

# PREDICTED ENERGY ASSESSMENT

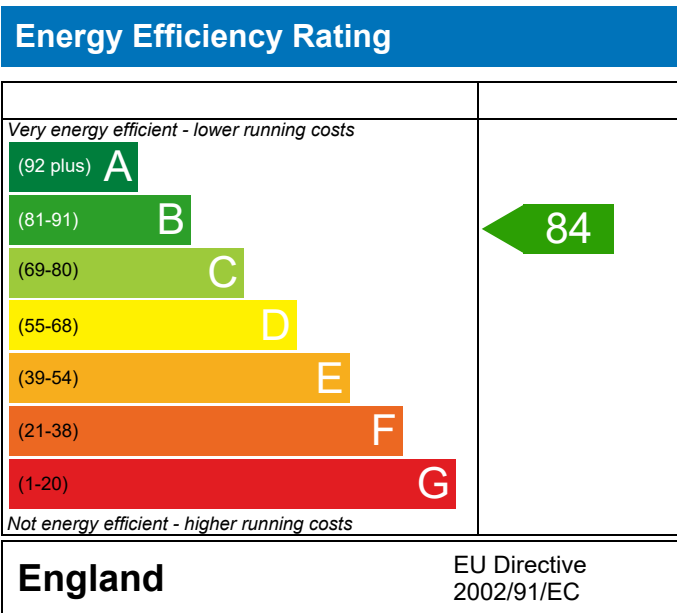


Plot 012 Er - SD

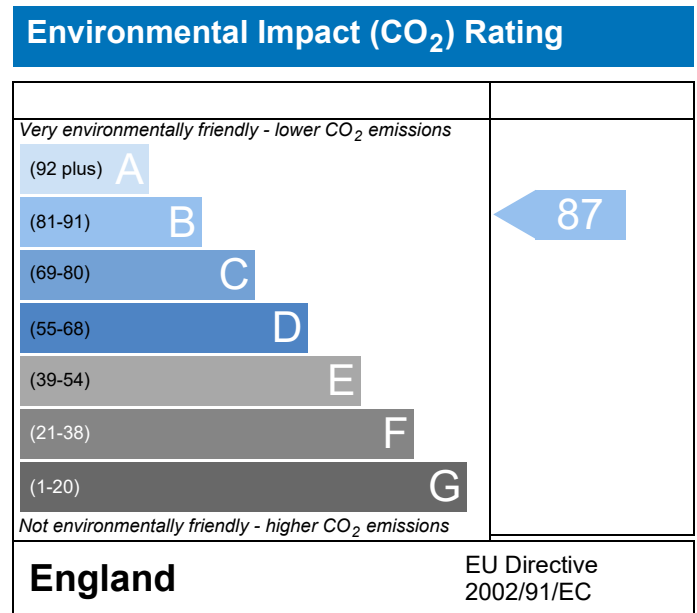
Dwelling type: House, Semi-Detached  
 Date of assessment: 08/07/2020  
 Produced by: Michael Juckes  
 Total floor area: 94.22 m<sup>2</sup>

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 012 Er - SD		Issued on Date	08/07/2020	
Assessment Reference	Plot 012 Er - SD	Prop Type Ref	PRJ009232		
Property	Plot 012 Er - SD				
SAP Rating	84 B	DER	16.51	TER	17.90
Environmental	87 B	% DER<TER	7.79		
CO <sub>2</sub> Emissions (t/year)	1.29	DFEE	45.29	TFEE	51.05
General Requirements Compliance	Pass	% DFEE<TFEE	11.28		
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)	17.90	kgCO <sub>2</sub> /m <sup>2</sup>	
Dwelling Carbon Dioxide Emission Rate (DER)	16.51	kgCO <sub>2</sub> /m <sup>2</sup>	Pass
	-1.39 (-7.8%)	kgCO <sub>2</sub> /m <sup>2</sup>	

##### 1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	51.05	kWh/m <sup>2</sup> /yr	
Dwelling Fabric Energy Efficiency (DFEE)	45.29	kWh/m <sup>2</sup> /yr	
	-5.7 (-11.2%)	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	1.30 (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	
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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 East	4.48 m <sup>2</sup> , No overhang	
Windows facing West	3.33 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

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)



### 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

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# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)



Property Reference	Plot 012 Er - SD	Issued on Date	08/07/2020
Assessment Reference	Plot 012 Er - SD	Prop Type Ref	PRJ009232
Property	Plot 012 Er - SD		

SAP Rating	84 B	DER	16.51	TER	17.90
Environmental	87 B	% DER<TER	7.79		
CO <sub>2</sub> Emissions (t/year)	1.29	DFEE	45.29	TTEE	51.05
General Requirements Compliance	Pass	% DFEE<TTEE	11.28		

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			1.9900	1.0900	2.1691		(26)
Half Glazed Door			1.9300	1.0900	2.1037		(26a)
Ground Floor			47.1100	0.1500	7.0665	75.0000	3533.2500 (28a)
Render	97.9100	11.7300	86.1800	0.2700	23.2686	49.1000	4231.4380 (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) =	50.6153	(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) = 14421.5962 (34)  
 Thermal mass parameter (TMP =  $C_m / \text{TFA}$ ) in kJ/m<sup>2</sup>K 153.0630 (35)  
 Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.9057 (36)  
 Total fabric heat loss (33) + (36) = 57.5210 (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 = Sum(39)m / 12 =	103.8780	102.0805	102.0805	99.3842	99.3842	96.6879	96.6879	96.3090	98.0360	101.1817	101.6311	103.4286 (39)
HLP	1.1025	1.0834	1.0834	1.0548	1.0548	1.0262	1.0262	1.0222	1.0405	1.0739	1.0787	1.0977 (40)
HLP (average)												1.0620 (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) = 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)
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

(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	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 Specific data or Table 6c	FF Specific data or Table 6c	Access factor Table 6d	Gains W					
East	4.4800	26.5726	0.5000	0.0000	0.0000	0.7700	45.8325 (76)					
West	3.3300	26.5726	0.5000	0.0000	0.0000	0.7700	34.0675 (80)					
Solar gains	79.9000	131.8767	215.8179	316.9108	367.3536	401.1751	353.6148	325.3564	257.0796	158.6571	95.9688	63.2535 (83)
Total gains	700.5135	746.6758	805.3552	867.9910	879.3100	878.7746	811.8373	793.4970	748.0441	688.3023	668.0553	667.2017 (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	3.5710	3.6162	3.6162	3.6872	3.6872	3.7622	3.7622	3.7730	3.7242	3.6395	3.6278	3.5821
util living area	0.9668	0.9573	0.9350	0.8844	0.7976	0.6428	0.5396	0.5388	0.7142	0.8847	0.9457	0.9693 (86)

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)



### CALCULATION OF HEAT DEMAND 09 Jan 2014

MIT	19.7330	19.8653	20.0855	20.4174	20.7006	20.9055	20.9613	20.9627	20.8621	20.5279	20.1390	19.7418 (87)
Th 2	19.9988	20.0144	20.0144	20.0379	20.0379	20.0616	20.0616	20.0649	20.0497	20.0222	20.0183	20.0027 (88)
util rest of house												
	0.9596	0.9481	0.9209	0.8595	0.7526	0.5705	0.4462	0.4437	0.6410	0.8519	0.9318	0.9624 (89)
MIT 2	18.3540	18.5534	18.8663	19.3445	19.7205	19.9824	20.0374	20.0420	19.9310	19.4947	18.9514	18.3703 (90)
Living area fraction									fLA = Living area / (4) =			0.1812 (91)
MIT	18.6038	18.7911	19.0872	19.5389	19.8981	20.1496	20.2047	20.2088	20.0997	19.6819	19.1665	18.6188 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.4538	18.6411	18.9372	19.3889	19.7481	19.9996	20.0547	20.0588	19.9497	19.5319	19.0165	18.4688 (93)

#### 8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9442	0.9311	0.9012	0.8394	0.7372	0.5654	0.4455	0.4431	0.6324	0.8316	0.9130	0.9477 (94)
Useful gains	661.4341	695.2172	725.8021	728.5982	648.2255	496.8300	361.6583	351.5701	473.0908	572.4120	609.9632	632.2872 (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	1283.2872	1249.5781	1167.5140	1002.6787	779.9739	531.7462	372.7065	362.0070	524.4643	782.3259	1017.9927	1248.2555 (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	462.6587	372.5305	328.6337	197.3379	98.0208	0.0000	0.0000	0.0000	0.0000	156.1759	293.7813	458.2804 (98)
Space heating												2367.4191 (98)
RHI space heating demand												2367 (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)	2.3800 (2b)	112.1218 (1b) - (3b)
First floor	47.1100 (1c)	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 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			1.9900	1.0900	2.1691		(26)
Half Glazed Door			1.9300	1.0900	2.1037		(26a)
Ground Floor			47.1100	0.1500	7.0665	75.0000	3533.2500 (28a)
Render	97.9100	11.7300	86.1800	0.2700	23.2686	49.1000	4231.4380 (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) =	50.6153		(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) =	14421.5962 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							153.0630 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.9057 (36)
Total fabric heat loss						(33) + (36) =	57.5210 (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 =	99.8336	99.3842	98.9348	96.6879	96.3090	96.3090	96.3090	96.3090	96.3090	96.3090	97.1373	98.0360 (39)
HLP	1.0596	1.0548	1.0500	1.0262	1.0222	1.0222	1.0222	1.0222	1.0222	1.0222	1.0310	1.0405 (40)
HLP (average)												1.0329 (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	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
East	4.4800	19.6403	0.5000	0.0000	0.7700	33.8755 (76)						
West	3.3300	19.6403	0.5000	0.0000	0.7700	25.1798 (80)						
Solar gains	59.0553	115.5247	190.2528	277.4724	340.0528	348.1046	331.4097	284.6761	221.2719	137.0798	73.6351	48.5642 (83)
Total gains	679.6689	730.3238	779.7902	828.5525	852.0093	825.7041	789.6322	752.8166	712.2364	666.7250	645.7215	652.5123 (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	40.1268	40.3082	40.4913	41.4323	41.5953	41.5953	41.5953	41.5953	41.5953	41.5953	41.2406	40.8625
alpha	3.6751	3.6872	3.6994	3.7622	3.7730	3.7730	3.7730	3.7730	3.7730	3.7730	3.7494	3.7242
util living area	0.9778	0.9691	0.9492	0.9012	0.8098	0.6630	0.5116	0.5529	0.7623	0.9160	0.9661	0.9806 (86)
MIT	19.5237	19.6845	19.9751	20.3712	20.6940	20.8975	20.9706	20.9601	20.8191	20.4186	19.9223	19.5094 (87)
Th 2	20.0340	20.0379	20.0418	20.0616	20.0649	20.0649	20.0649	20.0649	20.0649	20.0649	20.0576	20.0497 (88)
util rest of house	0.9734	0.9629	0.9387	0.8800	0.7678	0.5896	0.4130	0.4542	0.6985	0.8936	0.9584	0.9767 (89)
MIT 2	18.0733	18.3079	18.7279	19.2998	19.7350	19.9789	20.0483	20.0408	19.8972	19.3770	18.6672	18.0631 (90)
Living area fraction	fLA = Living area / (4) =											0.1812 (91)
MIT	18.3361	18.5573	18.9539	19.4939	19.9088	20.1453	20.2154	20.2074	20.0642	19.5657	18.8946	18.3251 (92)
Temperature adjustment												
adjusted MIT	18.1861	18.4073	18.8039	19.3439	19.7588	19.9953	20.0654	20.0574	19.9142	19.4157	18.7446	18.1751 (93)

#### 8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9615	0.9487	0.9211	0.8603	0.7521	0.5837	0.4130	0.4533	0.6869	0.8740	0.9436	0.9659 (94)
Useful gains	653.5016	692.8744	718.2435	712.7629	640.8311	481.9254	326.1506	341.2724	489.2111	582.7118	609.3123	630.2684 (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	1386.2969	1342.4109	1217.2803	1009.7989	776.1309	519.6149	333.7525	352.2378	559.9645	849.0296	1131.1198	1370.0630 (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	545.1996	436.4885	371.2834	213.8659	100.6631	0.0000	0.0000	0.0000	0.0000	198.1404	375.7014	550.4072 (98)
Space heating												2791.7495 (98)
Space heating per m2												(98) / (4) = 29.6301 (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 3084.8060 (211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	545.1996	436.4885	371.2834	213.8659	100.6631	0.0000	0.0000	0.0000	0.0000	198.1404	375.7014	550.4072	(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)	602.4305	482.3077	410.2579	236.3159	111.2299	0.0000	0.0000	0.0000	0.0000	218.9397	415.1397	608.1847	(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	89.7035	89.6478	89.5175	89.2081	88.6386	87.3000	87.3000	87.3000	87.3000	89.1197	89.5349	87.3000	(216)
Fuel for water heating, kWh/month	194.2889	170.4858	177.2602	156.5880	152.3450	135.1708	126.9370	143.2746	144.2810	162.6906	174.8006	188.6101	(219)
Water heating fuel used												1926.7325	(219)
Annual totals kWh/year													
Space heating fuel - main system												3084.8060	(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 5612.8177 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3084.8060	3.4800	107.3512	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1926.7325	3.4800	67.0503	(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			373.7103	(255)

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

Energy cost deflator (Table 12): 0.4200 (256)  
 Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] = 1.1274 (257)  
 SAP value 84.2726  
 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	3084.8060	0.2160	666.3181	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1926.7325	0.2160	416.1742	(264)
Space and water heating			1082.4923	(265)
Pumps and fans	135.6821	0.5190	70.4190	(267)
Energy for lighting	465.5970	0.5190	241.6448	(268)
Total kg/year			1394.5562	(272)
CO2 emissions per m2			14.8000	(273)
EI value			86.5773	
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			1.9900	1.0900	2.1691		(26)					
Half Glazed Door			1.9300	1.0900	2.1037		(26a)					
Ground Floor			47.1100	0.1500	7.0665	75.0000	3533.2500 (28a)					
Render	97.9100	11.7300	86.1800	0.2700	23.2686	49.1000	4231.4380 (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) =	50.6153		(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) =	14421.5962 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							153.0630 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.9057 (36)					
Total fabric heat loss						(33) + (36) =	57.5210 (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	103.8780	102.0805	102.0805	99.3842	99.3842	96.6879	96.6879	96.3090	98.0360	101.1817	101.6311	103.4286 (39)
Average = Sum(39)m / 12 =												100.0641 (39)
HLP	Jan 1.1025	Feb 1.0834	Mar 1.0834	Apr 1.0548	May 1.0548	Jun 1.0262	Jul 1.0262	Aug 1.0222	Sep 1.0405	Oct 1.0739	Nov 1.0787	Dec 1.0977 (40)
HLP (average)												1.0620 (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)
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 or Table 6c	Access factor Table 6d	Gains W					
East	4.4800	26.5726	0.5000	0.0000	0.0000	0.7700	45.8325 (76)					
West	3.3300	26.5726	0.5000	0.0000	0.0000	0.7700	34.0675 (80)					
Solar gains	79.9000	131.8767	215.8179	316.9108	367.3536	401.1751	353.6148	325.3564	257.0796	158.6571	95.9688	63.2535 (83)
Total gains	700.5135	746.6758	805.3552	867.9910	879.3100	878.7746	811.8373	793.4970	748.0441	688.3023	668.0553	667.2017 (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	38.5645	39.2435	39.2435	40.3082	40.3082	41.4323	41.4323	41.5953	40.8625	39.5921	39.4171	38.7320
alpha	3.5710	3.6162	3.6162	3.6872	3.6872	3.7622	3.7622	3.7730	3.7242	3.6395	3.6278	3.5821
util living area	0.9668	0.9573	0.9350	0.8844	0.7976	0.6428	0.5396	0.5388	0.7142	0.8847	0.9457	0.9693 (86)
MIT	19.7330	19.8653	20.0855	20.4174	20.7006	20.9055	20.9613	20.9627	20.8621	20.5279	20.1390	19.7418 (87)
Th 2	19.9988	20.0144	20.0144	20.0379	20.0379	20.0616	20.0616	20.0649	20.0497	20.0222	20.0183	20.0027 (88)
util rest of house	0.9596	0.9481	0.9209	0.8595	0.7526	0.5705	0.4462	0.4437	0.6410	0.8519	0.9318	0.9624 (89)
MIT 2	18.3540	18.5534	18.8663	19.3445	19.7205	19.9824	20.0374	20.0420	19.9310	19.4947	18.9514	18.3703 (90)
Living area fraction												0.1812 (91)
MIT	18.6038	18.7911	19.0872	19.5389	19.8981	20.1496	20.2047	20.2088	20.0997	19.6819	19.1665	18.6188 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.4538	18.6411	18.9372	19.3889	19.7481	19.9996	20.0547	20.0588	19.9497	19.5319	19.0165	18.4688 (93)

#### 8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9442	0.9311	0.9012	0.8394	0.7372	0.5654	0.4455	0.4431	0.6324	0.8316	0.9130	0.9477 (94)
Useful gains	661.4341	695.2172	725.8021	728.5982	648.2255	496.8300	361.6583	351.5701	473.0908	572.4120	609.9632	632.2872 (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	1283.2872	1249.5781	1167.5140	1002.6787	779.9739	531.7462	372.7065	362.0070	524.4643	782.3259	1017.9927	1248.2555 (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	462.6587	372.5305	328.6337	197.3379	98.0208	0.0000	0.0000	0.0000	0.0000	156.1759	293.7813	458.2804 (98)
Space heating												2367.4191 (98)
Space heating per m2												(98) / (4) = 25.1265 (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													2615.9327 (211)
Space heating requirement	462.6587	372.5305	328.6337	197.3379	98.0208	0.0000	0.0000	0.0000	0.0000	156.1759	293.7813	458.2804	(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)	511.2251	411.6359	363.1312	218.0529	108.3103	0.0000	0.0000	0.0000	0.0000	172.5701	324.6202	506.3872	(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	89.6013	89.5451	89.4326	89.1456	88.6179	87.3000	87.3000	87.3000	87.3000	88.9307	89.3615	87.3000	(216)
Fuel for water heating, kWh/month	194.5105	170.6813	177.4287	156.6976	152.3805	135.1708	126.9370	143.2746	144.2810	163.0364	175.1397	188.8467	(219)
Water heating fuel used													1928.3847 (219)
Annual totals kWh/year													
Space heating fuel - main system													2615.9327 (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													5145.5966 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2615.9327	3.9700	103.8525 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1928.3847	3.9700	76.5569 (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			380.2631 (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	2615.9327	0.2160	565.0415 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1928.3847	0.2160	416.5311 (264)
Space and water heating			981.5726 (265)
Pumps and fans	135.6821	0.5190	70.4190 (267)
Energy for lighting	465.5970	0.5190	241.6448 (268)
Total kg/year			1293.6364 (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	2615.9327	1.2200	3191.4380 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1928.3847	1.2200	2352.6293 (264)
Space and water heating			5544.0673 (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			7389.9942 (272)
Primary energy kWh/m2/year			78.4334 (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 (92.1%)

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	£270	£230	£40
Space heating	£219	£219	£0
Water heating	£77	£45	£31
Lighting	£85	£85	£0
Generated (PV)	-£0	-£357	£357
<b>Total cost of fuels</b>	<b>£380</b>	<b>-£8</b>	<b>£388</b>
<b>Total cost of uses</b>	<b>£381</b>	<b>-£8</b>	<b>£388</b>
Delivered energy	55 kWh/m <sup>2</sup>	24 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			1.9900	1.0900	2.1691		(26)
Half Glazed Door			1.9300	1.0900	2.1037		(26a)
Ground Floor			47.1100	0.1500	7.0665	75.0000	3533.2500 (28a)
Render	97.9100	11.7300	86.1800	0.2700	23.2686	49.1000	4231.4380 (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) =	50.6153		(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) =	14421.5962 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							153.0630 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.9057 (36)
Total fabric heat loss						(33) + (36) =	57.5210 (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 =	99.8336	99.3842	98.9348	96.6879	96.3090	96.3090	96.3090	96.3090	96.3090	96.3090	97.1373	98.0360 (39)
HLP	1.0596	1.0548	1.0500	1.0262	1.0222	1.0222	1.0222	1.0222	1.0222	1.0222	1.0310	1.0405 (40)
HLP (average)												1.0329 (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 cont	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)
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	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
East	4.4800	19.6403	0.5000	0.0000	0.7700	33.8755 (76)						
West	3.3300	19.6403	0.5000	0.0000	0.7700	25.1798 (80)						
Solar gains	59.0553	115.5247	190.2528	277.4724	340.0528	348.1046	331.4097	284.6761	221.2719	137.0798	73.6351	48.5642 (83)
Total gains	679.6689	730.3238	779.7902	828.5525	852.0093	825.7041	789.6322	752.8166	712.2364	666.7250	645.7215	652.5123 (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	40.1268	40.3082	40.4913	41.4323	41.5953	41.5953	41.5953	41.5953	41.5953	41.2406	40.8625
	alpha	3.6751	3.6872	3.6994	3.7622	3.7730	3.7730	3.7730	3.7730	3.7730	3.7494	3.7242
util living area		0.9778	0.9691	0.9492	0.9012	0.8098	0.6630	0.5116	0.5529	0.7623	0.9160	0.9806 (86)
MIT		19.5237	19.6845	19.9751	20.3712	20.6940	20.8975	20.9706	20.9601	20.8191	20.4186	19.9223
Th 2		20.0340	20.0379	20.0418	20.0616	20.0649	20.0649	20.0649	20.0649	20.0649	20.0649	20.0497 (88)
util rest of house		0.9734	0.9629	0.9387	0.8800	0.7678	0.5896	0.4130	0.4542	0.6985	0.8936	0.9767 (89)
MIT 2		18.0733	18.3079	18.7279	19.2998	19.7350	19.9789	20.0483	20.0408	19.8972	19.3770	18.6672
Living area fraction		18.3361	18.5573	18.9539	19.4939	19.9088	20.1453	20.2154	20.2074	20.0642	19.5657	18.8946
MIT		18.1861	18.4073	18.8039	19.3439	19.7588	19.9953	20.0654	20.0574	19.9142	19.4157	18.7446
Temperature adjustment												-0.1500
adjusted MIT												18.1751 (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	0.9615	0.9487	0.9211	0.8603	0.7521	0.5837	0.4130	0.4533	0.6869	0.8740	0.9436	0.9659	(94)
Useful gains	653.5016	692.8744	718.2435	712.7629	640.8311	481.9254	326.1506	341.2724	489.2111	582.7118	609.3123	630.2684	(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													
	1386.2969	1342.4109	1217.2803	1009.7989	776.1309	519.6149	333.7525	352.2378	559.9645	849.0296	1131.1198	1370.0630	(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													
	545.1996	436.4885	371.2834	213.8659	100.6631	0.0000	0.0000	0.0000	0.0000	198.1404	375.7014	550.4072	(98)
Space heating													
Space heating per m2													(98) / (4) = 29.6301 (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													3084.8060 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	545.1996	436.4885	371.2834	213.8659	100.6631	0.0000	0.0000	0.0000	0.0000	198.1404	375.7014	550.4072	(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)	602.4305	482.3077	410.2579	236.3159	111.2299	0.0000	0.0000	0.0000	0.0000	218.9397	415.1397	608.1847	(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	89.7927	89.8322	89.8717	89.9344	90.0190	87.3000	87.3000	87.3000	87.3000	89.4636	89.6706	87.3000	(216)
Fuel for water heating, kWh/month	166.2019	123.6091	97.3561	49.2463	19.0827	2.4406	0.0000	28.8401	54.6558	102.3419	141.4046	165.1125	(219)
Water heating fuel used													
Annual totals kWh/year													
Space heating fuel - main system													3084.8060 (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													2959.1373 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3084.8060	3.4800	107.3512	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	950.2915	3.4800	33.0701	(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			118.5022	(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] =	0.3575	(257)
SAP value		95.0129	
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	3084.8060	0.2160	666.3181 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	950.2915	0.2160	205.2630 (264)
Space and water heating			871.5811 (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			313.1577 (272)
EI value			3.3200 (273)
EI rating			96.9858
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			1.9900	1.0900	2.1691		(26)					
Half Glazed Door			1.9300	1.0900	2.1037		(26a)					
Ground Floor			47.1100	0.1500	7.0665	75.0000	3533.2500 (28a)					
Render	97.9100	11.7300	86.1800	0.2700	23.2686	49.1000	4231.4380 (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) =	50.6153		(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) =	14421.5962 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							153.0630 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.9057 (36)					
Total fabric heat loss						(33) + (36) =	57.5210 (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	103.8780	102.0805	102.0805	99.3842	99.3842	96.6879	96.6879	96.3090	98.0360	101.1817	101.6311	103.4286 (39)
Average = Sum(39)m / 12 =												100.0641 (39)
HLP	Jan 1.1025	Feb 1.0834	Mar 1.0834	Apr 1.0548	May 1.0548	Jun 1.0262	Jul 1.0262	Aug 1.0222	Sep 1.0405	Oct 1.0739	Nov 1.0787	Dec 1.0977 (40)
HLP (average)												1.0620 (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 cont	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)
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	-901.3268 (H17)											
Solar input	-30.5842	-43.1534	-73.3713	-99.5852	-116.8490	-122.7549	-112.0743	-104.5518	-82.7929	-56.0180	-34.9633	-24.6284 (63)
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)

	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	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
East	4.4800	26.5726	0.5000	0.0000	0.7700	45.8325 (76)						
West	3.3300	26.5726	0.5000	0.0000	0.7700	34.0675 (80)						
Solar gains	79.9000	131.8767	215.8179	316.9108	367.3536	401.1751	353.6148	325.3564	257.0796	158.6571	95.9688	63.2535 (83)
Total gains	700.5135	746.6758	805.3552	867.9910	879.3100	878.7746	811.8373	793.4970	748.0441	688.3023	668.0553	667.2017 (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	38.5645	39.2435	39.2435	40.3082	40.3082	41.4323	41.4323	41.5953	40.8625	39.5921	39.4171	38.7320
alpha	3.5710	3.6162	3.6162	3.6872	3.6872	3.7622	3.7622	3.7730	3.7242	3.6395	3.6278	3.5821
util living area	0.9668	0.9573	0.9350	0.8844	0.7976	0.6428	0.5396	0.5388	0.7142	0.8847	0.9457	0.9693 (86)
MIT	19.7330	19.8653	20.0855	20.4174	20.7006	20.9055	20.9613	20.9627	20.8621	20.5279	20.1390	19.7418 (87)
Th 2	19.9988	20.0144	20.0144	20.0379	20.0379	20.0616	20.0616	20.0649	20.0497	20.0222	20.0183	20.0027 (88)
util rest of house	0.9596	0.9481	0.9209	0.8595	0.7526	0.5705	0.4462	0.4437	0.6410	0.8519	0.9318	0.9624 (89)
MIT 2	18.3540	18.5534	18.8663	19.3445	19.7205	19.9824	20.0374	20.0420	19.9310	19.4947	18.9514	18.3703 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.6038	18.7911	19.0872	19.5389	19.8981	20.1496	20.2047	20.2088	20.0997	19.6819	19.1665	18.6188 (92)
Temperature adjustment	-0.1500											
adjusted MIT	18.4538	18.6411	18.9372	19.3889	19.7481	19.9996	20.0547	20.0588	19.9497	19.5319	19.0165	18.4688 (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	0.9442	0.9311	0.9012	0.8394	0.7372	0.5654	0.4455	0.4431	0.6324	0.8316	0.9130	0.9477	(94)
Useful gains	661.4341	695.2172	725.8021	728.5982	648.2255	496.8300	361.6583	351.5701	473.0908	572.4120	609.9632	632.2872	(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													
	1283.2872	1249.5781	1167.5140	1002.6787	779.9739	531.7462	372.7065	362.0070	524.4643	782.3259	1017.9927	1248.2555	(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													
	462.6587	372.5305	328.6337	197.3379	98.0208	0.0000	0.0000	0.0000	0.0000	156.1759	293.7813	458.2804	(98)
Space heating													
Space heating per m2													(98) / (4) = 25.1265 (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													2615.9327 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	462.6587	372.5305	328.6337	197.3379	98.0208	0.0000	0.0000	0.0000	0.0000	156.1759	293.7813	458.2804	(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)	511.2251	411.6359	363.1312	218.0529	108.3103	0.0000	0.0000	0.0000	0.0000	172.5701	324.6202	506.3872	(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	89.7206	89.7517	89.8215	89.9432	89.9838	87.3000	87.3000	87.3000	87.3000	89.3119	89.5395	89.7113	(216)
Fuel for water heating, kWh/month	160.1636	122.2076	94.9747	44.5881	20.2118	0.0000	0.0000	23.5131	49.4437	99.6187	135.7436	161.1892	(219)
Water heating fuel used													
Annual totals kWh/year													
Space heating fuel - main system													2615.9327 (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													2225.8321 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2615.9327	3.9700	103.8525 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	911.6541	3.9700	36.1927 (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			-7.7854 (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	2615.9327	0.2160	565.0415 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	911.6541	0.2160	196.9173 (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			761.9588 (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			86.3480 (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	2615.9327	1.2200	3191.4380 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	911.6541	1.2200	1112.2181 (264)
Space and water heating			4303.6560 (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			307.2688 (272)
Primary energy kWh/m2/year			3.2612 (273)

# BASIC COMPLIANCE REPORT

## Calculation Type: New Build (As Designed)



<b>Property Reference</b>	Plot 012 Er - SD	<b>Issued on Date</b>	08/07/2020
<b>Assessment Reference</b>	Plot 012 Er - SD	<b>Prop Type Ref</b>	PRJ009232
<b>Property</b>	Plot 012 Er - SD		

<b>SAP Rating</b>	84 B	<b>DER</b>	16.51	<b>TER</b>	17.90
<b>Environmental</b>	87 B	<b>% DER&lt;TER</b>	7.79		
<b>CO<sub>2</sub> Emissions (t/year)</b>	1.29	<b>DFEE</b>	45.29	<b>TFEE</b>	51.05
<b>General Requirements Compliance</b>	Pass	<b>% DFEE&lt;TFEE</b>	11.28		

<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)	17.90	kgCO <sub>2</sub> /m <sup>2</sup>	
Dwelling Carbon Dioxide Emission Rate (DER)	16.51	kgCO <sub>2</sub> /m <sup>2</sup>	Pass
	-1.39 (-7.8%)	kgCO <sub>2</sub> /m <sup>2</sup>	

##### 1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	51.05	kWh/m <sup>2</sup> /yr	
Dwelling Fabric Energy Efficiency (DFEE)	45.29	kWh/m <sup>2</sup> /yr	
	-5.7 (-11.2%)	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	1.30 (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 East	4.48 m <sup>2</sup> , No overhang	
Windows facing West	3.33 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.*