)
Fuel for water heating, kWh/month	161.1514	119.4917	93.4961	46.3633	16.7195	0.5747	0.0000	26.5090	51.9565	98.6247	136.9823	160.1647	(219)
												912.0340	(219)
Water heating fuel used													
Annual totals kWh/year													
Space heating fuel - main system													3327.9115 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
pump for solar water heating													50.0000 (230g)
Total electricity for the above, kWh/year													125.0000 (231)
Electricity for lighting (calculated in Appendix L)													419.1320 (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													3056.8381 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3327.9115	3.4800	115.8113	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	912.0340	3.4800	31.7388	(247)
Pumps and fans for heating	75.0000	13.1900	9.8925	(249)
Pump for solar water heating	50.0000	13.1900	6.5950	(249)
Energy for lighting	419.1320	13.1900	55.2835	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit		-1727.2394	13.1900	-227.8229 (252)
Total energy cost			111.4982	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.3594 (257)
SAP value		94.9864
SAP rating (Section 12)		95 (258)
SAP band		A

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

Energy Emission factor Emissions

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

	kWh/year	kg CO2/kWh	kg CO2/year
Space heating - main system 1	3327.9115	0.2160	718.8289 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	912.0340	0.2160	196.9994 (264)
Space and water heating			915.8282 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	419.1320	0.5190	217.5295 (268)
Energy saving/generation technologies			
PV Unit	-1727.2394	0.5190	-896.4372 (269)
Total kg/year			301.7955 (272)
CO2 emissions per m2			3.5400 (273)
EI value			96.8963
EI rating			97 (274)
EI band			A

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	42.6500 (1b)	2.4200 (2b)	103.2130 (1b) - (3b)
First floor	42.6500 (1c)	2.7000 (2c)	115.1550 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.3000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 218.3680 (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) =	0.1374 (8)							
Pressure test					Yes							
Measured/design AP50					5.0100							
Infiltration rate					0.3879 (18)							
Number of sides sheltered					1 (19)							
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)							
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3588 (21)							
Wind speed	Jan 4.2000	Feb 4.0000	Mar 4.0000	Apr 3.7000	May 3.7000	Jun 3.3000	Jul 3.4000	Aug 3.2000	Sep 3.3000	Oct 3.5000	Nov 3.5000	Dec 3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.3767	0.3588	0.3588	0.3319	0.3319	0.2960	0.3050	0.2870	0.2960	0.3139	0.3139	0.3409 (22b)
Effective ac	0.5710	0.5644	0.5644	0.5551	0.5551	0.5438	0.5465	0.5412	0.5438	0.5493	0.5493	0.5581 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Windows (Uw = 1.40)			8.2300	1.3258	10.9110		(27)
Solid Door			4.3000	1.0000	4.3000		(26)
Flr - Ground			42.6470	0.1500	6.3971	75.6000	3224.1132 (28a)
Wl - Brick	95.1070	12.5240	82.5830	0.2400	19.8199	38.9400	3215.7820 (29a)
RF - Ins Joist	42.6470		42.6470	0.1100	4.6912	5.8200	248.2055 (30)
RF - Joist over Bay	1.5700		1.5700	0.1100	0.1727	5.8200	9.1374 (30)
Total net area of external elements Aum(A, m2)			181.9770				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.2918		(33)
Party Wall			42.8730	0.0000	0.0000	54.0300	2316.4282 (32)
Ground Floor Stud			79.6720			5.8200	463.6912 (32c)
1st Floor Stud			100.1106			5.8200	582.6437 (32c)
Internal Floor			42.6400			18.0000	767.5200 (32d)
Internal Ceiling			42.6400			5.8200	248.1648 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 11075.6861 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							129.8439 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.9713 (36)
Total fabric heat loss							(33) + (36) = 56.2632 (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	41.1444	40.6690	40.6690	39.9994	39.9994	39.1877	39.3819	38.9992	39.1877	39.5819	39.5819	40.2168 (38)
Average = Sum(39)m / 12 =	97.4076	96.9322	96.9322	96.2625	96.2625	95.4508	95.6450	95.2624	95.4508	95.8451	95.8451	96.4799 (39)
HLP	1.1419	1.1364	1.1364	1.1285	1.1285	1.1190	1.1213	1.1168	1.1190	1.1236	1.1236	1.1311 (40)
HLP (average)												1.1272 (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												2.5558 (42)
Average daily hot water use (litres/day)												94.8997 (43)
Daily hot water use	104.3896	100.5937	96.7977	93.0017	89.2057	85.4097	85.4097	89.2057	93.0017	96.7977	100.5937	104.3896 (44)
Energy conte	154.8068	135.3950	139.7155	121.8074	116.8771	100.8561	93.4580	107.2444	108.5252	126.4757	138.0581	149.9221 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Energy content (annual)												Total = Sum(45)m =	1493.1414 (45)
Distribution loss (46)m = 0.15 x (45)m													
	23.2210	20.3093	20.9573	18.2711	17.5316	15.1284	14.0187	16.0867	16.2788	18.9714	20.7087	22.4883	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	14.6813	13.2473	14.6226	14.0981	14.5297	14.0167	14.4564	14.5039	14.0611	14.5842	14.1725	14.6667	(61)
Total heat required for water heating calculated for each month	169.4882	148.6423	154.3382	135.9056	131.4068	114.8728	107.9143	121.7483	122.5863	141.0599	152.2306	164.5888	(62)
Aperture area of solar collector												3.0000 (H1)	
Zero-loss collector efficiency												0.7000 (H2)	
Collector heat loss coefficient												1.8000 (H3)	
Collector 2nd order heat loss coefficient												0.0050 (H3a)	
Collector effective heat loss coefficient												1.8063 (H3b)	
Collector performance ratio												2.5804 (H4)	
Annual solar radiation per m2												1140.0998 (H5)	
Overshading factor												0.8000 (H6)	
Solar energy available												1915.3676 (H7)	
Adjustment factor for showers												1.0000 (H7a)	
Solar-to-load ratio												1.2828 (H8)	
Utilisation factor												0.5414 (H9)	
Collector performance factor												0.8793 (H10)	
Dedicated solar storage volume												75.0000 (H11)	
Effective solar volume												75.0000 (H13)	
Daily hot water demand												94.8997 (H14)	
Volume ratio Veff/V												0.7903 (H15)	
Solar storage volume factor												0.9529 (H16)	
Solar input												-868.8807 (H17)	
Solar input	-26.7437	-40.1957	-67.6947	-93.5748	-112.6956	-118.6072	-115.7592	-103.3737	-80.6835	-54.8875	-32.5077	-22.1573	(63)
												Solar input (sum of months) = Sum(63)m =	
												-868.8807 (63)	
Output from w/h	142.7444	108.4466	86.6435	42.3307	18.7112	0.0000	0.0000	18.3746	41.9028	86.1724	119.7229	142.4315	(64)
												Total per year (kWh/year) = Sum(64)m =	
												807.4805 (64)	
Heat gains from water heating, kWh/month	55.1436	48.3307	50.1111	44.0255	42.4941	37.0388	34.6889	39.2847	39.5999	45.6992	49.4474	53.5158	(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	153.3465	153.3465	153.3465	153.3465	153.3465	153.3465	153.3465	153.3465	153.3465	153.3465	153.3465	153.3465	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	59.3325	52.6986	42.8574	32.4458	24.2536	20.4759	22.1249	28.7588	38.6001	49.0116	57.2038	60.9815	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	343.5234	347.0881	338.1051	318.9815	294.8415	272.1532	256.9960	253.4313	262.4143	281.5378	305.6779	328.3662	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8904	52.8904	52.8904	52.8904	52.8904	52.8904	52.8904	52.8904	52.8904	52.8904	52.8904	52.8904	(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)	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	-102.2310	(71)
Water heating gains (Table 5)	74.1177	71.9206	67.3536	61.1465	57.1157	51.4428	46.6248	52.8021	54.9999	61.4237	68.6770	71.9298	(72)
Total internal gains	583.9795	578.7132	555.3220	519.5798	483.2167	451.0779	432.7517	441.9982	463.0201	498.9791	538.5647	568.2835	(73)

6. Solar gains

[Jan]		Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
North		3.5470	11.9814	0.7600	0.7200	0.7700	16.1157 (74)						
South		4.6810	50.9848	0.7600	0.7200	0.7700	90.5021 (78)						
Solar gains	106.6179	160.9774	214.5181	274.1332	302.9500	324.5999	308.3733	285.3001	251.2905	188.7216	130.2287	90.7869	(83)
Total gains	690.5974	739.6906	769.8401	793.7130	786.1667	775.6777	741.1250	727.2983	714.3106	687.7006	668.7933	659.0703	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, T _{hl} (C)												21.0000 (85)	
Utilisation factor for gains for living area, n _{il,m} (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	31.5846	31.7395	31.7395	31.9603	31.9603	32.2321	32.1666	32.2959	32.2321	32.0995	32.0995	31.8883	
alpha	3.1056	3.1160	3.1160	3.1307	3.1307	3.1488	3.1444	3.1531	3.1488	3.1400	3.1400	3.1259	
util living area	0.9532	0.9401	0.9126	0.8566	0.7500	0.5561	0.3863	0.4030	0.6553	0.8494	0.9289	0.9580	(86)
MIT	19.4150	19.5784	19.9023	20.3056	20.6775	20.9177	20.9817	20.9790	20.8467	20.4331	19.8820	19.3883	(87)
Th 2	19.9667	19.9712	19.9712	19.9776	19.9776	19.9853	19.9835	19.9871	19.9853	19.9816	19.9816	19.9755	(88)
util rest of house	0.9449	0.9295	0.8963	0.8278	0.6954	0.4624	0.2657	0.2825	0.5726	0.8138	0.9144	0.9505	(89)
MIT 2	18.5507	18.7135	19.0289	19.4182	19.7542	19.9465	19.9793	19.9819	19.8998	19.5455	19.0209	18.5315	(90)
Living area fraction												f _{LA} = Living area / (4) =	
MIT	18.7445	18.9075	19.2248	19.6172	19.9613	20.1643	20.2041	20.2055	20.1121	19.7445	19.2140	18.7236	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.5945	18.7575	19.0748	19.4672	19.8113	20.0143	20.0541	20.0555	19.9621	19.5945	19.0640	18.5736	(93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9308	0.9139	0.8790	0.8110	0.6853	0.4653	0.2744	0.2910	0.5705	0.7978	0.8980	0.9372	(94)
Useful gains	642.7856	676.0281	676.6543	643.6947	538.7908	360.9330	203.3590	211.6083	407.5152	548.6220	600.5863	617.6847	(95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000	(96)
Heat loss rate W													
	1314.4671	1275.3850	1131.6636	920.9671	655.6710	383.1678	206.0285	214.8680	454.5493	766.2378	1060.4312	1299.9338	(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													
	499.7311	402.7678	338.5269	199.6361	86.9588	0.0000	0.0000	0.0000	0.0000	161.9062	331.0883	507.5934	(98)
Space heating												2528.2086	(98)
Space heating per m2												(98) / (4) =	29.6390 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2793.6007 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	499.7311	402.7678	338.5269	199.6361	86.9588	0.0000	0.0000	0.0000	0.0000	161.9062	331.0883	507.5934	(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)	552.1890	445.0473	374.0628	220.5924	96.0871	0.0000	0.0000	0.0000	0.0000	178.9018	365.8435	560.8767	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	142.7444	108.4466	86.6435	42.3307	18.7112	0.0000	0.0000	18.3746	41.9028	86.1724	119.7229	142.4315	(64)
Efficiency of water heater	89.7689	89.8017	89.8290	89.9234	89.9164	87.3000	87.3000	87.3000	87.3000	89.3622	89.6275	89.7789	(216)
(217)m	89.7689	89.8017	89.8290	89.9234	89.9164	87.3000	87.3000	87.3000	87.3000	89.3622	89.6275	89.7789	(217)
Fuel for water heating, kWh/month	159.0132	120.7622	96.4538	47.0742	20.8096	0.0000	0.0000	21.0477	47.9986	96.4305	133.5783	158.6469	(219)
Water heating fuel used												901.8149	(219)
Annual totals kWh/year													
Space heating fuel - main system													2793.6007 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
pump for solar water heating													50.0000 (230g)
Total electricity for the above, kWh/year													125.0000 (231)
Electricity for lighting (calculated in Appendix L)													419.1320 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 2.50 * 1140 * 0.80) =										-1824.1596			-1824.1596 (233)
Total delivered energy for all uses													2415.3879 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2793.6007	3.6300	101.4077	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	901.8149	3.6300	32.7359	(247)
Pumps and fans for heating	75.0000	19.4400	14.5800	(249)
Pump for solar water heating	50.0000	19.4400	9.7200	(249)
Energy for lighting	419.1320	19.4400	81.4793	(250)
Additional standing charges			95.0000	(251)
Energy saving/generation technologies				
PV Unit	-1824.1596	19.4400	-354.6166	(252)
Total energy cost			-19.6938	(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	2793.6007	0.2160	603.4177	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	901.8149	0.2160	194.7920	(264)
Space and water heating			798.2098	(265)
Pumps and fans	125.0000	0.5190	64.8750	(267)
Energy for lighting	419.1320	0.5190	217.5295	(268)
Energy saving/generation technologies				
PV Unit	-1824.1596	0.5190	-946.7389	(269)
Total kg/year			133.8754	(272)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2793.6007	1.2200	3408.1928 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	901.8149	1.2200	1100.2142 (264)
Space and water heating			4508.4070 (265)
Pumps and fans	125.0000	3.0700	383.7500 (267)
Energy for lighting	419.1320	3.0700	1286.7352 (268)
Energy saving/generation technologies			
PV Unit	-1824.1596	3.0700	-5600.1701 (269)
Primary energy kWh/year			578.7221 (272)
Primary energy kWh/m2/year			6.7845 (273)

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

 Overheating Calculation Input Data

Dwelling type	SemiDetached House
Number of storeys	2
Cross ventilation possible	Yes
SAP Region	Thames Valley
Front of dwelling faces	North
Overshading	Average or unknown
Thermal mass parameter	129.8 (calculated from construction elements)
Night ventilation	Yes
Ventilation rate during hot weather (ach)	3.87 (Calculated rate)

 Overheating Calculation

Summer ventilation heat loss coefficient	278.74 (P1)
Transmission heat loss coefficient	56.26 (37)
Summer heat loss coefficient	335.01 (P2)

Overhangs

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

Solar shading

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

[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Shading	Gains W
North	3.5470	81.1852	0.7600	0.7200	0.7650	108.4896
South	4.6810	112.2060	0.7600	0.7200	0.7650	197.8813

 total: 306.3709

Solar gains	Jun 322	Jul 306	Aug 283	(P3/P4)
Internal gains	448	430	439	
Total summer gains	771	736	722	(P5)
Summer gain/loss ratio	2.30	2.20	2.16	(P6)
Summer external temperature	16.00	17.90	17.80	
Thermal mass temperature increment (TMP = 129.8)	1.09	1.09	1.09	
Threshold temperature	19.39	21.19	21.05	(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	220		Issued on Date	16/05/2022	
Assessment Reference	220 E	Prop Type Ref	3B5P		
Property	Plot 220				
SAP Rating	84 B	DER	17.91	TER	18.59
Environmental	86 B	% DER<TER	3.68		
CO₂ Emissions (t/year)	1.26	DFEE	45.98	TFEE	52.29
General Requirements Compliance	Pass	% DFEE<TFEE	12.07		
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)	18.59	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	17.91	kgCO ₂ /m ²	Pass
	-0.68 (-3.7%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	52.29	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	45.98	kWh/m ² /yr	
	-6.3 (-12.0%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.15 (max. 0.25)	0.15 (max. 0.70)	Pass
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	Pass
Openings	1.26 (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	5.01 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

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

Calculation Type: New Build (As Designed)

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Programmer, room thermostat and TRVs

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100

%

Minimum

75

%

Pass

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)

Slight

Pass

Based on:

Overshading

Average

Windows facing North

3.55 m², No overhang

Windows facing South

4.68 m², No overhang

Air change rate

3.87 ach

Blinds/curtains

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

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

5.01 (design value)

Maximum

10.0

Pass

10 Key features

Party wall U-value

0.00

W/m²K

Roof U-value

0.11

W/m²K

Roof U-value

0.11

W/m²K

Door U-value

1.00

W/m²K