

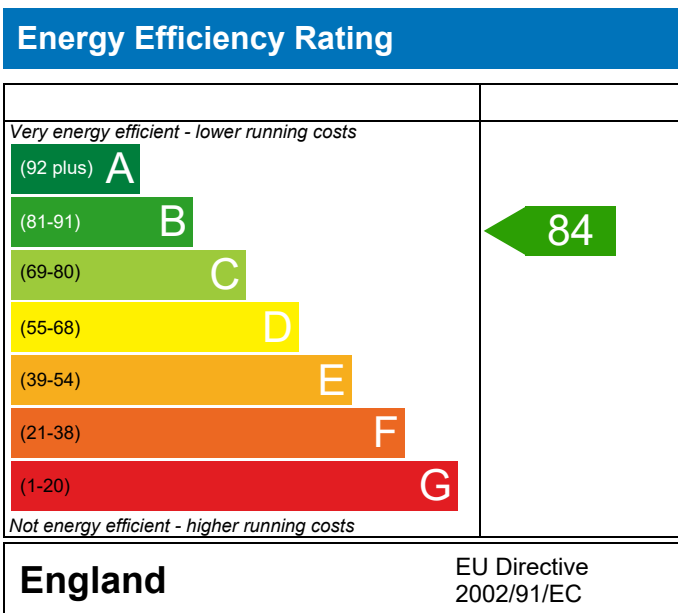
PREDICTED ENERGY ASSESSMENT

Lancing Phase 2,
BN15

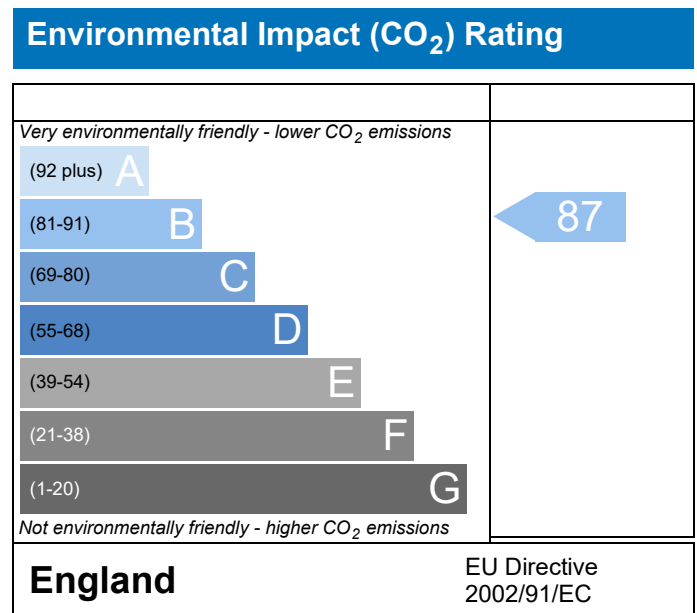
Dwelling type: House, End-Terrace
Date of assessment: 01/02/2023
Produced by: Michael Juckes
Total floor area: 94.29 m²

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	630 - PRJ012992			Issued on Date	01/02/2023
Assessment Reference	630	Prop Type Ref	Clover		
Property	Lancing Phase 2, BN15				
SAP Rating	84 B	DER	16.35	TER	17.33
Environmental	87 B	% DER<TER	5.68		
CO ₂ Emissions (t/year)	1.29	DFEE	42.96	TFEE	49.50
General Requirements Compliance	Pass	% DFEE<TFEE	13.22		
Assessor Details	Chris Nicholls, , Tel: ,			Assessor ID	T850-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

DWELLING AS DESIGNED

End-Terrace House, total floor area 94 m²

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

1a TER and DER

Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 17.33 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 16.35 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)49.5 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)43.0 kWh/m²/yrOK

2 Fabric U-values

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

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

Data from database

Ideal LOGIC COMBI ESP1 30

Combi boiler

Efficiency: 89.6% SEDBUK2009

Minimum: 88.0%

OK

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls:

No cylinder

Boiler interlock

Yes

OK

7 Low energy lights

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

Minimum 75% OK

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (South East England): Slight OK

Based on:

Overshading:

Average

Windows facing North:

5.52 m², No overhang

Windows facing South:

6.78 m², No overhang

Air change rate:

4.61 ach

Blinds/curtains:

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

10 Key features

Party wall U-value 0.00 W/m²K

Roof U-value 0.10 W/m²K

Door U-value 1.09 W/m²K

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	47.1450 (1b)	2.3850 (2b)	112.4408 (1b) - (3b)
First floor	47.1450 (1c)	2.6860 (2c)	126.6315 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.2900		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 239.0723 (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				2 * 10 =	20.0000 (7a)							
Number of passive vents				0 * 10 =	0.0000 (7b)							
Number of flueless gas fires				0 * 40 =	0.0000 (7c)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) =	0.0837 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.3337 (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) =		0.3086 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.3935	0.3858	0.3781	0.3395	0.3318	0.2932	0.2932	0.2855	0.3086	0.3318	0.3472	0.3626 (22b)
	0.5774	0.5744	0.5715	0.5576	0.5550	0.5430	0.5430	0.5408	0.5476	0.5550	0.5603	0.5658 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Solid Door			2.1200	1.0900	2.3108		(26)
Windows (Uw = 1.40)			12.2900	1.3258	16.3068		(27)
Flr - Ground			47.1450	0.1586	7.4760	75.6000	3564.1620 (28a)
Brick	86.4050	11.5320	74.8730	0.2500	18.7183	51.1900	3832.7489 (29a)
Render	12.8030	2.8800	9.9230	0.2500	2.4808	51.1900	507.9584 (29a)
Rf - Ins Joist	47.1450		47.1450	0.1000	4.7145	7.4000	348.8730 (30)
Total net area of external elements Aum(A, m2)			193.5060				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	52.0071		(33)
Party Wall			43.6110	0.0000	0.0000	7.4000	322.7214 (32)
Stud			91.2883			7.4000	675.5331 (32c)
Stud			101.1548			7.4000	748.5452 (32c)
Internal Floor			47.1450			7.4000	348.8730 (32d)
Internal Ceiling			47.1450			7.4000	348.8730 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	10698.2880 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							113.4615 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.1559 (36)
Total fabric heat loss						(33) + (36) =	60.1631 (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	45.5552	45.3180	45.0855	43.9935	43.7892	42.8381	42.8381	42.6619	43.2044	43.7892	44.2025	44.6346 (38)
Average = Sum(39)m / 12 =	105.7182	105.4810	105.2485	104.1565	103.9522	103.0011	103.0011	102.8250	103.3675	103.9522	104.3655	104.7977 (39)
												104.1556 (39)
HLP	1.1212	1.1187	1.1162	1.1046	1.1025	1.0924	1.0924	1.0905	1.0963	1.1025	1.1069	1.1114 (40)
HLP (average)												1.1046 (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												2.6800 (42)
Average daily hot water use (litres/day)												97.8502 (43)
Daily hot water use	107.6352	103.7212	99.8072	95.8932	91.9792	88.0652	88.0652	91.9792	95.8932	99.8072	103.7212	107.6352 (44)
Energy conte	159.6199	139.6046	144.0595	125.5945	120.5109	103.9918	96.3637	110.5787	111.8994	130.4079	142.3505	154.5834 (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 =	1539.5649 (45)
Distribution loss (46)m = 0.15 x (45)m														
	23.9430	20.9407	21.6089	18.8392	18.0766	15.5988	14.4546	16.5868	16.7849	19.5612	21.3526	23.1875	23.1875	(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	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	14.6958	13.2599	14.6483	14.1196	14.5494	14.0330	14.4715	14.5220	14.0802	14.6074	14.1854	14.6807	14.6807	(61)
Total heat required for water heating calculated for each month	174.3157	152.8645	158.7077	139.7141	135.0604	118.0248	110.8352	125.1008	125.9796	145.0153	156.5358	169.2641	169.2641	(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	(63)
Solar input (sum of months) = Sum(63)m =													0.0000 (63)	
Output from w/h	174.3157	152.8645	158.7077	139.7141	135.0604	118.0248	110.8352	125.1008	125.9796	145.0153	156.5358	169.2641	169.2641	(64)
Total per year (kWh/year) = Sum(64)m =													1711.4180 (64)	
Heat gains from water heating, kWh/month	56.7476	49.7335	51.5618	45.2901	43.7073	38.0855	35.6588	40.3979	40.7266	47.0125	50.8779	55.0691	55.0691	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m	134.0005	134.0005	134.0005	134.0005	134.0005	134.0005	134.0005	134.0005	134.0005	134.0005	134.0005	134.0005	134.0005	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.8245	21.1607	17.2091	13.0284	9.7389	8.2220	8.8841	11.5479	15.4996	19.6803	22.9698	24.4867	24.4867	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	246.7528	249.3133	242.8608	229.1244	211.7846	195.4876	184.6002	182.0397	188.4921	202.2286	219.5684	235.8654	235.8654	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.4000	36.4000	36.4000	36.4000	36.4000	36.4000	36.4000	36.4000	36.4000	36.4000	36.4000	36.4000	36.4000	(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	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	(71)
Water heating gains (Table 5)	76.2736	74.0082	69.3035	62.9029	58.7463	52.8966	47.9285	54.2983	56.5647	63.1888	70.6637	74.0177	74.0177	(72)
Total internal gains	413.0511	410.6824	395.5736	371.2558	346.4699	322.8062	307.6129	314.0860	326.7565	351.2978	379.4020	400.5699	400.5699	(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		5.5160	10.6334	0.7300	0.7200	0.7700	21.3641 (74)							
South		6.7750	46.7521	0.7300	0.7200	0.7700	115.3715 (78)							
Solar gains	136.7356	229.7767	310.0639	383.4655	433.5862	433.5051	416.5810	377.8864	334.8394	252.3993	163.1100	117.5018	117.5018	(83)
Total gains	549.7867	640.4591	705.6375	754.7213	780.0561	756.3113	724.1940	691.9725	661.5960	603.6972	542.5120	518.0717	518.0717	(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	28.1101	28.1733	28.2355	28.5315	28.5876	28.8516	28.8516	28.9010	28.7493	28.5876	28.4744	28.3570	28.3570	
alpha	2.8740	2.8782	2.8824	2.9021	2.9058	2.9234	2.9234	2.9267	2.9166	2.9058	2.8983	2.8905	2.8905	
util living area	0.9756	0.9615	0.9387	0.8953	0.8176	0.6919	0.5551	0.5919	0.7720	0.9095	0.9630	0.9793	0.9793	(86)
MIT	18.8255	19.0834	19.4695	19.9601	20.4144	20.7573	20.9085	20.8867	20.6388	20.0530	19.3502	18.7757	18.7757	(87)
Th 2	19.9836	19.9856	19.9876	19.9970	19.9988	20.0071	20.0071	20.0086	20.0039	19.9988	19.9952	19.9915	19.9915	(88)
util rest of house	0.9716	0.9552	0.9282	0.8757	0.7801	0.6229	0.4527	0.4923	0.7139	0.8887	0.9558	0.9758	0.9758	(89)
MIT 2	17.9953	18.2513	18.6327	19.1168	19.5465	19.8537	19.9658	19.9543	19.7578	19.2147	18.5249	17.9516	17.9516	(90)
Living area fraction													fLA = Living area / (4) = 0.2008 (91)	
MIT	18.1620	18.4184	18.8007	19.2861	19.7207	20.0351	20.1551	20.1415	19.9347	19.3830	18.6905	18.1171	18.1171	(92)
Temperature adjustment													-0.1500	
adjusted MIT	18.0120	18.2684	18.6507	19.1361	19.5707	19.8851	20.0051	19.9915	19.7847	19.2330	18.5405	17.9671	17.9671	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	0.9608	0.9409	0.9103	0.8552	0.7614	0.6134	0.4525	0.4904	0.6990	0.8687	0.9419	0.9662	0.9662	(94)
Useful gains	528.2460	602.6298	642.3650	645.4416	593.9697	463.8859	327.6678	339.3408	462.4622	524.4048	510.9688	500.5468	500.5468	(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	4.2000	(96)
Heat loss rate W	1449.6041	1410.1090	1278.8476	1066.1545	818.1806	544.3756	350.7264	369.2933	587.6121	897.4210	1193.9992	1442.7587	1442.7587	(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	1.0000	(97a)
Space heating kWh	685.4904	542.6260	473.5431	302.9133	166.8129	0.0000	0.0000	0.0000	0.0000	277.5240	491.7818	701.0056	701.0056	(98)
Space heating													3641.6972 (98)	
Space heating per m ²													(98) / (4) = 38.6223 (99)	

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													4023.9748 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	685.4904	542.6260	473.5431	302.9133	166.8129	0.0000	0.0000	0.0000	0.0000	277.5240	491.7818	701.0056	(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)	757.4479	599.5868	523.2520	334.7108	184.3237	0.0000	0.0000	0.0000	0.0000	306.6564	543.4053	774.5919	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	174.3157	152.8645	158.7077	139.7141	135.0604	118.0248	110.8352	125.1008	125.9796	145.0153	156.5358	169.2641	(64)
Efficiency of water heater (217)m	89.8324	89.7767	89.6749	89.4649	89.0398	87.3000	87.3000	87.3000	87.3000	89.3756	89.7061	87.3000	(216)
Fuel for water heating, kWh/month	194.0454	170.2719	176.9812	156.1665	151.6855	135.1945	126.9590	143.2998	144.3065	162.2537	174.4986	188.3655	(219)
Water heating fuel used													1924.0282 (219)
Annual totals kWh/year													
Space heating fuel - main system													4023.9748 (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)													420.7489 (232)
Total delivered energy for all uses													6443.7519 (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	4023.9748	0.2160	869.1785 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1924.0282	0.2160	415.5901 (264)
Space and water heating			1284.7686 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	420.7489	0.5190	218.3687 (268)
Total CO2, kg/year			1542.0623 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			16.3500 (273)

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

	TFA	N	EF	
DER				16.3500 ZC1
Total Floor Area				94.2900
Assumed number of occupants				2.6800
CO2 emission factor in Table 12 for electricity displaced from grid				0.5190
CO2 emissions from appliances, equation (L14)				15.5075 ZC2
CO2 emissions from cooking, equation (L16)				1.9442 ZC3
Total CO2 emissions				33.8017 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				33.8017 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 (m2)	Storey height (m)	Volume (m3)
Ground floor	47.1450 (1b)	2.3850 (2b)	112.4408 (1b) - (3b)
First floor	47.1450 (1c)	2.6860 (2c)	126.6315 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.2900		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 239.0723 (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) =	0.1255 (8)							
Pressure test				Yes								
Measured/design AP50				5.0000								
Infiltration rate					0.3755 (18)							
Number of sides sheltered				1	1 (19)							
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)							
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3473 (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	0.4428	0.4342	0.4255	0.3821	0.3734	0.3300	0.3300	0.3213	0.3473	0.3734	0.3907	0.4081 (22b)
Effective ac	0.5981	0.5942	0.5905	0.5730	0.5697	0.5544	0.5544	0.5516	0.5603	0.5697	0.5763	0.5833 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			2.1200	1.0000	2.1200		(26)					
TER Opening Type (Uw = 1.40)			12.2900	1.3258	16.3068		(27)					
Flr - Ground			47.1450	0.1300	6.1289		(28a)					
Brick	86.4050	11.5320	74.8730	0.1800	13.4771		(29a)					
Render	12.8030	2.8800	9.9230	0.1800	1.7861		(29a)					
Rf - Ins Joist	47.1450		47.1450	0.1300	6.1289		(30)					
Total net area of external elements Aum(A, m2)			193.5060				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =		45.9478 (33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.5067 (36)					
Total fabric heat loss							(33) + (36) = 55.4545 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 47.1827	Feb 46.8823	Mar 46.5878	Apr 45.2049	May 44.9461	Jun 43.7416	Jul 43.7416	Aug 43.5185	Sep 44.2056	Oct 44.9461	Nov 45.4696	Dec 46.0168 (38)
Heat transfer coeff	102.6372	102.3368	102.0423	100.6593	100.4006	99.1961	99.1961	98.9730	99.6600	100.4006	100.9240	101.4713 (39)
Average = Sum(39)m / 12 =												100.6581 (39)
HLP	Jan 1.0885	Feb 1.0853	Mar 1.0822	Apr 1.0676	May 1.0648	Jun 1.0520	Jul 1.0520	Aug 1.0497	Sep 1.0570	Oct 1.0648	Nov 1.0704	Dec 1.0762 (40)
HLP (average)												1.0675 (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												2.6800 (42)
Average daily hot water use (litres/day)												97.8502 (43)
Daily hot water use	107.6352	103.7212	99.8072	95.8932	91.9792	88.0652	88.0652	91.9792	95.8932	99.8072	103.7212	107.6352 (44)
Energy conte	159.6199	139.6046	144.0595	125.5945	120.5109	103.9918	96.3637	110.5787	111.8994	130.4079	142.3505	154.5834 (45)
Energy content (annual)												Total = Sum(45)m = 1539.5649 (45)
Distribution loss (46)m = 0.15 x (45)m	23.9430	20.9407	21.6089	18.8392	18.0766	15.5988	14.4546	16.5868	16.7849	19.5612	21.3526	23.1875 (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

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													3878.0835 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	699.4821	551.7590	474.5237	287.4420	136.1220	0.0000	0.0000	0.0000	0.0000	263.5831	495.5855	713.6326	(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)	748.9102	590.7484	508.0553	307.7538	145.7409	0.0000	0.0000	0.0000	0.0000	282.2089	530.6055	764.0606	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	210.5788	185.6320	194.9201	172.8843	167.3825	147.4212	141.2407	157.4503	159.1892	181.2686	191.6655	205.5423	(64)
Efficiency of water heater (217)m	87.8434	87.6255	87.2063	86.3223	84.5360	80.3000	80.3000	80.3000	80.3000	85.9927	87.3364	80.3000	(216)
Fuel for water heating, kWh/month	239.7207	211.8471	223.5162	200.2778	198.0014	183.5880	175.8913	196.0776	198.2431	210.7954	219.4566	233.7648	(219)
Water heating fuel used													2491.1801 (219)
Annual totals kWh/year													
Space heating fuel - main system													3878.0835 (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)													423.3754 (232)
Total delivered energy for all uses													6867.6390 (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	3878.0835	0.2160	837.6660 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2491.1801	0.2160	538.0949 (264)
Space and water heating			1375.7609 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	423.3754	0.5190	219.7318 (268)
Total CO2, kg/m2/year			1634.4178 (272)
Emissions per m2 for space and water heating			14.5907 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3304 (272b)
Emissions per m2 for pumps and fans			0.4128 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.5907 * 1.00) + 2.3304 + 0.4128, rounded to 2 d.p.			17.3300 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	47.1450 (1b)	2.3850 (2b)	112.4408 (1b) - (3b)
First floor	47.1450 (1c)	2.6860 (2c)	126.6315 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.2900		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 239.0723 (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) =	0.1255 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.3755 (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) =		0.3473 (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	0.4428	0.4342	0.4255	0.3821	0.3734	0.3300	0.3300	0.3213	0.3473	0.3734	0.3907	0.4081 (22b)
Effective ac	0.5981	0.5942	0.5905	0.5730	0.5697	0.5544	0.5544	0.5516	0.5603	0.5697	0.5763	0.5833 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Solid Door			2.1200	1.0900	2.3108		(26)
Windows (Uw = 1.40)			12.2900	1.3258	16.3068		(27)
Flr - Ground			47.1450	0.1586	7.4760	75.6000	3564.1620 (28a)
Brick	86.4050	11.5320	74.8730	0.2500	18.7183	51.1900	3832.7489 (29a)
Render	12.8030	2.8800	9.9230	0.2500	2.4808	51.1900	507.9584 (29a)
Rf - Ins Joist	47.1450		47.1450	0.1000	4.7145	7.4000	348.8730 (30)
Total net area of external elements Aum(A, m2)			193.5060				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	52.0071		(33)
Party Wall			43.6110	0.0000	0.0000	7.4000	322.7214 (32)
Stud			91.2883			7.4000	675.5331 (32c)
Stud			101.1548			7.4000	748.5452 (32c)
Internal Floor			47.1450			7.4000	348.8730 (32d)
Internal Ceiling			47.1450			7.4000	348.8730 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	10698.2880 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							113.4615 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.1559 (36)
Total fabric heat loss						(33) + (36) =	60.1631 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	47.1827	46.8823	46.5878	45.2049	44.9461	43.7416	43.7416	43.5185	44.2056	44.9461	45.4696	46.0168 (38)
Average = Sum(39)m / 12 =	107.3457	107.0453	106.7509	105.3679	105.1092	103.9046	103.9046	103.6816	104.3686	105.1092	105.6326	106.1799 (39)
HLP	1.1385	1.1353	1.1322	1.1175	1.1147	1.1020	1.1020	1.0996	1.1069	1.1147	1.1203	1.1261 (40)
HLP (average)												1.1175 (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												2.6800 (42)
Average daily hot water use (litres/day)												97.8502 (43)
Daily hot water use	107.6352	103.7212	99.8072	95.8932	91.9792	88.0652	88.0652	91.9792	95.8932	99.8072	103.7212	107.6352 (44)
Energy conte	159.6199	139.6046	144.0595	125.5945	120.5109	103.9918	96.3637	110.5787	111.8994	130.4079	142.3505	154.5834 (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 =	1539.5649 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water storage loss:																						
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Heat gains from water heating, kWh/month	33.9192	29.6660	30.6126	26.6888	25.6086	22.0983	20.4773	23.4980	23.7786	27.7117	30.2495	32.8490	65)									

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	134.0005	134.0005	134.0005	134.0005	134.0005	134.0005	134.0005	134.0005	134.0005	134.0005	134.0005	134.0005	134.0005
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	23.8245	21.1607	17.2091	13.0284	9.7389	8.2220	8.8841	11.5479	15.4996	19.6803	22.9698	24.4867	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	246.7528	249.3133	242.8608	229.1244	211.7846	195.4876	184.6002	182.0397	188.4921	202.2286	219.5684	235.8654	(68)
Pumps, fans	36.4000	36.4000	36.4000	36.4000	36.4000	36.4000	36.4000	36.4000	36.4000	36.4000	36.4000	36.4000	(69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	(71)
Total internal gains	45.5904	44.1458	41.1460	37.0678	34.4201	30.6920	27.5232	31.5833	33.0259	37.2469	42.0132	44.1518	(72)
	379.3678	377.8200	364.4161	342.4207	319.1437	297.6017	284.2077	288.3710	300.2177	322.3559	347.7515	367.7040	(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	5.5160	10.6334	0.7300	0.7200	0.7700	21.3641 (74)							
South	6.7750	46.7521	0.7300	0.7200	0.7700	115.3715 (78)							
Solar gains	136.7356	229.7767	310.0639	383.4655	433.5862	433.5051	416.5810	377.8864	334.8394	252.3993	163.1100	117.5018	(83)
Total gains	516.1034	607.5967	674.4800	725.8862	752.7299	731.1068	700.7887	666.2575	635.0571	574.7552	510.8615	485.2058	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
alpha	27.6839	27.7616	27.8381	28.2035	28.2730	28.6007	28.6007	28.6622	28.4736	28.2730	28.1328	27.9879	
util living area	2.8456	2.8508	2.8559	2.8802	2.8849	2.9067	2.9067	2.9108	2.8982	2.8849	2.8755	2.8659	
	0.9792	0.9662	0.9451	0.9042	0.8303	0.7078	0.5716	0.6105	0.7882	0.9191	0.9681	0.9824	(86)
MIT	18.7352	18.9987	19.3950	19.9043	20.3750	20.7374	20.8993	20.8749	20.6097	19.9986	19.2769	18.6911	(87)
Th 2	19.9695	19.9721	19.9747	19.9866	19.9888	19.9992	19.9992	20.0012	19.9952	19.9888	19.9843	19.9796	(88)
util rest of house	0.9757	0.9606	0.9355	0.8858	0.7941	0.6391	0.4674	0.5095	0.7316	0.9000	0.9618	0.9795	(89)
MIT 2	17.8962	18.1586	18.5511	19.0563	19.5040	19.8323	19.9535	19.9407	19.7274	19.1563	18.4453	17.8595	(90)
Living area fraction	18.0646	18.3273	18.7206	19.2266	19.6789	20.0140	20.1434	20.1283	19.9045	19.3254	18.6123	18.0265	(91)
Temperature adjustment	18.0646	18.3273	18.7206	19.2266	19.6789	20.0140	20.1434	20.1283	19.9045	19.3254	18.6123	18.0265	(92)
adjusted MIT	18.0646	18.3273	18.7206	19.2266	19.6789	20.0140	20.1434	20.1283	19.9045	19.3254	18.6123	18.0265	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9668	0.9485	0.9203	0.8690	0.7813	0.6402	0.4836	0.5235	0.7257	0.8842	0.9504	0.9716	(94)
Ext temp.	498.9681	576.3328	620.7457	630.8159	588.0742	468.0597	338.8989	348.7900	460.8590	508.1907	485.5151	471.4101	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	1477.5760	1437.3249	1304.5562	1088.0912	838.6526	562.5408	368.1758	386.5511	605.8128	917.1186	1216.0703	1468.0951	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating	728.0843	578.5867	508.7550	329.2383	186.4303	0.0000	0.0000	0.0000	0.0000	304.2423	525.9998	741.5337	(98)
Space heating per m2												3902.8703 (98)	
												(98) / (4) =	41.3922 (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	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	976.7037	768.8944	787.9801	0.0000	0.0000	0.0000	0.0000	(100)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.7364	0.8063	0.7843	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	719.2734	619.9907	618.0203	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	957.0739	919.5293	881.1998	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	171.2163	222.8567	195.8055	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction												589.8786 (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	42.8041	55.7142	48.9514	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling per m2												147.4697 (107)
Energy for space heating												1.5640 (108)
Energy for space cooling												41.3922 (99)
Total												1.5640 (108)
Dwelling Fabric Energy Efficiency (DFEE)												42.9562 (109)
												43.0 (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 (m2)	Storey height (m)	Volume (m3)
Ground floor	47.1450 (1b)	2.3850 (2b)	112.4408 (1b) - (3b)
First floor	47.1450 (1c)	2.6860 (2c)	126.6315 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.2900		(3a) + (3b) + (3c) + (3d) + (3e) ... (3n) = 239.0723 (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) =	0.1255 (8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate					0.3755 (18)
Number of sides sheltered				1	1 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3473 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4428	0.4342	0.4255	0.3821	0.3734	0.3300	0.3300	0.3213	0.3473	0.3734	0.3907	0.4081 (22b)
Effective ac	0.5981	0.5942	0.5905	0.5730	0.5697	0.5544	0.5544	0.5516	0.5603	0.5697	0.5763	0.5833 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.40)			12.2900	1.3258	16.3068		(27)
Flr - Ground			47.1450	0.1300	6.1289		(28a)
Brick	86.4050	11.5320	74.8730	0.1800	13.4771		(29a)
Render	12.8030	2.8800	9.9230	0.1800	1.7861		(29a)
Rf - Ins Joist	47.1450		47.1450	0.1300	6.1289		(30)
Total net area of external elements Sum(A, m2)			193.5060				(31)
Fabric heat loss, W/K = Sum (A x U)					(26) ... (30) + (32) =		45.9478 (33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)
 Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.5067 (36)
 Total fabric heat loss (33) + (36) = 55.4545 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	47.1827	46.8823	46.5878	45.2049	44.9461	43.7416	43.7416	43.5185	44.2056	44.9461	45.4696	46.0168 (38)
Average = Sum(39)m / 12 =	102.6372	102.3368	102.0423	100.6593	100.4006	99.1961	99.1961	98.9730	99.6600	100.4006	100.9240	101.4713 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0885	1.0853	1.0822	1.0676	1.0648	1.0520	1.0520	1.0497	1.0570	1.0648	1.0704	1.0762 (40)
HLP (average)												1.0675 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6800 (42)
 Average daily hot water use (litres/day) 97.8502 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	107.6352	103.7212	99.8072	95.8932	91.9792	88.0652	88.0652	91.9792	95.8932	99.8072	103.7212	107.6352 (44)
Energy conte	159.6199	139.6046	144.0595	125.5945	120.5109	103.9918	96.3637	110.5787	111.8994	130.4079	142.3505	154.5834 (45)
Energy content (annual)												Total = Sum(45)m = 1539.5649 (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	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Heat gains from water heating, kWh/month	33.9192	29.6660	30.6126	26.6888	25.6086	22.0983	20.4773	23.4980	23.7786	27.7117	30.2495	32.8490	32.8490	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	134.0005	134.0005	134.0005	134.0005	134.0005	134.0005	134.0005	134.0005	134.0005	134.0005	134.0005	134.0005	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.9733	21.2928	17.3165	13.1097	9.7997	8.2733	8.9396	11.6200	15.5963	19.8031	23.1132	24.6396	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	246.7528	249.3133	242.8608	229.1244	211.7846	195.4876	184.6002	182.0397	188.4921	202.2286	219.5684	235.8654	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.4000	36.4000	36.4000	36.4000	36.4000	36.4000	36.4000	36.4000	36.4000	36.4000	36.4000	36.4000	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	(71)
Water heating gains (Table 5)	45.5904	44.1458	41.1460	37.0678	34.4201	30.6920	27.5232	31.5833	33.0259	37.2469	42.0132	44.1518	(72)
Total internal gains	379.5165	377.9521	364.5235	342.5021	319.2045	297.6530	284.2631	288.4431	300.3144	322.4787	347.8949	367.8569	(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	5.5160	10.6334	0.6300	0.7000	0.7700	17.9254 (74)							
South	6.7750	46.7521	0.6300	0.7000	0.7700	96.8015 (78)							
Solar gains	114.7268	192.7921	260.1563	321.7433	363.7967	363.7286	349.5286	317.0623	280.9441	211.7734	136.8560	98.5888	(83)
Total gains	494.2434	570.7442	624.6798	664.2454	683.0011	661.3816	633.7917	605.5054	581.2585	534.2522	484.7508	466.4457	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area, nil,m (see Table 9a)	63.7967	63.9840	64.1686	65.0503	65.2179	66.0098	66.0098	66.1586	65.7025	65.2179	64.8796	64.5297	21.0000 (85)
alpha	5.2531	5.2656	5.2779	5.3367	5.3479	5.4007	5.4007	5.4106	5.3802	5.3479	5.3253	5.3020	
util living area	0.9990	0.9975	0.9939	0.9817	0.9415	0.8260	0.6572	0.7044	0.9048	0.9862	0.9977	0.9992	(86)
MIT	19.7708	19.9132	20.1340	20.4278	20.7059	20.9102	20.9798	20.9708	20.8361	20.4767	20.0710	19.7495	(87)
Th 2	20.0102	20.0128	20.0154	20.0274	20.0297	20.0402	20.0402	20.0422	20.0361	20.0297	20.0251	20.0203	(88)
util rest of house	0.9986	0.9967	0.9916	0.9740	0.9142	0.7472	0.5295	0.5802	0.8506	0.9790	0.9968	0.9990	(89)
MIT 2	18.8831	19.0273	19.2492	19.5490	19.8153	19.9941	20.0344	20.0329	19.9377	19.6010	19.1951	18.8701	(90)
Living area fraction	fLA = Living area / (4) =												
MIT	19.0613	19.2052	19.4268	19.7255	19.9941	20.1780	20.2242	20.2212	20.1181	19.7768	19.3709	19.0466	(92)
Temperature adjustment	0.0000												
adjusted MIT	19.0613	19.2052	19.4268	19.7255	19.9941	20.1780	20.2242	20.2212	20.1181	19.7768	19.3709	19.0466	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9981	0.9957	0.9897	0.9709	0.9130	0.7600	0.5554	0.6053	0.8562	0.9765	0.9959	0.9986	(94)
Useful gains	493.3160	568.2952	618.2573	644.9296	623.5664	502.6450	352.0322	366.4973	497.6552	521.6837	482.7477	465.8022	(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	1515.0630	1463.9481	1319.0852	1089.6830	832.7334	553.3165	359.5107	378.1943	599.7608	921.3574	1238.4309	1506.5060	(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	760.1798	601.8787	521.4160	320.2225	155.6202	0.0000	0.0000	0.0000	0.0000	297.3573	544.0919	774.2836	(98)
Space heating	3975.0499 (98)												
Space heating per m2	42.1577 (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	932.4431	734.0509	752.1949	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8161	0.8952	0.8736	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	760.9494	657.0989	657.1295	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	875.6453	841.2950	810.2868	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	82.5811	137.0419	113.9490	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling	333.5720 (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	20.6453	34.2605	28.4873	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											83.3930 (107)	
Space cooling per m2											0.8844 (108)	
Energy for space heating											42.1577 (99)	
Energy for space cooling											0.8844 (108)	
Total											43.0421 (109)	
Target Fabric Energy Efficiency (TFEE)											49.5 (109)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	47.1450 (1b)	2.3850 (2b)	112.4408 (1b) - (3b)
First floor	47.1450 (1c)	2.6860 (2c)	126.6315 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.2900		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 239.0723 (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				2 * 10 =	20.0000 (7a)							
Number of passive vents				0 * 10 =	0.0000 (7b)							
Number of flueless gas fires				0 * 40 =	0.0000 (7c)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) =	0.0837 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.3337 (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) =		0.3086 (21)							
Wind speed	Jan 5.7000	Feb 5.2000	Mar 4.9000	Apr 4.5000	May 4.6000	Jun 4.2000	Jul 4.3000	Aug 4.2000	Sep 4.5000	Oct 4.9000	Nov 4.9000	Dec 5.2000 (22)
Wind factor	1.4250	1.3000	1.2250	1.1250	1.1500	1.0500	1.0750	1.0500	1.1250	1.2250	1.2250	1.3000 (22a)
Adj infilt rate	0.4398	0.4012	0.3781	0.3472	0.3549	0.3241	0.3318	0.3241	0.3472	0.3781	0.3781	0.4012 (22b)
Effective ac	0.5967	0.5805	0.5715	0.5603	0.5630	0.5525	0.5550	0.5525	0.5603	0.5715	0.5715	0.5805 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Solid Door			2.1200	1.0900	2.3108		(26)
Windows (Uw = 1.40)			12.2900	1.3258	16.3068		(27)
Flr - Ground			47.1450	0.1586	7.4760	75.6000	3564.1620 (28a)
Brick	86.4050	11.5320	74.8730	0.2500	18.7183	51.1900	3832.7489 (29a)
Render	12.8030	2.8800	9.9230	0.2500	2.4808	51.1900	507.9584 (29a)
Rf - Ins Joist	47.1450		47.1450	0.1000	4.7145	7.4000	348.8730 (30)
Total net area of external elements Aum(A, m2)			193.5060				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	52.0071		(33)
Party Wall			43.6110	0.0000	0.0000	7.4000	322.7214 (32)
Stud			91.2883			7.4000	675.5331 (32c)
Stud			101.1548			7.4000	748.5452 (32c)
Internal Floor			47.1450			7.4000	348.8730 (32d)
Internal Ceiling			47.1450			7.4000	348.8730 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 10698.2880 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							113.4615 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.1559 (36)
Total fabric heat loss						(33) + (36) =	60.1631 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	47.0770	45.7971	45.0855	44.2025	44.4162	43.5895	43.7892	43.5895	44.2025	45.0855	45.0855	45.7971 (38)
Average = Sum(39)m / 12 =	107.2400	105.9601	105.2485	104.3655	104.5792	103.7526	103.9522	103.7526	104.3655	105.2485	105.2485	105.9601 (39)
HLP	1.1373	1.1238	1.1162	1.1069	1.1091	1.1004	1.1025	1.1004	1.1069	1.1162	1.1162	1.1238 (40)
HLP (average)												1.1133 (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												2.6800 (42)
Average daily hot water use (litres/day)												97.8502 (43)
Daily hot water use	107.6352	103.7212	99.8072	95.8932	91.9792	88.0652	88.0652	91.9792	95.8932	99.8072	103.7212	107.6352 (44)
Energy conte	159.6199	139.6046	144.0595	125.5945	120.5109	103.9918	96.3637	110.5787	111.8994	130.4079	142.3505	154.5834 (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 =	1539.5649 (45)
Distribution loss (46)m = 0.15 x (45)m														
	23.9430	20.9407	21.6089	18.8392	18.0766	15.5988	14.4546	16.5868	16.7849	19.5612	21.3526	23.1875	23.1875	(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	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	14.6958	13.2599	14.6483	14.1196	14.5494	14.0330	14.4715	14.5220	14.0802	14.6074	14.1854	14.6807	14.6807	(61)
Total heat required for water heating calculated for each month	174.3157	152.8645	158.7077	139.7141	135.0604	118.0248	110.8352	125.1008	125.9796	145.0153	156.5358	169.2641	169.2641	(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	(63)
Solar input (sum of months) = Sum(63)m =													0.0000 (63)	
Output from w/h	174.3157	152.8645	158.7077	139.7141	135.0604	118.0248	110.8352	125.1008	125.9796	145.0153	156.5358	169.2641	169.2641	(64)
Total per year (kWh/year) = Sum(64)m =													1711.4180 (64)	
RHI water heating demand													1711 (64)	
Heat gains from water heating, kWh/month	56.7476	49.7335	51.5618	45.2901	43.7073	38.0855	35.6588	40.3979	40.7266	47.0125	50.8779	55.0691	55.0691	(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	160.8005	160.8005	160.8005	160.8005	160.8005	160.8005	160.8005	160.8005	160.8005	160.8005	160.8005	160.8005	160.8005	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	59.5614	52.9019	43.0227	32.5709	24.3472	20.5549	22.2103	28.8698	38.7490	49.2007	57.4245	61.2168	61.2168	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	368.2877	372.1094	362.4789	341.9767	316.0964	291.7725	275.5227	271.7010	281.3315	301.8337	327.7140	352.0379	352.0379	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.7601	53.7601	53.7601	53.7601	53.7601	53.7601	53.7601	53.7601	53.7601	53.7601	53.7601	53.7601	53.7601	(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	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	(71)
Water heating gains (Table 5)	76.2736	74.0082	69.3035	62.9029	58.7463	52.8966	47.9285	54.2983	56.5647	63.1888	70.6637	74.0177	74.0177	(72)
Total internal gains	614.4829	609.3797	585.1654	547.8108	509.5501	475.5842	456.0217	465.2293	487.0054	524.5835	566.1625	597.6325	597.6325	(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		5.5160	13.4530	0.7300	0.7200	0.7700	27.0292 (74)							
South		6.7750	56.4170	0.7300	0.7200	0.7700	139.2220 (78)							
Solar gains	166.2512	241.8425	331.2470	431.0878	474.7682	516.1245	484.5671	441.2058	380.5692	285.8150	197.6576	140.4707	140.4707	(83)
Total gains	780.7341	851.2222	916.4123	978.8986	984.3183	991.7087	940.5888	906.4351	867.5746	810.3984	763.8200	738.1032	738.1032	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
tau	27.7112	28.0459	28.2355	28.4744	28.4162	28.6426	28.5876	28.6426	28.4744	28.2355	28.2355	28.0459	28.0459	
alpha	2.8474	2.8697	2.8824	2.8983	2.8944	2.9095	2.9058	2.9095	2.8983	2.8824	2.8824	2.8697	2.8697	
util living area	0.9357	0.9196	0.8841	0.8137	0.6996	0.5347	0.4089	0.3931	0.6063	0.7972	0.8988	0.9411	0.9411	(86)
MIT	19.3414	19.4992	19.8434	20.2825	20.6628	20.8911	20.9630	20.9694	20.8405	20.4663	19.9039	19.3433	19.3433	(87)
Th 2	19.9705	19.9815	19.9876	19.9952	19.9934	20.0005	19.9988	20.0005	19.9952	19.9876	19.9876	19.9815	19.9815	(88)
util rest of house	0.9254	0.9073	0.8660	0.7837	0.6481	0.4580	0.3123	0.2915	0.5291	0.7559	0.8802	0.9315	0.9315	(89)
MIT 2	18.4921	18.6529	18.9903	19.4118	19.7531	19.9408	19.9853	19.9905	19.9031	19.5834	19.0551	18.5031	18.5031	(90)
Living area fraction	18.6626	18.8228	19.1616	19.5867	19.9357	20.1316	20.1816	20.1871	20.0913	19.7606	19.2255	18.6718	18.6718	(92)
Temperature adjustment												-0.1500	-0.1500	
adjusted MIT	18.5126	18.6728	19.0116	19.4367	19.7857	19.9816	20.0316	20.0371	19.9413	19.6106	19.0755	18.5218	18.5218	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains	708.1751	755.5539	774.4512	748.3867	626.3547	452.6364	296.8600	267.6919	455.1355	598.1419	656.5538	674.5189	674.5189	(95)
Ext temp.	5.4000	5.6000	7.1000	9.5000	12.6000	15.3000	17.1000	17.4000	15.1000	12.0000	8.6000	5.6000	5.6000	(96)
Heat loss rate W	1406.1939	1385.1984	1253.6793	1037.0440	751.4781	485.7298	304.7477	273.6011	505.2641	801.0095	1102.5333	1369.1920	1369.1920	(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	1.0000	(97a)
Space heating kWh	519.3260	423.1211	356.5457	207.8333	93.0918	0.0000	0.0000	0.0000	0.0000	150.9335	321.1052	516.8368	516.8368	(98)
Space heating													2588.7934 (98)	
RHI space heating demand													2589 (98)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	47.1450 (1b)	2.3850 (2b)	112.4408 (1b) - (3b)
First floor	47.1450 (1c)	2.6860 (2c)	126.6315 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.2900		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 239.0723 (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				2 * 10 =	20.0000 (7a)							
Number of passive vents				0 * 10 =	0.0000 (7b)							
Number of flueless gas fires				0 * 40 =	0.0000 (7c)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) =	0.0837 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.3337 (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) =		0.3086 (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	0.3935	0.3858	0.3781	0.3395	0.3318	0.2932	0.2932	0.2855	0.3086	0.3318	0.3472	0.3626 (22b)
Effective ac	0.5774	0.5744	0.5715	0.5576	0.5550	0.5430	0.5430	0.5408	0.5476	0.5550	0.5603	0.5658 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Solid Door			2.1200	1.0900	2.3108		(26)
Windows (Uw = 1.40)			12.2900	1.3258	16.3068		(27)
Flr - Ground			47.1450	0.1586	7.4760	75.6000	3564.1620 (28a)
Brick	86.4050	11.5320	74.8730	0.2500	18.7183	51.1900	3832.7489 (29a)
Render	12.8030	2.8800	9.9230	0.2500	2.4808	51.1900	507.9584 (29a)
Rf - Ins Joist	47.1450		47.1450	0.1000	4.7145	7.4000	348.8730 (30)
Total net area of external elements Aum(A, m2)			193.5060				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	52.0071		(33)
Party Wall			43.6110	0.0000	0.0000	7.4000	322.7214 (32)
Stud			91.2883			7.4000	675.5331 (32c)
Stud			101.1548			7.4000	748.5452 (32c)
Internal Floor			47.1450			7.4000	348.8730 (32d)
Internal Ceiling			47.1450			7.4000	348.8730 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 10698.2880 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							113.4615 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.1559 (36)
Total fabric heat loss							(33) + (36) = 60.1631 (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	45.5552	45.3180	45.0855	43.9935	43.7892	42.8381	42.8381	42.6619	43.2044	43.7892	44.2025	44.6346 (38)
Average = Sum(39)m / 12 =	105.7182	105.4810	105.2485	104.1565	103.9522	103.0011	103.0011	102.8250	103.3675	103.9522	104.3655	104.7977 (39)
HLP	1.1212	1.1187	1.1162	1.1046	1.1025	1.0924	1.0924	1.0905	1.0963	1.1025	1.1069	1.1114 (40)
HLP (average)												1.1046 (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												2.6800 (42)
Average daily hot water use (litres/day)												97.8502 (43)
Daily hot water use	107.6352	103.7212	99.8072	95.8932	91.9792	88.0652	88.0652	91.9792	95.8932	99.8072	103.7212	107.6352 (44)
Energy conte	159.6199	139.6046	144.0595	125.5945	120.5109	103.9918	96.3637	110.5787	111.8994	130.4079	142.3505	154.5834 (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 =	1539.5649 (45)
Distribution loss (46)m = 0.15 x (45)m														
	23.9430	20.9407	21.6089	18.8392	18.0766	15.5988	14.4546	16.5868	16.7849	19.5612	21.3526	23.1875	23.1875	(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	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	14.6958	13.2599	14.6483	14.1196	14.5494	14.0330	14.4715	14.5220	14.0802	14.6074	14.1854	14.6807	14.6807	(61)
Total heat required for water heating calculated for each month	174.3157	152.8645	158.7077	139.7141	135.0604	118.0248	110.8352	125.1008	125.9796	145.0153	156.5358	169.2641	169.2641	(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	(63)
Solar input (sum of months) = Sum(63)m =													0.0000 (63)	
Output from w/h	174.3157	152.8645	158.7077	139.7141	135.0604	118.0248	110.8352	125.1008	125.9796	145.0153	156.5358	169.2641	169.2641	(64)
Heat gains from water heating, kWh/month	56.7476	49.7335	51.5618	45.2901	43.7073	38.0855	35.6588	40.3979	40.7266	47.0125	50.8779	55.0691	55.0691	(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	160.8005	160.8005	160.8005	160.8005	160.8005	160.8005	160.8005	160.8005	160.8005	160.8005	160.8005	160.8005	160.8005	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	59.5614	52.9019	43.0227	32.5709	24.3472	20.5549	22.2103	28.8698	38.7490	49.2007	57.4245	61.2168	61.2168	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	368.2877	372.1094	362.4789	341.9767	316.0964	291.7725	275.5227	271.7010	281.3315	301.8337	327.7140	352.0379	352.0379	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.7601	53.7601	53.7601	53.7601	53.7601	53.7601	53.7601	53.7601	53.7601	53.7601	53.7601	53.7601	53.7601	(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	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	(71)
Water heating gains (Table 5)	76.2736	74.0082	69.3035	62.9029	58.7463	52.8966	47.9285	54.2983	56.5647	63.1888	70.6637	74.0177	74.0177	(72)
Total internal gains	614.4829	609.3797	585.1654	547.8108	509.5501	475.5842	456.0217	465.2293	487.0054	524.5835	566.1625	597.6325	597.6325	(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		5.5160	10.6334	0.7300	0.7200	0.7700	21.3641 (74)							
South		6.7750	46.7521	0.7300	0.7200	0.7700	115.3715 (78)							
Solar gains	136.7356	229.7767	310.0639	383.4655	433.5862	433.5051	416.5810	377.8864	334.8394	252.3993	163.1100	117.5018	117.5018	(83)
Total gains	751.2186	839.1564	895.2292	931.2763	943.1363	909.0893	872.6027	843.1158	821.8449	776.9828	729.2724	715.1343	715.1343	(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	28.1101	28.1733	28.2355	28.5315	28.5876	28.8516	28.8516	28.9010	28.7493	28.5876	28.4744	28.3570	28.3570	
alpha	2.8740	2.8782	2.8824	2.9021	2.9058	2.9234	2.9234	2.9267	2.9166	2.9058	2.8983	2.8905	2.8905	
util living area	0.9488	0.9289	0.8983	0.8434	0.7531	0.6164	0.4796	0.5104	0.6898	0.8514	0.9273	0.9547	0.9547	(86)
MIT	19.1376	19.3732	19.7208	20.1554	20.5435	20.8236	20.9380	20.9238	20.7390	20.2531	19.6235	19.0871	19.0871	(87)
Th 2	19.9836	19.9856	19.9876	19.9970	19.9988	20.0071	20.0071	20.0086	20.0039	19.9988	19.9952	19.9915	19.9915	(88)
util rest of house	0.9411	0.9182	0.8926	0.8178	0.7099	0.5463	0.3849	0.4169	0.6260	0.8221	0.9146	0.9478	0.9478	(89)
MIT 2	18.3009	18.5325	18.8723	19.2958	19.6551	19.8993	19.9802	19.9736	19.8330	19.3967	18.7887	18.2573	18.2573	(90)
Living area fraction													fLA = Living area / (4) = 0.2008 (91)	
MIT	18.4689	18.7013	19.0426	19.4684	19.8334	20.0849	20.1725	20.1644	20.0149	19.5686	18.9563	18.4239	18.4239	(92)
Temperature adjustment													-0.1500	
adjusted MIT	18.3189	18.5513	18.8926	19.3184	19.6834	19.9349	20.0225	20.0144	19.8649	19.4186	18.8063	18.2739	18.2739	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	0.9246	0.8994	0.8620	0.7975	0.6947	0.5407	0.3865	0.4174	0.6161	0.8019	0.8957	0.9324	0.9324	(94)
Useful gains	694.5919	754.7538	771.6695	742.7295	655.1585	491.5765	337.2337	351.9558	506.3231	623.0557	653.2052	666.7839	666.7839	(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	4.2000	(96)
Heat loss rate W	1482.0526	1439.9491	1304.3051	1085.1404	829.8968	549.4997	352.5182	371.6463	595.9042	916.7141	1221.7316	1474.9137	1474.9137	(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	1.0000	(97a)
Space heating kWh	585.8707	460.4512	396.2808	246.5359	130.0053	0.0000	0.0000	0.0000	0.0000	218.4819	409.3390	601.2485	601.2485	(98)
Space heating													3048.2132 (98)	
Space heating per m2													(98) / (4) = 32.3281 (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													3368.1914 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	585.8707	460.4512	396.2808	246.5359	130.0053	0.0000	0.0000	0.0000	0.0000	218.4819	409.3390	601.2485	(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)	647.3709	508.7859	437.8794	272.4153	143.6522	0.0000	0.0000	0.0000	0.0000	241.4164	452.3083	664.3630	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	174.3157	152.8645	158.7077	139.7141	135.0604	118.0248	110.8352	125.1008	125.9796	145.0153	156.5358	169.2641	(64)
Efficiency of water heater (217)m	89.7457	89.6807	89.5612	89.3158	88.8407	87.3000	87.3000	87.3000	87.3000	89.1957	89.5916	87.3000	(216)
Fuel for water heating, kWh/month	194.2330	170.4542	177.2059	156.4272	152.0253	135.1945	126.9590	143.2998	144.3065	162.5812	174.7216	188.5381	(219)
Water heating fuel used													1925.9464 (219)
Annual totals kWh/year													
Space heating fuel - main system													3368.1914 (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)													420.7489 (232)
Total delivered energy for all uses													5789.8868 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3368.1914	3.4800	117.2131 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1925.9464	3.4800	67.0229 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	420.7489	13.1900	55.4968 (250)
Additional standing charges			120.0000 (251)
Total energy cost			369.6253 (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] =	1.1145 (257)
SAP value		84.4523
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	3368.1914	0.2160	727.5293 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1925.9464	0.2160	416.0044 (264)
Space and water heating			1143.5338 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	420.7489	0.5190	218.3687 (268)
Total kg/year			1400.8275 (272)
CO2 emissions per m2			14.8600 (273)
EI value			86.5237
EI rating			87 (274)
EI band			B

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9050 = 3.845$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9050 = 0.2387$, stars = 4
Water heating energy efficiency	$3.48 / 0.8874 = 3.921$, stars = 4
Water heating environmental impact	$0.216 / 0.8874 = 0.2434$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	47.1450 (1b)	2.3850 (2b)	112.4408 (1b) - (3b)
First floor	47.1450 (1c)	2.6860 (2c)	126.6315 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.2900		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 239.0723 (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				2 * 10 =	20.0000 (7a)							
Number of passive vents				0 * 10 =	0.0000 (7b)							
Number of flueless gas fires				0 * 40 =	0.0000 (7c)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) =	0.0837 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.3337 (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) =		0.3086 (21)							
Wind speed	Jan 5.7000	Feb 5.2000	Mar 4.9000	Apr 4.5000	May 4.6000	Jun 4.2000	Jul 4.3000	Aug 4.2000	Sep 4.5000	Oct 4.9000	Nov 4.9000	Dec 5.2000 (22)
Wind factor	1.4250	1.3000	1.2250	1.1250	1.1500	1.0500	1.0750	1.0500	1.1250	1.2250	1.2250	1.3000 (22a)
Adj infilt rate												
Effective ac	0.4398	0.4012	0.3781	0.3472	0.3549	0.3241	0.3318	0.3241	0.3472	0.3781	0.3781	0.4012 (22b)
	0.5967	0.5805	0.5715	0.5603	0.5630	0.5525	0.5550	0.5525	0.5603	0.5715	0.5715	0.5805 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Solid Door			2.1200	1.0900	2.3108		(26)
Windows (Uw = 1.40)			12.2900	1.3258	16.3068		(27)
Flr - Ground			47.1450	0.1586	7.4760	75.6000	3564.1620 (28a)
Brick	86.4050	11.5320	74.8730	0.2500	18.7183	51.1900	3832.7489 (29a)
Render	12.8030	2.8800	9.9230	0.2500	2.4808	51.1900	507.9584 (29a)
Rf - Ins Joist	47.1450		47.1450	0.1000	4.7145	7.4000	348.8730 (30)
Total net area of external elements Aum(A, m2)			193.5060				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	52.0071		(33)
Party Wall			43.6110	0.0000	0.0000	7.4000	322.7214 (32)
Stud			91.2883			7.4000	675.5331 (32c)
Stud			101.1548			7.4000	748.5452 (32c)
Internal Floor			47.1450			7.4000	348.8730 (32d)
Internal Ceiling			47.1450			7.4000	348.8730 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 10698.2880 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							113.4615 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.1559 (36)
Total fabric heat loss						(33) + (36) =	60.1631 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	47.0770	45.7971	45.0855	44.2025	44.4162	43.5895	43.7892	43.5895	44.2025	45.0855	45.0855	45.7971 (38)
Average = Sum(39)m / 12 =	107.2400	105.9601	105.2485	104.3655	104.5792	103.7526	103.9522	103.7526	104.3655	105.2485	105.2485	105.9601 (39)
												104.9728 (39)
HLP	1.1373	1.1238	1.1162	1.1069	1.1091	1.1004	1.1025	1.1004	1.1069	1.1162	1.1162	1.1238 (40)
HLP (average)												1.1133 (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												2.6800 (42)
Average daily hot water use (litres/day)												97.8502 (43)
Daily hot water use	107.6352	103.7212	99.8072	95.8932	91.9792	88.0652	88.0652	91.9792	95.8932	99.8072	103.7212	107.6352 (44)
Energy conte	159.6199	139.6046	144.0595	125.5945	120.5109	103.9918	96.3637	110.5787	111.8994	130.4079	142.3505	154.5834 (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 =	1539.5649 (45)
Distribution loss (46)m = 0.15 x (45)m													
	23.9430	20.9407	21.6089	18.8392	18.0766	15.5988	14.4546	16.5868	16.7849	19.5612	21.3526	23.1875	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	14.6958	13.2599	14.6483	14.1196	14.5494	14.0330	14.4715	14.5220	14.0802	14.6074	14.1854	14.6807	61)
Total heat required for water heating calculated for each month	174.3157	152.8645	158.7077	139.7141	135.0604	118.0248	110.8352	125.1008	125.9796	145.0153	156.5358	169.2641	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	174.3157	152.8645	158.7077	139.7141	135.0604	118.0248	110.8352	125.1008	125.9796	145.0153	156.5358	169.2641	64)
	Total per year (kWh/year) = Sum(64)m =											1711.4180 (64)	
Heat gains from water heating, kWh/month	56.7476	49.7335	51.5618	45.2901	43.7073	38.0855	35.6588	40.3979	40.7266	47.0125	50.8779	55.0691	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	160.8005	160.8005	160.8005	160.8005	160.8005	160.8005	160.8005	160.8005	160.8005	160.8005	160.8005	160.8005	66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	59.5614	52.9019	43.0227	32.5709	24.3472	20.5549	22.2103	28.8698	38.7490	49.2007	57.4245	61.2168	67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	368.2877	372.1094	362.4789	341.9767	316.0964	291.7725	275.5227	271.7010	281.3315	301.8337	327.7140	352.0379	68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.7601	53.7601	53.7601	53.7601	53.7601	53.7601	53.7601	53.7601	53.7601	53.7601	53.7601	53.7601	69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	70)
Losses e.g. evaporation (negative values) (Table 5)	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	71)
Water heating gains (Table 5)	76.2736	74.0082	69.3035	62.9029	58.7463	52.8966	47.9285	54.2983	56.5647	63.1888	70.6637	74.0177	72)
Total internal gains	614.4829	609.3797	585.1654	547.8108	509.5501	475.5842	456.0217	465.2293	487.0054	524.5835	566.1625	597.6325	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		5.5160	13.4530	0.7300	0.7200	0.7700	27.0292 (74)						
South		6.7750	56.4170	0.7300	0.7200	0.7700	139.2220 (78)						
Solar gains	166.2512	241.8425	331.2470	431.0878	474.7682	516.1245	484.5671	441.2058	380.5692	285.8150	197.6576	140.4707	83)
Total gains	780.7341	851.2222	916.4123	978.8986	984.3183	991.7087	940.5888	906.4351	867.5746	810.3984	763.8200	738.1032	84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	27.7112	28.0459	28.2355	28.4744	28.4162	28.6426	28.5876	28.6426	28.4744	28.2355	28.2355	28.0459	28.0459
alpha	2.8474	2.8697	2.8824	2.8983	2.8944	2.9095	2.9058	2.9095	2.8983	2.8824	2.8824	2.8697	2.8697
util living area	0.9357	0.9196	0.8841	0.8137	0.6996	0.5347	0.4089	0.3931	0.6063	0.7972	0.8988	0.9411	86)
MIT	19.3414	19.4992	19.8434	20.2825	20.6628	20.8911	20.9630	20.9694	20.8405	20.4663	19.9039	19.3433	87)
Th 2	19.9705	19.9815	19.9876	19.9952	19.9934	20.0005	19.9988	20.0005	19.9952	19.9876	19.9876	19.9815	88)
util rest of house	0.9254	0.9073	0.8660	0.7837	0.6481	0.4580	0.3123	0.2915	0.5291	0.7559	0.8802	0.9315	89)
MIT 2	18.4921	18.6529	18.9903	19.4118	19.7531	19.9408	19.9853	19.9905	19.9031	19.5834	19.0551	18.5031	90)
Living area fraction	fLA = Living area / (4) =											0.2008 (91)	
MIT	18.6626	18.8228	19.1616	19.5867	19.9357	20.1316	20.1816	20.1871	20.0913	19.7606	19.2255	18.6718	92)
Temperature adjustment												-0.1500	
adjusted MIT	18.5126	18.6728	19.0116	19.4367	19.7857	19.9816	20.0316	20.0371	19.9413	19.6106	19.0755	18.5218	93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9071	0.8876	0.8451	0.7645	0.6363	0.4564	0.3156	0.2953	0.5246	0.7381	0.8596	0.9139	94)
Useful gains	708.1751	755.5539	774.4512	748.3867	626.3547	452.6364	296.8600	267.6919	455.1355	598.1419	656.5538	674.5189	95)
Ext temp.	5.4000	5.6000	7.1000	9.5000	12.6000	15.3000	17.1000	17.4000	15.1000	12.0000	8.6000	5.6000	96)
Heat loss rate W	1406.1939	1385.1984	1253.6793	1037.0440	751.4781	485.7298	304.7477	273.6011	505.2641	801.0095	1102.5333	1369.1920	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	519.3260	423.1211	356.5457	207.8333	93.0918	0.0000	0.0000	0.0000	0.0000	150.9335	321.1052	516.8368	98)
Space heating												2588.7934 (98)	
Space heating per m2												(98) / (4) = 27.4557 (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

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													2860.5452 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	519.3260	423.1211	356.5457	207.8333	93.0918	0.0000	0.0000	0.0000	0.0000	150.9335	321.1052	516.8368	(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)	573.8409	467.5371	393.9731	229.6500	102.8639	0.0000	0.0000	0.0000	0.0000	166.7774	354.8124	571.0904	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	174.3157	152.8645	158.7077	139.7141	135.0604	118.0248	110.8352	125.1008	125.9796	145.0153	156.5358	169.2641	(64)
Efficiency of water heater (217)m	89.6740	89.6281	89.4896	89.1858	88.5780	87.3000	87.3000	87.3000	87.3000	88.9032	89.4257	87.3000	(216)
Fuel for water heating, kWh/month	194.3883	170.5543	177.3476	156.6551	152.4763	135.1945	126.9590	143.2998	144.3065	163.1160	175.0456	188.7234	(219)
Water heating fuel used													1928.0666 (219)
Annual totals kWh/year													
Space heating fuel - main system													2860.5452 (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)													420.7489 (232)
Total delivered energy for all uses													5284.3607 (238)

10a. Fuel costs - using BEDF prices (510)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2860.5452	4.2600	121.8592 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1928.0666	4.2600	82.1356 (247)
Pumps and fans for heating	75.0000	22.5500	16.9125 (249)
Energy for lighting	420.7489	22.5500	94.8789 (250)
Additional standing charges			96.0000 (251)
Total energy cost			411.7862 (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	2860.5452	0.2160	617.8778 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1928.0666	0.2160	416.4624 (264)
Space and water heating			1034.3401 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	420.7489	0.5190	218.3687 (268)
Total kg/year			1291.6338 (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	2860.5452	1.2200	3489.8652 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1928.0666	1.2200	2352.2412 (264)
Space and water heating			5842.1064 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	420.7489	3.0700	1291.6991 (268)
Primary energy kWh/year			7364.0555 (272)
Primary energy kWh/m2/year			78.1001 (273)

SAP 2012 EPC IMPROVEMENTS

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

(For testing purposes):

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

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.2	-£ 32	-193 kg (14.9%)
U Solar photovoltaic panels	+ 9.6	-£ 453	-1042 kg (94.8%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£32	2.04 kg/m ²	B 86 B 88
Solar photovoltaic panels	£453	11.05 kg/m ²	A 95 A 97
Total Savings	£484	13.09 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 510 TEST (21 Dec 2022)
 Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£112	£123	-£11
Mains gas	£300	£257	£43
Space heating	£235	£235	£0
Water heating	£82	£50	£32
Lighting	£95	£95	£0
Generated (PV)	-£0	-£453	£453
Total cost of fuels	£412	-£73	£485
Total cost of uses	£412	-£73	£485
Delivered energy	56 kWh/m ²	25 kWh/m ²	31 kWh/m ²
Carbon dioxide emissions	1.3 tonnes	0.1 tonnes	1.2 tonnes
CO2 emissions per m ²	14 kg/m ²	1 kg/m ²	13 kg/m ²
Primary energy	78 kWh/m ²	1 kWh/m ²	77 kWh/m ²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	47.1450 (1b)	2.3850 (2b)	112.4408 (1b) - (3b)
First floor	47.1450 (1c)	2.6860 (2c)	126.6315 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.2900		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 239.0723 (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				2 * 10 =	20.0000 (7a)							
Number of passive vents				0 * 10 =	0.0000 (7b)							
Number of flueless gas fires				0 * 40 =	0.0000 (7c)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) =	0.0837 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.3337 (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) =		0.3086 (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	0.3935	0.3858	0.3781	0.3395	0.3318	0.2932	0.2932	0.2855	0.3086	0.3318	0.3472	0.3626 (22b)
Effective ac	0.5774	0.5744	0.5715	0.5576	0.5550	0.5430	0.5430	0.5408	0.5476	0.5550	0.5603	0.5658 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Solid Door			2.1200	1.0900	2.3108		(26)
Windows (Uw = 1.40)			12.2900	1.3258	16.3068		(27)
Flr - Ground			47.1450	0.1586	7.4760	75.6000	3564.1620 (28a)
Brick	86.4050	11.5320	74.8730	0.2500	18.7183	51.1900	3832.7489 (29a)
Render	12.8030	2.8800	9.9230	0.2500	2.4808	51.1900	507.9584 (29a)
Rf - Ins Joist	47.1450		47.1450	0.1000	4.7145	7.4000	348.8730 (30)
Total net area of external elements Aum(A, m2)			193.5060				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	52.0071		(33)
Party Wall			43.6110	0.0000	0.0000	7.4000	322.7214 (32)
Stud			91.2883			7.4000	675.5331 (32c)
Stud			101.1548			7.4000	748.5452 (32c)
Internal Floor			47.1450			7.4000	348.8730 (32d)
Internal Ceiling			47.1450			7.4000	348.8730 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 10698.2880 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							113.4615 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.1559 (36)
Total fabric heat loss							(33) + (36) = 60.1631 (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	45.5552	45.3180	45.0855	43.9935	43.7892	42.8381	42.8381	42.6619	43.2044	43.7892	44.2025	44.6346 (38)
Average = Sum(39)m / 12 =	105.7182	105.4810	105.2485	104.1565	103.9522	103.0011	103.0011	102.8250	103.3675	103.9522	104.3655	104.7977 (39)
HLP	1.1212	1.1187	1.1162	1.1046	1.1025	1.0924	1.0924	1.0905	1.0963	1.1025	1.1069	1.1114 (40)
HLP (average)												1.1046 (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												2.6800 (42)
Average daily hot water use (litres/day)												97.8502 (43)
Daily hot water use	107.6352	103.7212	99.8072	95.8932	91.9792	88.0652	88.0652	91.9792	95.8932	99.8072	103.7212	107.6352 (44)
Energy conte	159.6199	139.6046	144.0595	125.5945	120.5109	103.9918	96.3637	110.5787	111.8994	130.4079	142.3505	154.5834 (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 =	1539.5649 (45)
Distribution loss (46)m = 0.15 x (45)m													
	23.9430	20.9407	21.6089	18.8392	18.0766	15.5988	14.4546	16.5868	16.7849	19.5612	21.3526	23.1875	(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	14.6958	13.2599	14.6483	14.1196	14.5494	14.0330	14.4715	14.5220	14.0802	14.6074	14.1854	14.6807	(61)
Total heat required for water heating calculated for each month	174.3157	152.8645	158.7077	139.7141	135.0604	118.0248	110.8352	125.1008	125.9796	145.0153	156.5358	169.2641	(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												1.1780 (H8)	
Utilisation factor												0.5721 (H9)	
Collector performance factor												0.8793 (H10)	
Dedicated solar storage volume												75.0000 (H11)	
Effective solar volume												75.0000 (H13)	
Daily hot water demand												97.8502 (H14)	
Volume ratio Veff/V												0.7665 (H15)	
Solar storage volume factor												0.9468 (H16)	
Solar input												-863.8162 (H17)	
Solar input	-25.0490	-41.7995	-71.1893	-95.4077	-117.8682	-115.8832	-114.3518	-99.9097	-78.2494	-53.4351	-29.7117	-20.9617	(63)
Solar input (sum of months) = Sum(63)m =												-863.8162 (63)	
Output from w/h	149.2668	111.0650	87.5184	44.3064	17.1922	2.1416	0.0000	25.1910	47.7302	91.5802	126.8242	148.3024	(64)
Total per year (kWh/year) = Sum(64)m =												851.1184 (64)	
Heat gains from water heating, kWh/month	56.7476	49.7335	51.5618	45.2901	43.7073	38.0855	35.6588	40.3979	40.7266	47.0125	50.8779	55.0691	(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	160.8005	160.8005	160.8005	160.8005	160.8005	160.8005	160.8005	160.8005	160.8005	160.8005	160.8005	160.8005	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	59.5614	52.9019	43.0227	32.5709	24.3472	20.5549	22.2103	28.8698	38.7490	49.2007	57.4245	61.2168	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	368.2877	372.1094	362.4789	341.9767	316.0964	291.7725	275.5227	271.7010	281.3315	301.8337	327.7140	352.0379	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.7601	53.7601	53.7601	53.7601	53.7601	53.7601	53.7601	53.7601	53.7601	53.7601	53.7601	53.7601	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	(71)
Water heating gains (Table 5)	76.2736	74.0082	69.3035	62.9029	58.7463	52.8966	47.9285	54.2983	56.5647	63.1888	70.6637	74.0177	(72)
Total internal gains	614.4829	609.3797	585.1654	547.8108	509.5501	475.5842	456.0217	465.2293	487.0054	524.5835	566.1625	597.6325	(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	5.5160	10.6334	0.7300	0.7200	0.7700	21.3641 (74)							
South	6.7750	46.7521	0.7300	0.7200	0.7700	115.3715 (78)							
Solar gains	136.7356	229.7767	310.0639	383.4655	433.5862	433.5051	416.5810	377.8864	334.8394	252.3993	163.1100	117.5018	(83)
Total gains	751.2186	839.1564	895.2292	931.2763	943.1363	909.0893	872.6027	843.1158	821.8449	776.9828	729.2724	715.1343	(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	28.1101	28.1733	28.2355	28.5315	28.5876	28.8516	28.8516	28.9010	28.7493	28.5876	28.4744	28.3570	
alpha	2.8740	2.8782	2.8824	2.9021	2.9058	2.9234	2.9234	2.9267	2.9166	2.9058	2.8983	2.8905	
util living area	0.9488	0.9289	0.8983	0.8434	0.7531	0.6164	0.4796	0.5104	0.6898	0.8514	0.9273	0.9547	(86)
MIT	19.1376	19.3732	19.7208	20.1554	20.5435	20.8236	20.9380	20.9238	20.7390	20.2531	19.6235	19.0871	(87)
Th 2	19.9836	19.9856	19.9876	19.9970	19.9988	20.0071	20.0071	20.0086	20.0039	19.9988	19.9952	19.9915	(88)
util rest of house	0.9411	0.9182	0.8826	0.8178	0.7099	0.5463	0.3849	0.4169	0.6260	0.8221	0.9146	0.9478	(89)
MIT 2	18.3009	18.5325	18.8723	19.2958	19.6551	19.8993	19.9802	19.9736	19.8330	19.3967	18.7887	18.2573	(90)
Living area fraction												fLA = Living area / (4) =	
MIT	18.4689	18.7013	19.0426	19.4684	19.8334	20.0849	20.1725	20.1644	20.0149	19.5686	18.9563	18.4239	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.3189	18.5513	18.8926	19.3184	19.6834	19.9349	20.0225	20.0144	19.8649	19.4186	18.8063	18.2739	(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	0.9246	0.8994	0.8620	0.7975	0.6947	0.5407	0.3865	0.4174	0.6161	0.8019	0.8957	0.9324	(94)
Useful gains	694.5919	754.7538	771.6695	742.7295	655.1585	491.5765	337.2337	351.9558	506.3231	623.0557	653.2052	666.7839	(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	1482.0526	1439.9491	1304.3051	1085.1404	829.8968	549.4997	352.5182	371.6463	595.9042	916.7141	1221.7316	1474.9137	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	585.8707	460.4512	396.2808	246.5359	130.0053	0.0000	0.0000	0.0000	0.0000	218.4819	409.3390	601.2485	(98)
Space heating												3048.2132	(98)
Space heating per m2												(98) / (4) =	32.3281 (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													3368.1914 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	585.8707	460.4512	396.2808	246.5359	130.0053	0.0000	0.0000	0.0000	0.0000	218.4819	409.3390	601.2485	(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)	647.3709	508.7859	437.8794	272.4153	143.6522	0.0000	0.0000	0.0000	0.0000	241.4164	452.3083	664.3630	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	149.2668	111.0650	87.5184	44.3064	17.1922	2.1416	0.0000	25.1910	47.7302	91.5802	126.8242	148.3024	(64)
Efficiency of water heater													87.3000 (216)
(217)m	89.8314	89.8599	89.9039	89.9975	90.1142	87.3000	87.3000	87.3000	87.3000	89.5307	89.7221	89.8484	(217)
Fuel for water heating, kWh/month	166.1632	123.5980	97.3467	49.2307	19.0782	2.4532	0.0000	28.8557	54.6738	102.2892	141.3522	165.0585	(219)
													950.0994 (219)
Water heating fuel used													
Annual totals kWh/year													
Space heating fuel - main system													3368.1914 (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)													420.7489 (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													3136.8003 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3368.1914	3.4800	117.2131	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	950.0994	3.4800	33.0635	(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	420.7489	13.1900	55.4968	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit		-1727.2394	13.1900	-227.8229 (252)
Total energy cost			114.4379	(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] =	0.3451 (257)
SAP value		95.1864
SAP rating (Section 12)		95 (258)
SAP band		A

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

Energy Emission factor Emissions

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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	3368.1914	0.2160	727.5293 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	950.0994	0.2160	205.2215 (264)
Space and water heating			932.7508 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	420.7489	0.5190	218.3687 (268)
Energy saving/generation technologies			
PV Unit	-1727.2394	0.5190	-896.4372 (269)
Total kg/year			319.5573 (272)
CO2 emissions per m2			3.3900 (273)
EI value			96.9258
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	47.1450 (1b)	2.3850 (2b)	112.4408 (1b) - (3b)
First floor	47.1450 (1c)	2.6860 (2c)	126.6315 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.2900		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 239.0723 (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				2 * 10 =	20.0000 (7a)							
Number of passive vents				0 * 10 =	0.0000 (7b)							
Number of flueless gas fires				0 * 40 =	0.0000 (7c)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) =	0.0837 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.3337 (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) =		0.3086 (21)							
Wind speed	Jan 5.7000	Feb 5.2000	Mar 4.9000	Apr 4.5000	May 4.6000	Jun 4.2000	Jul 4.3000	Aug 4.2000	Sep 4.5000	Oct 4.9000	Nov 4.9000	Dec 5.2000 (22)
Wind factor	1.4250	1.3000	1.2250	1.1250	1.1500	1.0500	1.0750	1.0500	1.1250	1.2250	1.2250	1.3000 (22a)
Adj infilt rate												
Effective ac	0.4398	0.4012	0.3781	0.3472	0.3549	0.3241	0.3318	0.3241	0.3472	0.3781	0.3781	0.4012 (22b)
	0.5967	0.5805	0.5715	0.5603	0.5630	0.5525	0.5550	0.5525	0.5603	0.5715	0.5715	0.5805 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Solid Door			2.1200	1.0900	2.3108		(26)
Windows (Uw = 1.40)			12.2900	1.3258	16.3068		(27)
Flr - Ground			47.1450	0.1586	7.4760	75.6000	3564.1620 (28a)
Brick	86.4050	11.5320	74.8730	0.2500	18.7183	51.1900	3832.7489 (29a)
Render	12.8030	2.8800	9.9230	0.2500	2.4808	51.1900	507.9584 (29a)
Rf - Ins Joist	47.1450		47.1450	0.1000	4.7145	7.4000	348.8730 (30)
Total net area of external elements Aum(A, m2)			193.5060				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	52.0071		(33)
Party Wall			43.6110	0.0000	0.0000	7.4000	322.7214 (32)
Stud			91.2883			7.4000	675.5331 (32c)
Stud			101.1548			7.4000	748.5452 (32c)
Internal Floor			47.1450			7.4000	348.8730 (32d)
Internal Ceiling			47.1450			7.4000	348.8730 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	10698.2880 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							113.4615 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.1559 (36)
Total fabric heat loss						(33) + (36) =	60.1631 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	47.0770	45.7971	45.0855	44.2025	44.4162	43.5895	43.7892	43.5895	44.2025	45.0855	45.0855	45.7971 (38)
Average = Sum(39)m / 12 =	107.2400	105.9601	105.2485	104.3655	104.5792	103.7526	103.9522	103.7526	104.3655	105.2485	105.2485	105.9601 (39)
												104.9728 (39)
HLP	1.1373	1.1238	1.1162	1.1069	1.1091	1.1004	1.1025	1.1004	1.1069	1.1162	1.1162	1.1238 (40)
HLP (average)												1.1133 (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												2.6800 (42)
Average daily hot water use (litres/day)												97.8502 (43)
Daily hot water use	107.6352	103.7212	99.8072	95.8932	91.9792	88.0652	88.0652	91.9792	95.8932	99.8072	103.7212	107.6352 (44)
Energy conte	159.6199	139.6046	144.0595	125.5945	120.5109	103.9918	96.3637	110.5787	111.8994	130.4079	142.3505	154.5834 (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 =	1539.5649 (45)
Distribution loss (46)m = 0.15 x (45)m													
	23.9430	20.9407	21.6089	18.8392	18.0766	15.5988	14.4546	16.5868	16.7849	19.5612	21.3526	23.1875	(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	14.6958	13.2599	14.6483	14.1196	14.5494	14.0330	14.4715	14.5220	14.0802	14.6074	14.1854	14.6807	(61)
Total heat required for water heating calculated for each month	174.3157	152.8645	158.7077	139.7141	135.0604	118.0248	110.8352	125.1008	125.9796	145.0153	156.5358	169.2641	(62)
Aperture area of solar collector												3.0000 (H1)	
Zero-loss collector efficiency												0.7000 (H2)	
Collector heat loss coefficient												1.8000 (H3)	
Collector 2nd order heat loss coefficient												0.0050 (H3a)	
Collector effective heat loss coefficient												1.8063 (H3b)	
Collector performance ratio												2.5804 (H4)	
Annual solar radiation per m2												1254.2188 (H5)	
Overshading factor												0.8000 (H6)	
Solar energy available												2107.0876 (H7)	
Adjustment factor for showers												1.0000 (H7a)	
Solar-to-load ratio												1.3686 (H8)	
Utilisation factor												0.5184 (H9)	
Collector performance factor												0.8793 (H10)	
Dedicated solar storage volume												75.0000 (H11)	
Effective solar volume												75.0000 (H13)	
Daily hot water demand												97.8502 (H14)	
Volume ratio Veff/V												0.7665 (H15)	
Solar storage volume factor												0.9468 (H16)	
Solar input	-28.4913	-41.1982	-70.9864	-99.1495	-118.2171	-125.8853	-121.5633	-107.4007	-82.7398	-56.6352	-33.6997	-909.3935	(H17)
Solar input												-23.4269 (63)	
Solar input (sum of months) = Sum(63)m =												-909.3935 (63)	
Output from w/h	145.8244	111.6663	87.7213	40.5647	16.8433	0.0000	0.0000	17.7001	43.2398	88.3801	122.8361	145.8371	(64)
Total per year (kWh/year) = Sum(64)m =												820.6132 (64)	
Heat gains from water heating, kWh/month	56.7476	49.7335	51.5618	45.2901	43.7073	38.0855	35.6588	40.3979	40.7266	47.0125	50.8779	55.0691	(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	160.8005	160.8005	160.8005	160.8005	160.8005	160.8005	160.8005	160.8005	160.8005	160.8005	160.8005	160.8005	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	59.5614	52.9019	43.0227	32.5709	24.3472	20.5549	22.2103	28.8698	38.7490	49.2007	57.4245	61.2168	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	368.2877	372.1094	362.4789	341.9767	316.0964	291.7725	275.5227	271.7010	281.3315	301.8337	327.7140	352.0379	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.7601	53.7601	53.7601	53.7601	53.7601	53.7601	53.7601	53.7601	53.7601	53.7601	53.7601	53.7601	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	-107.2004	(71)
Water heating gains (Table 5)	76.2736	74.0082	69.3035	62.9029	58.7463	52.8966	47.9285	54.2983	56.5647	63.1888	70.6637	74.0177	(72)
Total internal gains	614.4829	609.3797	585.1654	547.8108	509.5501	475.5842	456.0217	465.2293	487.0054	524.5835	566.1625	597.6325	(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	5.5160	13.4530	0.7300	0.7200	0.7700	27.0292 (74)							
South	6.7750	56.4170	0.7300	0.7200	0.7700	139.2220 (78)							
Solar gains	166.2512	241.8425	331.2470	431.0878	474.7682	516.1245	484.5671	441.2058	380.5692	285.8150	197.6576	140.4707	(83)
Total gains	780.7341	851.2222	916.4123	978.8986	984.3183	991.7087	940.5888	906.4351	867.5746	810.3984	763.8200	738.1032	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	27.7112	28.0459	28.2355	28.4744	28.4162	28.6426	28.5876	28.6426	28.4744	28.2355	28.2355	28.0459	(86)
alpha	2.8474	2.8697	2.8824	2.8983	2.8944	2.9095	2.9058	2.9095	2.8983	2.8824	2.8824	2.8697	
util living area	0.9357	0.9196	0.8841	0.8137	0.6996	0.5347	0.4089	0.3931	0.6063	0.7972	0.8988	0.9411	
MIT	19.3414	19.4992	19.8434	20.2825	20.6628	20.8911	20.9630	20.9694	20.8405	20.4663	19.9039	19.3433	(87)
Th 2	19.9705	19.9815	19.9876	19.9952	19.9934	20.0005	19.9988	20.0005	19.9952	19.9876	19.9876	19.9815	(88)
util rest of house	0.9254	0.9073	0.8660	0.7837	0.6481	0.4580	0.3123	0.2915	0.5291	0.7559	0.8802	0.9315	(89)
MIT 2	18.4921	18.6529	18.9903	19.4118	19.7531	19.9408	19.9853	19.9905	19.9031	19.5834	19.0551	18.5031	(90)
Living area fraction												fLA = Living area / (4) =	
MIT	18.6626	18.8228	19.1616	19.5867	19.9357	20.1316	20.1816	20.1871	20.0913	19.7606	19.2255	18.6718	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.5126	18.6728	19.0116	19.4367	19.7857	19.9816	20.0316	20.0371	19.9413	19.6106	19.0755	18.5218	(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	0.9071	0.8876	0.8451	0.7645	0.6363	0.4564	0.3156	0.2953	0.5246	0.7381	0.8596	0.9139	(94)	
Useful gains	708.1751	755.5539	774.4512	748.3867	626.3547	452.6364	296.8600	267.6919	455.1355	598.1419	656.5538	674.5189	(95)	
Ext temp.	5.4000	5.6000	7.1000	9.5000	12.6000	15.3000	17.1000	17.4000	15.1000	12.0000	8.6000	5.6000	(96)	
Heat loss rate W	1406.1939	1385.1984	1253.6793	1037.0440	751.4781	485.7298	304.7477	273.6011	505.2641	801.0095	1102.5333	1369.1920	(97)	
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	(97a)	
Space heating kWh	519.3260	423.1211	356.5457	207.8333	93.0918	0.0000	0.0000	0.0000	0.0000	150.9335	321.1052	516.8368	(98)	
Space heating												2588.7934	(98)	
Space heating per m2												(98) / (4) =	27.4557	(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														2860.5452	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Space heating requirement	519.3260	423.1211	356.5457	207.8333	93.0918	0.0000	0.0000	0.0000	0.0000	150.9335	321.1052	516.8368	(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)	573.8409	467.5371	393.9731	229.6500	102.8639	0.0000	0.0000	0.0000	0.0000	166.7774	354.8124	571.0904	(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	145.8244	111.6663	87.7213	40.5647	16.8433	0.0000	0.0000	17.7001	43.2398	88.3801	122.8361	145.8371	(64)		
Efficiency of water heater	89.7785	89.8126	89.8497	89.9615	89.9946	87.3000	87.3000	87.3000	87.3000	89.2913	89.5913	89.7758	(217)		
Fuel for water heating, kWh/month	162.4269	124.3326	97.6311	45.0912	18.7159	0.0000	0.0000	20.2750	49.5301	98.9796	137.1071	162.4460	(219)		
Water heating fuel used												916.5353	(219)		
Annual totals kWh/year															
Space heating fuel - main system														2860.5452	(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)														420.7489	(232)
Energy saving/generation technologies (Appendices M ,N and Q)															
PV Unit 0 (0.80 * 2.50 * 1254 * 0.80) =										-2006.7501				-2006.7501	(233)
Total delivered energy for all uses														2316.0794	(238)

10a. Fuel costs - using BEDF prices (510)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2860.5452	4.2600	121.8592	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	916.5353	4.2600	39.0444	(247)
Pumps and fans for heating	75.0000	22.5500	16.9125	(249)
Pump for solar water heating	50.0000	22.5500	11.2750	(249)
Energy for lighting	420.7489	22.5500	94.8789	(250)
Additional standing charges			96.0000	(251)
Energy saving/generation technologies				
PV Unit	-2006.7501	22.5500	-452.5221	(252)
Total energy cost			-72.5521	(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	2860.5452	0.2160	617.8778	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	916.5353	0.2160	197.9716	(264)
Space and water heating			815.8494	(265)
Pumps and fans	125.0000	0.5190	64.8750	(267)
Energy for lighting	420.7489	0.5190	218.3687	(268)
Energy saving/generation technologies				
PV Unit	-2006.7501	0.5190	-1041.5033	(269)
Total kg/year			57.5898	(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	2860.5452	1.2200	3489.8652 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	916.5353	1.2200	1118.1731 (264)
Space and water heating			4608.0383 (265)
Pumps and fans	125.0000	3.0700	383.7500 (267)
Energy for lighting	420.7489	3.0700	1291.6991 (268)
Energy saving/generation technologies			
PV Unit	-2006.7501	3.0700	-6160.7228 (269)
Primary energy kWh/year			122.7646 (272)
Primary energy kWh/m2/year			1.3020 (273)

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

Overheating Calculation Input Data

Dwelling type	EndTerrace House
Number of storeys	2
Cross ventilation possible	Yes
SAP Region	South East England
Front of dwelling faces	North
Overshading	Average or unknown
Thermal mass parameter	113.5 (calculated from construction elements)
Night ventilation	Yes
Ventilation rate during hot weather (ach)	4.61 (Calculated rate)

Overheating Calculation

Summer ventilation heat loss coefficient	363.70 (P1)
Transmission heat loss coefficient	60.16 (37)
Summer heat loss coefficient	423.86 (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	5.5160	86.6589	0.7300	0.7200	0.7650	172.9803
South	6.7750	118.3991	0.7300	0.7200	0.7650	290.2798
total:						463.2601

Solar gains	Jun 488	Jul 463	Aug 421	(P3)
Internal gains	473	453	462	
Total summer gains	961	916	884	(P5)
Summer gain/loss ratio	2.27	2.16	2.08	(P6)
Summer external temperature	15.40	17.40	17.50	
Thermal mass temperature increment (TMP = 113.5)	1.21	1.21	1.21	
Threshold temperature	18.87	20.77	20.79	(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	630 - PRJ012992		Issued on Date	01/02/2023	
Assessment Reference	630	Prop Type Ref	Clover		
Property	Lancing Phase 2, BN15				
SAP Rating	84 B	DER	16.35	TER	17.33
Environmental	87 B	% DER<TER	5.68		
CO₂ Emissions (t/year)	1.29	DFEE	42.96	TFEE	49.50
General Requirements Compliance	Pass	% DFEE<TFEE	13.22		
Assessor Details	Chris Nicholls, , Tel: ,		Assessor ID	T850-0001	
Client					

SUMMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	17.33	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.35	kgCO ₂ /m ²	Pass
	-0.98 (-5.7%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	49.50	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	42.96	kWh/m ² /yr	
	-6.5 (-13.1%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

Limiting System Efficiencies

4 Heating efficiency

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

Calculation Type: New Build (As Designed)

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Programmer, room thermostat and TRVs

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100

%

Minimum

75

%

Pass

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (South East England)

Slight

Pass

Based on:

Overshading

Average

Windows facing North

5.52 m², No overhang

Windows facing South

6.78 m², No overhang

Air change rate

4.61 ach

Blinds/curtains

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

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

5.00 (design value)

Maximum

10.0

Pass

10 Key features

Party wall U-value

0.00

W/m²K

Roof U-value

0.10

W/m²K

Door U-value

1.09

W/m²K