

# PREDICTED ENERGY ASSESSMENT

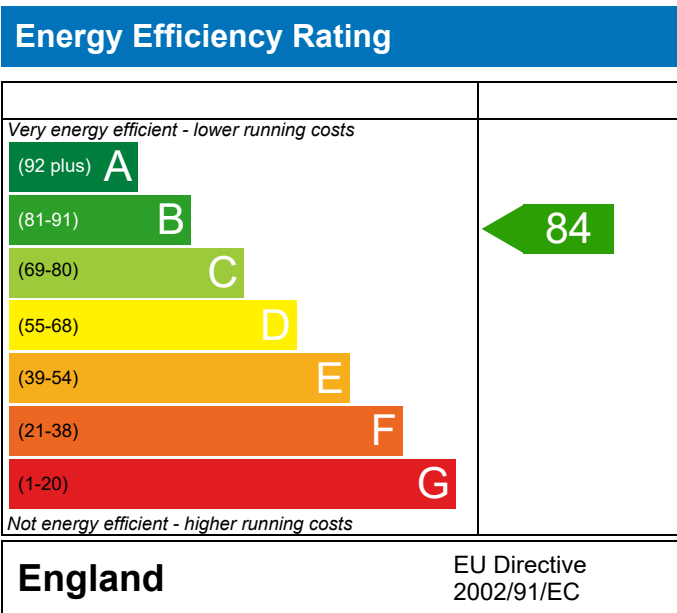


Plot 058 - PRJ009232

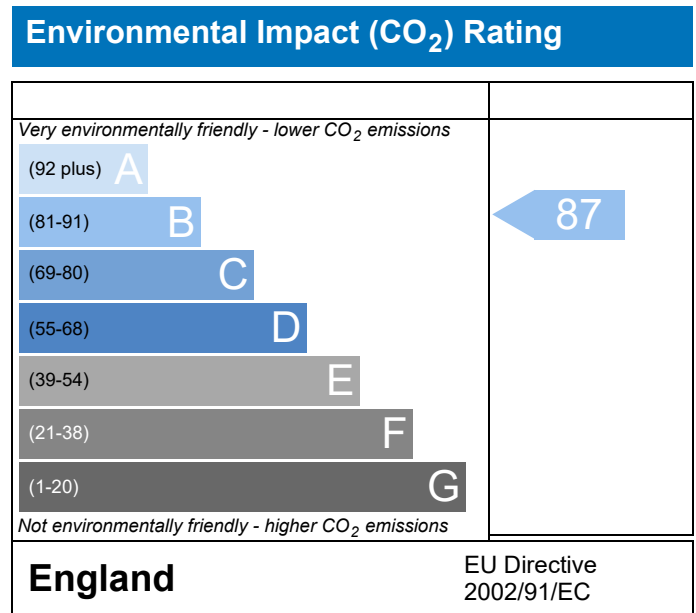
Dwelling type: House, Semi-Detached  
 Date of assessment: 08/07/2020  
 Produced by: Michael Juckes  
 Total floor area: 94.22 m<sup>2</sup>

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 (CO<sub>2</sub>) 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 (CO<sub>2</sub>) emissions. The higher the rating the less impact it has on the environment.

*This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.*

# BUILDING REGULATION COMPLIANCE

## Calculation Type: New Build (As Designed)



Property Reference	Plot 058 - PRJ009232		Issued on Date	08/07/2020	
Assessment Reference	058 S	Prop Type Ref	PRJ009232		
Property	Plot 058 - PRJ009232				
SAP Rating	84 B	DER	16.42	TER	17.84
Environmental	87 B	% DER<TER	7.97		
CO <sub>2</sub> Emissions (t/year)	1.29	DFEE	44.83	TFEE	50.67
General Requirements Compliance	Pass	% DFEE<TFEE	11.53		
Assessor Details	Mr. Michael Juckes, Michael Juckes, Tel: 02033971373, michael@briaryenergy.co.uk			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)	17.84	kgCO <sub>2</sub> /m <sup>2</sup>	
Dwelling Carbon Dioxide Emission Rate (DER)	16.42	kgCO <sub>2</sub> /m <sup>2</sup>	Pass
	-1.42 (-8.0%)	kgCO <sub>2</sub> /m <sup>2</sup>	

##### 1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	50.67	kWh/m <sup>2</sup> /yr	
Dwelling Fabric Energy Efficiency (DFEE)	44.83	kWh/m <sup>2</sup> /yr	
	-5.9 (-11.6%)	kWh/m <sup>2</sup> /yr	Pass

#### Criterion 2 – Limits on design flexibility

##### Limiting Fabric Standards

##### 2 Fabric U-values

Element	Average	Highest	
External wall	0.27 (max. 0.30)	0.27 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.15 (max. 0.25)	0.15 (max. 0.70)	Pass
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	Pass
Openings	1.29 (max. 2.00)	1.40 (max. 3.30)	Pass

##### 2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

##### 3 Air permeability

Air permeability at 50 pascals	5.01 (design value)	m <sup>3</sup> /(h.m <sup>2</sup> ) @ 50 Pa	
Maximum	10.0	m <sup>3</sup> /(h.m <sup>2</sup> ) @ 50 Pa	Pass

##### Limiting System Efficiencies

##### 4 Heating efficiency

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# BUILDING REGULATION COMPLIANCE

## Calculation Type: New Build (As Designed)



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

Secondary heating system

None

### 5 Cylinder insulation

Hot water storage

No cylinder

### 6 Controls

Space heating controls

Time and temperature zone control

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

### 7 Low energy lights

Percentage of fixed lights with low-energy fittings

100 %

Minimum

75 %

Pass

### 8 Mechanical ventilation

Continuous extract system (decentralised)

Specific fan power

0.1600 0.1800

Maximum

0.7

Pass

## Criterion 3 – Limiting the effects of heat gains in summer

### 9 Summertime temperature

Overheating risk (South West England)

Not significant

Pass

Based on:

Overshading

Average

Windows facing North East

3.33 m<sup>2</sup>, No overhang

Windows facing South West

4.48 m<sup>2</sup>, No overhang

Air change rate

4.21 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/m<sup>2</sup>K

Pass

### Air permeability and pressure testing

#### 3 Air permeability

Air permeability at 50 pascals

5.01 (design value) m<sup>3</sup>/(h.m<sup>2</sup>) @ 50 Pa

Maximum

10.0 m<sup>3</sup>/(h.m<sup>2</sup>) @ 50 Pa

Pass

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# BUILDING REGULATION COMPLIANCE

## Calculation Type: New Build (As Designed)



### 10 Key features

Party wall U-value	0.00	W/m <sup>2</sup> K
Roof U-value	0.12	W/m <sup>2</sup> K
Door U-value	1.09	W/m <sup>2</sup> K
Door U-value	1.09	W/m <sup>2</sup> K
Door U-value	1.00	W/m <sup>2</sup> K
Thermal bridging $\gamma$ -value	0.036	W/m <sup>2</sup> K

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# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)



Property Reference	Plot 058 - PRJ009232	Issued on Date	08/07/2020
Assessment Reference	058 S	Prop Type Ref	PRJ009232
Property	Plot 058 - PRJ009232		

SAP Rating	84 B	DER	16.42	TER	17.84
Environmental	87 B	% DER<TER	7.97		
CO <sub>2</sub> Emissions (t/year)	1.29	DFEE	44.83	TTEE	50.67
General Requirements Compliance	Pass	% DFEE<TTEE	11.53		

Assessor Details	Mr. Michael Juckes, Michael Juckes, Tel: 02033971373, michael@briaryenergy.co.uk	Assessor ID	T850-0001
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Client	
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### CALCULATION OF HEAT DEMAND 09 Jan 2014

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

#### 1. Overall dwelling dimensions

	Area (m <sup>2</sup> )	Storey height (m)	Volume (m <sup>3</sup> )
Ground floor	47.1100 (1b)	x 2.3800 (2b)	= 112.1218 (1b) - (3b)
First floor	47.1100 (1c)	x 2.6100 (2c)	= 122.9571 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.2200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 235.0789 (5)

#### 2. Ventilation rate

	main heating	secondary heating	other	total	m <sup>3</sup> 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				0 * 10 =	0.0000 (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)				0.0000 / (5) =	0.0000 (8)							
Pressure test					Yes							
Measured/design AP50					5.0100							
Infiltration rate					0.2505 (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) =		0.2317 (21)							
Wind speed	Jan 6.0000	Feb 5.6000	Mar 5.6000	Apr 5.0000	May 5.0000	Jun 4.4000	Jul 4.4000	Aug 4.3000	Sep 4.7000	Oct 5.4000	Nov 5.5000	Dec 5.9000 (22)
Wind factor	1.5000	1.4000	1.4000	1.2500	1.2500	1.1000	1.1000	1.0750	1.1750	1.3500	1.3750	1.4750 (22a)
Adj infiltr rate	0.3476	0.3244	0.3244	0.2896	0.2896	0.2549	0.2549	0.2491	0.2723	0.3128	0.3186	0.3418 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
Effective ac	0.5976	0.5744	0.5744	0.5396	0.5396	0.5049	0.5049	0.5000	0.5223	0.5628	0.5686	0.5918 (25)

#### 3. Heat losses and heat loss parameter

Element	Gross m <sup>2</sup>	Openings m <sup>2</sup>	NetArea m <sup>2</sup>	U-value W/m <sup>2</sup> K	A x U W/K	K-value kJ/m <sup>2</sup> K	A x K kJ/K
Windows (Uw = 1.40)			7.8100	1.3258	10.3542		(27)
Solid Door			2.1200	1.0900	2.3108		(26)
Half Glazed Door			2.1200	1.0900	2.3108		(26a)
Ground Floor			47.1100	0.1500	7.0665	75.0000	3533.2500 (28a)
Render	97.9100	12.0500	85.8600	0.2700	23.1822	49.1000	4215.7260 (29a)
Ins Joist	47.1100		47.1100	0.1200	5.6532	7.6200	358.9782 (30)
Total net area of external elements Aum(A, m <sup>2</sup> )			192.1300				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	50.8777	(33)
Party Wall			41.8400	0.0000	0.0000	45.0000	1882.8000 (32)
Ground Floor Block			21.4200			75.0000	1606.5000 (32c)
Ground Floor Stud			63.5800			9.0000	572.2200 (32c)
1st Floor Stud			107.1600			9.0000	964.4400 (32c)
Internal Floor			47.1100			18.0000	847.9800 (32d)
Internal Ceiling			47.1100			9.0000	423.9900 (32e)

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)



### CALCULATION OF HEAT DEMAND 09 Jan 2014

Heat capacity  $C_m = \text{Sum}(A \times k)$  (28) ... (30) + (32) + (32a) ... (32e) = 14405.8842 (34)  
 Thermal mass parameter (TMP =  $C_m / \text{TFA}$ ) in kJ/m<sup>2</sup>K 152.8962 (35)  
 Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.9158 (36)  
 Total fabric heat loss (33) + (36) = 57.7935 (37)

Ventilation heat loss calculated monthly (38)m =  $0.33 \times (25)m \times (5)$

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	46.3570	44.5595	44.5595	41.8632	41.8632	39.1669	39.1669	38.7880	40.5150	43.6607	44.1101	45.9076 (38)
Average = $\text{Sum}(39)m / 12 =$	104.1505	102.3530	102.3530	99.6567	99.6567	96.9604	96.9604	96.5815	98.3085	101.4542	101.9036	103.7011 (39)
HLP	1.1054	1.0863	1.0863	1.0577	1.0577	1.0291	1.0291	1.0251	1.0434	1.0768	1.0815	1.1006 (40)
HLP (average)												1.0649 (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 2.6792 (42)  
 Average daily hot water use (litres/day) 97.8308 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy cont	107.6139	103.7007	99.7874	95.8742	91.9610	88.0477	88.0477	91.9610	95.8742	99.7874	103.7007	107.6139 (44)
Energy content (annual)	159.5883	139.5769	144.0309	125.5696	120.4871	103.9712	96.3446	110.5568	111.8772	130.3821	142.3222	154.5527 (45)
Distribution loss (46)m = $0.15 \times (45)m$	23.9382	20.9365	21.6046	18.8354	18.0731	15.5957	14.4517	16.5835	16.7816	19.5573	21.3483	23.1829 (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	14.6957	13.2598	14.6481	14.1195	14.5493	14.0329	14.4714	14.5219	14.0801	14.6072	14.1853	14.6806 (61)
Total heat required for water heating calculated for each month	174.2840	152.8368	158.6790	139.6891	135.0364	118.0041	110.8160	125.0787	125.9573	144.9893	156.5075	169.2333 (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) = $\text{Sum}(63)m =$												0.0000 (63)
Output from w/h	174.2840	152.8368	158.6790	139.6891	135.0364	118.0041	110.8160	125.0787	125.9573	144.9893	156.5075	169.2333 (64)
Total per year (kWh/year) = $\text{Sum}(64)m =$												1711.1114 (64)
RHI water heating demand												1711 (64)
Heat gains from water heating, kWh/month	56.7370	49.7243	51.5523	45.2818	43.6993	38.0786	35.6524	40.3906	40.7192	47.0039	50.8685	55.0589 (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	160.7515	160.7515	160.7515	160.7515	160.7515	160.7515	160.7515	160.7515	160.7515	160.7515	160.7515	160.7515 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	65.9101	58.5407	47.6085	36.0427	26.9424	22.7459	24.5777	31.9470	42.8793	54.4451	63.5454	67.7419 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	368.1059	371.9257	362.2999	341.8079	315.9403	291.6285	275.3867	271.5669	281.1926	301.6847	327.5522	351.8641 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.7543	53.7543	53.7543	53.7543	53.7543	53.7543	53.7543	53.7543	53.7543	53.7543	53.7543	53.7543 (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)	-107.1677	-107.1677	-107.1677	-107.1677	-107.1677	-107.1677	-107.1677	-107.1677	-107.1677	-107.1677	-107.1677	-107.1677 (71)
Water heating gains (Table 5)	76.2594	73.9945	69.2907	62.8913	58.7356	52.8870	47.9199	54.2885	56.5544	63.1772	70.6506	74.0039 (72)
Total internal gains	620.6136	614.7991	589.5374	551.0801	511.9564	477.5995	458.2225	468.1406	490.9645	529.6452	572.0865	603.9481 (73)

#### 6. Solar gains

[Jan]	Area m <sup>2</sup>	Solar flux Table 6a W/m <sup>2</sup>	Specific data or Table 6b	g	FF Specific data or Table 6c	Access factor Table 6d	Gains W					
Northeast	3.3300	15.4538	0.5000	0.0000	0.7700	19.8125 (75)						
Southwest	4.4800	47.2368	0.5000	0.0000	0.7700	81.4741 (79)						
Solar gains	101.2866	151.4589	222.1488	305.0259	347.0729	378.6126	333.7262	309.6679	255.8927	174.1284	118.0661	82.6821 (83)
Total gains	721.9002	766.2579	811.6862	856.1061	859.0293	856.2121	791.9487	777.8085	746.8572	703.7735	690.1526	686.6302 (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)

tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	38.4217	39.0964	39.0964	40.1542	40.1542	41.2708	41.2708	41.4327	40.7049	39.4428	39.2688	38.5882
util living area	3.5614	3.6064	3.6064	3.6769	3.6769	3.7514	3.7514	3.7622	3.7137	3.6295	3.6179	3.5725
	0.9639	0.9541	0.9337	0.8883	0.8070	0.6558	0.5518	0.5489	0.7158	0.8790	0.9408	0.9667 (86)

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)



### CALCULATION OF HEAT DEMAND 09 Jan 2014

MIT	19.7540	19.8833	20.0873	20.4022	20.6850	20.8979	20.9578	20.9598	20.8600	20.5383	20.1598	19.7608 (87)
Th 2	19.9964	20.0120	20.0120	20.0355	20.0355	20.0592	20.0592	20.0625	20.0473	20.0198	20.0159	20.0003 (88)
util rest of house												
	0.9561	0.9444	0.9194	0.8640	0.7629	0.5833	0.4571	0.4526	0.6425	0.8451	0.9259	0.9593 (89)
MIT 2	18.3823	18.5772	18.8671	19.3226	19.7000	19.9730	20.0326	20.0378	19.9267	19.5060	18.9785	18.3958 (90)
Living area fraction									fLA = Living area / (4) =			0.1812 (91)
MIT	18.6309	18.8139	19.0881	19.5182	19.8784	20.1406	20.2002	20.2048	20.0958	19.6930	19.1925	18.6431 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.4809	18.6639	18.9381	19.3682	19.7284	19.9906	20.0502	20.0548	19.9458	19.5430	19.0425	18.4931 (93)

#### 8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9400	0.9268	0.8996	0.8437	0.7468	0.5776	0.4561	0.4518	0.6338	0.8249	0.9066	0.9438 (94)
Useful gains	678.5706	710.1436	730.1640	722.3333	641.5352	494.5458	361.2337	351.3813	473.3570	580.5235	625.6618	648.0544 (95)
Ext temp.	6.1000	6.4000	7.5000	9.3000	11.9000	14.5000	16.2000	16.3000	14.6000	11.8000	9.0000	6.4000 (96)
Heat loss rate W	1289.4725	1255.2439	1170.7260	1003.3632	780.1535	532.3706	373.3206	362.6456	525.5343	785.5627	1023.3676	1254.0663 (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	454.5110	366.3074	327.7782	202.3416	103.1320	0.0000	0.0000	0.0000	0.0000	152.5491	286.3482	450.8728 (98)
Space heating												2343.8403 (98)
RHI space heating demand												2344 (98)

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)



### CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

#### 1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	47.1100 (1b)	x 2.3800 (2b)	= 112.1218 (1b) - (3b)
First floor	47.1100 (1c)	x 2.6100 (2c)	= 122.9571 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.2200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 235.0789 (5)

#### 2. Ventilation rate

	main heating	secondary heating	other	total	m3 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					0 * 10 = 0.0000 (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)					0.0000 / (5) = 0.0000 (8)							
Pressure test					Yes							
Measured/design AP50					5.0100							
Infiltration rate					0.2505 (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)	=	0.2317 (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	0.2954	0.2896	0.2838	0.2549	0.2491	0.2201	0.2201	0.2143	0.2317	0.2491	0.2607	0.2723 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5454	0.5396	0.5338	0.5049	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5107	0.5223 (25)

#### 3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Windows (Uw = 1.40)			7.8100	1.3258	10.3542		(27)					
Solid Door			2.1200	1.0900	2.3108		(26)					
Half Glazed Door			2.1200	1.0900	2.3108		(26a)					
Ground Floor			47.1100	0.1500	7.0665	75.0000	3533.2500 (28a)					
Render	97.9100	12.0500	85.8600	0.2700	23.1822	49.1000	4215.7260 (29a)					
Ins Joist	47.1100		47.1100	0.1200	5.6532	7.6200	358.9782 (30)					
Total net area of external elements Aum(A, m2)			192.1300				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	50.8777		(33)					
Party Wall			41.8400	0.0000	0.0000	45.0000	1882.8000 (32)					
Ground Floor Block			21.4200			75.0000	1606.5000 (32c)					
Ground Floor Stud			63.5800			9.0000	572.2200 (32c)					
1st Floor Stud			107.1600			9.0000	964.4400 (32c)					
Internal Floor			47.1100			18.0000	847.9800 (32d)					
Internal Ceiling			47.1100			9.0000	423.9900 (32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	14405.8842 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							152.8962 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.9158 (36)					
Total fabric heat loss						(33) + (36) =	57.7935 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 42.3126	Feb 41.8632	Mar 41.4138	Apr 39.1669	May 38.7880	Jun 38.7880	Jul 38.7880	Aug 38.7880	Sep 38.7880	Oct 38.7880	Nov 39.6163	Dec 40.5150 (38)
Heat transfer coeff	100.1060	99.6567	99.2073	96.9604	96.5815	96.5815	96.5815	96.5815	96.5815	96.5815	97.4097	98.3085 (39)
Average = Sum(39)m / 12 =												97.5948 (39)
HLP	Jan 1.0625	Feb 1.0577	Mar 1.0529	Apr 1.0291	May 1.0251	Jun 1.0251	Jul 1.0251	Aug 1.0251	Sep 1.0251	Oct 1.0251	Nov 1.0339	Dec 1.0434 (40)
HLP (average)												1.0358 (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	2.6792 (42)
Average daily hot water use (litres/day)	97.8308 (43)



# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)



### CALCULATION OF ENERGY RATINGS 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	107.6139	103.7007	99.7874	95.8742	91.9610	88.0477	88.0477	91.9610	95.8742	99.7874	103.7007	107.6139 (44)
Energy conte	159.5883	139.5769	144.0309	125.5696	120.4871	103.9712	96.3446	110.5568	111.8772	130.3821	142.3222	154.5527 (45)
Energy content (annual)										Total = Sum(45)m =		1539.2597 (45)
Distribution loss (46)m = 0.15 x (45)m	23.9382	20.9365	21.6046	18.8354	18.0731	15.5957	14.4517	16.5835	16.7816	19.5573	21.3483	23.1829 (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	14.6957	13.2598	14.6481	14.1195	14.5493	14.0329	14.4714	14.5219	14.0801	14.6072	14.1853	14.6806 (61)
Total heat required for water heating calculated for each month	174.2840	152.8368	158.6790	139.6891	135.0364	118.0041	110.8160	125.0787	125.9573	144.9893	156.5075	169.2333 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	174.2840	152.8368	158.6790	139.6891	135.0364	118.0041	110.8160	125.0787	125.9573	144.9893	156.5075	169.2333 (64)
Heat gains from water heating, kWh/month	56.7370	49.7243	51.5523	45.2818	43.6993	38.0786	35.6524	40.3906	40.7192	47.0039	50.8685	55.0589 (65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabolic gains (Table 5), Watts												
(66)m	160.7515	160.7515	160.7515	160.7515	160.7515	160.7515	160.7515	160.7515	160.7515	160.7515	160.7515	160.7515 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	65.9101	58.5407	47.6085	36.0427	26.9424	22.7459	24.5777	31.9470	42.8793	54.4451	63.5454	67.7419 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	368.1059	371.9257	362.2999	341.8079	315.9403	291.6285	275.3867	271.5669	281.1926	301.6847	327.5522	351.8641 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.7543	53.7543	53.7543	53.7543	53.7543	53.7543	53.7543	53.7543	53.7543	53.7543	53.7543	53.7543 (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)	-107.1677	-107.1677	-107.1677	-107.1677	-107.1677	-107.1677	-107.1677	-107.1677	-107.1677	-107.1677	-107.1677	-107.1677 (71)
Water heating gains (Table 5)	76.2594	73.9945	69.2907	62.8913	58.7356	52.8870	47.9199	54.2885	56.5544	63.1772	70.6506	74.0039 (72)
Total internal gains	620.6136	614.7991	589.5374	551.0801	511.9564	477.5995	458.2225	468.1406	490.9645	529.6452	572.0865	603.9481 (73)

#### 6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W					
Northeast	3.3300	11.2829	0.5000	0.0000	0.7700	14.4653 (75)						
Southwest	4.4800	36.7938	0.5000	0.0000	0.7700	63.4620 (79)						
Solar gains	77.9273	137.5438	200.9558	270.3857	322.3798	328.6371	313.2671	273.1641	224.7929	155.4563	94.2139	66.1233 (83)
Total gains	698.5409	752.3429	790.4932	821.4658	834.3363	806.2366	771.4896	741.3046	715.7574	685.1014	666.3004	670.0715 (84)

#### 7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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)												
tau	39.9740	40.1542	40.3361	41.2708	41.4327	41.4327	41.4327	41.4327	41.4327	41.4327	41.0804	40.7049
alpha	3.6649	3.6769	3.6891	3.7514	3.7622	3.7622	3.7622	3.7622	3.7622	3.7622	3.7387	3.7137
util living area	0.9758	0.9662	0.9473	0.9035	0.8181	0.6750	0.5230	0.5610	0.7609	0.9101	0.9629	0.9789 (86)
MIT	19.5422	19.7063	19.9820	20.3597	20.6793	20.8900	20.9680	20.9577	20.8189	20.4334	19.9429	19.5265 (87)
Th 2	20.0316	20.0355	20.0395	20.0592	20.0625	20.0625	20.0625	20.0625	20.0625	20.0625	20.0552	20.0473 (88)
util rest of house	0.9711	0.9596	0.9365	0.8826	0.7770	0.6015	0.4227	0.4613	0.6970	0.8866	0.9544	0.9747 (89)
MIT 2	18.0983	18.3375	18.7360	19.2824	19.7153	19.9696	20.0444	20.0368	19.8948	19.3948	18.6948	18.0861 (90)
Living area fraction										FLA = Living area / (4) =		0.1812 (91)
MIT	18.3599	18.5855	18.9617	19.4776	19.8899	20.1364	20.2117	20.2037	20.0622	19.5830	18.9209	18.3470 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.2099	18.4355	18.8117	19.3276	19.7399	19.9864	20.0617	20.0537	19.9122	19.4330	18.7709	18.1970 (93)

#### 8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9586	0.9447	0.9185	0.8628	0.7607	0.5950	0.4226	0.4603	0.6854	0.8669	0.9390	0.9633 (94)
Useful gains	669.6024	710.7502	726.1046	708.7708	634.7213	479.6877	326.0312	341.2104	490.5533	593.8812	625.6517	645.4906 (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	1392.4674	1348.9012	1221.4115	1011.0639	776.5090	520.2231	334.3383	352.8776	561.3501	853.1014	1136.8590	1376.0271 (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	537.8115	428.8374	368.5083	217.6511	105.4901	0.0000	0.0000	0.0000	0.0000	192.8599	368.0692	543.5192 (98)
Space heating												2762.7467 (98)
Space heating per m2												(98) / (4) = 29.3223 (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

	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													3052.7588 (211)
Space heating requirement	537.8115	428.8374	368.5083	217.6511	105.4901	0.0000	0.0000	0.0000	0.0000	192.8599	368.0692	543.5192	(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)	594.2669	473.8535	407.1915	240.4984	116.5637	0.0000	0.0000	0.0000	0.0000	213.1048	406.7063	600.5737	(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	174.2840	152.8368	158.6790	139.6891	135.0364	118.0041	110.8160	125.0787	125.9573	144.9893	156.5075	169.2333	(64)
Efficiency of water heater (217)m	89.6953	89.6367	89.5124	89.2215	88.6752	87.3000	87.3000	87.3000	87.3000	89.0984	89.5210	87.3000	(216)
Fuel for water heating, kWh/month	194.3067	170.5069	177.2704	156.5643	152.2821	135.1708	126.9370	143.2746	144.2810	162.7294	174.8277	188.6256	(219)
Water heating fuel used													1926.7764 (219)
Annual totals kWh/year													
Space heating fuel - main system													3052.7588 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 6.1360, total flow = 29.0000, SFP = 0.2116)													60.6821 (230a)
mechanical ventilation fans (SFP = 0.2116)													30.0000 (230c)
central heating pump													45.0000 (230e)
main heating flue fan													135.6821 (231)
Total electricity for the above, kWh/year													465.5970 (232)
Electricity for lighting (calculated in Appendix L)													5580.8143 (238)
Total delivered energy for all uses													

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3052.7588	3.4800	106.2360	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1926.7764	3.4800	67.0518	(247)
Mechanical ventilation fans	60.6821	13.1900	8.0040	(249)
Pumps and fans for heating	75.0000	13.1900	9.8925	(249)
Energy for lighting	465.5970	13.1900	61.4122	(250)
Additional standing charges			120.0000	(251)
Total energy cost			372.5965	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200	(256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.1241	(257)
SAP value		84.3195	
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	3052.7588	0.2160	659.3959	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1926.7764	0.2160	416.1837	(264)
Space and water heating			1075.5796	(265)
Pumps and fans	135.6821	0.5190	70.4190	(267)
Energy for lighting	465.5970	0.5190	241.6448	(268)
Total kg/year			1387.6435	(272)
CO2 emissions per m2			14.7300	(273)
EI value			86.6439	
EI rating			87	(274)
EI band			B	

Calculation of stars for heating and DHW

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

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)



### CALCULATION OF ENERGY RATINGS 09 Jan 2014

Water heating energy efficiency  
Water heating environmental impact

$3.48 / 0.8869 = 3.924$ , stars = 4  
 $0.216 / 0.8869 = 0.2435$ , stars = 4

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)



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

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

#### 1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	47.1100 (1b)	x 2.3800 (2b)	= 112.1218 (1b) - (3b)
First floor	47.1100 (1c)	x 2.6100 (2c)	= 122.9571 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.2200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 235.0789 (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				0 * 10 =	0.0000 (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)				0.0000 / (5) =	0.0000 (8)							
Pressure test				Yes								
Measured/design AP50					5.0100							
Infiltration rate					0.2505 (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) =		0.2317 (21)							
Wind speed	Jan 6.0000	Feb 5.6000	Mar 5.6000	Apr 5.0000	May 5.0000	Jun 4.4000	Jul 4.4000	Aug 4.3000	Sep 4.7000	Oct 5.4000	Nov 5.5000	Dec 5.9000 (22)
Wind factor	1.5000	1.4000	1.4000	1.2500	1.2500	1.1000	1.1000	1.0750	1.1750	1.3500	1.3750	1.4750 (22a)
Adj infilt rate	0.3476	0.3244	0.3244	0.2896	0.2896	0.2549	0.2549	0.2491	0.2723	0.3128	0.3186	0.3418 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												
Effective ac	0.5976	0.5744	0.5744	0.5396	0.5396	0.5049	0.5049	0.5000	0.5223	0.5628	0.5686	0.5918 (25)

#### 3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Windows (Uw = 1.40)			7.8100	1.3258	10.3542		(27)					
Solid Door			2.1200	1.0900	2.3108		(26)					
Half Glazed Door			2.1200	1.0900	2.3108		(26a)					
Ground Floor			47.1100	0.1500	7.0665	75.0000	3533.2500 (28a)					
Render	97.9100	12.0500	85.8600	0.2700	23.1822	49.1000	4215.7260 (29a)					
Ins Joist	47.1100		47.1100	0.1200	5.6532	7.6200	358.9782 (30)					
Total net area of external elements Aum(A, m2)			192.1300				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	50.8777		(33)					
Party Wall			41.8400	0.0000	0.0000	45.0000	1882.8000 (32)					
Ground Floor Block			21.4200			75.0000	1606.5000 (32c)					
Ground Floor Stud			63.5800			9.0000	572.2200 (32c)					
1st Floor Stud			107.1600			9.0000	964.4400 (32c)					
Internal Floor			47.1100			18.0000	847.9800 (32d)					
Internal Ceiling			47.1100			9.0000	423.9900 (32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	14405.8842 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							152.8962 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.9158 (36)					
Total fabric heat loss						(33) + (36) =	57.7935 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 46.3570	Feb 44.5595	Mar 44.5595	Apr 41.8632	May 41.8632	Jun 39.1669	Jul 39.1669	Aug 38.7880	Sep 40.5150	Oct 43.6607	Nov 44.1101	Dec 45.9076 (38)
Heat transfer coeff	104.1505	102.3530	102.3530	99.6567	99.6567	96.9604	96.9604	96.5815	98.3085	101.4542	101.9036	103.7011 (39)
Average = Sum(39)m / 12 =												100.3366 (39)
HLP	Jan 1.1054	Feb 1.0863	Mar 1.0863	Apr 1.0577	May 1.0577	Jun 1.0291	Jul 1.0291	Aug 1.0251	Sep 1.0434	Oct 1.0768	Nov 1.0815	Dec 1.1006 (40)
HLP (average)												1.0649 (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	2.6792 (42)
Average daily hot water use (litres/day)	97.8308 (43)

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)



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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	107.6139	103.7007	99.7874	95.8742	91.9610	88.0477	88.0477	91.9610	95.8742	99.7874	103.7007	107.6139 (44)
Energy conte	159.5883	139.5769	144.0309	125.5696	120.4871	103.9712	96.3446	110.5568	111.8772	130.3821	142.3222	154.5527 (45)
Energy content (annual)												Total = Sum(45)m = 1539.2597 (45)
Distribution loss (46)m = 0.15 x (45)m	23.9382	20.9365	21.6046	18.8354	18.0731	15.5957	14.4517	16.5835	16.7816	19.5573	21.3483	23.1829 (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	14.6957	13.2598	14.6481	14.1195	14.5493	14.0329	14.4714	14.5219	14.0801	14.6072	14.1853	14.6806 (61)
Total heat required for water heating calculated for each month	174.2840	152.8368	158.6790	139.6891	135.0364	118.0041	110.8160	125.0787	125.9573	144.9893	156.5075	169.2333 (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	174.2840	152.8368	158.6790	139.6891	135.0364	118.0041	110.8160	125.0787	125.9573	144.9893	156.5075	169.2333 (64)
Total per year (kWh/year) = Sum(64)m =												1711.1114 (64)
Heat gains from water heating, kWh/month	56.7370	49.7243	51.5523	45.2818	43.6993	38.0786	35.6524	40.3906	40.7192	47.0039	50.8685	55.0589 (65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabolic gains (Table 5), Watts												
(66)m	160.7515	160.7515	160.7515	160.7515	160.7515	160.7515	160.7515	160.7515	160.7515	160.7515	160.7515	160.7515 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	65.9101	58.5407	47.6085	36.0427	26.9424	22.7459	24.5777	31.9470	42.8793	54.4451	63.5454	67.7419 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	368.1059	371.9257	362.2999	341.8079	315.9403	291.6285	275.3867	271.5669	281.1926	301.6847	327.5522	351.8641 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.7543	53.7543	53.7543	53.7543	53.7543	53.7543	53.7543	53.7543	53.7543	53.7543	53.7543	53.7543 (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)	-107.1677	-107.1677	-107.1677	-107.1677	-107.1677	-107.1677	-107.1677	-107.1677	-107.1677	-107.1677	-107.1677	-107.1677 (71)
Water heating gains (Table 5)	76.2594	73.9945	69.2907	62.8913	58.7356	52.8870	47.9199	54.2885	56.5544	63.1772	70.6506	74.0039 (72)
Total internal gains	620.6136	614.7991	589.5374	551.0801	511.9564	477.5995	458.2225	468.1406	490.9645	529.6452	572.0865	603.9481 (73)

#### 6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains						
	m <sup>2</sup>	Table 6a	Specific data	Specific data	factor	W						
		W/m <sup>2</sup>	or Table 6b	or Table 6c	Table 6d							
Northeast	3.3300	15.4538	0.5000	0.0000	0.7700	19.8125 (75)						
Southwest	4.4800	47.2368	0.5000	0.0000	0.7700	81.4741 (79)						
Solar gains	101.2866	151.4589	222.1488	305.0259	347.0729	378.6126	333.7262	309.6679	255.8927	174.1284	118.0661	82.6821 (83)
Total gains	721.9002	766.2579	811.6862	856.1061	859.0293	856.2121	791.9487	777.8085	746.8572	703.7735	690.1526	686.6302 (84)

#### 7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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)												
tau	38.4217	39.0964	39.0964	40.1542	40.1542	41.2708	41.2708	41.4327	40.7049	39.4428	39.2688	38.5882
alpha	3.5614	3.6064	3.6064	3.6769	3.6769	3.7514	3.7514	3.7622	3.7137	3.6295	3.6179	3.5725
util living area	0.9639	0.9541	0.9337	0.8883	0.8070	0.6558	0.5518	0.5489	0.7158	0.8790	0.9408	0.9667 (86)
MIT	19.7540	19.8833	20.0873	20.4022	20.6850	20.8979	20.9578	20.9598	20.8600	20.5383	20.1598	19.7608 (87)
Th 2	19.9964	20.0120	20.0120	20.0355	20.0355	20.0592	20.0592	20.0625	20.0473	20.0198	20.0159	20.0003 (88)
util rest of house	0.9561	0.9444	0.9194	0.8640	0.7629	0.5833	0.4571	0.4526	0.6425	0.8451	0.9259	0.9593 (89)
MIT 2	18.3823	18.5772	18.8671	19.3226	19.7000	19.9730	20.0326	20.0378	19.9267	19.5060	18.9785	18.3958 (90)
Living area fraction										FLA = Living area / (4) =		0.1812 (91)
MIT	18.6309	18.8139	19.0881	19.5182	19.8784	20.1406	20.2002	20.2048	20.0958	19.6930	19.1925	18.6431 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.4809	18.6639	18.9381	19.3682	19.7284	19.9906	20.0502	20.0548	19.9458	19.5430	19.0425	18.4931 (93)

#### 8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9400	0.9268	0.8996	0.8437	0.7468	0.5776	0.4561	0.4518	0.6338	0.8249	0.9066	0.9438 (94)
Useful gains	678.5706	710.1436	730.1640	722.3333	641.5352	494.5458	361.2337	351.3813	473.3570	580.5235	625.6618	648.0544 (95)
Ext temp.	6.1000	6.4000	7.5000	9.3000	11.9000	14.5000	16.2000	16.3000	14.6000	11.8000	9.0000	6.4000 (96)
Heat loss rate W	1289.4725	1255.2439	1170.7260	1003.3632	780.1535	532.3706	373.3206	362.6456	525.5343	785.5627	1023.3676	1254.0663 (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	454.5110	366.3074	327.7782	202.3416	103.1320	0.0000	0.0000	0.0000	0.0000	152.5491	286.3482	450.8728 (98)
Space heating												2343.8403 (98)
Space heating per m <sup>2</sup>												(98) / (4) = 24.8762 (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													2589.8787 (211)
Space heating requirement	454.5110	366.3074	327.7782	202.3416	103.1320	0.0000	0.0000	0.0000	0.0000	152.5491	286.3482	450.8728	(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)	502.2221	404.7596	362.1858	223.5818	113.9580	0.0000	0.0000	0.0000	0.0000	168.5626	316.4068	498.2020	(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	174.2840	152.8368	158.6790	139.6891	135.0364	118.0041	110.8160	125.0787	125.9573	144.9893	156.5075	169.2333	(64)
Efficiency of water heater (217)m	89.5898	89.5338	89.4307	89.1652	88.6575	87.3000	87.3000	87.3000	87.3000	88.9119	89.3426	87.3000	(216)
Fuel for water heating, kWh/month	194.5355	170.7028	177.4323	156.6633	152.3125	135.1708	126.9370	143.2746	144.2810	163.0708	175.1767	188.8688	(219)
Water heating fuel used													1928.4262 (219)
Annual totals kWh/year													
Space heating fuel - main system													2589.8787 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 6.1360, total flow = 29.0000, SFP = 0.2116)													
mechanical ventilation fans (SFP = 0.2116)													60.6821 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													135.6821 (231)
Electricity for lighting (calculated in Appendix L)													465.5970 (232)
Total delivered energy for all uses													5119.5841 (238)

10a. Fuel costs - using BEDF prices (461)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2589.8787	3.9700	102.8182 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1928.4262	3.9700	76.5585 (247)
Mechanical ventilation fans	60.6821	18.2700	11.0866 (249)
Pumps and fans for heating	75.0000	18.2700	13.7025 (249)
Energy for lighting	465.5970	18.2700	85.0646 (250)
Additional standing charges			90.0000 (251)
Total energy cost			379.2304 (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	2589.8787	0.2160	559.4138 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1928.4262	0.2160	416.5401 (264)
Space and water heating			975.9539 (265)
Pumps and fans	135.6821	0.5190	70.4190 (267)
Energy for lighting	465.5970	0.5190	241.6448 (268)
Total kg/year			1288.0177 (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	2589.8787	1.2200	3159.6521 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1928.4262	1.2200	2352.6799 (264)
Space and water heating			5512.3320 (265)
Pumps and fans	135.6821	3.0700	416.5441 (267)
Energy for lighting	465.5970	3.0700	1429.3828 (268)
Primary energy kWh/year			7358.2589 (272)
Primary energy kWh/m2/year			78.0966 (273)

SAP 2012 EPC IMPROVEMENTS

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)



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

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

(For testing purposes):

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

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.2	-£ 31	-194 kg (15.0%)
U Solar photovoltaic panels	+ 9.6	-£ 357	-1014 kg (92.6%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£31	2.06 kg/m <sup>2</sup>	B 85 B 88
Solar photovoltaic panels	£357	10.76 kg/m <sup>2</sup>	A 95 A 97
<b>Total Savings</b>	<b>£388</b>	<b>12.81 kg/m<sup>2</sup></b>	

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

Fuel prices for cost data on this page from database revision number 461 TEST (26 May 2020)  
 Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£110	£119	-£9
Mains gas	£269	£229	£40
Space heating	£218	£218	£0
Water heating	£77	£45	£31
Lighting	£85	£85	£0
Generated (PV)	-£0	-£357	£357
<b>Total cost of fuels</b>	<b>£379</b>	<b>-£9</b>	<b>£388</b>
<b>Total cost of uses</b>	<b>£380</b>	<b>-£9</b>	<b>£388</b>
Delivered energy	54 kWh/m <sup>2</sup>	23 kWh/m <sup>2</sup>	31 kWh/m <sup>2</sup>
Carbon dioxide emissions	1.3 tonnes	0.1 tonnes	1.2 tonnes
CO2 emissions per m <sup>2</sup>	14 kg/m <sup>2</sup>	1 kg/m <sup>2</sup>	13 kg/m <sup>2</sup>
Primary energy	78 kWh/m <sup>2</sup>	3 kWh/m <sup>2</sup>	75 kWh/m <sup>2</sup>

# 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	47.1100 (1b)	x 2.3800 (2b)	= 112.1218 (1b) - (3b)
First floor	47.1100 (1c)	x 2.6100 (2c)	= 122.9571 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.2200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 235.0789 (5)

#### 2. Ventilation rate

	main heating	secondary heating	other	total	m3 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					0 * 10 = 0.0000 (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)					0.0000 / (5) = 0.0000 (8)							
Pressure test					Yes							
Measured/design AP50					5.0100							
Infiltration rate					0.2505 (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) =		0.2317 (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	0.2954	0.2896	0.2838	0.2549	0.2491	0.2201	0.2201	0.2143	0.2317	0.2491	0.2607	0.2723 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5454	0.5396	0.5338	0.5049	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5107	0.5223 (25)

#### 3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Windows (Uw = 1.40)			7.8100	1.3258	10.3542		(27)
Solid Door			2.1200	1.0900	2.3108		(26)
Half Glazed Door			2.1200	1.0900	2.3108		(26a)
Ground Floor			47.1100	0.1500	7.0665	75.0000	3533.2500 (28a)
Render	97.9100	12.0500	85.8600	0.2700	23.1822	49.1000	4215.7260 (29a)
Ins Joist	47.1100		47.1100	0.1200	5.6532	7.6200	358.9782 (30)
Total net area of external elements Aum(A, m2)			192.1300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	50.8777		(33)
Party Wall			41.8400	0.0000	0.0000	45.0000	1882.8000 (32)
Ground Floor Block			21.4200			75.0000	1606.5000 (32c)
Ground Floor Stud			63.5800			9.0000	572.2200 (32c)
1st Floor Stud			107.1600			9.0000	964.4400 (32c)
Internal Floor			47.1100			18.0000	847.9800 (32d)
Internal Ceiling			47.1100			9.0000	423.9900 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	14405.8842 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							152.8962 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.9158 (36)
Total fabric heat loss						(33) + (36) =	57.7935 (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	42.3126	41.8632	41.4138	39.1669	38.7880	38.7880	38.7880	38.7880	38.7880	38.7880	39.6163	40.5150 (38)
Average = Sum(39)m / 12 =	100.1060	99.6567	99.2073	96.9604	96.5815	96.5815	96.5815	96.5815	96.5815	96.5815	97.4097	98.3085 (39)
HLP	1.0625	1.0577	1.0529	1.0291	1.0251	1.0251	1.0251	1.0251	1.0251	1.0251	1.0339	1.0434 (40)
HLP (average)												1.0358 (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	2.6792 (42)
Average daily hot water use (litres/day)	97.8308 (43)



# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)



### CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	107.6139	103.7007	99.7874	95.8742	91.9610	88.0477	88.0477	91.9610	95.8742	99.7874	103.7007	107.6139 (44)
Energy content (annual)	159.5883	139.5769	144.0309	125.5696	120.4871	103.9712	96.3446	110.5568	111.8772	130.3821	142.3222	154.5527 (45)
Distribution loss (46)m = 0.15 x (45)m	23.9382	20.9365	21.6046	18.8354	18.0731	15.5957	14.4517	16.5835	16.7816	19.5573	21.3483	23.1829 (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	14.6957	13.2598	14.6481	14.1195	14.5493	14.0329	14.4714	14.5219	14.0801	14.6072	14.1853	14.6806 (61)
Total heat required for water heating calculated for each month	174.2840	152.8368	158.6790	139.6891	135.0364	118.0041	110.8160	125.0787	125.9573	144.9893	156.5075	169.2333 (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												1.1782 (H8)
Utilisation factor												0.5720 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												97.8308 (H14)
Volume ratio Veff/V												0.7666 (H15)
Solar storage volume factor												0.9468 (H16)
Solar input	-25.0468	-41.7960	-71.1833	-95.3997	-117.8583	-115.8735	-114.3422	-99.9013	-78.2428	-53.4306	-29.7092	-863.7437 (H17)
Solar input (sum of months) = Sum(63)m =												-863.7437 (63)
Output from w/h	149.2371	111.0408	87.4956	44.2894	17.1781	2.1306	0.0000	25.1774	47.7145	91.5587	126.7984	148.2734 (64)
Total per year (kWh/year) = Sum(64)m =												850.8940 (64)
Heat gains from water heating, kWh/month	56.7370	49.7243	51.5523	45.2818	43.6993	38.0786	35.6524	40.3906	40.7192	47.0039	50.8685	55.0589 (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	160.7515	160.7515	160.7515	160.7515	160.7515	160.7515	160.7515	160.7515	160.7515	160.7515	160.7515	160.7515 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	65.9101	58.5407	47.6085	36.0427	26.9424	22.7459	24.5777	31.9470	42.8793	54.4451	63.5454	67.7419 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	368.1059	371.9257	362.2999	341.8079	315.9403	291.6285	275.3867	271.5669	281.1926	301.6847	327.5522	351.8641 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.7543	53.7543	53.7543	53.7543	53.7543	53.7543	53.7543	53.7543	53.7543	53.7543	53.7543	53.7543 (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)	-107.1677	-107.1677	-107.1677	-107.1677	-107.1677	-107.1677	-107.1677	-107.1677	-107.1677	-107.1677	-107.1677	-107.1677 (71)
Water heating gains (Table 5)	76.2594	73.9945	69.2907	62.8913	58.7356	52.8870	47.9199	54.2885	56.5544	63.1772	70.6506	74.0039 (72)
Total internal gains	620.6136	614.7991	589.5374	551.0801	511.9564	477.5995	458.2225	468.1406	490.9645	529.6452	572.0865	603.9481 (73)

#### 6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W					
Northeast	3.3300	11.2829	0.5000	0.0000	0.7700	14.4653 (75)						
Southwest	4.4800	36.7938	0.5000	0.0000	0.7700	63.4620 (79)						
Solar gains	77.9273	137.5438	200.9558	270.3857	322.3798	328.6371	313.2671	273.1641	224.7929	155.4563	94.2139	66.1233 (83)
Total gains	698.5409	752.3429	790.4932	821.4658	834.3363	806.2366	771.4896	741.3046	715.7574	685.1014	666.3004	670.0715 (84)

#### 7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor for gains for living area, nil,m (see Table 9a)	39.9740	40.1542	40.3361	41.2708	41.4327	41.4327	41.4327	41.4327	41.4327	41.4327	41.0804	40.7049
tau	3.6649	3.6769	3.6891	3.7514	3.7622	3.7622	3.7622	3.7622	3.7622	3.7622	3.7387	3.7137
util living area	0.9758	0.9662	0.9473	0.9035	0.8181	0.6750	0.5230	0.5610	0.7609	0.9101	0.9629	0.9789 (86)
MIT	19.5422	19.7063	19.9820	20.3597	20.6793	20.8900	20.9680	20.9577	20.8189	20.4334	19.9429	19.5265 (87)
Th 2	20.0316	20.0355	20.0395	20.0592	20.0625	20.0625	20.0625	20.0625	20.0625	20.0625	20.0552	20.0473 (88)
util rest of house	0.9711	0.9596	0.9365	0.8826	0.7770	0.6015	0.4227	0.4613	0.6970	0.8866	0.9544	0.9747 (89)
MIT 2	18.0983	18.3375	18.7360	19.2824	19.7153	19.9696	20.0444	20.0368	19.8948	19.3948	18.6948	18.0861 (90)
Living area fraction	18.3599	18.5855	18.9617	19.4776	19.8899	20.1364	20.2117	20.2037	20.0622	19.5830	18.9209	0.1812 (91)
MIT	18.3599	18.5855	18.9617	19.4776	19.8899	20.1364	20.2117	20.2037	20.0622	19.5830	18.9209	18.3470 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.2099	18.4355	18.8117	19.3276	19.7399	19.9864	20.0617	20.0537	19.9122	19.4330	18.7709	18.1970 (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	0.9586	0.9447	0.9185	0.8628	0.7607	0.5950	0.4226	0.4603	0.6854	0.8669	0.9390	0.9633 (94)
Useful gains	669.6024	710.7502	726.1046	708.7708	634.7213	479.6877	326.0312	341.2104	490.5533	593.8812	625.6517	645.4906 (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												
	1392.4674	1348.9012	1221.4115	1011.0639	776.5090	520.2231	334.3383	352.8776	561.3501	853.1014	1136.8590	1376.0271 (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												
	537.8115	428.8374	368.5083	217.6511	105.4901	0.0000	0.0000	0.0000	0.0000	192.8599	368.0692	543.5192 (98)
Space heating												2762.7467 (98)
Space heating per m2												(98) / (4) = 29.3223 (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												3052.7588 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	537.8115	428.8374	368.5083	217.6511	105.4901	0.0000	0.0000	0.0000	0.0000	192.8599	368.0692	543.5192 (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)	594.2669	473.8535	407.1915	240.4984	116.5637	0.0000	0.0000	0.0000	0.0000	213.1048	406.7063	600.5737 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	149.2371	111.0408	87.4956	44.2894	17.1781	2.1306	0.0000	25.1774	47.7145	91.5587	126.7984	148.2734 (64)
Efficiency of water heater (217)m	89.7851	89.8228	89.8679	89.9426	90.0378	87.3000	87.3000	87.3000	87.3000	89.4446	89.6579	87.3000 (216)
Fuel for water heating, kWh/month	166.2159	123.6220	97.3602	49.2419	19.0787	2.4406	0.0000	28.8401	54.6558	102.3636	141.4246	165.1252 (219)
Water heating fuel used												950.3685 (219)
Annual totals kWh/year												
Space heating fuel - main system												3052.7588 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
(MEV)Decentralised, Database: total watage = 6.1360, total flow = 29.0000, SFP = 0.2116)												
mechanical ventilation fans (SFP = 0.2116)												60.6821 (230a)
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												185.6821 (231)
Electricity for lighting (calculated in Appendix L)												465.5970 (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												2927.1670 (238)

#### 10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3052.7588	3.4800	106.2360 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	950.3685	3.4800	33.0728 (247)
Mechanical ventilation fans	60.6821	13.1900	8.0040 (249)
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	465.5970	13.1900	61.4122 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-1727.2394	13.1900	-227.8229 (252)
Total energy cost			117.3897 (255)

#### 11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.3541 (257)
SAP value		95.0597
SAP rating (Section 12)		95 (258)
SAP band		A

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP  
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	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3052.7588	0.2160	659.3959 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	950.3685	0.2160	205.2796 (264)
Space and water heating			864.6755 (265)
Pumps and fans	185.6821	0.5190	96.3690 (267)
Energy for lighting	465.5970	0.5190	241.6448 (268)
Energy saving/generation technologies			
PV Unit			
Total kg/year	-1727.2394	0.5190	-896.4372 (269)
CO2 emissions per m2			306.2521 (272)
EI value			3.2500 (273)
EI rating			97.0523
EI band			97 (274) A

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# 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	47.1100 (1b)	x 2.3800 (2b)	= 112.1218 (1b) - (3b)
First floor	47.1100 (1c)	x 2.6100 (2c)	= 122.9571 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.2200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 235.0789 (5)

#### 2. Ventilation rate

	main heating	secondary heating	other	total	m3 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					0 * 10 = 0.0000 (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) =					0.0000 / (5) = 0.0000 (8)							
Pressure test					Yes							
Measured/design AP50					5.0100							
Infiltration rate					0.2505 (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) =		0.2317 (21)							
Wind speed	Jan 6.0000	Feb 5.6000	Mar 5.6000	Apr 5.0000	May 5.0000	Jun 4.4000	Jul 4.4000	Aug 4.3000	Sep 4.7000	Oct 5.4000	Nov 5.5000	Dec 5.9000 (22)
Wind factor	1.5000	1.4000	1.4000	1.2500	1.2500	1.1000	1.1000	1.0750	1.1750	1.3500	1.3750	1.4750 (22a)
Adj infilt rate	0.3476	0.3244	0.3244	0.2896	0.2896	0.2549	0.2549	0.2491	0.2723	0.3128	0.3186	0.3418 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												
Effective ac	0.5976	0.5744	0.5744	0.5396	0.5396	0.5049	0.5049	0.5000	0.5223	0.5628	0.5686	0.5918 (25)

#### 3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Windows (Uw = 1.40)			7.8100	1.3258	10.3542		(27)
Solid Door			2.1200	1.0900	2.3108		(26)
Half Glazed Door			2.1200	1.0900	2.3108		(26a)
Ground Floor			47.1100	0.1500	7.0665	75.0000	3533.2500 (28a)
Render	97.9100	12.0500	85.8600	0.2700	23.1822	49.1000	4215.7260 (29a)
Ins Joist	47.1100		47.1100	0.1200	5.6532	7.6200	358.9782 (30)
Total net area of external elements Aum(A, m2)			192.1300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	50.8777		(33)
Party Wall			41.8400	0.0000	0.0000	45.0000	1882.8000 (32)
Ground Floor Block			21.4200			75.0000	1606.5000 (32c)
Ground Floor Stud			63.5800			9.0000	572.2200 (32c)
1st Floor Stud			107.1600			9.0000	964.4400 (32c)
Internal Floor			47.1100			18.0000	847.9800 (32d)
Internal Ceiling			47.1100			9.0000	423.9900 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	14405.8842 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							152.8962 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.9158 (36)
Total fabric heat loss						(33) + (36) =	57.7935 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	46.3570	44.5595	44.5595	41.8632	41.8632	39.1669	39.1669	38.7880	40.5150	43.6607	44.1101	45.9076 (38)
Heat transfer coeff	104.1505	102.3530	102.3530	99.6567	99.6567	96.9604	96.9604	96.5815	98.3085	101.4542	101.9036	103.7011 (39)
Average = Sum(39)m / 12 =												100.3366 (39)
HLP	1.1054	1.0863	1.0863	1.0577	1.0577	1.0291	1.0291	1.0251	1.0434	1.0768	1.0815	1.1006 (40)
HLP (average)												1.0649 (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	2.6792 (42)
Average daily hot water use (litres/day)	97.8308 (43)

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)



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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	107.6139	103.7007	99.7874	95.8742	91.9610	88.0477	88.0477	91.9610	95.8742	99.7874	103.7007	107.6139 (44)
Energy content (annual)	159.5883	139.5769	144.0309	125.5696	120.4871	103.9712	96.3446	110.5568	111.8772	130.3821	142.3222	154.5527 (45)
Distribution loss (46)m = 0.15 x (45)m	23.9382	20.9365	21.6046	18.8354	18.0731	15.5957	14.4517	16.5835	16.7816	19.5573	21.3483	23.1829 (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	14.6957	13.2598	14.6481	14.1195	14.5493	14.0329	14.4714	14.5219	14.0801	14.6072	14.1853	14.6806 (61)
Total heat required for water heating calculated for each month	174.2840	152.8368	158.6790	139.6891	135.0364	118.0041	110.8160	125.0787	125.9573	144.9893	156.5075	169.2333 (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												1220.6462 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												2050.6856 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.3323 (H8)
Utilisation factor												0.5279 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												97.8308 (H14)
Volume ratio Veff/V												0.7666 (H15)
Solar storage volume factor												0.9468 (H16)
Solar input	-30.5842	-43.1534	-73.3713	-99.5852	-116.8490	-122.7549	-112.0743	-104.5518	-82.7929	-56.0180	-34.9633	-901.3268 (H17)
Solar input (sum of months) = Sum(63)m =												-901.3268 (63)
Output from w/h	143.6998	109.6834	85.3077	40.1039	18.1873	0.0000	0.0000	20.5270	43.1644	88.9713	121.5442	144.6049 (64)
Total per year (kWh/year) = Sum(64)m =												815.7938 (64)
Heat gains from water heating, kWh/month	56.7370	49.7243	51.5523	45.2818	43.6993	38.0786	35.6524	40.3906	40.7192	47.0039	50.8685	55.0589 (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	160.7515	160.7515	160.7515	160.7515	160.7515	160.7515	160.7515	160.7515	160.7515	160.7515	160.7515	160.7515 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	65.9101	58.5407	47.6085	36.0427	26.9424	22.7459	24.5777	31.9470	42.8793	54.4451	63.5454	67.7419 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	368.1059	371.9257	362.2999	341.8079	315.9403	291.6285	275.3867	271.5669	281.1926	301.6847	327.5522	351.8641 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.7543	53.7543	53.7543	53.7543	53.7543	53.7543	53.7543	53.7543	53.7543	53.7543	53.7543	53.7543 (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)	-107.1677	-107.1677	-107.1677	-107.1677	-107.1677	-107.1677	-107.1677	-107.1677	-107.1677	-107.1677	-107.1677	-107.1677 (71)
Water heating gains (Table 5)	76.2594	73.9945	69.2907	62.8913	58.7356	52.8870	47.9199	54.2885	56.5544	63.1772	70.6506	74.0039 (72)
Total internal gains	620.6136	614.7991	589.5374	551.0801	511.9564	477.5995	458.2225	468.1406	490.9645	529.6452	572.0865	603.9481 (73)

#### 6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W					
Northeast	3.3300	15.4538	0.5000	0.0000	0.7700	19.8125 (75)						
Southwest	4.4800	47.2368	0.5000	0.0000	0.7700	81.4741 (79)						
Solar gains	101.2866	151.4589	222.1488	305.0259	347.0729	378.6126	333.7262	309.6679	255.8927	174.1284	118.0661	82.6821 (83)
Total gains	721.9002	766.2579	811.6862	856.1061	859.0293	856.2121	791.9487	777.8085	746.8572	703.7735	690.1526	686.6302 (84)

#### 7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	38.4217	39.0964	39.0964	40.1542	40.1542	41.2708	41.2708	41.4327	40.7049	39.4428	39.2688	38.5882
alpha	3.5614	3.6064	3.6064	3.6769	3.6769	3.7514	3.7514	3.7622	3.7137	3.6295	3.6179	3.5725
util living area	0.9639	0.9541	0.9337	0.8883	0.8070	0.6558	0.5518	0.5489	0.7158	0.8790	0.9408	0.9667 (86)
MIT	19.7540	19.8833	20.0873	20.4022	20.6850	20.8979	20.9578	20.9598	20.8600	20.5383	20.1598	19.7608 (87)
Th 2	19.9964	20.0120	20.0120	20.0355	20.0355	20.0592	20.0592	20.0625	20.0473	20.0198	20.0159	20.0003 (88)
util rest of house	0.9561	0.9444	0.9194	0.8640	0.7629	0.5833	0.4571	0.4526	0.6425	0.8451	0.9259	0.9593 (89)
MIT 2	18.3823	18.5772	18.8671	19.3226	19.7000	19.9730	20.0326	20.0378	19.9267	19.5060	18.9785	18.3958 (90)
Living area fraction									fLA = Living area / (4) =			0.1812 (91)
MIT	18.6309	18.8139	19.0881	19.5182	19.8784	20.1406	20.2002	20.2048	20.0958	19.6930	19.1925	18.6431 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.4809	18.6639	18.9381	19.3682	19.7284	19.9906	20.0502	20.0548	19.9458	19.5430	19.0425	18.4931 (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	0.9400	0.9268	0.8996	0.8437	0.7468	0.5776	0.4561	0.4518	0.6338	0.8249	0.9066	0.9438	(94)
Useful gains	678.5706	710.1436	730.1640	722.3333	641.5352	494.5458	361.2337	351.3813	473.3570	580.5235	625.6618	648.0544	(95)
Ext temp.	6.1000	6.4000	7.5000	9.3000	11.9000	14.5000	16.2000	16.3000	14.6000	11.8000	9.0000	6.4000	(96)
Heat loss rate W													
	1289.4725	1255.2439	1170.7260	1003.3632	780.1535	532.3706	373.3206	362.6456	525.5343	785.5627	1023.3676	1254.0663	(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													
	454.5110	366.3074	327.7782	202.3416	103.1320	0.0000	0.0000	0.0000	0.0000	152.5491	286.3482	450.8728	(98)
Space heating													
Space heating per m2													(98) / (4) = 24.8762 (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													2589.8787 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	454.5110	366.3074	327.7782	202.3416	103.1320	0.0000	0.0000	0.0000	0.0000	152.5491	286.3482	450.8728	(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)	502.2221	404.7596	362.1858	223.5818	113.9580	0.0000	0.0000	0.0000	0.0000	168.5626	316.4068	498.2020	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	143.6998	109.6834	85.3077	40.1039	18.1873	0.0000	0.0000	20.5270	43.1644	88.9713	121.5442	144.6049	(64)
Efficiency of water heater (217)m	89.7101	89.7420	89.8201	89.9546	90.0054	87.3000	87.3000	87.3000	87.3000	89.2943	89.5222	87.3000	(216)
Fuel for water heating, kWh/month	160.1824	122.2208	94.9762	44.5824	20.2069	0.0000	0.0000	23.5131	49.4437	99.6383	135.7699	161.2067	(219)
Water heating fuel used													(219)
Annual totals kWh/year													
Space heating fuel - main system													2589.8787 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 6.1360, total flow = 29.0000, SFP = 0.2116)													
mechanical ventilation fans (SFP = 0.2116)													60.6821 (230a)
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													185.6821 (231)
Electricity for lighting (calculated in Appendix L)													465.5970 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 2.50 * 1221 * 0.80) =										-1953.0339			-1953.0339 (233)
Total delivered energy for all uses													2199.8644 (238)

#### 10a. Fuel costs - using BEDF prices (461)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2589.8787	3.9700	102.8182 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	911.7405	3.9700	36.1961 (247)
Mechanical ventilation fans	60.6821	18.2700	11.0866 (249)
Pumps and fans for heating	75.0000	18.2700	13.7025 (249)
Pump for solar water heating	50.0000	18.2700	9.1350 (249)
Energy for lighting	465.5970	18.2700	85.0646 (250)
Additional standing charges			90.0000 (251)
Energy saving/generation technologies			
PV Unit	-1953.0339	18.2700	-356.8193 (252)
Total energy cost			-8.8163 (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	2589.8787	0.2160	559.4138 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	911.7405	0.2160	196.9359 (264)

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)



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

Space and water heating			756.3497 (265)
Pumps and fans	185.6821	0.5190	96.3690 (267)
Energy for lighting	465.5970	0.5190	241.6448 (268)
Energy saving/generation technologies			
PV Unit	-1953.0339	0.5190	-1013.6246 (269)
Total kg/year			80.7390 (272)

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 13a. Primary energy - Individual heating systems including micro-CHP  
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	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2589.8787	1.2200	3159.6521 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	911.7405	1.2200	1112.3234 (264)
Space and water heating			4271.9754 (265)
Pumps and fans	185.6821	3.0700	570.0441 (267)
Energy for lighting	465.5970	3.0700	1429.3828 (268)
Energy saving/generation technologies			
PV Unit	-1953.0339	3.0700	-5995.8141 (269)
Primary energy kWh/year			275.5883 (272)
Primary energy kWh/m2/year			2.9249 (273)

# BASIC COMPLIANCE REPORT

## Calculation Type: New Build (As Designed)



<b>Property Reference</b>	Plot 058 - PRJ009232	<b>Issued on Date</b>	08/07/2020
<b>Assessment Reference</b>	058 S	<b>Prop Type Ref</b>	PRJ009232
<b>Property</b>	Plot 058 - PRJ009232		

<b>SAP Rating</b>	84 B	<b>DER</b>	16.42	<b>TER</b>	17.84
<b>Environmental</b>	87 B	<b>% DER&lt;TER</b>	7.97		
<b>CO<sub>2</sub> Emissions (t/year)</b>	1.29	<b>DFEE</b>	44.83	<b>TFEE</b>	50.67
<b>General Requirements Compliance</b>	Pass	<b>% DFEE&lt;TFEE</b>	11.53		

<b>Assessor Details</b>	Mr. Michael Juckes, Michael Juckes, Tel: 02033971373, michael@briaryenergy.co.uk	<b>Assessor ID</b>	T850-0001
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<b>Client</b>	
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### 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)	17.84	kgCO <sub>2</sub> /m <sup>2</sup>	
Dwelling Carbon Dioxide Emission Rate (DER)	16.42	kgCO <sub>2</sub> /m <sup>2</sup>	Pass
	-1.42 (-8.0%)	kgCO <sub>2</sub> /m <sup>2</sup>	

##### 1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	50.67	kWh/m <sup>2</sup> /yr	
Dwelling Fabric Energy Efficiency (DFEE)	44.83	kWh/m <sup>2</sup> /yr	
	-5.9 (-11.6%)	kWh/m <sup>2</sup> /yr	Pass

#### Criterion 2 – Limits on design flexibility

##### Limiting Fabric Standards

##### 2 Fabric U-values

Element	Average	Highest	
External wall	0.27 (max. 0.30)	0.27 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.15 (max. 0.25)	0.15 (max. 0.70)	Pass
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	Pass
Openings	1.29 (max. 2.00)	1.40 (max. 3.30)	Pass

##### 2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

##### 3 Air permeability

Air permeability at 50 pascals	5.01 (design value)	
Maximum	10.0	Pass

##### Limiting System Efficiencies

##### 4 Heating efficiency



# BASIC COMPLIANCE REPORT

## Calculation Type: New Build (As Designed)



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
Secondary heating system	None	

### 5 Cylinder insulation

Hot water storage	No cylinder	
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### 6 Controls

Space heating controls	Time and temperature zone control	Pass
Hot water controls	No cylinder	
Boiler interlock	Yes	Pass

### 7 Low energy lights

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

### 8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power	0.1600 0.1800	
Maximum	0.7	Pass

## Criterion 3 – Limiting the effects of heat gains in summer

### 9 Summertime temperature

Overheating risk (South West England)	Not significant	Pass
Based on:		
Overshading	Average	
Windows facing North East	3.33 m <sup>2</sup> , No overhang	
Windows facing South West	4.48 m <sup>2</sup> , No overhang	
Air change rate	4.21 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/m <sup>2</sup> K	Pass

### Air permeability and pressure testing

#### 3 Air permeability

Air permeability at 50 pascals	5.01 (design value)	
Maximum	10.0	Pass

# BASIC COMPLIANCE REPORT

## Calculation Type: New Build (As Designed)



### 10 Key features

Party wall U-value	0.00	W/m <sup>2</sup> K
Roof U-value	0.12	W/m <sup>2</sup> K
Door U-value	1.09	W/m <sup>2</sup> K
Door U-value	1.09	W/m <sup>2</sup> K
Door U-value	1.00	W/m <sup>2</sup> K
Thermal bridging y-value	0.036	W/m <sup>2</sup> K

*This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.*