

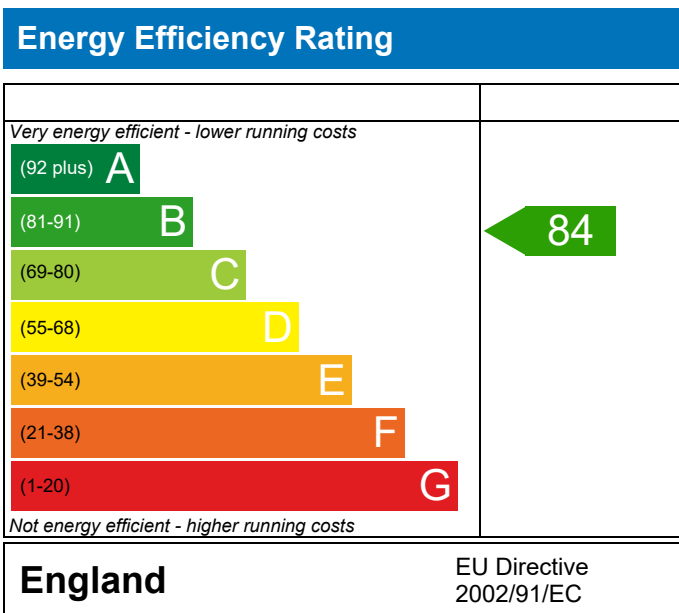
PREDICTED ENERGY ASSESSMENT

Lancing Phase 2,
BN15

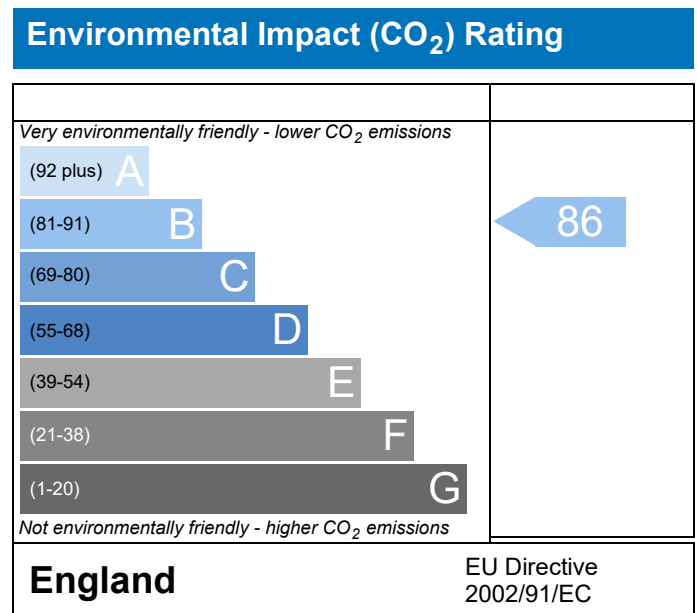
Dwelling type: House, Semi-Detached
Date of assessment: 01/02/2023
Produced by: Michael Juckes
Total floor area: 94.308 m²

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	626 - PRJ012992			Issued on Date	01/02/2023
Assessment Reference	626	Prop Type Ref	Daisy		
Property	Lancing Phase 2, BN15				
SAP Rating	84 B	DER	17.14	TER	17.99
Environmental	86 B	% DER<TER	4.71		
CO ₂ Emissions (t/year)	1.34	DFEE	48.05	TFEE	54.91
General Requirements Compliance	Pass	% DFEE<TFEE	12.50		
Assessor Details	Chris Nicholls, , Tel: ,			Assessor ID	T850-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

DWELLING AS DESIGNED

Semi-Detached House, total floor area 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) 17.99 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 17.14 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 54.9 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 48.0 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	1.37 (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: 6.63 m², No overhang

Windows facing East: 6.12 m², No overhang

Windows facing West: 6.51 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 (m ²)	Storey height (m)	Volume (m ³)
Ground floor	47.1540 (1b)	x 2.3850 (2b)	= 112.4623 (1b) - (3b)
First floor	47.1540 (1c)	x 2.6830 (2c)	= 126.5142 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.3080		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 238.9765 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour							
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)							
Number of open flues	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) =	0.3087 (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	0.3087	0.3318	0.3472	0.3627 (22b)
Effective ac	0.5774	0.5744	0.5715	0.5576	0.5551	0.5430	0.5430	0.5408	0.5476	0.5551	0.5603	0.5658 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Solid Door			2.1200	1.0900	2.3108		(26)
Windows (Uw = 1.40)			19.2600	1.3258	25.5341		(27)
Flr - Ground			47.1540	0.1586	7.4773	75.6000	3564.8424 (28a)
Brick	99.1610	21.3830	77.7780	0.2500	19.4445	51.1900	3981.4558 (29a)
RF - Ins Joist	47.1540		47.1540	0.1000	4.7154	7.4000	348.9396 (30)
Total net area of external elements Aum(A, m ²)			193.4660				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	59.4821	(33)
Party Wall			43.5850	0.0000	0.0000	7.4000	322.5290 (32)
Stud			28.2861			7.4000	209.3171 (32c)
Stud			102.7589			7.4000	760.4159 (32c)
Block			56.2145			54.0300	3037.2667 (32c)
Internal Floor			47.1540			7.4000	348.9396 (32d)
Internal Ceiling			47.1540			7.4000	348.9396 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 12922.6458 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							137.0260 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.0867 (36)
Total fabric heat loss							(33) + (36) = 69.5688 (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	45.5381	45.3010	45.0686	43.9768	43.7725	42.8216	42.8216	42.6455	43.1878	43.7725	44.1857	44.6177 (38)
Average = Sum(39)m / 12 =	115.1070	114.8698	114.6374	113.5456	113.3413	112.3904	112.3904	112.2143	112.7567	113.3413	113.7545	114.1866 (39)
HLP	1.2205	1.2180	1.2156	1.2040	1.2018	1.1917	1.1917	1.1899	1.1956	1.2018	1.2062	1.2108 (40)
HLP (average)												1.2040 (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												2.6802 (42)
Average daily hot water use (litres/day)												97.8552 (43)
Daily hot water use	107.6407	103.7265	99.8123	95.8981	91.9839	88.0697	88.0697	91.9839	95.8981	99.8123	103.7265	107.6407 (44)
Energy conte	159.6281	139.6117	144.0668	125.6009	120.5171	103.9971	96.3686	110.5844	111.9051	130.4146	142.3577	154.5913 (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 =	1539.6432 (45)
Distribution loss (46)m = 0.15 x (45)m														
	23.9442	20.9418	21.6100	18.8401	18.0776	15.5996	14.4553	16.5877	16.7858	19.5622	21.3537	23.1887	(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	14.5495	14.0331	14.4715	14.5221	14.0802	14.6074	14.1854	14.6807	(61)	
Total heat required for water heating calculated for each month	174.3239	152.8716	158.7151	139.7206	135.0666	118.0301	110.8401	125.1064	125.9853	145.0220	156.5431	169.2719	(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	174.3239	152.8716	158.7151	139.7206	135.0666	118.0301	110.8401	125.1064	125.9853	145.0220	156.5431	169.2719	(64)	
Total per year (kWh/year) = Sum(64)m =	1711.4968 (64)													
Heat gains from water heating, kWh/month	56.7503	49.7359	51.5643	45.2922	43.7093	38.0873	35.6604	40.3998	40.7285	47.0147	50.8803	55.0718	(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	134.0109	134.0109	134.0109	134.0109	134.0109	134.0109	134.0109	134.0109	134.0109	134.0109	134.0109	134.0109	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.0607	19.5941	15.9350	12.0638	9.0179	7.6133	8.2264	10.6930	14.3521	18.2233	21.2693	22.6739	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	246.7841	249.3449	242.8917	229.1534	211.8114	195.5124	184.6236	182.0628	188.5160	202.2542	219.5962	235.8953	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.4011	36.4011	36.4011	36.4011	36.4011	36.4011	36.4011	36.4011	36.4011	36.4011	36.4011	36.4011	(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)	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	(71)
Water heating gains (Table 5)	76.2773	74.0117	69.3068	62.9059	58.7491	52.8990	47.9307	54.3008	56.5674	63.1918	70.6671	74.0212	(72)
Total internal gains	411.3253	409.1540	394.3368	370.3264	345.7816	322.2279	306.9840	313.2599	325.6388	349.8726	377.7358	398.7936	(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	6.6320	10.6334	0.7300	0.7200	0.7700	25.6865 (74)							
East	6.1200	19.6403	0.7300	0.7200	0.7700	43.7812 (76)							
West	6.5100	19.6403	0.7300	0.7200	0.7700	46.5711 (80)							
Solar gains	116.0388	225.8365	374.4921	558.5042	700.7540	725.8025	687.4359	578.6612	438.8265	268.1598	144.3463	95.7149	(83)
Total gains	527.3641	634.9905	768.8289	928.8306	1046.5356	1048.0304	994.4199	891.9211	764.4653	618.0324	522.0822	494.5085	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	31.1851	31.2495	31.3129	31.6139	31.6709	31.9389	31.9389	31.9890	31.8351	31.6709	31.5559	31.4365	
alpha	3.0790	3.0833	3.0875	3.1076	3.1114	3.1293	3.1293	3.1326	3.1223	3.1114	3.1037	3.0958	
util living area	0.9864	0.9754	0.9481	0.8800	0.7595	0.6023	0.4675	0.5297	0.7640	0.9314	0.9783	0.9888	(86)
MIT	18.8703	19.1303	19.5803	20.1507	20.6042	20.8651	20.9547	20.9329	20.7034	20.0791	19.3675	18.8229	(87)
Th 2	19.9036	19.9056	19.9076	19.9168	19.9185	19.9266	19.9266	19.9281	19.9235	19.9185	19.9150	19.9114	(88)
util rest of house	0.9837	0.9704	0.9374	0.8553	0.7111	0.5241	0.3648	0.4238	0.6971	0.9120	0.9731	0.9865	(89)
MIT 2	17.9634	18.2222	18.6660	19.2203	19.6325	19.8510	19.9096	19.9007	19.7343	19.1665	18.4667	17.9219	(90)
Living area fraction	fLA = Living area / (4) =												0.1800 (91)
MIT	18.1266	18.3857	18.8305	19.3877	19.8074	20.0335	20.0977	20.0865	19.9087	19.3307	18.6288	18.0841	(92)
Temperature adjustment													-0.1500
adjusted MIT	17.9766	18.2357	18.6805	19.2377	19.6574	19.8835	19.9477	19.9365	19.7587	19.1807	18.4788	17.9341	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9768	0.9602	0.9220	0.8368	0.6979	0.5207	0.3669	0.4247	0.6852	0.8947	0.9635	0.9806	(94)
Ext temp.	515.1306	609.6893	708.8597	777.2027	730.3735	545.7101	364.8705	378.7807	523.8329	552.9795	503.0200	484.9191	(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	1574.2730	1531.8660	1396.3449	1173.8052	901.9008	593.8165	376.2492	396.8428	638.0564	972.5517	1294.3916	1568.2515	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating per m ²	788.0019	619.7027	511.4890	285.5538	127.6163	0.0000	0.0000	0.0000	0.0000	312.1617	569.7875	805.9993	(98)
(98) / (4) =	42.6296 (99)												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													4442.3342 (211)
Space heating requirement	788.0019	619.7027	511.4890	285.5538	127.6163	0.0000	0.0000	0.0000	0.0000	312.1617	569.7875	805.9993	(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)	870.7204	684.7544	565.1812	315.5291	141.0125	0.0000	0.0000	0.0000	0.0000	344.9301	629.5995	890.6070	(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	174.3239	152.8716	158.7151	139.7206	135.0666	118.0301	110.8401	125.1064	125.9853	145.0220	156.5431	169.2719	(64)
Efficiency of water heater (217)m	89.9030	89.8483	89.7212	89.4231	88.8259	87.3000	87.3000	87.3000	87.3000	89.4598	89.7906	89.9279	(217)
Fuel for water heating, kWh/month	193.9021	170.1441	176.8982	156.2466	152.0577	135.2006	126.9646	143.3063	144.3131	162.1085	174.3423	188.2308	(219)
Water heating fuel used													1923.7150 (219)
Annual totals kWh/year													
Space heating fuel - main system													4442.3342 (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)													389.5993 (232)
Total delivered energy for all uses													6830.6485 (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	4442.3342	0.2160	959.5442	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1923.7150	0.2160	415.5224	(264)
Space and water heating			1375.0666	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	389.5993	0.5190	202.2020	(268)
Total CO2, kg/year			1616.1936	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			17.1400	(273)

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

DER			17.1400	ZC1
Total Floor Area		TFA	94.3080	
Assumed number of occupants		N	2.6802	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			15.5065	ZC2
CO2 emissions from cooking, equation (L16)			1.9439	ZC3
Total CO2 emissions			34.5904	ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000	ZC5
Additional allowable electricity generation, kWh/m ² /year			0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000	ZC7
Net CO2 emissions			34.5904	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	47.1540 (1b)	2.3850 (2b)	112.4623 (1b) - (3b)
First floor	47.1540 (1c)	2.6830 (2c)	126.5142 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.3080		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 238.9765 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour							
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)							
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)							
Number of intermittent fans				3 * 10 =	30.0000 (7a)							
Number of passive vents				0 * 10 =	0.0000 (7b)							
Number of flueless gas fires				0 * 40 =	0.0000 (7c)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) =	0.1255 (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) =		0.3474 (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	0.4429	0.4342	0.4255	0.3821	0.3734	0.3300	0.3300	0.3213	0.3474	0.3734	0.3908	0.4082 (22b)
Effective ac	0.5981	0.5943	0.5905	0.5730	0.5697	0.5545	0.5545	0.5516	0.5603	0.5697	0.5764	0.5833 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K					
TER Opaque door			2.1200	1.0000	2.1200		(26)					
TER Opening Type (Uw = 1.40)			19.2600	1.3258	25.5341		(27)					
Flr - Ground			47.1540	0.1300	6.1300		(28a)					
Brick	99.1610	21.3830	77.7780	0.1800	14.0000		(29a)					
RF - Ins Joist	47.1540		47.1540	0.1300	6.1300		(30)					
Total net area of external elements Aum(A, m ²)			193.4660				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 53.9142		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.6942 (36)					
Total fabric heat loss							(33) + (36) = 64.6084 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 47.1658	Feb 46.8655	Mar 46.5711	Apr 45.1883	May 44.9296	Jun 43.7252	Jul 43.7252	Aug 43.5022	Sep 44.1891	Oct 44.9296	Nov 45.4530	Dec 46.0001 (38)
Heat transfer coeff	111.7742	111.4739	111.1795	109.7967	109.5380	108.3336	108.3336	108.1106	108.7975	109.5380	110.0613	110.6085 (39)
Average = Sum(39)m / 12 =												109.7954 (39)
HLP	Jan 1.1852	Feb 1.1820	Mar 1.1789	Apr 1.1642	May 1.1615	Jun 1.1487	Jul 1.1487	Aug 1.1464	Sep 1.1536	Oct 1.1615	Nov 1.1670	Dec 1.1728 (40)
HLP (average)												1.1642 (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												2.6802 (42)
Average daily hot water use (litres/day)												97.8552 (43)
Daily hot water use	107.6407	103.7265	99.8123	95.8981	91.9839	88.0697	88.0697	91.9839	95.8981	99.8123	103.7265	107.6407 (44)
Energy conte	159.6281	139.6117	144.0668	125.6009	120.5171	103.9971	96.3686	110.5844	111.9051	130.4146	142.3577	154.5913 (45)
Energy content (annual)												Total = Sum(45)m = 1539.6432 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	23.9442	20.9418	21.6100	18.8401	18.0776	15.5996	14.4553	16.5877	16.7858	19.5622	21.3537	23.1887 (46)
Total storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Total heat required for water heating calculated for each month	50.9589	46.0274	50.8633	47.2922	46.8740	43.4316	44.8793	46.8740	47.2922	50.8633	49.3151	50.9589	61											
Solar input	210.5870	185.6391	194.9301	172.8931	167.3911	147.4287	141.2479	157.4583	159.1973	181.2778	191.6728	205.5502	(62)											
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Heat gains from water heating, kWh/month	210.5870	185.6391	194.9301	172.8931	167.3911	147.4287	141.2479	157.4583	159.1973	181.2778	191.6728	205.5502	(64)											
	65.8161	57.9277	60.6180	53.5854	51.7904	45.4369	43.2624	48.4878	49.0315	56.0787	59.6627	64.1413	(65)											

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	134.0109	134.0109	134.0109	134.0109	134.0109	134.0109	134.0109	134.0109	134.0109	134.0109	134.0109	134.0109	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.1107	19.6385	15.9711	12.0911	9.0383	7.6305	8.2450	10.7172	14.3846	18.2645	21.3174	22.7252	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	246.7841	249.3449	242.8917	229.1534	211.8114	195.5124	184.6236	182.0628	188.5160	202.2542	219.5962	235.8953	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.4011	36.4011	36.4011	36.4011	36.4011	36.4011	36.4011	36.4011	36.4011	36.4011	36.4011	36.4011	(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)	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	(71)
Water heating gains (Table 5)	88.4624	86.2020	81.4758	74.4241	69.6108	63.1069	58.1484	65.1718	68.0993	75.3745	82.8649	86.2115	(72)
Total internal gains	423.5604	421.3887	406.5419	381.8720	356.6638	332.4530	317.2203	324.1550	337.2032	362.0966	389.9818	411.0352	(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	6.6320	10.6334	0.6300	0.7000	0.7700	21.5520
East	6.1200	19.6403	0.6300	0.7000	0.7700	36.7342
West	6.5100	19.6403	0.6300	0.7000	0.7700	39.0751
Solar gains	97.3613	189.4861	314.2143	468.6080	587.9614	608.9781
Total gains	520.9218	610.8748	720.7562	850.4800	944.6252	941.4311

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	58.5928	58.7507	58.9063	59.6481	59.7890	60.4537	60.4537	60.5784	60.1959	59.7890	59.5047	59.2103		
alpha	4.9062	4.9167	4.9271	4.9765	4.9859	5.0302	5.0302	5.0386	5.0131	4.9859	4.9670	4.9474		
util living area	0.9986	0.9967	0.9894	0.9580	0.8627	0.6870	0.5224	0.5927	0.8585	0.9819	0.9971	0.9990	(86)	
MIT	19.6677	19.8259	20.1095	20.4897	20.7975	20.9536	20.9904	20.9827	20.8556	20.4408	19.9872	19.6439	(87)	
Th 2	19.9319	19.9344	19.9369	19.9487	19.9509	19.9612	19.9612	19.9632	19.9573	19.9509	19.9465	19.9418	(88)	
util rest of house	0.9981	0.9955	0.9855	0.9420	0.8140	0.5949	0.4047	0.4698	0.7887	0.9724	0.9959	0.9986	(89)	
MIT 2	18.1532	18.3860	18.8000	19.3494	19.7546	19.9310	19.9578	19.9561	19.8393	19.2910	18.6307	18.1254	(90)	
Living area fraction									fLA = Living area / (4) =			0.1800	(91)	
MIT	18.4258	18.6452	19.0357	19.5547	19.9424	20.1151	20.1437	20.1409	20.0222	19.4980	18.8749	18.3987	(92)	
Temperature adjustment												0.0000		
adjusted MIT	18.4258	18.6452	19.0357	19.5547	19.9424	20.1151	20.1437	20.1409	20.0222	19.4980	18.8749	18.3987	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9971	0.9934	0.9809	0.9344	0.8136	0.6095	0.4259	0.4918	0.7938	0.9666	0.9940	0.9978	(94)
Ext temp.	519.4055	606.8629	706.9725	794.6724	768.5053	573.7744	380.7607	398.2067	559.9471	567.5065	508.0373	490.2670	(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	1578.9007	1532.2284	1393.7134	1169.8455	902.8518	597.4676	383.8973	404.4282	644.3246	974.6649	1295.9568	1570.5012	(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	788.2644	621.8456	510.9352	270.1246	99.9538	0.0000	0.0000	0.0000	0.0000	302.9258	567.3020	803.6942	(98)
Space heating per m2												3965.0459	(98)
										(98) / (4) =		42.0436	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													4245.2311 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	788.2644	621.8456	510.9352	270.1246	99.9538	0.0000	0.0000	0.0000	0.0000	302.9258	567.3020	803.6942	(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)	843.9662	665.7876	547.0399	289.2127	107.0170	0.0000	0.0000	0.0000	0.0000	324.3317	607.3897	860.4863	(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	210.5870	185.6391	194.9301	172.8931	167.3911	147.4287	141.2479	157.4583	159.1973	181.2778	191.6728	205.5502	(64)
Efficiency of water heater (217)m	88.0647	87.8594	87.3654	86.1702	83.8005	80.3000	80.3000	80.3000	80.3000	86.3346	87.6169	88.1421	(216)
Fuel for water heating, kWh/month	239.1275	211.2910	223.1204	200.6414	199.7495	183.5974	175.9003	196.0876	198.2532	209.9713	218.7623	233.2032	(219)
Water heating fuel used													2489.7052 (219)
Annual totals kWh/year													
Space heating fuel - main system													4245.2311 (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)													390.4812 (232)
Total delivered energy for all uses													7200.4176 (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	4245.2311	0.2160	916.9699 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2489.7052	0.2160	537.7763 (264)
Space and water heating			1454.7463 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	390.4812	0.5190	202.6598 (268)
Total CO2, kg/m2/year			1696.3310 (272)
Emissions per m2 for space and water heating			15.4255 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.1489 (272b)
Emissions per m2 for pumps and fans			0.4127 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.4255 * 1.00) + 2.1489 + 0.4127, rounded to 2 d.p.			17.9900 (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	47.1540 (1b)	2.3850 (2b)	112.4623 (1b) - (3b)
First floor	47.1540 (1c)	2.6830 (2c)	126.5142 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.3080		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 238.9765 (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) =		0.3474 (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	0.4429	0.4342	0.4255	0.3821	0.3734	0.3300	0.3300	0.3213	0.3474	0.3734	0.3908	0.4082 (22b)
Effective ac	0.5981	0.5943	0.5905	0.5730	0.5697	0.5545	0.5545	0.5516	0.5603	0.5697	0.5764	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)			19.2600	1.3258	25.5341		(27)
Flr - Ground			47.1540	0.1586	7.4773	75.6000	3564.8424 (28a)
Brick	99.1610	21.3830	77.7780	0.2500	19.4445	51.1900	3981.4558 (29a)
RF - Ins Joist	47.1540		47.1540	0.1000	4.7154	7.4000	348.9396 (30)
Total net area of external elements Aum(A, m2)			193.4660				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	59.4821	(33)
Party Wall			43.5850	0.0000	0.0000	7.4000	322.5290 (32)
Stud			28.2861			7.4000	209.3171 (32c)
Stud			102.7589			7.4000	760.4159 (32c)
Block			56.2145			54.0300	3037.2667 (32c)
Internal Floor			47.1540			7.4000	348.9396 (32d)
Internal Ceiling			47.1540			7.4000	348.9396 (32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12922.6458 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							137.0260 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.0867 (36)
Total fabric heat loss						(33) + (36) =	69.5688 (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	47.1658	46.8655	46.5711	45.1883	44.9296	43.7252	43.7252	43.5022	44.1891	44.9296	45.4530	46.0001 (38)
Average = Sum(39)m / 12 =	116.7346	116.4343	116.1399	114.7571	114.4984	113.2940	113.2940	113.0710	113.7579	114.4984	115.0218	115.5689 (39)
HLP	1.2378	1.2346	1.2315	1.2168	1.2141	1.2013	1.2013	1.1990	1.2062	1.2141	1.2196	1.2254 (40)
HLP (average)												1.2168 (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												2.6802 (42)
Average daily hot water use (litres/day)												97.8552 (43)
Daily hot water use	107.6407	103.7265	99.8123	95.8981	91.9839	88.0697	88.0697	91.9839	95.8981	99.8123	103.7265	107.6407 (44)
Energy conte	159.6281	139.6117	144.0668	125.6009	120.5171	103.9971	96.3686	110.5844	111.9051	130.4146	142.3577	154.5913 (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 =	1539.6432 (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	33.9210	29.6675	30.6142	26.6902	25.6099	22.0994	20.4783	23.4992	23.7798	27.7131	30.2510	32.8506	65									

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	134.0109	134.0109	134.0109	134.0109	134.0109	134.0109	134.0109	134.0109	134.0109	134.0109	134.0109	134.0109	134.0109 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.0607	19.5941	15.9350	12.0638	9.0179	7.6133	8.2264	10.6930	14.3521	18.2233	21.2693	22.6739	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	246.7841	249.3449	242.8917	229.1534	211.8114	195.5124	184.6236	182.0628	188.5160	202.2542	219.5962	235.8953	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.4011	36.4011	36.4011	36.4011	36.4011	36.4011	36.4011	36.4011	36.4011	36.4011	36.4011	36.4011	(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)	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	(71)
Water heating gains (Table 5)	45.5927	44.1481	41.1481	37.0697	34.4219	30.6936	27.5246	31.5849	33.0275	37.2488	42.0153	44.1541	(72)
Total internal gains	377.6408	376.2904	363.1781	341.4903	318.4545	297.0225	283.5779	287.5439	299.0989	320.9296	346.0841	365.9265	(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	6.6320	10.6334	0.7300	0.7200	0.7700	25.6865 (74)							
East	6.1200	19.6403	0.7300	0.7200	0.7700	43.7812 (76)							
West	6.5100	19.6403	0.7300	0.7200	0.7700	46.5711 (80)							
Solar gains	116.0388	225.8365	374.4921	558.5042	700.7540	725.8025	687.4359	578.6612	438.8265	268.1598	144.3463	95.7149	(83)
Total gains	493.6796	602.1269	737.6702	899.9945	1019.2084	1022.8250	971.0138	866.2052	737.9255	589.0894	490.4304	461.6414	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)	30.7503	30.8296	30.9078	31.2802	31.3509	31.6841	31.6841	31.7466	31.5549	31.3509	31.2082	31.0605		
alpha	3.0500	3.0553	3.0605	3.0853	3.0901	3.1123	3.1123	3.1164	3.1037	3.0901	3.0805	3.0707		
util living area	0.9886	0.9787	0.9534	0.8888	0.7718	0.6155	0.4799	0.5447	0.7791	0.9392	0.9817	0.9907	(86)	
MIT	18.7908	19.0553	19.5149	20.1049	20.5766	20.8541	20.9503	20.9262	20.6798	20.0299	19.3023	18.7486	(87)	
Th 2	19.8899	19.8924	19.8949	19.9066	19.9087	19.9189	19.9189	19.9208	19.9150	19.9087	19.9043	19.8997	(88)	
util rest of house	0.9863	0.9743	0.9437	0.8652	0.7241	0.5365	0.3746	0.4366	0.7135	0.9215	0.9772	0.9888	(89)	
MIT 2	17.8748	18.1388	18.5932	19.1700	19.6015	19.8368	19.9002	19.8904	19.7092	19.1129	18.3948	17.8399	(90)	
Living area fraction	18.0397	18.3038	18.7591	19.3383	19.7770	20.0199	20.0892	20.0769	fLA = Living area / (4) =	19.8839	19.2779	18.5582	0.1800	(91)
MIT	18.0397	18.3038	18.7591	19.3383	19.7770	20.0199	20.0892	20.0769	19.8839	19.2779	18.5582	18.0034	(92)	
Temperature adjustment	18.0397	18.3038	18.7591	19.3383	19.7770	20.0199	20.0892	20.0769	19.8839	19.2779	18.5582	0.0000	(93)	
adjusted MIT	18.0397	18.3038	18.7591	19.3383	19.7770	20.0199	20.0892	20.0769	19.8839	19.2779	18.5582	18.0034	(93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9808	0.9658	0.9308	0.8506	0.7176	0.5445	0.3920	0.4533	0.7114	0.9082	0.9696	0.9841	(94)
Useful gains	484.2046	581.5454	686.6245	765.5563	731.4248	556.8874	380.6465	392.6766	524.9265	535.0357	475.5134	454.3116	(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	1603.8977	1560.6598	1423.7726	1197.8692	924.8085	614.0384	395.3066	415.7473	657.9614	993.6091	1317.9380	1595.2489	(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	833.0516	657.9648	548.4382	311.2653	143.8775	0.0000	0.0000	0.0000	0.0000	341.1786	606.5457	848.8574	(98)
Space heating												4291.1790	(98)
Space heating per m2												(98) / (4) =	45.5017 (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	1064.9638	838.3758	859.3395	0.0000	0.0000	0.0000	0.0000	(100)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8256	0.8792	0.8448	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	879.2820	737.0659	726.0119	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1297.2427	1234.5106	1113.7760	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	300.9317	370.0989	288.4965	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												959.5271 (104)
Cooled fraction												1.0000 (105)
Intermittency factor (Table 10b)												
Intermittency factor	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	75.2329	92.5247	72.1241	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												239.8818 (107)
Space cooling per m2												2.5436 (108)
Energy for space heating												45.5017 (99)
Energy for space cooling												2.5436 (108)
Total												48.0453 (109)
Dwelling Fabric Energy Efficiency (DFEE)												48.0 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	47.1540 (1b)	2.3850 (2b)	112.4623 (1b) - (3b)
First floor	47.1540 (1c)	2.6830 (2c)	126.5142 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.3080		(4)
Dwelling volume			(3a) + (3b) + (3c) + (3d) + (3e)...(3n) = 238.9765 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour							
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)							
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)							
Number of intermittent fans				3 * 10 =	30.0000 (7a)							
Number of passive vents				0 * 10 =	0.0000 (7b)							
Number of flueless gas fires				0 * 40 =	0.0000 (7c)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) =	0.1255 (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) =	0.3474 (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	0.4429	0.4342	0.4255	0.3821	0.3734	0.3300	0.3300	0.3213	0.3474	0.3734	0.3908	0.4082 (22b)
Effective ac	0.5981	0.5943	0.5905	0.5730	0.5697	0.5545	0.5545	0.5516	0.5603	0.5697	0.5764	0.5833 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K					
TER Opaque door			2.1200	1.0000	2.1200		(26)					
TER Opening Type (Uw = 1.40)			19.2600	1.3258	25.5341		(27)					
Flr - Ground			47.1540	0.1300	6.1300		(28a)					
Brick	99.1610	21.3830	77.7780	0.1800	14.0000		(29a)					
RF - Ins Joist	47.1540		47.1540	0.1300	6.1300		(30)					
Total net area of external elements Aum(A, m ²)			193.4660				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 53.9142		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.6942 (36)					
Total fabric heat loss							(33) + (36) = 64.6084 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 47.1658	Feb 46.8655	Mar 46.5711	Apr 45.1883	May 44.9296	Jun 43.7252	Jul 43.7252	Aug 43.5022	Sep 44.1891	Oct 44.9296	Nov 45.4530	Dec 46.0001 (38)
Heat transfer coeff	111.7742	111.4739	111.1795	109.7967	109.5380	108.3336	108.3336	108.1106	108.7975	109.5380	110.0613	110.6085 (39)
Average = Sum(39)m / 12 =												109.7954 (39)
HLP	Jan 1.1852	Feb 1.1820	Mar 1.1789	Apr 1.1642	May 1.1615	Jun 1.1487	Jul 1.1487	Aug 1.1464	Sep 1.1536	Oct 1.1615	Nov 1.1670	Dec 1.1728 (40)
HLP (average)												1.1642 (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												2.6802 (42)
Average daily hot water use (litres/day)												97.8552 (43)
Daily hot water use	107.6407	103.7265	99.8123	95.8981	91.9839	88.0697	88.0697	91.9839	95.8981	99.8123	103.7265	107.6407 (44)
Energy conte	159.6281	139.6117	144.0668	125.6009	120.5171	103.9971	96.3686	110.5844	111.9051	130.4146	142.3577	154.5913 (45)
Energy content (annual)												Total = Sum(45)m = 1539.6432 (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 (46)
If cylinder contains dedicated solar storage												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
	33.9210	29.6675	30.6142	26.6902	25.6099	22.0994	20.4783	23.4992	23.7798	27.7131	30.2510	32.8506 (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	134.0109	134.0109	134.0109	134.0109	134.0109	134.0109	134.0109	134.0109	134.0109	134.0109	134.0109	134.0109 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.1107	19.6385	15.9711	12.0911	9.0383	7.6305	8.2450	10.7172	14.3846	18.2645	21.3174	22.7252 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	246.7841	249.3449	242.8917	229.1534	211.8114	195.5124	184.6236	182.0628	188.5160	202.2542	219.5962	235.8953 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.4011	36.4011	36.4011	36.4011	36.4011	36.4011	36.4011	36.4011	36.4011	36.4011	36.4011	36.4011 (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)	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087 (71)
Water heating gains (Table 5)	45.5927	44.1481	41.1481	37.0697	34.4219	30.6936	27.5246	31.5849	33.0275	37.2488	42.0153	44.1541 (72)
Total internal gains	377.6907	376.3347	363.2141	341.5176	318.4749	297.0397	283.5965	287.5681	299.1314	320.9708	346.1322	365.9778 (73)

6. Solar gains

[Jan]	Area m ²		Solar flux Table 6a W/m ²		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W	
North	6.6320		10.6334		0.6300		0.7000		0.7700		21.5520 (74)	
East	6.1200		19.6403		0.6300		0.7000		0.7700		36.7342 (76)	
West	6.5100		19.6403		0.6300		0.7000		0.7700		39.0751 (80)	
Solar gains	97.3613	189.4861	314.2143	468.6080	587.9614	608.9781	576.7869	485.5205	368.1935	224.9971	121.1125	80.3087 (83)
Total gains	475.0520	565.8208	677.4284	810.1256	906.4362	906.0179	860.3835	773.0887	667.3249	545.9680	467.2447	446.2866 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)												
Utilisation factor for gains for living area, nll,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	58.5928	58.7507	58.9063	59.6481	59.7890	60.4537	60.4537	60.5784	60.1959	59.7890	59.5047	59.2103
alpha	4.9062	4.9167	4.9271	4.9765	4.9859	5.0302	5.0302	5.0386	5.0131	4.9859	4.9670	4.9474
util living area	0.9991	0.9976	0.9919	0.9649	0.8776	0.7069	0.5410	0.6166	0.8787	0.9865	0.9981	0.9993 (86)
MIT	19.6226	19.7820	20.0686	20.4568	20.7781	20.9473	20.9888	20.9794	20.8364	20.4032	19.9442	19.5995 (87)
Th 2	19.9319	19.9344	19.9369	19.9487	19.9509	19.9612	19.9612	19.9632	19.9573	19.9509	19.9465	19.9418 (88)
util rest of house	0.9988	0.9968	0.9888	0.9511	0.8317	0.6147	0.4200	0.4907	0.8139	0.9792	0.9973	0.9991 (89)
MIT 2	18.6725	18.8335	19.1206	19.5091	19.8020	19.9374	19.9585	19.9573	19.8636	19.4643	19.0054	18.6572 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.8435	19.0042	19.2912	19.6797	19.9777	20.1192	20.1439	20.1413	20.0387	19.6333	19.1744	18.8268 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.8435	19.0042	19.2912	19.6797	19.9777	20.1192	20.1439	20.1413	20.0387	19.6333	19.1744	18.8268 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9983	0.9958	0.9863	0.9466	0.8331	0.6297	0.4419	0.5135	0.8199	0.9762	0.9964	0.9988 (94)
Useful gains	474.2472	563.4346	668.1299	766.8931	755.1270	570.5492	380.2264	396.9482	547.1716	532.9777	465.5564	445.7339 (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	1625.5859	1572.2549	1422.1206	1183.5719	906.7207	597.9151	383.9256	404.4724	646.1167	989.4920	1328.9209	1617.8520 (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	856.5960	677.9272	560.9690	300.0087	112.7857	0.0000	0.0000	0.0000	0.0000	339.6466	621.6225	872.0559 (98)
Space heating per m2	(98) / (4) =											46.0365 (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	1018.3359	801.6687	821.6403	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8836	0.9362	0.9060	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	899.8453	750.5093	744.4307	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1160.7378	1105.2273	1004.9708	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	187.8426	263.9102	193.8418	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling	645.5946 (104)											

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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	0.0000 (106)
Space cooling kWh													
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	46.9607	65.9775	48.4605	0.0000	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling per m2													161.3987 (107)
Energy for space heating													1.7114 (108)
Energy for space cooling													46.0365 (99)
Total													1.7114 (108)
Target Fabric Energy Efficiency (TFEE)													47.7479 (109)
													54.9 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	47.1540 (1b)	2.3850 (2b)	112.4623 (1b) - (3b)
First floor	47.1540 (1c)	2.6830 (2c)	126.5142 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.3080		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 238.9765 (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) =		0.3087 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.7000	5.2000	4.9000	4.5000	4.6000	4.2000	4.3000	4.2000	4.5000	4.9000	4.9000	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	0.4013	0.3781	0.3472	0.3550	0.3241	0.3318	0.3241	0.3472	0.3781	0.3781	0.4013 (22b)
	0.5967	0.5805	0.5715	0.5603	0.5630	0.5525	0.5551	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)			19.2600	1.3258	25.5341		(27)
Flr - Ground			47.1540	0.1586	7.4773	75.6000	3564.8424 (28a)
Brick	99.1610	21.3830	77.7780	0.2500	19.4445	51.1900	3981.4558 (29a)
RF - Ins Joist	47.1540		47.1540	0.1000	4.7154	7.4000	348.9396 (30)
Total net area of external elements Aum(A, m2)			193.4660				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	59.4821	(33)
Party Wall			43.5850	0.0000	0.0000	7.4000	322.5290 (32)
Stud			28.2861			7.4000	209.3171 (32c)
Stud			102.7589			7.4000	760.4159 (32c)
Block			56.2145			54.0300	3037.2667 (32c)
Internal Floor			47.1540			7.4000	348.9396 (32d)
Internal Ceiling			47.1540			7.4000	348.9396 (32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =	12922.6458	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							137.0260 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.0867 (36)
Total fabric heat loss					(33) + (36) =	69.5688	(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	47.0596	45.7800	45.0686	44.1857	44.3994	43.5729	43.7725	43.5729	44.1857	45.0686	45.0686	45.7800 (38)
Average = Sum(39)m / 12 =	116.6284	115.3488	114.6374	113.7545	113.9682	113.1417	113.3413	113.1417	113.7545	114.6374	114.6374	115.3488 (39)
												114.3617 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2367	1.2231	1.2156	1.2062	1.2085	1.1997	1.2018	1.1997	1.2062	1.2156	1.2156	1.2231 (40)
HLP (average)												1.2126 (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												2.6802 (42)
Average daily hot water use (litres/day)												97.8552 (43)
Daily hot water use	107.6407	103.7265	99.8123	95.8981	91.9839	88.0697	88.0697	91.9839	95.8981	99.8123	103.7265	107.6407 (44)
Energy conte	159.6281	139.6117	144.0668	125.6009	120.5171	103.9971	96.3686	110.5844	111.9051	130.4146	142.3577	154.5913 (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 =	1539.6432 (45)
Distribution loss (46)m = 0.15 x (45)m														
	23.9442	20.9418	21.6100	18.8401	18.0776	15.5996	14.4553	16.5877	16.7858	19.5622	21.3537	23.1887	23.1887	(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	14.5495	14.0331	14.4715	14.5221	14.0802	14.6074	14.1854	14.6807	14.6807	(61)
Total heat required for water heating calculated for each month	174.3239	152.8716	158.7151	139.7206	135.0666	118.0301	110.8401	125.1064	125.9853	145.0220	156.5431	169.2719	169.2719	(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	174.3239	152.8716	158.7151	139.7206	135.0666	118.0301	110.8401	125.1064	125.9853	145.0220	156.5431	169.2719	169.2719	(64)
Total per year (kWh/year) = Sum(64)m =													1711.4968 (64)	
RHI water heating demand													1711 (64)	
Heat gains from water heating, kWh/month	56.7503	49.7359	51.5643	45.2922	43.7093	38.0873	35.6604	40.3998	40.7285	47.0147	50.8803	55.0718	55.0718	(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	160.8131	160.8131	160.8131	160.8131	160.8131	160.8131	160.8131	160.8131	160.8131	160.8131	160.8131	160.8131	160.8131 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.1518	48.9853	39.8376	30.1596	22.5447	19.0331	20.5660	26.7324	35.8802	45.5582	53.1731	56.6846	56.6846 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	368.3344	372.1566	362.5249	342.0201	316.1365	291.8095	275.5576	271.7355	281.3672	301.8720	327.7556	352.0825	352.0825 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.7615	53.7615	53.7615	53.7615	53.7615	53.7615	53.7615	53.7615	53.7615	53.7615	53.7615	53.7615	53.7615 (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)	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087 (71)
Water heating gains (Table 5)	76.2773	74.0117	69.3068	62.9059	58.7491	52.8990	47.9307	54.3008	56.5674	63.1918	70.6671	74.0212	74.0212 (72)
Total internal gains	610.1294	605.5196	582.0352	545.4514	507.7961	474.1076	454.4202	463.1347	484.1807	520.9879	561.9617	593.1543	593.1543 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W							
North	6.6320	13.4530	0.7300	0.7200	0.7700	32.4978 (74)							
East	6.1200	25.1540	0.7300	0.7200	0.7700	56.0721 (76)							
West	6.5100	25.1540	0.7300	0.7200	0.7700	59.6453 (80)							
Solar gains	148.2152	250.2050	419.6212	650.5496	785.3402	879.5676	815.8421	696.3482	521.0034	319.5244	183.9229	120.0729	120.0729 (83)
Total gains	758.3446	855.7246	1001.6564	1196.0011	1293.1363	1353.6752	1270.2623	1159.4828	1005.1840	840.5123	745.8846	713.2272	713.2272 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	30.7783	31.1197	31.3129	31.5559	31.4967	31.7268	31.6709	31.7268	31.5559	31.3129	31.3129	31.1197	31.1197
alpha	3.0519	3.0746	3.0875	3.1037	3.0998	3.1151	3.1114	3.1151	3.1037	3.0875	3.0875	3.0746	3.0746
util living area	0.9584	0.9422	0.8958	0.7891	0.6335	0.4504	0.3394	0.3424	0.5894	0.8265	0.9301	0.9629	0.9629 (86)
MIT	19.3478	19.5275	19.9411	20.4442	20.7894	20.9462	20.9833	20.9843	20.8800	20.4874	19.8930	19.3461	19.3461 (87)
Th 2	19.8908	19.9016	19.9076	19.9150	19.9132	19.9202	19.9185	19.9202	19.9150	19.9076	19.9076	19.9016	19.9016 (88)
util rest of house	0.9503	0.9313	0.8766	0.7527	0.5742	0.3737	0.2489	0.2436	0.5038	0.7831	0.9139	0.9554	0.9554 (89)
MIT 2	18.4249	18.6072	19.0098	19.4812	19.7746	19.8944	19.9135	19.9161	19.8521	19.5299	18.9728	18.4319	18.4319 (90)
Living area fraction													fLA = Living area / (4) = 0.1800 (91)
MIT	18.5910	18.7729	19.1774	19.6545	19.9573	20.0837	20.1061	20.1083	20.0371	19.7022	19.1384	18.5965	18.5965 (92)
Temperature adjustment													-0.1500
adjusted MIT	18.4410	18.6229	19.0274	19.5045	19.8073	19.9337	19.9561	19.9583	19.8871	19.5522	18.9884	18.4465	18.4465 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9363	0.9152	0.8578	0.7372	0.5680	0.3747	0.2521	0.2471	0.5014	0.7664	0.8966	0.9423	0.9423 (94)
Useful gains	710.0037	783.1179	859.2704	881.7229	734.4801	507.1949	320.2730	286.5651	504.0483	644.1829	668.7610	672.0774	672.0774 (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	1520.9516	1502.1709	1367.3297	1138.0610	821.4004	524.2696	323.7137	289.4548	544.5551	865.7688	1190.8991	1481.8250	1481.8250 (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	603.3452	483.2036	377.9961	184.5635	64.6687	0.0000	0.0000	0.0000	0.0000	164.8598	375.9394	602.4522	602.4522 (98)
Space heating													2857.0285 (98)
RHI space heating demand													2857 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	47.1540 (1b)	2.3850 (2b)	112.4623 (1b) - (3b)
First floor	47.1540 (1c)	2.6830 (2c)	126.5142 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.3080		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 238.9765 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour							
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)							
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)							
Number of intermittent fans				2 * 10 =	20.0000 (7a)							
Number of passive vents				0 * 10 =	0.0000 (7b)							
Number of flueless gas fires				0 * 40 =	0.0000 (7c)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) =	0.0837 (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) =		0.3087 (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	0.3087	0.3318	0.3472	0.3627 (22b)
Effective ac	0.5774	0.5744	0.5715	0.5576	0.5551	0.5430	0.5430	0.5408	0.5476	0.5551	0.5603	0.5658 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Solid Door			2.1200	1.0900	2.3108		(26)
Windows (Uw = 1.40)			19.2600	1.3258	25.5341		(27)
Flr - Ground			47.1540	0.1586	7.4773	75.6000	3564.8424 (28a)
Brick	99.1610	21.3830	77.7780	0.2500	19.4445	51.1900	3981.4558 (29a)
RF - Ins Joist	47.1540		47.1540	0.1000	4.7154	7.4000	348.9396 (30)
Total net area of external elements Aum(A, m ²)			193.4660				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	59.4821	(33)
Party Wall			43.5850	0.0000	0.0000	7.4000	322.5290 (32)
Stud			28.2861			7.4000	209.3171 (32c)
Stud			102.7589			7.4000	760.4159 (32c)
Block			56.2145			54.0300	3037.2667 (32c)
Internal Floor			47.1540			7.4000	348.9396 (32d)
Internal Ceiling			47.1540			7.4000	348.9396 (32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =	12922.6458 (34)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							137.0260 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.0867 (36)
Total fabric heat loss					(33) + (36) =		69.5688 (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	45.5381	45.3010	45.0686	43.9768	43.7725	42.8216	42.8216	42.6455	43.1878	43.7725	44.1857	44.6177 (38)
Average = Sum(39)m / 12 =	115.1070	114.8698	114.6374	113.5456	113.3413	112.3904	112.3904	112.2143	112.7567	113.3413	113.7545	114.1866 (39)
HLP	1.2205	1.2180	1.2156	1.2040	1.2018	1.1917	1.1917	1.1899	1.1956	1.2018	1.2062	1.2108 (40)
HLP (average)												1.2040 (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												2.6802 (42)
Average daily hot water use (litres/day)												97.8552 (43)
Daily hot water use	107.6407	103.7265	99.8123	95.8981	91.9839	88.0697	88.0697	91.9839	95.8981	99.8123	103.7265	107.6407 (44)
Energy conte	159.6281	139.6117	144.0668	125.6009	120.5171	103.9971	96.3686	110.5844	111.9051	130.4146	142.3577	154.5913 (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 =	1539.6432 (45)
Distribution loss (46)m = 0.15 x (45)m														
23.9442	20.9418	21.6100	18.8401	18.0776	15.5996	14.4553	16.5877	16.7858	19.5622	21.3537	23.1887		(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	14.5495	14.0331	14.4715	14.5221	14.0802	14.6074	14.1854	14.6807	(61)	
Total heat required for water heating calculated for each month	174.3239	152.8716	158.7151	139.7206	135.0666	118.0301	110.8401	125.1064	125.9853	145.0220	156.5431	169.2719	(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	174.3239	152.8716	158.7151	139.7206	135.0666	118.0301	110.8401	125.1064	125.9853	145.0220	156.5431	169.2719	(64)	
Heat gains from water heating, kWh/month	56.7503	49.7359	51.5643	45.2922	43.7093	38.0873	35.6604	40.3998	40.7285	47.0147	50.8803	55.0718	(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	160.8131	160.8131	160.8131	160.8131	160.8131	160.8131	160.8131	160.8131	160.8131	160.8131	160.8131	160.8131	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.1518	48.9853	39.8376	30.1596	22.5447	19.0331	20.5660	26.7324	35.8802	45.5582	53.1731	56.6846	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	368.3344	372.1566	362.5249	342.0201	316.1365	291.8095	275.5576	271.7355	281.3672	301.8720	327.7556	352.0825	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.7615	53.7615	53.7615	53.7615	53.7615	53.7615	53.7615	53.7615	53.7615	53.7615	53.7615	53.7615	(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)	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	(71)
Water heating gains (Table 5)	76.2773	74.0117	69.3068	62.9059	58.7491	52.8990	47.9307	54.3008	56.5674	63.1918	70.6671	74.0212	(72)
Total internal gains	610.1294	605.5196	582.0352	545.4514	507.7961	474.1076	454.4202	463.1347	484.1807	520.9879	561.9617	593.1543	(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		6.6320	10.6334	0.7300	0.7200	0.7700	25.6865 (74)						
East		6.1200	19.6403	0.7300	0.7200	0.7700	43.7812 (76)						
West		6.5100	19.6403	0.7300	0.7200	0.7700	46.5711 (80)						
Solar gains	116.0388	225.8365	374.4921	558.5042	700.7540	725.8025	687.4359	578.6612	438.8265	268.1598	144.3463	95.7149	(83)
Total gains	726.1682	831.3561	956.5273	1103.9556	1208.5500	1199.9101	1141.8561	1041.7959	923.0072	789.1477	706.3080	688.8691	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	31.1851	31.2495	31.3129	31.6139	31.6709	31.9389	31.9389	31.9890	31.8351	31.6709	31.5559	31.4365	
alpha	3.0790	3.0833	3.0875	3.1076	3.1114	3.1293	3.1293	3.1326	3.1223	3.1114	3.1037	3.0958	
util living area	0.9683	0.9514	0.9139	0.8321	0.7028	0.5444	0.4146	0.4662	0.6893	0.8826	0.9529	0.9727	(86)
MIT	19.1482	19.3911	19.8013	20.3052	20.6874	20.8988	20.9677	20.9532	20.7832	20.2637	19.6151	19.0987	(87)
Th 2	19.9036	19.9056	19.9076	19.9168	19.9185	19.9266	19.9266	19.9281	19.9235	19.9185	19.9150	19.9114	(88)
util rest of house	0.9624	0.9424	0.8980	0.8016	0.6512	0.4688	0.3207	0.3684	0.6174	0.8538	0.9427	0.9675	(89)
MIT 2	18.2370	18.4765	18.8762	19.3583	19.6979	19.8713	19.9148	19.9096	19.7908	19.3347	18.7073	18.1941	(90)
Living area fraction	18.4010	18.6411	19.0427	19.5287	19.8760	20.0563	20.1043	20.0975	19.9694	19.5019	18.8707	18.3569	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.2510	18.4911	18.8927	19.3787	19.7260	19.9063	19.9543	19.9475	19.8194	19.3519	18.7207	18.2069	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	690.2083	771.0706	841.5707	865.6062	774.7772	560.7424	369.0354	385.7661	562.7261	659.2200	655.4054	659.0159	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1605.8572	1561.2049	1420.6693	1189.8119	909.6751	596.3753	376.9925	398.0760	644.9025	991.9482	1321.9059	1599.3997	(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	681.2428	530.9703	430.8493	233.4281	100.3641	0.0000	0.0000	0.0000	0.0000	247.5498	479.8804	699.6455	(98)
Space heating													3403.9303 (98)
Space heating per m ²													(98) / (4) = 36.0938 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

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													3761.2490 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	681.2428	530.9703	430.8493	233.4281	100.3641	0.0000	0.0000	0.0000	0.0000	247.5498	479.8804	699.6455	(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)	752.7545	586.7075	476.0766	257.9316	110.8995	0.0000	0.0000	0.0000	0.0000	273.5357	530.2546	773.0889	(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	174.3239	152.8716	158.7151	139.7206	135.0666	118.0301	110.8401	125.1064	125.9853	145.0220	156.5431	169.2719	(64)
Efficiency of water heater (217)m	89.8291	89.7645	89.6157	89.2747	88.6361	87.3000	87.3000	87.3000	87.3000	89.2909	89.6913	89.8583	(216)
Fuel for water heating, kWh/month	194.0617	170.3031	177.1064	156.5063	152.3833	135.2006	126.9646	143.3063	144.3131	162.4152	174.5354	188.3764	(219)
Water heating fuel used													1925.4724 (219)
Annual totals kWh/year													
Space heating fuel - main system													3761.2490 (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)													389.5993 (232)
Total delivered energy for all uses													6151.3207 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3761.2490	3.4800	130.8915 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1925.4724	3.4800	67.0064 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	389.5993	13.1900	51.3881 (250)
Additional standing charges			120.0000 (251)
Total energy cost			379.1786 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.1432 (257)
SAP value		84.0526
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	3761.2490	0.2160	812.4298 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1925.4724	0.2160	415.9020 (264)
Space and water heating			1228.3318 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	389.5993	0.5190	202.2020 (268)
Total kg/year			1469.4589 (272)
CO2 emissions per m2			15.5800 (273)
EI value			85.8653
EI rating			86 (274)
EI band			B

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9050 = 3.845$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9050 = 0.2387$, stars = 4
Water heating energy efficiency	$3.48 / 0.8876 = 3.921$, stars = 4
Water heating environmental impact	$0.216 / 0.8876 = 0.2433$, stars = 4

FULL SAP CALCULATION PRINTOUT

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FULL SAP CALCULATION PRINTOUT

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	47.1540 (1b)	x 2.3850 (2b)	= 112.4623 (1b) - (3b)
First floor	47.1540 (1c)	x 2.6830 (2c)	= 126.5142 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.3080		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 238.9765 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour							
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)							
Number of open flues	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) =	0.3087 (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	0.4013	0.3781	0.3472	0.3550	0.3241	0.3318	0.3241	0.3472	0.3781	0.3781	0.4013 (22b)
	0.5967	0.5805	0.5715	0.5603	0.5630	0.5525	0.5551	0.5525	0.5603	0.5715	0.5715	0.5805 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Solid Door			2.1200	1.0900	2.3108		(26)
Windows (Uw = 1.40)			19.2600	1.3258	25.5341		(27)
Flr - Ground			47.1540	0.1586	7.4773	75.6000	3564.8424 (28a)
Brick	99.1610	21.3830	77.7780	0.2500	19.4445	51.1900	3981.4558 (29a)
RF - Ins Joist	47.1540		47.1540	0.1000	4.7154	7.4000	348.9396 (30)
Total net area of external elements Aum(A, m ²)			193.4660				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	59.4821	(33)
Party Wall			43.5850	0.0000	0.0000	7.4000	322.5290 (32)
Stud			28.2861			7.4000	209.3171 (32c)
Stud			102.7589			7.4000	760.4159 (32c)
Block			56.2145			54.0300	3037.2667 (32c)
Internal Floor			47.1540			7.4000	348.9396 (32d)
Internal Ceiling			47.1540			7.4000	348.9396 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 12922.6458 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							137.0260 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.0867 (36)
Total fabric heat loss							(33) + (36) = 69.5688 (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	47.0596	45.7800	45.0686	44.1857	44.3994	43.5729	43.7725	43.5729	44.1857	45.0686	45.0686	45.7800 (38)
Average = Sum(39)m / 12 =	116.6284	115.3488	114.6374	113.7545	113.9682	113.1417	113.3413	113.1417	113.7545	114.6374	114.6374	115.3488 (39)
HLP	1.2367	1.2231	1.2156	1.2062	1.2085	1.1997	1.2018	1.1997	1.2062	1.2156	1.2156	1.2231 (40)
HLP (average)												1.2126 (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												2.6802 (42)
Average daily hot water use (litres/day)												97.8552 (43)
Daily hot water use	107.6407	103.7265	99.8123	95.8981	91.9839	88.0697	88.0697	91.9839	95.8981	99.8123	103.7265	107.6407 (44)
Energy conte	159.6281	139.6117	144.0668	125.6009	120.5171	103.9971	96.3686	110.5844	111.9051	130.4146	142.3577	154.5913 (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 =	1539.6432 (45)
Distribution loss (46)m = 0.15 x (45)m														
	23.9442	20.9418	21.6100	18.8401	18.0776	15.5996	14.4553	16.5877	16.7858	19.5622	21.3537	23.1887	(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	14.5495	14.0331	14.4715	14.5221	14.0802	14.6074	14.1854	14.6807	(61)	
Total heat required for water heating calculated for each month	174.3239	152.8716	158.7151	139.7206	135.0666	118.0301	110.8401	125.1064	125.9853	145.0220	156.5431	169.2719	(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	174.3239	152.8716	158.7151	139.7206	135.0666	118.0301	110.8401	125.1064	125.9853	145.0220	156.5431	169.2719	(64)	
	Total per year (kWh/year) = Sum(64)m =												1711.4968 (64)	
Heat gains from water heating, kWh/month	56.7503	49.7359	51.5643	45.2922	43.7093	38.0873	35.6604	40.3998	40.7285	47.0147	50.8803	55.0718	(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	160.8131	160.8131	160.8131	160.8131	160.8131	160.8131	160.8131	160.8131	160.8131	160.8131	160.8131	160.8131	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.1518	48.9853	39.8376	30.1596	22.5447	19.0331	20.5660	26.7324	35.8802	45.5582	53.1731	56.6846	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	368.3344	372.1566	362.5249	342.0201	316.1365	291.8095	275.5576	271.7355	281.3672	301.8720	327.7556	352.0825	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.7615	53.7615	53.7615	53.7615	53.7615	53.7615	53.7615	53.7615	53.7615	53.7615	53.7615	53.7615	(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)	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	(71)
Water heating gains (Table 5)	76.2773	74.0117	69.3068	62.9059	58.7491	52.8990	47.9307	54.3008	56.5674	63.1918	70.6671	74.0212	(72)
Total internal gains	610.1294	605.5196	582.0352	545.4514	507.7961	474.1076	454.4202	463.1347	484.1807	520.9879	561.9617	593.1543	(73)

6. Solar gains

[Jan]	Area	Solar flux	Specific data	FF	Access factor	Gains							
	m2	Table 6a	g	Specific data	Table 6d	W							
		W/m2	or Table 6b	or Table 6c									
North	6.6320	13.4530	0.7300	0.7200	0.7700	32.4978 (74)							
East	6.1200	25.1540	0.7300	0.7200	0.7700	56.0721 (76)							
West	6.5100	25.1540	0.7300	0.7200	0.7700	59.6453 (80)							
Solar gains	148.2152	250.2050	419.6212	650.5496	785.3402	879.5676	815.8421	696.3482	521.0034	319.5244	183.9229	120.0729	(83)
Total gains	758.3446	855.7246	1001.6564	1196.0011	1293.1363	1353.6752	1270.2623	1159.4828	1005.1840	840.5123	745.8846	713.2272	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	30.7783	31.1197	31.3129	31.5559	31.4967	31.7268	31.6709	31.7268	31.5559	31.3129	31.3129	31.1197	
alpha	3.0519	3.0746	3.0875	3.1037	3.0998	3.1151	3.1114	3.1151	3.1037	3.0875	3.0875	3.0746	
util living area	0.9584	0.9422	0.8958	0.7891	0.6335	0.4504	0.3394	0.3424	0.5894	0.8265	0.9301	0.9629	(86)
MIT	19.3478	19.5275	19.9411	20.4442	20.7894	20.9462	20.9833	20.9843	20.8800	20.4874	19.8930	19.3461	(87)
Th 2	19.8908	19.9016	19.9076	19.9150	19.9132	19.9202	19.9185	19.9202	19.9150	19.9076	19.9076	19.9016	(88)
util rest of house	0.9503	0.9313	0.8766	0.7527	0.5742	0.3737	0.2489	0.2436	0.5038	0.7831	0.9139	0.9554	(89)
MIT 2	18.4249	18.6072	19.0098	19.4812	19.7746	19.8944	19.9135	19.9161	19.8521	19.5299	18.9728	18.4319	(90)
Living area fraction	18.5910	18.7729	19.1774	19.6545	19.9573	20.0837	20.1061	20.1083	20.0371	19.7022	19.1384	18.5965	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.4410	18.6229	19.0274	19.5045	19.8073	19.9337	19.9561	19.9583	19.8871	19.5522	18.9884	18.4465	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9363	0.9152	0.8578	0.7372	0.5680	0.3747	0.2521	0.2471	0.5014	0.7664	0.8966	0.9423	(94)
Ext temp.	710.0037	783.1179	859.2704	881.7229	734.4801	507.1949	320.2730	286.5651	504.0483	644.1829	668.7610	672.0774	(95)
Heat loss rate W	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)
Month fracti	1520.9516	1502.1709	1367.3297	1138.0610	821.4004	524.2696	323.7137	289.4548	544.5551	865.7688	1190.8991	1481.8250	(97)
Space heating kWh	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 per m2	603.3452	483.2036	377.9961	184.5635	64.6687	0.0000	0.0000	0.0000	0.0000	164.8598	375.9394	602.4522	(98)
	(98) / (4) =												30.2947 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

8c. Space cooling requirement

Not applicable

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3156.9376 (211)
Space heating requirement	603.3452	483.2036	377.9961	184.5635	64.6687	0.0000	0.0000	0.0000	0.0000	164.8598	375.9394	602.4522	(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)	666.6798	533.9267	417.6752	203.9375	71.4571	0.0000	0.0000	0.0000	0.0000	182.1656	415.4026	665.6930	(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	174.3239	152.8716	158.7151	139.7206	135.0666	118.0301	110.8401	125.1064	125.9853	145.0220	156.5431	169.2719	(64)
Efficiency of water heater (217)m	89.7624	89.7097	89.5295	89.0929	88.3110	87.3000	87.3000	87.3000	87.3000	88.9737	89.5352	89.7782	(217)
Fuel for water heating, kWh/month	194.2058	170.4070	177.2768	156.8256	152.9442	135.2006	126.9646	143.3063	144.3131	162.9942	174.8398	188.5446	(219)
Water heating fuel used													1927.8228 (219)
Annual totals kWh/year													
Space heating fuel - main system													3156.9376 (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)													389.5993 (232)
Total delivered energy for all uses													5549.3596 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3156.9376	4.2600	134.4855 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1927.8228	4.2600	82.1252 (247)
Pumps and fans for heating	75.0000	22.5500	16.9125 (249)
Energy for lighting	389.5993	22.5500	87.8546 (250)
Additional standing charges			96.0000 (251)
Total energy cost			417.3779 (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	3156.9376	0.2160	681.8985 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1927.8228	0.2160	416.4097 (264)
Space and water heating			1098.3082 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	389.5993	0.5190	202.2020 (268)
Total kg/year			1339.4353 (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	3156.9376	1.2200	3851.4638 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1927.8228	1.2200	2351.9438 (264)
Space and water heating			6203.4076 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	389.5993	3.0700	1196.0698 (268)
Primary energy kWh/year			7629.7274 (272)
Primary energy kWh/m2/year			80.9022 (273)

SAP 2012 EPC IMPROVEMENTS

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

(For testing purposes):

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

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.2	-£ 32	-193 kg (14.4%)
U Solar photovoltaic panels	+ 9.6	-£ 453	-1042 kg (90.8%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£32	2.04 kg/m ²	B 85 B 88
Solar photovoltaic panels	£453	11.04 kg/m ²	A 95 A 96
Total Savings	£484	13.09 kg/m ²	

Potential energy efficiency rating: A 95
 Potential environmental impact rating: A 96

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	£105	£116	-£11
Mains gas	£313	£270	£43
Space heating	£247	£247	£0
Water heating	£82	£50	£32
Lighting	£88	£88	£0
Generated (PV)	-£0	-£453	£453
Total cost of fuels	£418	-£67	£485
Total cost of uses	£417	-£68	£485
Delivered energy	59 kWh/m ²	27 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	81 kWh/m ²	4 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	47.1540 (1b)	2.3850 (2b)	112.4623 (1b) - (3b)
First floor	47.1540 (1c)	2.6830 (2c)	126.5142 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.3080		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 238.9765 (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) =	0.3087 (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 inflt rate												
Effective ac	0.3935	0.3858	0.3781	0.3395	0.3318	0.2932	0.2932	0.2855	0.3087	0.3318	0.3472	0.3627 (22b)
	0.5774	0.5744	0.5715	0.5576	0.5551	0.5430	0.5430	0.5408	0.5476	0.5551	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)			19.2600	1.3258	25.5341		(27)
Flr - Ground			47.1540	0.1586	7.4773	75.6000	3564.8424 (28a)
Brick	99.1610	21.3830	77.7780	0.2500	19.4445	51.1900	3981.4558 (29a)
RF - Ins Joist	47.1540		47.1540	0.1000	4.7154	7.4000	348.9396 (30)
Total net area of external elements Aum(A, m2)			193.4660				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	59.4821	(33)
Party Wall			43.5850	0.0000	0.0000	7.4000	322.5290 (32)
Stud			28.2861			7.4000	209.3171 (32c)
Stud			102.7589			7.4000	760.4159 (32c)
Block			56.2145			54.0300	3037.2667 (32c)
Internal Floor			47.1540			7.4000	348.9396 (32d)
Internal Ceiling			47.1540			7.4000	348.9396 (32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12922.6458 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							137.0260 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.0867 (36)
Total fabric heat loss						(33) + (36) =	69.5688 (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	45.5381	45.3010	45.0686	43.9768	43.7725	42.8216	42.8216	42.6455	43.1878	43.7725	44.1857	44.6177 (38)
Average = Sum(39)m / 12 =	115.1070	114.8698	114.6374	113.5456	113.3413	112.3904	112.3904	112.2143	112.7567	113.3413	113.7545	114.1866 (39)
												113.5446 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2205	1.2180	1.2156	1.2040	1.2018	1.1917	1.1917	1.1899	1.1956	1.2018	1.2062	1.2108 (40)
HLP (average)												1.2040 (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 2.6802 (42)

Average daily hot water use (litres/day) 97.8552 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	107.6407	103.7265	99.8123	95.8981	91.9839	88.0697	88.0697	91.9839	95.8981	99.8123	103.7265	107.6407 (44)
Energy conte	159.6281	139.6117	144.0668	125.6009	120.5171	103.9971	96.3686	110.5844	111.9051	130.4146	142.3577	154.5913 (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 =	1539.6432 (45)
Distribution loss (46)m = 0.15 x (45)m													
	23.9442	20.9418	21.6100	18.8401	18.0776	15.5996	14.4553	16.5877	16.7858	19.5622	21.3537	23.1887	(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	14.5495	14.0331	14.4715	14.5221	14.0802	14.6074	14.1854	14.6807	(61)
Total heat required for water heating calculated for each month	174.3239	152.8716	158.7151	139.7206	135.0666	118.0301	110.8401	125.1064	125.9853	145.0220	156.5431	169.2719	(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												1.1779 (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												97.8552 (H14)	
Volume ratio Veff/V												0.7664 (H15)	
Solar storage volume factor												0.9468 (H16)	
Solar input	-25.0495	-41.8004	-71.1909	-95.4098	-117.8707	-115.8857	-114.3542	-99.9119	-78.2510	-53.4362	-29.7123	-20.9621	(63)
Solar input (sum of months) = Sum(63)m =												-863.8349 (63)	
Output from w/h	149.2744	111.0712	87.5242	44.3108	17.1958	2.1444	0.0000	25.1945	47.7343	91.5858	126.8308	148.3098	(64)
Total per year (kWh/year) = Sum(64)m =												851.1760 (64)	
Heat gains from water heating, kWh/month	56.7503	49.7359	51.5643	45.2922	43.7093	38.0873	35.6604	40.3998	40.7285	47.0147	50.8803	55.0718	(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	160.8131	160.8131	160.8131	160.8131	160.8131	160.8131	160.8131	160.8131	160.8131	160.8131	160.8131	160.8131	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.1518	48.9853	39.8376	30.1596	22.5447	19.0331	20.5660	26.7324	35.8802	45.5582	53.1731	56.6846	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	368.3344	372.1566	362.5249	342.0201	316.1365	291.8095	275.5576	271.7355	281.3672	301.8720	327.7556	352.0825	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.7615	53.7615	53.7615	53.7615	53.7615	53.7615	53.7615	53.7615	53.7615	53.7615	53.7615	53.7615	(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)	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	(71)
Water heating gains (Table 5)	76.2773	74.0117	69.3068	62.9059	58.7491	52.8990	47.9307	54.3008	56.5674	63.1918	70.6671	74.0212	(72)
Total internal gains	610.1294	605.5196	582.0352	545.4514	507.7961	474.1076	454.4202	463.1347	484.1807	520.9879	561.9617	593.1543	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data g or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W							
North	6.6320	10.6334	0.7300	0.7200	0.7700	25.6865 (74)							
East	6.1200	19.6403	0.7300	0.7200	0.7700	43.7812 (76)							
West	6.5100	19.6403	0.7300	0.7200	0.7700	46.5711 (80)							
Solar gains	116.0388	225.8365	374.4921	558.5042	700.7540	725.8025	687.4359	578.6612	438.8265	268.1598	144.3463	95.7149	(83)
Total gains	726.1682	831.3561	956.5273	1103.9556	1208.5500	1199.9101	1141.8561	1041.7959	923.0072	789.1477	706.3080	688.8691	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, T _{hl} (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	31.1851	31.2495	31.3129	31.6139	31.6709	31.9389	31.9389	31.9890	31.8351	31.6709	31.5559	31.4365	
alpha	3.0790	3.0833	3.0875	3.1076	3.1114	3.1293	3.1293	3.1326	3.1223	3.1114	3.1037	3.0958	
util living area	0.9683	0.9514	0.9139	0.8321	0.7028	0.5444	0.4146	0.4662	0.6893	0.8826	0.9529	0.9727	(86)
MIT	19.1482	19.3911	19.8013	20.3052	20.6874	20.8988	20.9677	20.9532	20.7832	20.2637	19.6151	19.0987	(87)
Th 2	19.9036	19.9056	19.9076	19.9168	19.9185	19.9266	19.9266	19.9281	19.9235	19.9185	19.9150	19.9114	(88)
util rest of house	0.9624	0.9424	0.8980	0.8016	0.6512	0.4688	0.3207	0.3684	0.6174	0.8538	0.9427	0.9675	(89)
MIT 2	18.2370	18.4765	18.8762	19.3583	19.6979	19.8713	19.9148	19.9096	19.7908	19.3347	18.7073	18.1941	(90)
Living area fraction												fLA = Living area / (4) =	
MIT	18.4010	18.6411	19.0427	19.5287	19.8760	20.0563	20.1043	20.0975	19.9694	19.5019	18.8707	18.3569	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.2510	18.4911	18.8927	19.3787	19.7260	19.9063	19.9543	19.9475	19.8194	19.3519	18.7207	18.2069	(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	0.9505	0.9275	0.8798	0.7841	0.6411	0.4673	0.3232	0.3703	0.6097	0.8354	0.9279	0.9567	(94)
Useful gains	690.2083	771.0706	841.5707	865.6062	774.7772	560.7424	369.0354	385.7661	562.7261	659.2200	655.4054	659.0159	(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	1605.8572	1561.2049	1420.6693	1189.8119	909.6751	596.3753	376.9925	398.0760	644.9025	991.9482	1321.9059	1599.3997	(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	681.2428	530.9703	430.8493	233.4281	100.3641	0.0000	0.0000	0.0000	0.0000	247.5498	479.8804	699.6455	(98)
Space heating													3403.9303 (98)
Space heating per m2													(98) / (4) = 36.0938 (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													3761.2490 (211)
Space heating requirement	681.2428	530.9703	430.8493	233.4281	100.3641	0.0000	0.0000	0.0000	0.0000	247.5498	479.8804	699.6455	(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)	752.7545	586.7075	476.0766	257.9316	110.8995	0.0000	0.0000	0.0000	0.0000	273.5357	530.2546	773.0889	(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	149.2744	111.0712	87.5242	44.3108	17.1958	2.1444	0.0000	25.1945	47.7343	91.5858	126.8308	148.3098	(64)
Efficiency of water heater (217)m	89.9077	89.9297	89.9433	89.9738	90.0174	87.3000	87.3000	87.3000	87.3000	89.6129	89.8118	89.9235	(216)
Fuel for water heating, kWh/month	166.0308	123.5089	97.3104	49.2485	19.1028	2.4564	0.0000	28.8597	54.6785	102.2015	141.2184	164.9289	(219)
Water heating fuel used													949.5447 (219)
Annual totals kWh/year													
Space heating fuel - main system													3761.2490 (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)													389.5993 (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													3498.1536 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3761.2490	3.4800	130.8915	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	949.5447	3.4800	33.0442	(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	389.5993	13.1900	51.3881	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	-1727.2394	13.1900	-227.8229	(252)
Total energy cost			123.9884	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200	(256)
Energy cost factor (ECF)		0.3738	(257)
SAP value	$[(255) \times (256)] / [(4) + 45.0] =$	94.7853	
SAP rating (Section 12)		95	(258)
SAP band		A	

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3761.2490	0.2160	812.4298 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	949.5447	0.2160	205.1017 (264)
Space and water heating			1017.5314 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	389.5993	0.5190	202.2020 (268)
Energy saving/generation technologies			
PV Unit	-1727.2394	0.5190	-896.4372 (269)
Total kg/year			388.1712 (272)
CO2 emissions per m2			4.1200 (273)
EI value			96.2662
EI rating			96 (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	47.1540 (1b)	2.3850 (2b)	112.4623 (1b) - (3b)
First floor	47.1540 (1c)	2.6830 (2c)	126.5142 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.3080		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 238.9765 (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) =	0.3087 (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	0.4013	0.3781	0.3472	0.3550	0.3241	0.3318	0.3241	0.3472	0.3781	0.3781	0.4013 (22b)
Effective ac	0.5967	0.5805	0.5715	0.5603	0.5630	0.5525	0.5551	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)			19.2600	1.3258	25.5341		(27)
Flr - Ground			47.1540	0.1586	7.4773	75.6000	3564.8424 (28a)
Brick	99.1610	21.3830	77.7780	0.2500	19.4445	51.1900	3981.4558 (29a)
RF - Ins Joist	47.1540		47.1540	0.1000	4.7154	7.4000	348.9396 (30)
Total net area of external elements Aum(A, m2)			193.4660				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	59.4821	(33)
Party Wall			43.5850	0.0000	0.0000	7.4000	322.5290 (32)
Stud			28.2861			7.4000	209.3171 (32c)
Stud			102.7589			7.4000	760.4159 (32c)
Block			56.2145			54.0300	3037.2667 (32c)
Internal Floor			47.1540			7.4000	348.9396 (32d)
Internal Ceiling			47.1540			7.4000	348.9396 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 12922.6458 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							137.0260 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.0867 (36)
Total fabric heat loss							(33) + (36) = 69.5688 (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	47.0596	45.7800	45.0686	44.1857	44.3994	43.5729	43.7725	43.5729	44.1857	45.0686	45.0686	45.7800 (38)
Average = Sum(39)m / 12 =	116.6284	115.3488	114.6374	113.7545	113.9682	113.1417	113.3413	113.1417	113.7545	114.6374	114.6374	115.3488 (39)
HLP	1.2367	1.2231	1.2156	1.2062	1.2085	1.1997	1.2018	1.1997	1.2062	1.2156	1.2156	1.2231 (40)
HLP (average)												1.2126 (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												2.6802 (42)
Average daily hot water use (litres/day)												97.8552 (43)
Daily hot water use	107.6407	103.7265	99.8123	95.8981	91.9839	88.0697	88.0697	91.9839	95.8981	99.8123	103.7265	107.6407 (44)
Energy conte	159.6281	139.6117	144.0668	125.6009	120.5171	103.9971	96.3686	110.5844	111.9051	130.4146	142.3577	154.5913 (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 =	1539.6432 (45)
Distribution loss (46)m = 0.15 x (45)m													
	23.9442	20.9418	21.6100	18.8401	18.0776	15.5996	14.4553	16.5877	16.7858	19.5622	21.3537	23.1887	(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	14.5495	14.0331	14.4715	14.5221	14.0802	14.6074	14.1854	14.6807	(61)
Total heat required for water heating calculated for each month	174.3239	152.8716	158.7151	139.7206	135.0666	118.0301	110.8401	125.1064	125.9853	145.0220	156.5431	169.2719	(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												97.8552 (H14)	
Volume ratio Veff/V												0.7664 (H15)	
Solar storage volume factor												0.9468 (H16)	
Solar input	-28.4920	-41.1992	-70.9881	-99.1518	-118.2199	-125.8883	-121.5662	-107.4033	-82.7418	-56.6366	-33.7005	-23.4275	(63)
Solar input (sum of months) = Sum(63)m =												-909.4151 (63)	
Output from w/h	145.8319	111.6725	87.7270	40.5687	16.8467	0.0000	0.0000	17.7032	43.2435	88.3854	122.8426	145.8445	(64)
Total per year (kWh/year) = Sum(64)m =												820.6659 (64)	
Heat gains from water heating, kWh/month	56.7503	49.7359	51.5643	45.2922	43.7093	38.0873	35.6604	40.3998	40.7285	47.0147	50.8803	55.0718	(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	160.8131	160.8131	160.8131	160.8131	160.8131	160.8131	160.8131	160.8131	160.8131	160.8131	160.8131	160.8131	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.1518	48.9853	39.8376	30.1596	22.5447	19.0331	20.5660	26.7324	35.8802	45.5582	53.1731	56.6846	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	368.3344	372.1566	362.5249	342.0201	316.1365	291.8095	275.5576	271.7355	281.3672	301.8720	327.7556	352.0825	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.7615	53.7615	53.7615	53.7615	53.7615	53.7615	53.7615	53.7615	53.7615	53.7615	53.7615	53.7615	(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)	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	-107.2087	(71)
Water heating gains (Table 5)	76.2773	74.0117	69.3068	62.9059	58.7491	52.8990	47.9307	54.3008	56.5674	63.1918	70.6671	74.0212	(72)
Total internal gains	610.1294	605.5196	582.0352	545.4514	507.7961	474.1076	454.4202	463.1347	484.1807	520.9879	561.9617	593.1543	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W					
North	6.6320	13.4530	0.7300	0.7300	0.7200	0.7700	32.4978 (74)						
East	6.1200	25.1540	0.7300	0.7300	0.7200	0.7700	56.0721 (76)						
West	6.5100	25.1540	0.7300	0.7300	0.7200	0.7700	59.6453 (80)						
Solar gains	148.2152	250.2050	419.6212	650.5496	785.3402	879.5676	815.8421	696.3482	521.0034	319.5244	183.9229	120.0729	(83)
Total gains	758.3446	855.7246	1001.6564	1196.0011	1293.1363	1353.6752	1270.2623	1159.4828	1005.1840	840.5123	745.8846	713.2272	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, T _{hl} (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area, nil,m (see Table 9a)												21.0000 (85)	
tau	30.7783	31.1197	31.3129	31.5559	31.4967	31.7268	31.6709	31.7268	31.5559	31.3129	31.3129	31.1197	
alpha	3.0519	3.0746	3.0875	3.1037	3.0998	3.1151	3.1114	3.1151	3.1037	3.0875	3.0875	3.0746	
util living area	0.9584	0.9422	0.8958	0.7891	0.6335	0.4504	0.3394	0.3424	0.5894	0.8265	0.9301	0.9629	(86)
MIT	19.3478	19.5275	19.9411	20.4442	20.7894	20.9462	20.9833	20.9843	20.8800	20.4874	19.8930	19.3461	(87)
Th 2	19.8908	19.9016	19.9076	19.9150	19.9132	19.9202	19.9185	19.9202	19.9150	19.9076	19.9076	19.9016	(88)
util rest of house	0.9503	0.9313	0.8766	0.7527	0.5742	0.3737	0.2489	0.2436	0.5038	0.7831	0.9139	0.9554	(89)
MIT 2	18.4249	18.6072	19.0098	19.4812	19.7746	19.8944	19.9135	19.9161	19.8521	19.5299	18.9728	18.4319	(90)
Living area fraction												fLA = Living area / (4) = 0.1800 (91)	
MIT	18.5910	18.7729	19.1774	19.6545	19.9573	20.0837	20.1061	20.1083	20.0371	19.7022	19.1384	18.5965	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.4410	18.6229	19.0274	19.5045	19.8073	19.9337	19.9561	19.9583	19.8871	19.5522	18.9884	18.4465	(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	0.9363	0.9152	0.8578	0.7372	0.5680	0.3747	0.2521	0.2471	0.5014	0.7664	0.8966	0.9423	(94)	
Useful gains	710.0037	783.1179	859.2704	881.7229	734.4801	507.1949	320.2730	286.5651	504.0483	644.1829	668.7610	672.0774	(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	1520.9516	1502.1709	1367.3297	1138.0610	821.4004	524.2696	323.7137	289.4548	544.5551	865.7688	1190.8991	1481.8250	(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	603.3452	483.2036	377.9961	184.5635	64.6687	0.0000	0.0000	0.0000	0.0000	164.8598	375.9394	602.4522	(98)	
Space heating												2857.0285	(98)	
Space heating per m2												(98) / (4) =	30.2947	(99)

8c. Space cooling requirement

Not applicable

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													90.5000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													3156.9376	(211)
Space heating requirement	603.3452	483.2036	377.9961	184.5635	64.6687	0.0000	0.0000	0.0000	0.0000	164.8598	375.9394	602.4522	(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)	666.6798	533.9267	417.6752	203.9375	71.4571	0.0000	0.0000	0.0000	0.0000	182.1656	415.4026	665.6930	(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	145.8319	111.6725	87.7270	40.5687	16.8467	0.0000	0.0000	17.7032	43.2435	88.3854	122.8426	145.8445	(64)	
Efficiency of water heater (217)m	89.8588	89.8815	89.8794	89.9061	89.8196	87.3000	87.3000	87.3000	87.3000	89.3569	89.6903	89.8580	(216)	
Fuel for water heating, kWh/month	162.2900	124.2441	97.6052	45.1234	18.7561	0.0000	0.0000	20.2785	49.5344	98.9129	136.9630	162.3054	(219)	
Water heating fuel used												916.0131	(219)	
Annual totals kWh/year														
Space heating fuel - main system													3156.9376	(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)													389.5993	(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													2580.7998	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3156.9376	4.2600	134.4855	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	916.0131	4.2600	39.0222	(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	389.5993	22.5500	87.8546	(250)
Additional standing charges			96.0000	(251)
Energy saving/generation technologies				
PV Unit	-2006.7501	22.5500	-452.5221	(252)
Total energy cost			-66.9723	(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	3156.9376	0.2160	681.8985	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	916.0131	0.2160	197.8588	(264)
Space and water heating			879.7573	(265)
Pumps and fans	125.0000	0.5190	64.8750	(267)
Energy for lighting	389.5993	0.5190	202.2020	(268)
Energy saving/generation technologies				
PV Unit	-2006.7501	0.5190	-1041.5033	(269)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Total kg/year 105.3311 (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	3156.9376	1.2200	3851.4638 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	916.0131	1.2200	1117.5359 (264)
Space and water heating			4968.9998 (265)
Pumps and fans	125.0000	3.0700	383.7500 (267)
Energy for lighting	389.5993	3.0700	1196.0698 (268)
Energy saving/generation technologies			
PV Unit	-2006.7501	3.0700	-6160.7228 (269)
Primary energy kWh/year			388.0968 (272)
Primary energy kWh/m2/year			4.1152 (273)

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

Overheating Calculation Input Data

Dwelling type	SemiDetached House
Number of storeys	2
Cross ventilation possible	Yes
SAP Region	South East England
Front of dwelling faces	East
Overshading	Average or unknown
Thermal mass parameter	137.0 (calculated from construction elements)
Night ventilation	Yes
Ventilation rate during hot weather (ach)	4.61 (Calculated rate)

Overheating Calculation

Summer ventilation heat loss coefficient	363.55 (P1)
Transmission heat loss coefficient	69.57 (37)
Summer heat loss coefficient	433.12 (P2)

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

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

[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Shading	Gains W
North	6.6320	86.6589	0.7300	0.7200	0.7650	207.9777
East	6.1200	124.7972	0.7300	0.7200	0.7650	276.3858
West	6.5100	124.7972	0.7300	0.7200	0.7650	293.9986

total: 778.3621

Solar gains	Jun 831	Jul 778	Aug 663	(P3)
Internal gains	471	451	460	
Total summer gains	1302	1230	1123	(P5)

Summer gain/loss ratio	3.01	2.84	2.59	(P6)
Summer external temperature	15.40	17.40	17.50	
Thermal mass temperature increment (TMP = 137.0)	1.04	1.04	1.04	
Threshold temperature	19.45	21.28	21.13	(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	626 - PRJ012992		Issued on Date	01/02/2023	
Assessment Reference	626	Prop Type Ref	Daisy		
Property	Lancing Phase 2, BN15				
SAP Rating	84 B	DER	17.14	TER	17.99
Environmental	86 B	% DER<TER	4.71		
CO₂ Emissions (t/year)	1.34	DFEE	48.05	TFEE	54.91
General Requirements Compliance	Pass	% DFEE<TFEE	12.50		
Assessor Details	Chris Nicholls, , Tel: ,		Assessor ID	T850-0001	
Client					

SUMMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas			
Fuel factor	1.00 (mains gas)			
Target Carbon Dioxide Emission Rate (TER)	17.99	kgCO ₂ /m ²		
Dwelling Carbon Dioxide Emission Rate (DER)	17.14	kgCO ₂ /m ²		Pass
	-0.85 (-4.7%)	kgCO ₂ /m ²		

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	54.91	kWh/m ² /yr		
Dwelling Fabric Energy Efficiency (DFEE)	48.05	kWh/m ² /yr		
	-6.9 (-12.6%)	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	1.37 (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

6.63 m², No overhang

Windows facing East

6.12 m², No overhang

Windows facing West

6.51 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