



elmhurst  
energy



## SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: Plot 30

Contact: Tobias Whiting  
Abacus Energy (UK) Ltd  
[toby@abacusenergyuk.com](mailto:toby@abacusenergyuk.com)

Report Issue Date: 08/02/2024

EXCELLENCE  
IN ENERGY  
ASSESSMENT

# PREDICTED ENERGY ASSESSMENT

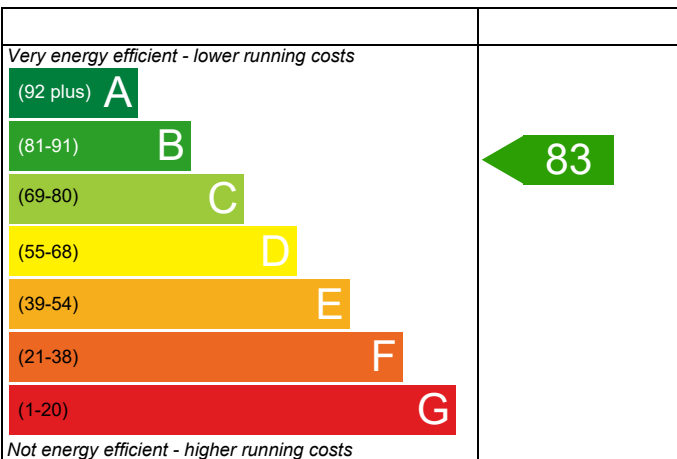
Plot 30

Dwelling type: Flat, Detached  
 Date of assessment: 08/02/2024  
 Produced by: Abacus Energy (UK) Ltd  
 Total floor area: 60.63 m<sup>2</sup>  
 DRRN: 6288-2002-0340

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.

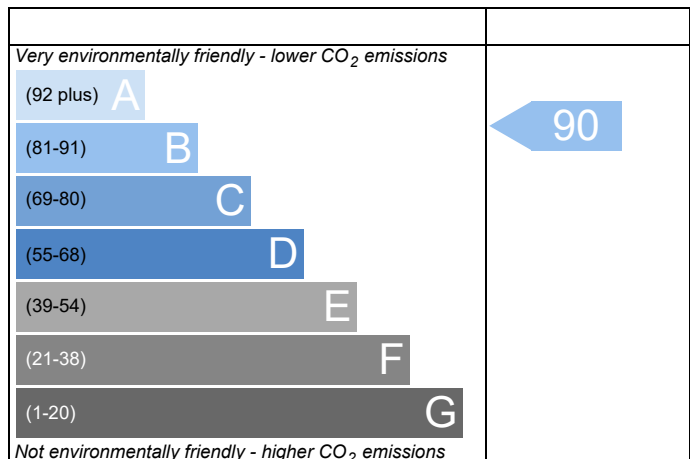
## Energy Efficiency Rating



**England** EU Directive 2002/91/EC

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.

## Environmental Impact (CO<sub>2</sub>) Rating



**England** EU Directive 2002/91/EC

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 been produced by an accredited Elmhurst member whose work is subject to quality assurance audits. The data used to produce the report has been verified by the Elmhurst members' portal.



# BUILDING REGULATION COMPLIANCE

## Calculation Type: New Build (As Designed)

Property Reference	SAP 0931 Plot 30	Issued on Date	08/02/2024
Assessment Reference	Rev B	Prop Type Ref	Block Ev
Property	Plot 30		

SAP Rating	83 B	DER	14.65	TER	19.99
Environmental	90 B	% DER<TER	26.73		
CO <sub>2</sub> Emissions (t/year)	0.71	DFEE	43.78	TFEE	52.78
General Requirements Compliance	Pass	% DFEE<TFEE	17.06		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com	Assessor ID	E477-0001
Client	Foreman Homes, FORE		

### 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)	19.99	kgCO <sub>2</sub> /m <sup>2</sup>	
Dwelling Carbon Dioxide Emission Rate (DER)	14.65	kgCO <sub>2</sub> /m <sup>2</sup>	Pass
	-5.34 (-26.7%)	kgCO <sub>2</sub> /m <sup>2</sup>	

##### 1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	52.78	kWh/m <sup>2</sup> /yr	
Dwelling Fabric Energy Efficiency (DFEE)	43.78	kWh/m <sup>2</sup> /yr	
	-9.0 (-17.0%)	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	0.22 (max. 0.30)	0.23 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Roof	0.11 (max. 0.20)	0.17 (max. 0.35)	Pass
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	Pass

##### 2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

##### 3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	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 Vaillant ecoFIT sustain 830 VUW 306/6-3 (H-GB) Combi boiler Efficiency: 89.3% 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	Programmer, room thermostat and TRVs	Pass
Hot water controls	No cylinder	
Boiler interlock	Yes	Pass

### 7 Low energy lights

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

### 8 Mechanical ventilation

Continuous supply and extract system			
Specific fan power	0.58		
Maximum	1.5		Pass
MVHR efficiency	93	%	
Minimum	70	%	Pass

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

### 9 Summertime temperature

Overheating risk (Southern England)	Medium	Pass
Based on:		
Overshading	Average	
Windows facing North East	4.52 m <sup>2</sup> , No overhang	
Windows facing South West	3.93 m <sup>2</sup> , No overhang	
Air change rate	4.00 ach	
Blinds/curtains	None	

## Criterion 4 – Building performance consistent with DER and DFEE rate

### Party Walls

Type	U-value	W/m <sup>2</sup> K	
			Pass

### Air permeability and pressure testing

#### 3 Air permeability

Air permeability at 50 pascals	5.00 (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	0.10	W/m <sup>2</sup> K
Door U-value	1.10	W/m <sup>2</sup> K
Photovoltaic array	418.00	kWh/Year

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# RECOMMENDATIONS

	Typical cost	Typical savings per year	Energy efficiency	Environmental impact	Result
Low energy lights			0	0	Already installed
Solar water heating			0	0	Not applicable
Photovoltaic			0	0	Not applicable
Wind turbine			0	0	Not applicable
<b>Totals</b>	<b>£0</b>	<b>£0</b>	<b>B 83</b>	<b>B 90</b>	

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# THERMAL BRIDGING

## Calculation Type: New Build (As Designed)

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Assessment Reference	Rev B	Prop Type Ref	Block Ev
Property	Plot 30		

SAP Rating	83 B	DER	14.65	TER	19.99
Environmental	90 B	% DER<TER	26.73		
CO <sub>2</sub> Emissions (t/year)	0.71	DFEE	43.78	TFEE	52.78
General Requirements Compliance	Pass	% DFEE<TFEE	17.06		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com	Assessor ID	E477-0001
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Client	Foreman Homes, FORE
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	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.043	1.01	0.04	Catnic Thermally Broken
External wall	E3 Sill	Independently assessed	0.021	8.05	0.17	Knauf P5
External wall	E4 Jamb	Independently assessed	0.014	10.44	0.15	Knauf P6
External wall	E7 Party floor between dwellings (in blocks of flats)	Table K1 - Approved	0.070	63.06	4.41	
External wall	E11 Eaves (insulation at rafter level)	Table K1 - Approved	0.040	7.20	0.29	
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.044	10.98	0.48	Knauf P21
External wall	E13 Gable (insulation at rafter level)	Independently assessed	0.010	3.08	0.03	Knauf P20
External wall	E16 Corner (normal)	Independently assessed	0.039	7.40	0.29	Knauf P23
External roof	R1 Head of roof window	Table K1 - Default	0.080	8.05	0.64	
External roof	R3 Jamb of roof window	Table K1 - Default	0.080	6.36	0.51	
External roof	R6 Flat ceiling	Table K1 - Default	0.060	10.17	0.61	
External roof	R8 Roof to wall (rafter)	Table K1 - Default	0.060	9.24	0.55	

Total: **8.18** W/mK:  
 Y-Value: **0.061** W/m<sup>2</sup>K:

# FULL SAP CALCULATION PRINTOUT

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CO <sub>2</sub> Emissions (t/year)	0.71	DFEE	43.78	TFEE	52.78
General Requirements Compliance	Pass	% DFEE<TFEE	17.06		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com			Assessor ID	E477-0001
Client	Foreman Homes, FORE				



# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)

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

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

DWELLING AS DESIGNED

Top-floor flat, total floor area 61 m<sup>2</sup>

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

#### 1a TER and DER

Fuel for main heating:Mains gas  
Fuel factor:1.00 (mains gas)  
Target Carbon Dioxide Emission Rate (TER) 19.99 kgCO<sub>2</sub>/m<sup>2</sup>  
Dwelling Carbon Dioxide Emission Rate (DER) 14.65 kgCO<sub>2</sub>/m<sup>2</sup>OK

#### 1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 52.8 kWh/m<sup>2</sup>/yr  
Dwelling Fabric Energy Efficiency (DFEE) 43.8 kWh/m<sup>2</sup>/yrOK

#### 2 Fabric U-values

Element	Average	Highest	
External wall	0.22 (max. 0.30)	0.23 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.11 (max. 0.20)	0.17 (max. 0.35)	OK
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

#### 2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

#### 3 Air permeability

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

#### 4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas  
Data from database  
Vaillant ecoFIT sustain 830 VUW 306/6-3 (H-GB)  
Combi boiler  
Efficiency: 89.3% SEDBUK2009  
Minimum: 88.0% OK

Secondary heating system: None

#### 5 Cylinder insulation

Hot water storage No cylinder

#### 6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls: No cylinder

Boiler interlock Yes OK

#### 7 Low energy lights

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

#### 8 Mechanical ventilation

Continuous supply and extract system  
Specific fan power: 0.58  
Maximum 1.5 OK  
MVHR efficiency: 93%  
Minimum: 70% OK

#### 9 Summertime temperature

Overheating risk (Southern England): Medium OK

Based on:

Overshading: Average  
Windows facing North East: 4.52 m<sup>2</sup>, No overhang  
Windows facing South West: 3.93 m<sup>2</sup>, No overhang  
Air change rate: 4.00 ach  
Blinds/curtains: None

#### 10 Key features

Party wall U-value 0.00 W/m<sup>2</sup>K  
Roof U-value 0.10 W/m<sup>2</sup>K  
Door U-value 1.10 W/m<sup>2</sup>K  
Photovoltaic array 418.00 kWh/Year

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)

### CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

#### 1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	60.6300 (1b)	x 2.3000 (2b)	= 139.4490 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.6300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 139.4490 (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)
Air changes per hour					
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) =	0.0000 (8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate					0.2500 (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) =		0.2313 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.2948	0.2891	0.2833	0.2544	0.2486	0.2197	0.2197	0.2139	0.2313	0.2486	0.2602	0.2717 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												65.1000 (23c)
Effective ac	0.4693	0.4636	0.4578	0.4289	0.4231	0.3942	0.3942	0.3884	0.4058	0.4231	0.4347	0.4462 (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
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			8.4500	1.1450	9.6756		(27)
Brick and Block	44.4900		44.4900	0.2200	9.7878	42.2200	1878.3678 (29a)
Wall to Corridor	15.2600	2.1200	13.1400	0.2300	3.0219	113.5000	1491.3900 (29a)
Dormers	12.7400	8.4500	4.2900	0.2300	0.9867	9.0000	38.6100 (29a)
Pitched Roof	54.4600		54.4600	0.1000	5.4460	9.1000	495.5860 (30)
Sloping Ceiling	7.8300		7.8300	0.1700	1.3311	9.1000	71.2530 (30)
Total net area of external elements Aum(A, m2)			134.7800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.5811		(33)
Party Floor 1			60.6300			70.0000	4244.1000 (32d)
Ground Floor Stud			115.6400			9.0000	1040.7600 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	9260.0668 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							152.7308 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.1808 (36)
Total fabric heat loss						(33) + (36) =	40.7618 (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
Jan	21.5983	21.3323	21.0663	19.7360	19.4700	18.1398	18.1398	17.8737	18.6719	19.4700	20.0021	20.5342 (38)
Heat transfer coeff	62.3602	62.0941	61.8281	60.4979	60.2318	58.9016	58.9016	58.6356	59.4337	60.2318	60.7639	61.2960 (39)
Average = Sum(39)m / 12 =												60.4314 (39)
HLP	1.0285	1.0241	1.0198	0.9978	0.9934	0.9715	0.9715	0.9671	0.9803	0.9934	1.0022	1.0110 (40)
HLP (average)												0.9967 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

#### 4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												1.9994 (42)
Average daily hot water use (litres/day)												81.6855 (43)
Daily hot water use	89.8541	86.5866	83.3192	80.0518	76.7844	73.5170	73.5170	76.7844	80.0518	83.3192	86.5866	89.8541 (44)

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)

### CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy conte	133.2510	116.5422	120.2611	104.8465	100.6027	86.8125	80.4445	92.3113	93.4138	108.8648	118.8344	129.0465 (45)
Energy content (annual)	Total = Sum(45)m = 1285.2312 (45)											
Distribution loss (46)m = 0.15 x (45)m												
	19.9876	17.4813	18.0392	15.7270	15.0904	13.0219	12.0667	13.8467	14.0121	16.3297	17.8252	19.3570 (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	1.3769	1.1605	1.1523	0.9652	0.8883	0.7340	0.6801	0.8151	0.8600	1.0431	1.1833	1.3335 (61)
Total heat required for water heating calculated for each month												
	134.6279	117.7026	121.4134	105.8117	101.4911	87.5465	81.1247	93.1264	94.2737	109.9079	120.0177	130.3799 (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	134.6279	117.7026	121.4134	105.8117	101.4911	87.5465	81.1247	93.1264	94.2737	109.9079	120.0177	130.3799 (64)
	Total per year (kWh/year) = Sum(64)m = 1297.4235 (64)											
Heat gains from water heating, kWh/month												
	44.6502	39.0404	40.2749	35.1028	33.6725	29.0486	26.9178	30.8973	31.2751	36.4583	39.8083	43.2413 (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	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	16.7091	14.8409	12.0694	9.1373	6.8303	5.7664	6.2308	8.0990	10.8705	13.8026	16.1097	17.1735 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	174.5330	176.3441	171.7801	162.0641	149.7993	138.2721	130.5713	128.7602	133.3241	143.0402	155.3049	166.8321 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970 (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)												
	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756 (71)
Water heating gains (Table 5)												
	60.0137	58.0958	54.1329	48.7538	45.2587	40.3453	36.1799	41.5286	43.4376	49.0031	55.2892	58.1200 (72)
Total internal gains	307.2466	305.2716	293.9733	275.9461	257.8791	240.3747	228.9728	234.3787	243.6230	261.8367	282.6947	298.1165 (73)

#### 6. Solar gains

[Jan]		Area	Solar flux	Specific data	FF	Access	Gains					
		m2	Table 6a	g	Specific data	factor	W					
			W/m2	or Table 6b	or Table 6c	Table 6d						
Northeast		4.5200	11.2829	0.6300	0.7000	0.7700	15.5859 (75)					
Southwest		3.9300	36.7938	0.6300	0.7000	0.7700	44.1916 (79)					
Solar gains	59.7775	107.0002	160.1534	221.4868	269.1216	276.4294	262.6563	225.7039	181.1704	121.9657	72.5424	50.5470 (83)
Total gains	367.0241	412.2718	454.1268	497.4329	527.0007	516.8041	491.6292	460.0825	424.7934	383.8024	355.2372	348.6636 (84)

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

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	41.2481	41.4249	41.6031	42.5179	42.7057	43.6701	43.6701	43.8683	43.2792	42.7057	42.3317	41.9643	
alpha	3.7499	3.7617	3.7735	3.8345	3.8470	3.9113	3.9113	3.9246	3.8853	3.8470	3.8221	3.7976	
util living area	0.9869	0.9787	0.9606	0.9139	0.8172	0.6565	0.5059	0.5541	0.7811	0.9351	0.9785	0.9891 (86)	
MIT	19.4305	19.6205	19.9338	20.3535	20.6978	20.9115	20.9754	20.9652	20.8166	20.3759	19.8432	19.4097 (87)	
Th 2	20.0596	20.0633	20.0669	20.0851	20.0888	20.1072	20.1072	20.1108	20.0998	20.0888	20.0815	20.0742 (88)	
util rest of house	0.9843	0.9743	0.9522	0.8949	0.7767	0.5856	0.4119	0.4594	0.7206	0.9170	0.9734	0.9869 (89)	
MIT 2	18.6233	18.8142	19.1255	19.5456	19.8649	20.0561	20.0976	20.0962	19.9816	19.5764	19.0503	18.6138 (90)	
Living area fraction												fLA = Living area / (4) = 0.3388 (91)	
MIT	18.8968	19.0874	19.3993	19.8193	20.1471	20.3459	20.3950	20.3906	20.2645	19.8473	19.3189	18.8834 (92)	
Temperature adjustment													0.0000
adjusted MIT	18.8968	19.0874	19.3993	19.8193	20.1471	20.3459	20.3950	20.3906	20.2645	19.8473	19.3189	18.8834 (93)	

#### 8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9799	0.9686	0.9448	0.8885	0.7795	0.6055	0.4431	0.4903	0.7328	0.9112	0.9679	0.9831 (94)
Ext temp.	359.6595	399.3157	429.0708	441.9556	410.7970	312.9503	217.8240	225.5953	311.2710	349.7140	343.8420	342.7731 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Month fracti	910.2565	880.9519	797.5392	660.5915	508.7824	338.4430	223.5292	233.9918	366.3797	556.9799	742.4690	900.0349 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating	409.6442	323.6595	274.1405	157.4179	72.9012	0.0000	0.0000	0.0000	0.0000	154.2058	287.0114	414.6027 (98)
Space heating per m2												2093.5832 (98)
												(98) / (4) = 34.5305 (99)

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)

### CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2321.0457 (211)
Space heating requirement	409.6442	323.6595	274.1405	157.4179	72.9012	0.0000	0.0000	0.0000	0.0000	154.2058	287.0114	414.6027	(98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)
Space heating fuel (main heating system)	454.1510	358.8242	303.9252	174.5209	80.8217	0.0000	0.0000	0.0000	0.0000	170.9599	318.1945	459.6483	(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	134.6279	117.7026	121.4134	105.8117	101.4911	87.5465	81.1247	93.1264	94.2737	109.9079	120.0177	130.3799	(64)
Efficiency of water heater (217)m	86.2790	85.9869	85.3848	83.9965	81.4871	76.2000	76.2000	76.2000	76.2000	83.7935	85.5646	86.4023	(217)
Fuel for water heating, kWh/month	156.0379	136.8843	142.1955	125.9715	124.5486	114.8904	106.4628	122.2132	123.7188	131.1652	140.2656	150.8988	(219)
Water heating fuel used													1575.2525 (219)
Annual totals kWh/year													
Space heating fuel - main system													2321.0457 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8120)													
mechanical ventilation fans (SFP = 0.8120)													138.1438 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													213.1438 (231)
Electricity for lighting (calculated in Appendix L)													295.0887 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses													4404.5306 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2321.0457	0.2160	501.3459	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1575.2525	0.2160	340.2545	(264)
Space and water heating			841.6004	(265)
Pumps and fans	213.1438	0.5190	110.6216	(267)
Energy for lighting	295.0887	0.5190	153.1510	(268)
Energy saving/generation technologies				
PV Unit	-418.0000	0.5190	-216.9420	(269)
Total CO2, kg/year			888.4310	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			14.6500	(273)

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

DER			14.6500	ZC1
Total Floor Area		TFA	60.6300	
Assumed number of occupants		N	1.9994	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			17.0583	ZC2
CO2 emissions from cooking, equation (L16)			2.7542	ZC3
Total CO2 emissions			34.4625	ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000	ZC5
Additional allowable electricity generation, kWh/m <sup>2</sup> /year			0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000	ZC7
Net CO2 emissions			34.4625	ZC8

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)

### CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

#### 1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	60.6300 (1b)	2.3000 (2b)	139.4490 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.6300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	139.4490 (5)

#### 2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				2 * 10 =	20.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Air changes per hour					
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) =	0.1434 (8)
Pressure test				Yes	
Measured/design AP50					5.0000
Infiltration rate					0.3934 (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) =	0.3639 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4640	0.4549	0.4458	0.4003	0.3912	0.3457	0.3457	0.3366	0.3639	0.3912	0.4094	0.4276 (22b)
Effective ac	0.6076	0.6035	0.5994	0.5801	0.5765	0.5598	0.5598	0.5567	0.5662	0.5765	0.5838	0.5914 (25)

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

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			2.1200	1.0000	2.1200		(26)					
TER Opening Type (Uw = 1.40)			8.4500	1.3258	11.2027		(27)					
Brick and Block	44.4900		44.4900	0.1800	8.0082		(29a)					
Wall to Corridor	15.2600	2.1200	13.1400	0.1800	2.3652		(29a)					
Dormers	12.7400	8.4500	4.2900	0.1800	0.7722		(29a)					
Pitched Roof	54.4600		54.4600	0.1300	7.0798		(30)					
Sloping Ceiling	7.8300		7.8300	0.1300	1.0179		(30)					
Total net area of external elements Aum(A, m2)			134.7800				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	32.5660	(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.5658 (36)					
Total fabric heat loss						(33) + (36) =	42.1318 (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	27.9627	27.7703	27.5818	26.6962	26.5305	25.7592	25.7592	25.6163	26.0563	26.5305	26.8657	27.2161 (38)
Average = Sum(39)m / 12 =	70.0944	69.9021	69.7135	68.8279	68.6622	67.8909	67.8909	67.7481	68.1880	68.6622	68.9974	69.3479 (39)
HLP	1.1561	1.1529	1.1498	1.1352	1.1325	1.1198	1.1198	1.1174	1.1247	1.1325	1.1380	1.1438 (40)
HLP (average)												1.1352 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

#### 4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												1.9994 (42)
Average daily hot water use (litres/day)												81.6855 (43)
Daily hot water use	89.8541	86.5866	83.3192	80.0518	76.7844	73.5170	73.5170	76.7844	80.0518	83.3192	86.5866	89.8541 (44)
Energy conte	133.2510	116.5422	120.2611	104.8465	100.6027	86.8125	80.4445	92.3113	93.4138	108.8648	118.8344	129.0465 (45)
Energy content (annual)												Total = Sum(45)m = 1285.2312 (45)
Distribution loss (46)m = 0.15 x (45)m	19.9876	17.4813	18.0392	15.7270	15.0904	13.0219	12.0667	13.8467	14.0121	16.3297	17.8252	19.3570 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)

### CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	45.7886	39.8536	42.4586	39.4776	39.1285	36.2549	37.4634	39.1285	39.4776	42.4586	42.7003	45.7886	45.7886	45.7886	(61)
Total heat required for water heating calculated for each month	179.0396	156.3957	162.7196	144.3241	139.7312	123.0674	117.9080	131.4398	132.8914	151.3233	161.5347	174.8351	174.8351	174.8351	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Output from w/h	179.0396	156.3957	162.7196	144.3241	139.7312	123.0674	117.9080	131.4398	132.8914	151.3233	161.5347	174.8351	174.8351	174.8351	(64)
Heat gains from water heating, kWh/month	55.7531	48.7137	50.6014	44.7309	43.2325	37.9289	36.1137	40.4756	40.9295	46.8122	50.1875	54.3551	54.3551	54.3551	(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	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.7091	14.8409	12.0694	9.1373	6.8303	5.7664	6.2308	8.0990	10.8705	13.8026	16.1097	17.1735	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	174.5330	176.3441	171.7801	162.0641	149.7993	138.2721	130.5713	128.7602	133.3241	143.0402	155.3049	166.8321	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	(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)	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	(71)
Water heating gains (Table 5)	74.9370	72.4906	68.0127	62.1262	58.1082	52.6790	48.5399	54.4027	56.8465	62.9196	69.7049	73.0579	(72)
Total internal gains	322.1699	319.6664	307.8531	289.3185	270.7287	252.7084	241.3328	247.2528	257.0320	275.7532	297.1103	313.0544	(73)

#### 6. Solar gains

[Jan]	Area	Solar flux	Specific data	g	FF	Access	Gains						
	m2	Table 6a	or Table 6b	W/m2	or Table 6c	factor	W						
						Table 6d							
Northeast	4.5200	11.2829	0.6300	0.7000	0.7700	15.5859	(75)						
Southwest	3.9300	36.7938	0.6300	0.7000	0.7700	44.1916	(79)						
Solar gains	59.7775	107.0002	160.1534	221.4868	269.1216	276.4294	262.6563	225.7039	181.1704	121.9657	72.5424	50.5470	(83)
Total gains	381.9474	426.6666	468.0066	510.8052	539.8502	529.1377	503.9891	472.9566	438.2023	397.7189	369.6528	363.6015	(84)

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

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
tau	60.0678	60.2331	60.3960	61.1731	61.3207	62.0174	62.0174	62.1481	61.7472	61.3207	61.0228	60.7144		
alpha	5.0045	5.0155	5.0264	5.0782	5.0880	5.1345	5.1345	5.1432	5.1165	5.0880	5.0682	5.0476		
util living area	0.9975	0.9952	0.9887	0.9660	0.8973	0.7450	0.5756	0.6304	0.8647	0.9768	0.9951	0.9981	(86)	
MIT	19.7783	19.9150	20.1509	20.4728	20.7604	20.9373	20.9865	20.9790	20.8575	20.4940	20.0822	19.7561	(87)	
Th 2	19.9553	19.9578	19.9604	19.9722	19.9744	19.9847	19.9847	19.9866	19.9807	19.9744	19.9699	19.9652	(88)	
util rest of house	0.9967	0.9936	0.9846	0.9526	0.8563	0.6552	0.4515	0.5055	0.7973	0.9652	0.9931	0.9974	(89)	
MIT 2	18.3311	18.5323	18.8768	19.3455	19.7335	19.9417	19.9796	19.9777	19.8631	19.3831	18.7856	18.3058	(90)	
Living area fraction	18.8214	19.0008	19.3085	19.7274	20.0814	20.2789	20.3207	20.3169	20.2000	19.7594	19.2248	18.7971	(92)	
Temperature adjustment												0.0000		
adjusted MIT	18.8214	19.0008	19.3085	19.7274	20.0814	20.2789	20.3207	20.3169	20.2000	19.7594	19.2248	18.7971	(93)	

#### 8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	380.1751	423.0129	459.1662	484.5596	464.9454	361.5098	248.9200	259.2263	356.6754	382.5862	366.3426	362.2720	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1017.8698	985.6724	892.9223	745.2283	575.4842	385.5490	252.6050	265.3647	415.9444	628.9077	836.5817	1012.2772	(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	474.4449	378.1072	322.7145	187.6815	82.2409	0.0000	0.0000	0.0000	0.0000	183.2632	338.5721	483.6039	(98)
Space heating												2450.6282	(98)
Space heating per m2												40.4194	(99)

#### 8c. Space cooling requirement

Not applicable

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)

### CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2623.7989 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	474.4449	378.1072	322.7145	187.6815	82.2409	0.0000	0.0000	0.0000	0.0000	183.2632	338.5721	483.6039	(98)
Space heating efficiency (main heating system 1)	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000	(210)
Space heating fuel (main heating system)	507.9710	404.8257	345.5187	200.9437	88.0524	0.0000	0.0000	0.0000	0.0000	196.2133	362.4969	517.7772	(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	179.0396	156.3957	162.7196	144.3241	139.7312	123.0674	117.9080	131.4398	132.8914	151.3233	161.5347	174.8351	(64)
Efficiency of water heater (217)m	87.3886	87.1911	86.7428	85.7135	83.7675	80.3000	80.3000	80.3000	80.3000	85.5343	86.8708	80.3000	(216)
Fuel for water heating, kWh/month	204.8777	179.3712	187.5886	168.3797	166.8084	153.2596	146.8344	163.6859	165.4936	176.9153	185.9483	199.8609	(219)
Water heating fuel used													2099.0234 (219)
Annual totals kWh/year													
Space heating fuel - main system													2623.7989 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													75.0000 (231)
Electricity for lighting (calculated in Appendix L)													295.0887 (232)
Total delivered energy for all uses													5092.9110 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2623.7989	0.2160	566.7406 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2099.0234	0.2160	453.3891 (264)
Space and water heating			1020.1296 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	295.0887	0.5190	153.1510 (268)
Total CO2, kg/m2/year			1212.2056 (272)
Emissions per m2 for space and water heating			16.8255 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.5260 (272b)
Emissions per m2 for pumps and fans			0.6420 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.8255 * 1.00) + 2.5260 + 0.6420, rounded to 2 d.p.			19.9900 (273)

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)

### CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

#### 1. Overall dwelling dimensions

	Area (m <sup>2</sup> )	Storey height (m)	Volume (m <sup>3</sup> )
Ground floor	60.6300 (1b)	2.3000 (2b)	139.4490 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.6300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	139.4490 (5)

#### 2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				2 * 10 =	20.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) =	0.1434 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3934 (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) =	0.3639 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4640	0.4549	0.4458	0.4003	0.3912	0.3457	0.3457	0.3366	0.3639	0.3912	0.4094	0.4276 (22b)
Effective ac	0.6076	0.6035	0.5994	0.5801	0.5765	0.5598	0.5598	0.5567	0.5662	0.5765	0.5838	0.5914 (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
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			8.4500	1.1450	9.6756		(27)
Brick and Block	44.4900		44.4900	0.2200	9.7878	42.2200	1878.3678 (29a)
Wall to Corridor	15.2600	2.1200	13.1400	0.2300	3.0219	113.5000	1491.3900 (29a)
Dormers	12.7400	8.4500	4.2900	0.2300	0.9867	9.0000	38.6100 (29a)
Pitched Roof	54.4600		54.4600	0.1000	5.4460	9.1000	495.5860 (30)
Sloping Ceiling	7.8300		7.8300	0.1700	1.3311	9.1000	71.2530 (30)
Total net area of external elements Aum(A, m <sup>2</sup> )			134.7800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.5811		(33)
Party Floor 1			60.6300			70.0000	4244.1000 (32d)
Ground Floor Stud			115.6400			9.0000	1040.7600 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	9260.0668 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m <sup>2</sup> K		152.7308 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)		8.1808 (36)
Total fabric heat loss	(33) + (36) =	40.7618 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	27.9627	27.7703	27.5818	26.6962	26.5305	25.7592	25.7592	25.6163	26.0563	26.5305	26.8657	27.2161 (38)
Heat transfer coeff	68.7245	68.5321	68.3436	67.4580	67.2923	66.5210	66.5210	66.3782	66.8181	67.2923	67.6275	67.9779 (39)
Average = Sum(39)m / 12 =												67.4572 (39)
HLP	1.1335	1.1303	1.1272	1.1126	1.1099	1.0972	1.0972	1.0948	1.1021	1.1099	1.1154	1.1212 (40)
HLP (average)												1.1126 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

#### 4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												1.9994 (42)
Average daily hot water use (litres/day)												81.6855 (43)
Daily hot water use	89.8541	86.5866	83.3192	80.0518	76.7844	73.5170	73.5170	76.7844	80.0518	83.3192	86.5866	89.8541 (44)
Energy conte	133.2510	116.5422	120.2611	104.8465	100.6027	86.8125	80.4445	92.3113	93.4138	108.8648	118.8344	129.0465 (45)
Energy content (annual)										Total = Sum(45)m =		1285.2312 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)



# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)

### CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Heat gains from water heating, kWh/month	28.3158	24.7652	25.5555	22.2799	21.3781	18.4477	17.0945	19.6161	19.8504	23.1338	25.2523	27.4224	(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	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.7091	14.8409	12.0694	9.1373	6.8303	5.7664	6.2308	8.0990	10.8705	13.8026	16.1097	17.1735	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	174.5330	176.3441	171.7801	162.0641	149.7993	138.2721	130.5713	128.7602	133.3241	143.0402	155.3049	166.8321	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	(71)
Water heating gains (Table 5)	38.0589	36.8530	34.3488	30.9443	28.7340	25.6217	22.9764	26.3658	27.5700	31.0938	35.0727	36.8580	(72)
Total internal gains	282.2919	281.0288	271.1892	255.1366	238.3544	222.6511	212.7694	216.2158	224.7555	240.9274	259.4781	273.8545	(73)

#### 6. Solar gains

[Jan]		Area	Solar flux	Specific data	FF	Access	Gains						
		m2	Table 6a	g		factor	W						
			W/m2	or Table 6b	or Table 6c	Table 6d							
Northeast		4.5200	11.2829	0.6300	0.7000	0.7700	15.5859 (75)						
Southwest		3.9300	36.7938	0.6300	0.7000	0.7700	44.1916 (79)						
Solar gains	59.7775	107.0002	160.1534	221.4868	269.1216	276.4294	262.6563	225.7039	181.1704	121.9657	72.5424	50.5470	(83)
Total gains	342.0694	388.0290	431.3426	476.6233	507.4760	499.0805	475.4257	441.9197	405.9259	362.8930	332.0206	324.4016	(84)

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

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	37.4283	37.5334	37.6369	38.1310	38.2249	38.6681	38.6681	38.7513	38.4962	38.2249	38.0354	37.8394	
alpha	3.4952	3.5022	3.5091	3.5421	3.5483	3.5779	3.5779	3.5834	3.5664	3.5483	3.5357	3.5226	
util living area	0.9898	0.9832	0.9688	0.9322	0.8537	0.7157	0.5688	0.6214	0.8278	0.9507	0.9835	0.9915	(86)
MIT	19.1820	19.3767	19.7102	20.1597	20.5646	20.8445	20.9495	20.9302	20.7168	20.1977	19.6150	19.1507	(87)
Th 2	19.9736	19.9761	19.9787	19.9905	19.9928	20.0032	20.0032	20.0051	19.9991	19.9928	19.9883	19.9836	(88)
util rest of house	0.9875	0.9795	0.9616	0.9156	0.8156	0.6401	0.4580	0.5122	0.7694	0.9354	0.9793	0.9896	(89)
MIT 2	18.3124	18.5075	18.8390	19.2862	19.6669	19.9125	19.9836	19.9757	19.8137	19.3312	18.7546	18.2887	(90)
Living area fraction										fLA = Living area / (4) =		0.3388	(91)
MIT	18.6070	18.8019	19.1341	19.5821	19.9710	20.2282	20.3108	20.2990	20.1196	19.6247	19.0461	18.5807	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6070	18.8019	19.1341	19.5821	19.9710	20.2282	20.3108	20.2990	20.1196	19.6247	19.0461	18.5807	(93)

#### 8. Space heating requirement

Utilisation	0.9836	0.9740	0.9542	0.9076	0.8147	0.6586	0.4940	0.5466	0.7774	0.9284	0.9741	0.9862	(94)
Useful gains	336.4524	377.9561	411.5784	432.5608	413.4233	328.6936	234.8775	241.5608	315.5727	336.8973	323.4377	319.9207	(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	983.2400	952.7300	863.4629	720.5963	556.5754	374.3956	246.8474	258.8115	402.2203	607.2950	807.8843	977.5702	(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	481.2099	386.2480	336.2021	207.3855	106.5051	0.0000	0.0000	0.0000	0.0000	201.1759	348.8016	489.2913	(98)
Space heating												2556.8194	(98)
Space heating per m2											(98) / (4) =	42.1709	(99)

#### 8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	625.2973	492.2553	504.4740	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8013	0.8661	0.8394	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	501.0565	426.3418	423.4607	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	658.4968	629.4204	591.5860	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)

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Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	113.3571	151.0904	125.0852	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												389.5327 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	28.3393	37.7726	31.2713	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												97.3832 (107)
Space cooling per m2												1.6062 (108)
Energy for space heating												42.1709 (99)
Energy for space cooling												1.6062 (108)
Total												43.7771 (109)
Dwelling Fabric Energy Efficiency (DFEE)												43.8 (109)

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# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)

### CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

#### 1. Overall dwelling dimensions

	Area (m <sup>2</sup> )	Storey height (m)	Volume (m <sup>3</sup> )
Ground floor	60.6300 (1b)	2.3000 (2b)	139.4490 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.6300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	139.4490 (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				2 * 10 =	20.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Air changes per hour					
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) =	0.1434 (8)
Pressure test				Yes	
Measured/design AP50					5.0000
Infiltration rate					0.3934 (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) =	0.3639 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4640	0.4549	0.4458	0.4003	0.3912	0.3457	0.3457	0.3366	0.3639	0.3912	0.4094	0.4276 (22b)
Effective ac	0.6076	0.6035	0.5994	0.5801	0.5765	0.5598	0.5598	0.5567	0.5662	0.5765	0.5838	0.5914 (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					
TER Opaque door			2.1200	1.0000	2.1200		(26)					
TER Opening Type (Uw = 1.40)			8.4500	1.3258	11.2027		(27)					
Brick and Block	44.4900		44.4900	0.1800	8.0082		(29a)					
Wall to Corridor	15.2600	2.1200	13.1400	0.1800	2.3652		(29a)					
Dormers	12.7400	8.4500	4.2900	0.1800	0.7722		(29a)					
Pitched Roof	54.4600		54.4600	0.1300	7.0798		(30)					
Sloping Ceiling	7.8300		7.8300	0.1300	1.0179		(30)					
Total net area of external elements Aum(A, m <sup>2</sup> )			134.7800				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	32.5660	(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m <sup>2</sup> K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.5658 (36)					
Total fabric heat loss						(33) + (36) =	42.1318 (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	27.9627	27.7703	27.5818	26.6962	26.5305	25.7592	25.7592	25.6163	26.0563	26.5305	26.8657	27.2161 (38)
Average = Sum(39)m / 12 =	70.0944	69.9021	69.7135	68.8279	68.6622	67.8909	67.8909	67.7481	68.1880	68.6622	68.9974	69.3479 (39)
HLP	1.1561	1.1529	1.1498	1.1352	1.1325	1.1198	1.1198	1.1174	1.1247	1.1325	1.1380	1.1438 (40)
HLP (average)												1.1352 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

#### 4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												1.9994 (42)
Average daily hot water use (litres/day)												81.6855 (43)
Daily hot water use	89.8541	86.5866	83.3192	80.0518	76.7844	73.5170	73.5170	76.7844	80.0518	83.3192	86.5866	89.8541 (44)
Energy conte	133.2510	116.5422	120.2611	104.8465	100.6027	86.8125	80.4445	92.3113	93.4138	108.8648	118.8344	129.0465 (45)
Energy content (annual)												Total = Sum(45)m = 1285.2312 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

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### CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	28.3158	24.7652	25.5555	22.2799	21.3781	18.4477	17.0945	19.6161	19.8504	23.1338	25.2523	27.4224	(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	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.7091	14.8409	12.0694	9.1373	6.8303	5.7664	6.2308	8.0990	10.8705	13.8026	16.1097	17.1735	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	174.5330	176.3441	171.7801	162.0641	149.7993	138.2721	130.5713	128.7602	133.3241	143.0402	155.3049	166.8321	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	(71)
Water heating gains (Table 5)	38.0589	36.8530	34.3488	30.9443	28.7340	25.6217	22.9764	26.3658	27.5700	31.0938	35.0727	36.8580	(72)
Total internal gains	282.2919	281.0288	271.1892	255.1366	238.3544	222.6511	212.7694	216.2158	224.7555	240.9274	259.4781	273.8545	(73)

#### 6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains							
	m2	Table 6a	Specific data	Specific data	factor	W							
		W/m2	or Table 6b	or Table 6c	Table 6d								
Northeast	4.5200	11.2829	0.6300	0.7000	0.7700	15.5859 (75)							
Southwest	3.9300	36.7938	0.6300	0.7000	0.7700	44.1916 (79)							
Solar gains	59.7775	107.0002	160.1534	221.4868	269.1216	276.4294	262.6563	225.7039	181.1704	121.9657	72.5424	50.5470	(83)
Total gains	342.0694	388.0290	431.3426	476.6233	507.4760	499.0805	475.4257	441.9197	405.9259	362.8930	332.0206	324.4016	(84)

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

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	60.0678	60.2331	60.3960	61.1731	61.3207	62.0174	62.0174	62.1481	61.7472	61.3207	61.0228	60.7144	
alpha	5.0045	5.0155	5.0264	5.0782	5.0880	5.1345	5.1345	5.1432	5.1165	5.0880	5.0682	5.0476	
util living area	0.9985	0.9969	0.9920	0.9740	0.9153	0.7740	0.6055	0.6661	0.8916	0.9840	0.9970	0.9989	(86)
MIT	19.7173	19.8565	20.0970	20.4275	20.7295	20.9249	20.9831	20.9731	20.8310	20.4453	20.0250	19.6958	(87)
Th 2	19.9553	19.9578	19.9604	19.9722	19.9744	19.9847	19.9847	19.9866	19.9807	19.9744	19.9699	19.9652	(88)
util rest of house	0.9980	0.9958	0.9890	0.9633	0.8791	0.6860	0.4773	0.5381	0.8314	0.9756	0.9957	0.9985	(89)
MIT 2	18.7856	18.9265	19.1676	19.5017	19.7848	19.9486	19.9803	19.9786	19.8819	19.5243	19.1046	18.7721	(90)
Living area fraction	fLA = Living area / (4) =												
MIT	19.1012	19.2415	19.4825	19.8153	20.1048	20.2793	20.3200	20.3155	20.2034	19.8363	19.4164	19.0850	(92)
Temperature adjustment	0.0000												
adjusted MIT	19.1012	19.2415	19.4825	19.8153	20.1048	20.2793	20.3200	20.3155	20.2034	19.8363	19.4164	19.0850	(93)

#### 8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9974	0.9947	0.9872	0.9613	0.8845	0.7138	0.5213	0.5821	0.8468	0.9742	0.9948	0.9980	(94)
Useful gains	341.1793	385.9863	425.8355	458.1816	448.8391	356.2382	247.8575	257.2374	343.7221	353.5125	330.2873	323.7556	(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	1037.4827	1002.5028	905.0534	751.2793	577.0948	385.5753	252.5542	265.2677	416.1805	634.1868	849.8020	1032.2453	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	518.0497	414.2991	356.5382	211.0303	95.4222	0.0000	0.0000	0.0000	0.0000	208.8217	374.0505	527.1163	(98)
Space heating	(98) / (4) =												
Space heating per m2	2705.3280 (98)												
	44.6203 (99)												

#### 8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	638.1747	502.3928	514.8855	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8498	0.9153	0.8894	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	542.3320	459.8535	457.9361	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	658.4968	629.4204	591.5860	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	83.6387	126.1577	99.4355	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling	309.2319 (104)												

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)

### CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Cooled fraction											FC = cooled area / (4) =	1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	20.9097	31.5394	24.8589	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											77.3080 (107)	
Space cooling per m2											1.2751 (108)	
Energy for space heating											44.6203 (99)	
Energy for space cooling											1.2751 (108)	
Total											45.8954 (109)	
Target Fabric Energy Efficiency (TFEE)											52.8 (109)	

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# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)

### CALCULATION OF HEAT DEMAND 09 Jan 2014

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

#### 1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	60.6300 (1b)	x 2.3000 (2b)	= 139.4490 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.6300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 139.4490 (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)							
Air changes per hour												
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) =	0.0000 (8)							
Pressure test				Yes								
Measured/design AP50				5.0000								
Infiltration rate				0.2500	(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) =		0.2313 (21)							
Wind speed	Jan 5.1000	Feb 4.7000	Mar 4.6000	Apr 4.3000	May 4.3000	Jun 4.0000	Jul 4.0000	Aug 3.9000	Sep 4.0000	Oct 4.5000	Nov 4.4000	Dec 4.7000 (22)
Wind factor	1.2750	1.1750	1.1500	1.0750	1.0750	1.0000	1.0000	0.9750	1.0000	1.1250	1.1000	1.1750 (22a)
Adj infilt rate	0.2948	0.2717	0.2659	0.2486	0.2486	0.2313	0.2313	0.2255	0.2313	0.2602	0.2544	0.2717 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												65.1000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.4693	0.4462	0.4404	0.4231	0.4231	0.4058	0.4058	0.4000	0.4058	0.4347	0.4289	0.4462 (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					
Front Door			2.1200	1.1000	2.3320		(26)					
Windows (Uw = 1.20)			8.4500	1.1450	9.6756		(27)					
Brick and Block	44.4900		44.4900	0.2200	9.7878	42.2200	1878.3678 (29a)					
Wall to Corridor	15.2600	2.1200	13.1400	0.2300	3.0219	113.5000	1491.3900 (29a)					
Dormers	12.7400	8.4500	4.2900	0.2300	0.9867	9.0000	38.6100 (29a)					
Pitched Roof	54.4600		54.4600	0.1000	5.4460	9.1000	495.5860 (30)					
Sloping Ceiling	7.8300		7.8300	0.1700	1.3311	9.1000	71.2530 (30)					
Total net area of external elements Aum(A, m2)			134.7800				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.5811		(33)					
Party Floor 1			60.6300			70.0000	4244.1000 (32d)					
Ground Floor Stud			115.6400			9.0000	1040.7600 (32c)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	9260.0668 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							152.7308 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.1808 (36)					
Total fabric heat loss						(33) + (36) =	40.7618 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 21.5983	Feb 20.5342	Mar 20.2681	Apr 19.4700	May 19.4700	Jun 18.6719	Jul 18.6719	Aug 18.4058	Sep 18.6719	Oct 20.0021	Nov 19.7360	Dec 20.5342 (38)
Heat transfer coeff	62.3602	61.2960	61.0299	60.2318	60.2318	59.4337	59.4337	59.1676	59.4337	60.7639	60.4979	61.2960 (39)
Average = Sum(39)m / 12 =												60.4314 (39)
HLP	Jan 1.0285	Feb 1.0110	Mar 1.0066	Apr 0.9934	May 0.9934	Jun 0.9803	Jul 0.9803	Aug 0.9759	Sep 0.9803	Oct 1.0022	Nov 0.9978	Dec 1.0110 (40)
HLP (average)												0.9967 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

#### 4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												1.9994 (42)
Average daily hot water use (litres/day)												81.6855 (43)
Daily hot water use	89.8541	86.5866	83.3192	80.0518	76.7844	73.5170	73.5170	76.7844	80.0518	83.3192	86.5866	89.8541 (44)

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)

### CALCULATION OF HEAT DEMAND 09 Jan 2014

Energy content (annual)	133.2510	116.5422	120.2611	104.8465	100.6027	86.8125	80.4445	92.3113	93.4138	108.8648	118.8344	129.0465 (45)
Distribution loss (46)m = 0.15 x (45)m	19.9876	17.4813	18.0392	15.7270	15.0904	13.0219	12.0667	13.8467	14.0121	16.3297	17.8252	19.3570 (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	1.3769	1.1605	1.1523	0.9652	0.8883	0.7340	0.6801	0.8151	0.8600	1.0431	1.1833	1.3335 (61)
Total heat required for water heating calculated for each month	134.6279	117.7026	121.4134	105.8117	101.4911	87.5465	81.1247	93.1264	94.2737	109.9079	120.0177	130.3799 (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	134.6279	117.7026	121.4134	105.8117	101.4911	87.5465	81.1247	93.1264	94.2737	109.9079	120.0177	130.3799 (64)
RHI water heating demand												1297 (64)
Heat gains from water heating, kWh/month	44.6502	39.0404	40.2749	35.1028	33.6725	29.0486	26.9178	30.8973	31.2751	36.4583	39.8083	43.2413 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	119.9634	119.9634	119.9634	119.9634	119.9634	119.9634	119.9634	119.9634	119.9634	119.9634	119.9634	119.9634 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.7729	37.1023	30.1736	22.8434	17.0757	14.4160						
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	260.4970	263.2001	256.3883	241.8867	223.5810	206.3763	194.8825	192.1794	198.9912	213.4928	231.7984	249.0032 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	48.9957	48.9957	48.9957	48.9957	48.9957	48.9957	48.9957	48.9957	48.9957	48.9957	48.9957	48.9957 (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)	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756 (71)
Water heating gains (Table 5)	60.0137	58.0958	54.1329	48.7538	45.2587	40.3453	36.1799	41.5286	43.4376	49.0031	55.2892	58.1200 (72)
Total internal gains	454.2670	450.3817	432.6783	405.4674	377.8990	353.1212	338.6229	345.9391	361.5886	388.9859	419.3454	442.0406 (73)

#### 6. Solar gains

[Jan]		Area	Solar flux	Specific data	FF	Access	Gains					
		m <sup>2</sup>	Table 6a	g	Specific data	factor	W					
			W/m <sup>2</sup>	or Table 6b	or Table 6c	Table 6d						
Northeast		4.5200	15.0428	0.6300	0.7000	0.7700	20.7797 (75)					
Southwest		3.9300	46.3896	0.6300	0.7000	0.7700	55.7166 (79)					
Solar gains	76.4964	117.4534	175.9396	249.2947	290.2685	322.9259	299.4037	262.2105	211.5908	141.9074	92.0732	61.7107 (83)
Total gains	530.7634	567.8351	608.6179	654.7621	668.1674	676.0471	638.0267	608.1495	573.1793	530.8933	511.4186	503.7513 (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	41.2481	41.9643	42.1472	42.7057	42.7057	43.2792	43.2792	43.4738	43.2792	42.3317	42.5179	41.9643
alpha	3.7499	3.7976	3.8098	3.8470	3.8470	3.8853	3.8853	3.8983	3.8853	3.8221	3.8345	3.7976
util living area	0.9504	0.9355	0.8964	0.8121	0.6720	0.4759	0.3410	0.3557	0.5809	0.8126	0.9167	0.9557 (86)
MIT	19.9176	20.0558	20.3245	20.6386	20.8672	20.9740	20.9946	20.9938	20.9446	20.7029	20.3161	19.9118 (87)
Th 2	20.0596	20.0742	20.0778	20.0888	20.0888	20.0998	20.0998	20.1035	20.0998	20.0815	20.0851	20.0742 (88)
util rest of house	0.9409	0.9237	0.8774	0.7793	0.6182	0.4053	0.2598	0.2715	0.5069	0.7709	0.8990	0.9471 (89)
MIT 2	19.1011	19.2462	19.5063	19.8053	20.0002	20.0873	20.0983	20.1017	20.0704	19.8628	19.5091	19.1077 (90)
Living area fraction										fLA = Living area / (4) =		0.3388 (91)
MIT	19.3777	19.5205	19.7835	20.0876	20.2939	20.3877	20.4019	20.4039	20.3665	20.1474	19.7825	19.3801 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3777	19.5205	19.7835	20.0876	20.2939	20.3877	20.4019	20.4039	20.3665	20.1474	19.7825	19.3801 (93)

#### 8. Space heating requirement

Utilisation	0.9328	0.9154	0.8706	0.7792	0.6309	0.4283	0.2873	0.3000	0.5296	0.7742	0.8922	0.9393 (94)
Useful gains	495.0748	519.8085	529.8370	510.1995	421.5634	289.5486	183.3018	182.4446	303.5676	411.0015	456.2740	473.1985 (95)
Ext temp.	5.4000	5.7000	7.3000	9.6000	12.6000	15.4000	17.3000	17.3000	15.0000	11.8000	8.4000	5.5000 (96)
Heat loss rate W	871.6529	847.1411	761.8679	631.6857	463.4183	296.4349	184.3579	183.6522	318.9537	507.2214	688.6172	850.7937 (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	280.1741	219.9675	172.6310	87.4700	31.1400	0.0000	0.0000	0.0000	0.0000	71.5876	167.2871	280.9308 (98)
Space heating												1311.1881 (98)
RHI space heating demand												1311 (98)

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)

### CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

#### 1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	60.6300 (1b)	x 2.3000 (2b)	= 139.4490 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.6300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 139.4490 (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)							
Air changes per hour												
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) =	0.0000 (8)							
Pressure test				Yes								
Measured/design AP50				5.0000								
Infiltration rate					0.2500 (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) =		0.2313 (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	0.2948	0.2891	0.2833	0.2544	0.2486	0.2197	0.2197	0.2139	0.2313	0.2486	0.2602	0.2717 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												65.1000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.4693	0.4636	0.4578	0.4289	0.4231	0.3942	0.3942	0.3884	0.4058	0.4231	0.4347	0.4462 (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					
Front Door			2.1200	1.1000	2.3320		(26)					
Windows (Uw = 1.20)			8.4500	1.1450	9.6756		(27)					
Brick and Block	44.4900		44.4900	0.2200	9.7878	42.2200	1878.3678 (29a)					
Wall to Corridor	15.2600	2.1200	13.1400	0.2300	3.0219	113.5000	1491.3900 (29a)					
Dormers	12.7400	8.4500	4.2900	0.2300	0.9867	9.0000	38.6100 (29a)					
Pitched Roof	54.4600		54.4600	0.1000	5.4460	9.1000	495.5860 (30)					
Sloping Ceiling	7.8300		7.8300	0.1700	1.3311	9.1000	71.2530 (30)					
Total net area of external elements Aum(A, m2)			134.7800				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.5811		(33)					
Party Floor 1			60.6300			70.0000	4244.1000 (32d)					
Ground Floor Stud			115.6400			9.0000	1040.7600 (32c)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	9260.0668 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							152.7308 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.1808 (36)					
Total fabric heat loss						(33) + (36) =	40.7618 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 21.5983	Feb 21.3323	Mar 21.0663	Apr 19.7360	May 19.4700	Jun 18.1398	Jul 18.1398	Aug 17.8737	Sep 18.6719	Oct 19.4700	Nov 20.0021	Dec 20.5342 (38)
Heat transfer coeff	62.3602	62.0941	61.8281	60.4979	60.2318	58.9016	58.9016	58.6356	59.4337	60.2318	60.7639	61.2960 (39)
Average = Sum(39)m / 12 =												60.4314 (39)
HLP	Jan 1.0285	Feb 1.0241	Mar 1.0198	Apr 0.9978	May 0.9934	Jun 0.9715	Jul 0.9715	Aug 0.9671	Sep 0.9803	Oct 0.9934	Nov 1.0022	Dec 1.0110 (40)
HLP (average)												0.9967 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

#### 4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												1.9994 (42)
Average daily hot water use (litres/day)												81.6855 (43)
Daily hot water use	89.8541	86.5866	83.3192	80.0518	76.7844	73.5170	73.5170	76.7844	80.0518	83.3192	86.5866	89.8541 (44)

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)

### CALCULATION OF ENERGY RATINGS 09 Jan 2014

Energy conte	133.2510	116.5422	120.2611	104.8465	100.6027	86.8125	80.4445	92.3113	93.4138	108.8648	118.8344	129.0465 (45)											
Energy content (annual)												Total = Sum(45)m = 1285.2312 (45)											
Distribution loss (46)m = 0.15 x (45)m												19.9876	17.4813	18.0392	15.7270	15.0904	13.0219	12.0667	13.8467	14.0121	16.3297	17.8252	19.3570 (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												Total heat required for water heating calculated for each month											
Combi loss	1.3769	1.1605	1.1523	0.9652	0.8883	0.7340	0.6801	0.8151	0.8600	1.0431	1.1833	1.3335 (61)											
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	134.6279	117.7026	121.4134	105.8117	101.4911	87.5465	81.1247	93.1264	94.2737	109.9079	120.0177	130.3799 (62)											
Heat gains from water heating, kWh/month	44.6502	39.0404	40.2749	35.1028	33.6725	29.0486	26.9178	30.8973	31.2751	36.4583	39.8083	43.2413 (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	119.9634	119.9634	119.9634	119.9634	119.9634	119.9634	119.9634	119.9634	119.9634	119.9634	119.9634	119.9634 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.7729	37.1023	30.1736	22.8434	17.0757	14.4160	15.5770	20.2476	27.1763	34.5065	40.2742	42.9338 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	260.4970	263.2001	256.3883	241.8867	223.5810	206.3763	194.8825	192.1794	198.9912	213.4928	231.7984	249.0032 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	48.9957	48.9957	48.9957	48.9957	48.9957	48.9957	48.9957	48.9957	48.9957	48.9957	48.9957	48.9957 (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)	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756 (71)
Water heating gains (Table 5)	60.0137	58.0958	54.1329	48.7538	45.2587	40.3453	36.1799	41.5286	43.4376	49.0031	55.2892	58.1200 (72)
Total internal gains	454.2670	450.3817	432.6783	405.4674	377.8990	353.1212	338.6229	345.9391	361.5886	388.9859	419.3454	442.0406 (73)

#### 6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W						
Northeast	4.5200	11.2829	0.6300	0.7000	0.7700	15.5859 (75)						
Southwest	3.9300	36.7938	0.6300	0.7000	0.7700	44.1916 (79)						
Solar gains	59.7775	107.0002	160.1534	221.4868	269.1216	276.4294	262.6563	225.7039	181.1704	121.9657	72.5424	50.5470 (83)
Total gains	514.0445	557.3819	592.8317	626.9542	647.0206	629.5505	601.2793	571.6429	542.7589	510.9516	491.8878	492.5876 (84)

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

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	41.2481	41.4249	41.6031	42.5179	42.7057	43.6701	43.6701	43.8683	43.2792	42.7057	42.3317	41.9643
alpha	3.7499	3.7617	3.7735	3.8345	3.8470	3.9113	3.9113	3.9246	3.8853	3.8470	3.8221	3.7976
util living area	0.9628	0.9476	0.9174	0.8497	0.7330	0.5636	0.4218	0.4584	0.6722	0.8659	0.9429	0.9673 (86)
MIT	19.7371	19.9090	20.1831	20.5356	20.7996	20.9481	20.9869	20.9820	20.8941	20.5707	20.1136	19.7153 (87)
Th 2	20.0596	20.0633	20.0669	20.0851	20.0888	20.1072	20.1072	20.1108	20.0998	20.0888	20.0815	20.0742 (88)
util rest of house	0.9560	0.9381	0.9022	0.8223	0.6863	0.4958	0.3401	0.3753	0.6064	0.8356	0.9310	0.9613 (89)
MIT 2	18.9241	19.0946	19.3628	19.7096	19.9460	20.0785	20.1023	20.1036	20.0356	19.7515	19.3114	18.9144 (90)
Living area fraction												fLA = Living area / (4) = 0.3388 (91)
MIT	19.1996	19.3705	19.6407	19.9894	20.2352	20.3731	20.4020	20.4012	20.3264	20.0290	19.5832	19.1857 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1996	19.3705	19.6407	19.9894	20.2352	20.3731	20.4020	20.4012	20.3264	20.0290	19.5832	19.1857 (93)

#### 8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	487.5004	518.2404	530.1084	513.5488	449.2042	325.2681	220.9666	230.3619	338.6312	425.8283	454.1925	470.0221 (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	929.1396	898.5343	812.4638	670.8865	514.0880	340.0424	223.9415	234.6123	370.0578	567.9279	758.5270	918.5632 (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	328.5796	255.5576	210.0725	113.2832	48.2736	0.0000	0.0000	0.0000	0.0000	105.7221	219.1208	333.7146 (98)
Space heating												1614.3238 (98)
Space heating per m2												(98) / (4) = 26.6258 (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 %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1789.7159 (211)
Space heating requirement	328.5796	255.5576	210.0725	113.2832	48.2736	0.0000	0.0000	0.0000	0.0000	105.7221	219.1208	333.7146	(98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)
Space heating fuel (main heating system)	364.2789	283.3232	232.8963	125.5911	53.5184	0.0000	0.0000	0.0000	0.0000	117.2085	242.9278	369.9718	(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	134.6279	117.7026	121.4134	105.8117	101.4911	87.5465	81.1247	93.1264	94.2737	109.9079	120.0177	130.3799	(64)
Efficiency of water heater (217)m	85.6276	85.2604	84.5128	82.8488	80.2130	76.2000	76.2000	76.2000	76.2000	82.4764	84.6933	85.7728	(216)
Fuel for water heating, kWh/month	157.2249	138.0508	143.6627	127.7167	126.5270	114.8904	106.4628	122.2132	123.7188	133.2599	141.7086	152.0061	(219)
Water heating fuel used													1587.4418 (219)
Annual totals kWh/year													
Space heating fuel - main system													1789.7159 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8120)													
mechanical ventilation fans (SFP = 0.8120)													138.1438 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													213.1438 (231)
Electricity for lighting (calculated in Appendix L)													295.0887 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses													3885.3902 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1789.7159	3.4800	62.2821	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1587.4418	3.4800	55.2430	(247)
Mechanical ventilation fans	138.1438	13.1900	18.2212	(249)
Pumps and fans for heating	75.0000	13.1900	9.8925	(249)
Energy for lighting	295.0887	13.1900	38.9222	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	0.0000	13.1900	0.0000	(252)
Total energy cost			304.5609	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.2110 (257)
SAP value		83.1069
SAP rating (Section 12)		83 (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	1789.7159	0.2160	386.5786	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1587.4418	0.2160	342.8874	(264)
Space and water heating			729.4661	(265)
Pumps and fans	213.1438	0.5190	110.6216	(267)
Energy for lighting	295.0887	0.5190	153.1510	(268)
Energy saving/generation technologies				
PV Unit	-418.0000	0.5190	-216.9420	(269)
Total kg/year			776.2967	(272)
CO2 emissions per m2			12.8000	(273)
EI value			90.1521	
EI rating			90	(274)
EI band			B	

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)

### CALCULATION OF ENERGY RATINGS 09 Jan 2014

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Calculation of stars for heating and DHW  
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Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9020 = 3.858$ , stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9020 = 0.2395$ , stars = 4
Water heating energy efficiency	$3.48 / 0.8135 = 4.278$ , stars = 4
Water heating environmental impact	$0.216 / 0.8135 = 0.2655$ , stars = 4

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# 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	60.6300 (1b)	x 2.3000 (2b)	= 139.4490 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.6300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 139.4490 (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)
Air changes per hour					
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) =	0.0000 (8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate				0.2500	(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) =		0.2313 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	4.7000	4.6000	4.3000	4.3000	4.0000	4.0000	3.9000	4.0000	4.5000	4.4000	4.7000 (22)
Wind factor	1.2750	1.1750	1.1500	1.0750	1.0750	1.0000	1.0000	0.9750	1.0000	1.1250	1.1000	1.1750 (22a)
Adj infilt rate	0.2948	0.2717	0.2659	0.2486	0.2486	0.2313	0.2313	0.2255	0.2313	0.2602	0.2544	0.2717 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												65.1000 (23c)
Effective ac	0.4693	0.4462	0.4404	0.4231	0.4231	0.4058	0.4058	0.4000	0.4058	0.4347	0.4289	0.4462 (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
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			8.4500	1.1450	9.6756		(27)
Brick and Block	44.4900		44.4900	0.2200	9.7878	42.2200	1878.3678 (29a)
Wall to Corridor	15.2600	2.1200	13.1400	0.2300	3.0219	113.5000	1491.3900 (29a)
Dormers	12.7400	8.4500	4.2900	0.2300	0.9867	9.0000	38.6100 (29a)
Pitched Roof	54.4600		54.4600	0.1000	5.4460	9.1000	495.5860 (30)
Sloping Ceiling	7.8300		7.8300	0.1700	1.3311	9.1000	71.2530 (30)
Total net area of external elements Aum(A, m2)			134.7800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.5811		(33)
Party Floor 1			60.6300			70.0000	4244.1000 (32d)
Ground Floor Stud			115.6400			9.0000	1040.7600 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	9260.0668 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							152.7308 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.1808 (36)
Total fabric heat loss						(33) + (36) =	40.7618 (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	21.5983	20.5342	20.2681	19.4700	19.4700	18.6719	18.6719	18.4058	18.6719	20.0021	19.7360	20.5342 (38)
Heat transfer coeff	62.3602	61.2960	61.0299	60.2318	60.2318	59.4337	59.4337	59.1676	59.4337	60.7639	60.4979	61.2960 (39)
Average = Sum(39)m / 12 =												60.4314 (39)
HLP	1.0285	1.0110	1.0066	0.9934	0.9934	0.9803	0.9803	0.9759	0.9803	1.0022	0.9978	1.0110 (40)
HLP (average)												0.9967 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

#### 4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												1.9994 (42)
Average daily hot water use (litres/day)												81.6855 (43)
Daily hot water use	89.8541	86.5866	83.3192	80.0518	76.7844	73.5170	73.5170	76.7844	80.0518	83.3192	86.5866	89.8541 (44)

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)

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

Energy conte	133.2510	116.5422	120.2611	104.8465	100.6027	86.8125	80.4445	92.3113	93.4138	108.8648	118.8344	129.0465 (45)
Energy content (annual)	Total = Sum(45)m = 1285.2312 (45)											
Distribution loss (46)m = 0.15 x (45)m	19.9876	17.4813	18.0392	15.7270	15.0904	13.0219	12.0667	13.8467	14.0121	16.3297	17.8252	19.3570 (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	1.3769	1.1605	1.1523	0.9652	0.8883	0.7340	0.6801	0.8151	0.8600	1.0431	1.1833	1.3335 (61)
Total heat required for water heating calculated for each month	134.6279	117.7026	121.4134	105.8117	101.4911	87.5465	81.1247	93.1264	94.2737	109.9079	120.0177	130.3799 (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	134.6279	117.7026	121.4134	105.8117	101.4911	87.5465	81.1247	93.1264	94.2737	109.9079	120.0177	130.3799 (64)
	Total per year (kWh/year) = Sum(64)m = 1297.4235 (64)											
Heat gains from water heating, kWh/month	44.6502	39.0404	40.2749	35.1028	33.6725	29.0486	26.9178	30.8973	31.2751	36.4583	39.8083	43.2413 (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	119.9634	119.9634	119.9634	119.9634	119.9634	119.9634	119.9634	119.9634	119.9634	119.9634	119.9634	119.9634 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.7729	37.1023	30.1736	22.8434	17.0757	14.4160	15.5770	20.2476	27.1763	34.5065	40.2742	42.9338 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	260.4970	263.2001	256.3883	241.8867	223.5810	206.3763	194.8825	192.1794	198.9912	213.4928	231.7984	249.0032 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	48.9957	48.9957	48.9957	48.9957	48.9957	48.9957	48.9957	48.9957	48.9957	48.9957	48.9957	48.9957 (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)	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756 (71)
Water heating gains (Table 5)	60.0137	58.0958	54.1329	48.7538	45.2587	40.3453	36.1799	41.5286	43.4376	49.0031	55.2892	58.1200 (72)
Total internal gains	454.2670	450.3817	432.6783	405.4674	377.8990	353.1212	338.6229	345.9391	361.5886	388.9859	419.3454	442.0406 (73)

#### 6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W						
Northeast	4.5200	15.0428	0.6300	0.7000	0.7700	20.7797 (75)						
Southwest	3.9300	46.3896	0.6300	0.7000	0.7700	55.7166 (79)						
Solar gains	76.4964	117.4534	175.9396	249.2947	290.2685	322.9259	299.4037	262.2105	211.5908	141.9074	92.0732	61.7107 (83)
Total gains	530.7634	567.8351	608.6179	654.7621	668.1674	676.0471	638.0267	608.1495	573.1793	530.8933	511.4186	503.7513 (84)

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

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	41.2481	41.9643	42.1472	42.7057	42.7057	43.2792	43.2792	43.4738	43.2792	42.3317	42.5179	41.9643
alpha	3.7499	3.7976	3.8098	3.8470	3.8470	3.8853	3.8853	3.8983	3.8853	3.8221	3.8345	3.7976
util living area	0.9504	0.9355	0.8964	0.8121	0.6720	0.4759	0.3410	0.3557	0.5809	0.8126	0.9167	0.9557 (86)
MIT	19.9176	20.0558	20.3245	20.6386	20.8672	20.9740	20.9946	20.9938	20.9446	20.7029	20.3161	19.9118 (87)
Th 2	20.0596	20.0742	20.0778	20.0888	20.0888	20.0998	20.0998	20.1035	20.0998	20.0815	20.0851	20.0742 (88)
util rest of house	0.9409	0.9237	0.8774	0.7793	0.6182	0.4053	0.2598	0.2715	0.5069	0.7709	0.8990	0.9471 (89)
MIT 2	19.1011	19.2462	19.5063	19.8053	20.0002	20.0873	20.0983	20.1017	20.0704	19.8628	19.5091	19.1077 (90)
Living area fraction	19.3777	19.5205	19.7835	20.0876	20.2939	20.3877	20.4019	20.4039	20.3665	20.1474	19.7825	19.3801 (92)
Temperature adjustment	fLA = Living area / (4) = 0.3388 (91)											
adjusted MIT	19.3777	19.5205	19.7835	20.0876	20.2939	20.3877	20.4019	20.4039	20.3665	20.1474	19.7825	19.3801 (93)

#### 8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9328	0.9154	0.8706	0.7792	0.6309	0.4283	0.2873	0.3000	0.5296	0.7742	0.8922	0.9393 (94)
Ext temp.	495.0748	519.8085	529.8370	510.1995	421.5634	289.5486	183.3018	182.4446	303.5676	411.0015	456.2740	473.1985 (95)
Heat loss rate W	5.4000	5.7000	7.3000	9.6000	12.6000	15.4000	17.3000	17.3000	15.0000	11.8000	8.4000	5.5000 (96)
Month fracti	871.6529	847.1411	761.8679	631.6857	463.4183	296.4349	184.3579	183.6522	318.9537	507.2214	688.6172	850.7937 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating	280.1741	219.9675	172.6310	87.4700	31.1400	0.0000	0.0000	0.0000	0.0000	71.5876	167.2871	280.9308 (98)
Space heating per m2	(98) / (4) = 21.6261 (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 %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1453.6454 (211)
Space heating requirement	280.1741	219.9675	172.6310	87.4700	31.1400	0.0000	0.0000	0.0000	0.0000	71.5876	167.2871	280.9308	(98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)
Space heating fuel (main heating system)	310.6143	243.8665	191.3869	96.9734	34.5233	0.0000	0.0000	0.0000	0.0000	79.3654	185.4624	311.4532	(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	134.6279	117.7026	121.4134	105.8117	101.4911	87.5465	81.1247	93.1264	94.2737	109.9079	120.0177	130.3799	(64)
Efficiency of water heater (217)m	85.1240	84.7711	83.8397	81.9567	79.0819	76.2000	76.2000	76.2000	76.2000	81.1692	83.7706	85.2359	(216)
Fuel for water heating, kWh/month	158.1550	138.8476	144.8161	129.1068	128.3367	114.8904	106.4628	122.2132	123.7188	135.4059	143.2694	152.9635	(219)
Water heating fuel used													1598.1863 (219)
Annual totals kWh/year													
Space heating fuel - main system													1453.6454 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8120)													
mechanical ventilation fans (SFP = 0.8120)													138.1438 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													213.1438 (231)
Electricity for lighting (calculated in Appendix L)													295.0887 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses													3560.0640 (238)

#### 10a. Fuel costs - using BEDF prices (536)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1453.6454	7.6100	110.6224	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1598.1863	7.6100	121.6220	(247)
Mechanical ventilation fans	138.1438	31.0800	42.9351	(249)
Pumps and fans for heating	75.0000	31.0800	23.3100	(249)
Energy for lighting	295.0887	31.0800	91.7136	(250)
Additional standing charges			105.0000	(251)
Energy saving/generation technologies				
PV Unit	0.0000	31.0800	0.0000	(252)
Total energy cost			495.2030	(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	1453.6454	0.2160	313.9874	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1598.1863	0.2160	345.2082	(264)
Space and water heating			659.1956	(265)
Pumps and fans	213.1438	0.5190	110.6216	(267)
Energy for lighting	295.0887	0.5190	153.1510	(268)
Energy saving/generation technologies				
PV Unit	-418.0000	0.5190	-216.9420	(269)
Total kg/year			706.0263	(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	1453.6454	1.2200	1773.4474	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1598.1863	1.2200	1949.7872	(264)
Space and water heating			3723.2346	(265)
Pumps and fans	213.1438	3.0700	654.3513	(267)
Energy for lighting	295.0887	3.0700	905.9222	(268)
Energy saving/generation technologies				
PV Unit	-418.0000	3.0700	-1283.2600	(269)
Primary energy kWh/year			4000.2481	(272)

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)

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

Primary energy kWh/m<sup>2</sup>/year

65.9780 (273)

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SAP 2012 EPC IMPROVEMENTS  
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Current energy efficiency rating: B 83  
Current environmental impact rating: B 90

(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	Not applicable
O	Not considered
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U Solar photovoltaic panels	Not applicable
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: (none)	SAP change	Cost change	CO2 change
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Recommended measures (none)	Typical annual savings	Energy efficiency	Environmental impact
	Total Savings £0		0.00 kg/m <sup>2</sup>

Potential energy efficiency rating: B 83  
Potential environmental impact rating: B 90

Fuel prices for cost data on this page from database revision number 536 TEST (31 Jan 2024)  
Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£158	£158	£0
Mains gas	£337	£337	£0
Space heating	£282	£282	£0
Water heating	£122	£122	£0
Lighting	£92	£92	£0
Total cost of fuels	£495	£495	£0
Total cost of uses	£496	£496	£0
Delivered energy	59 kWh/m <sup>2</sup>	59 kWh/m <sup>2</sup>	0 kWh/m <sup>2</sup>
Carbon dioxide emissions	0.7 tonnes	0.7 tonnes	0.0 tonnes
CO2 emissions per m <sup>2</sup>	12 kg/m <sup>2</sup>	12 kg/m <sup>2</sup>	0 kg/m <sup>2</sup>
Primary energy	66 kWh/m <sup>2</sup>	66 kWh/m <sup>2</sup>	0 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

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

No improvements selected / applicable

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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**

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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  
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No improvements selected / applicable

# U-VALUE CALCULATOR REPORT

Property Reference	SAP 0931 Plot 30		Issued on Date	08/02/2024
Assessment Reference	Rev B	Prop Type Ref	Block Ev	
Project	Plot 30			
Calculation Type	New Build (As Designed)			

SAP Rating	83 B	DER	14.65	TER	19.99
Environmental	90 B	% DER<TER	26.73		
CO <sub>2</sub> Emissions (t/year)	0.71	DFEE	43.78	TFEE	52.78
General Requirements Compliance	Pass	% DFEE<TFEE	17.06		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com	Assessor ID	E477-0001
Client	Foreman Homes, FORE		

## Building Elements

### Roof 000006 - Mineral Wool between and above

Roof Type: Pitched Roof, insulated flat ceiling

Layer	Description	Thickness (mm)	Conductivity (W/m <sup>2</sup> K)	Resistance (m <sup>2</sup> K/W)	Fraction (%)	Density (kg/m <sup>3</sup> )	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	<b>Mineral wool batt</b>						
	Main construction	350	0.0380	9.2105	100.00		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 2	<b>Mineral wool batt</b>						
	Main construction	100	0.0380	2.6316	87.50		
	Main construction	100	0.1300	0.7692	12.50		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 3	<b>Plasterboard, standard</b>						
	Main construction	12.5	0.2100	0.0595	100.00	700	1000
Int surface				0.1000			

Total resistance: Upper limit = 11.772 m<sup>2</sup> K/W Lower limit = 11.430 m<sup>2</sup> K/W Average = 11.601 m<sup>2</sup> K/W  
 Total correction = 0.0096 m<sup>2</sup> K/W U-value (unrounded) = 0.1 W/m<sup>2</sup> K

Unheated space: None

**Total thickness: 463 mm**

**U-value: 0.10 W/m<sup>2</sup> K**

**Kappa: 9.10 kJ/m<sup>2</sup> K**

# U-VALUE CALCULATOR REPORT

Property Reference	SAP 0931 Plot 30	Issued on Date	08/02/2024
Assessment Reference	Rev B	Prop Type Ref	Block Ev
Project	Plot 30		
Calculation Type	New Build (As Designed)		

SAP Rating	83 B	DER	14.65	TER	19.99
Environmental	90 B	% DER<TER	26.73		
CO <sub>2</sub> Emissions (t/year)	0.71	DFEE	43.78	TFEE	52.78
General Requirements Compliance	Pass	% DFEE<TFEE	17.06		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com	Assessor ID	E477-0001
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Client	Foreman Homes, FORE
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## Building Elements

### Roof 000007 - Insulation between and below

Roof Type: Pitched Roof, insulated sloping ceiling

Layer	Description	Thickness (mm)	Conductivity (W/m <sup>2</sup> K)	Resistance (m <sup>2</sup> K/W)	Fraction (%)	Density (kg/m <sup>3</sup> )	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	<b>Tiling</b>						
	Main construction	30	1.5000	0.0200	100.00		
Layer 2	<b>airspace/timber battens</b>						
	Main construction	25	0.2500	0.1000	91.59		
	Main construction	25	0.1563	0.1600	8.41		
	Corrections - Cavity Unventilated, Emissivity: Normal						
Layer 3	<b>Breather membrane</b>						
	Main construction	1	0.0000	0.0000	100.00		
Layer 4	<b>Standard cavity</b>						
	Main construction	50	0.2948	0.1696	87.50		
	Main construction	50	0.1300	0.3846	12.50		
	Corrections - Cavity Unventilated, Emissivity: Low Emissivity (BR443)						
Layer 5	<b>Celotex GA4000</b>						
	Main construction	100	0.0220	4.5455	87.50		
	Main construction	100	0.1300	0.7692	12.50		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 6	<b>Celotex GA4000</b>						
	Main construction	50	0.0220	2.2727	100.00		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 7	<b>Plasterboard, standard</b>						
	Main construction	12.5	0.2100	0.0595	100.00	700	1000
Int surface				0.1000			

Total resistance: Upper limit = 6.480 m<sup>2</sup> K/W Lower limit = 5.595 m<sup>2</sup> K/W Average = 6.037 m<sup>2</sup> K/W  
 Total correction = 0.0036 m<sup>2</sup> K/W U-value (unrounded) = 0.17 W/m<sup>2</sup> K

Unheated space: None

**Total thickness: 269 mm**

**U-value: 0.17 W/m<sup>2</sup> K**

**Kappa: 9.10 kJ/m<sup>2</sup> K**

# U-VALUE CALCULATOR REPORT

Property Reference	SAP 0931 Plot 30	Issued on Date	08/02/2024
Assessment Reference	Rev B	Prop Type Ref	Block Ev
Project	Plot 30		
Calculation Type	New Build (As Designed)		

SAP Rating	83 B	DER	14.65	TER	19.99
Environmental	90 B	% DER<TER	26.73		
CO <sub>2</sub> Emissions (t/year)	0.71	DFEE	43.78	TFEE	52.78
General Requirements Compliance	Pass	% DFEE<TFEE	17.06		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com	Assessor ID	E477-0001
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Client	Foreman Homes, FORE
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## Building Elements

### Wall 000001

#### Wall Type: Standard Wall

Layer	Description	Thickness (mm)	Conductivity (W/m <sup>2</sup> K)	Resistance (m <sup>2</sup> K/W)	Fraction (%)	Density (kg/m <sup>3</sup> )	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	<b>Brick, outer leaf</b>						
	Main construction	102	0.7700	0.1325	82.81		
	Main construction	102	0.9407	0.1084	17.19		
Layer 2	<b>Supafil 34</b>						
	Main construction	100	0.0340	2.9412	100.00		
	Corrections - Air Gap: Level 0, Fasteners: None or plastic						
Layer 3	<b>Supabloc</b>						
	Main construction	140	0.1100	1.2727	94.04	460	1000
	Main construction	140	0.8803	0.1590	5.96	460	1000
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 4	<b>airspace/plaster dabs</b>						
	Main construction	15	0.0882	0.1700	80.00		
	Main construction	15	0.0882	0.1700	20.00		
	Corrections - Cavity Unventilated, Emissivity: Normal						
Layer 5	<b>Plasterboard, standard</b>						
	Main construction	12.5	0.2100	0.0595	100.00	700	1000
Int surface				0.1300			

Total resistance:	Upper limit = 4.657 m <sup>2</sup> K/W	Lower limit = 4.366 m <sup>2</sup> K/W	Average = 4.511 m <sup>2</sup> K/W
	Total correction = 0.0004 m <sup>2</sup> K/W	U-value (unrounded) = 0.22 W/m <sup>2</sup> K	

Unheated space:	None	
<b>Total thickness: 370 mm</b>	<b>U-value: 0.22 W/m<sup>2</sup> K</b>	<b>Kappa: 42.22 kJ/m<sup>2</sup> K</b>

# U-VALUE CALCULATOR REPORT

Property Reference	SAP 0931 Plot 30	Issued on Date	08/02/2024
Assessment Reference	Rev B	Prop Type Ref	Block Ev
Project	Plot 30		
Calculation Type	New Build (As Designed)		

SAP Rating	83 B	DER	14.65	TER	19.99
Environmental	90 B	% DER<TER	26.73		
CO <sub>2</sub> Emissions (t/year)	0.71	DFEE	43.78	TFEE	52.78
General Requirements Compliance	Pass	% DFEE<TFEE	17.06		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com	Assessor ID	E477-0001
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Client	Foreman Homes, FORE
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## Building Elements

### Wall Wall to Corridor

#### Wall Type: Standard Wall

Layer	Description	Thickness (mm)	Conductivity (W/m <sup>2</sup> K)	Resistance (m <sup>2</sup> K/W)	Fraction (%)	Density (kg/m <sup>3</sup> )	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	<b>Plasterboard, standard</b>						
	Main construction	12.5	0.2100	0.0595	100.00		
Layer 2	<b>airspace/plaster dabs</b>						
	Main construction	15	0.0882	0.1700	80.00		
	Main construction	15	0.0882	0.1700	20.00		
	Corrections - Cavity Unventilated, Emissivity: Normal						
Layer 3	<b>Masterblock Masterlite Pro</b>						
	Main construction	100	0.5700	0.1754	100.00	1450	1000
Layer 4	<b>Supafil 40</b>						
	Main construction	100	0.0400	2.5000	100.00		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 5	<b>Masterblock Masterlite Pro</b>						
	Main construction	100	0.5700	0.1754	100.00	1450	1000
Layer 6	<b>airspace/plaster dabs</b>						
	Main construction	15	0.0882	0.1700	80.00		
	Main construction	15	0.0882	0.1700	20.00		
	Corrections - Cavity Unventilated, Emissivity: Normal						
Layer 7	<b>Plasterboard, standard</b>						
	Main construction	12.5	0.2100	0.0595	100.00	700	1000
Int surface				0.1300			

Total resistance:	Upper limit = 3.480 m <sup>2</sup> K/W	Lower limit = 3.480 m <sup>2</sup> K/W	Average = 3.480 m <sup>2</sup> K/W
	Total correction = 0.0052 m <sup>2</sup> K/W	U-value (unrounded) = 0.29 W/m <sup>2</sup> K	

Unheated space:	None	
<b>Total thickness: 355 mm</b>	<b>U-value: 0.29 W/m<sup>2</sup> K</b>	<b>Kappa: 113.50 kJ/m<sup>2</sup> K</b>

# SUMMARY FOR INPUT DATA

## Calculation Type: New Build (As Designed)

Property Reference	SAP 0931 Plot 30	Issued on Date	08/02/2024
Assessment Reference	Rev B	Prop Type Ref	Block Ev
Property	Plot 30		

SAP Rating	83 B	DER	14.65	TER	19.99
Environmental	90 B	% DER<TER	26.73		
CO <sub>2</sub> Emissions (t/year)	0.71	DFEE	43.78	TFEE	52.78
General Requirements Compliance	Pass	% DFEE<TFEE	17.06		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com	Assessor ID	E477-0001
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Client	Foreman Homes, FORE
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### SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	South East
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	Flat, Detached
2.0 Number of Storeys	1
3.0 Date Built	2023
4.0 Sheltered Sides	1
5.0 Sunlight/Shade	Average or unknown

#### 6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	31.53 m	60.63 m <sup>2</sup>	2.30 m

7.0 Living Area	20.54	m <sup>2</sup>
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8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	152.73	kJ/m <sup>2</sup> K

#### 9.0 External Walls

Description	Type	Construction	U-Value (W/m <sup>2</sup> K)	Kappa (kJ/m <sup>2</sup> K)	Gross Area (m <sup>2</sup> )	Nett Area (m <sup>2</sup> )
Brick and Block	Cavity Wall	Other	0.22	42.22	44.49	44.49
Wall to Corridor	Cavity Wall	Other	0.29	113.50	15.26	13.14
Dormers	Timber Frame	Timber framed wall (one layer of plasterboard)	0.23	9.00	12.74	4.29

#### 9.1 Party Walls

Description	Type	Construction	U-Value (W/m <sup>2</sup> K)	Kappa (kJ/m <sup>2</sup> K)	Area (m <sup>2</sup> )
		Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill		110.00	

#### 9.2 Internal Walls

Description	Construction	Kappa (kJ/m <sup>2</sup> K)	Area (m <sup>2</sup> )
Ground Floor Stud	Plasterboard on timber frame	9.00	115.64

#### 10.0 External Roofs

Description	Type	Construction	U-Value (W/m <sup>2</sup> K)	Kappa (kJ/m <sup>2</sup> K)	Gross Area (m <sup>2</sup> )	Nett Area (m <sup>2</sup> )
Pitched Roof	External Plane Roof	Other	0.10	9.10	54.46	54.46
Sloping Ceiling	External Slope Roof	Other	0.17	9.10	7.83	7.83

# SUMMARY FOR INPUT DATA

## Calculation Type: New Build (As Designed)

### 11.1 Party Floors

Description	Construction	Kappa (kJ/m <sup>2</sup> K)	Area (m <sup>2</sup> )
Party Floor 1	Precast concrete plank floor (screed laid on rubber), carpeted	70.00	60.63

### 12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m <sup>2</sup> K)
Front Door	Manufacturer	Solid Door							1.10
Windows	Manufacturer	Window	Double Low-E Soft 0.1			0.63		0.70	1.20

### 13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m <sup>2</sup> )	Curtain Closed
Front Door	Solid Door	[2] Wall to Corridor	South East							2.12	
Windows	Window	[3] Dormers	South West	None	0.00					3.93	
North Elevation	Window	[3] Dormers	North East	None	0.00					4.52	

### 14.0 Conservatory

### 15.0 Draught Proofing

 %

### 16.0 Draught Lobby

### 17.0 Thermal Bridging

### 17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	1.01	0.043	No	Catnic Thermally Broken
Independently assessed	E3 Sill	8.05	0.021	No	Knauf P5
Independently assessed	E4 Jamb	10.44	0.014	No	Knauf P6
Table K1 - Approved	E7 Party floor between dwellings (in blocks of flats)	63.06	0.070	No	
Table K1 - Approved	E11 Eaves (insulation at rafter level)	7.20	0.040	No	
Independently assessed	E12 Gable (insulation at ceiling level)	10.98	0.044	No	Knauf P21
Independently assessed	E13 Gable (insulation at rafter level)	3.08	0.010	No	Knauf P20
Independently assessed	E16 Corner (normal)	7.40	0.039	No	Knauf P23
Table K1 - Default	R1 Head of roof window	8.05	0.080	No	
Table K1 - Default	R3 Jamb of roof window	6.36	0.080	No	
Table K1 - Default	R6 Flat ceiling	10.17	0.060	No	
Table K1 - Default	R8 Roof to wall (rafter)	9.24	0.060	No	

Y-value  W/m<sup>2</sup>K

### 18.0 Pressure Testing

Designed AP <sub>50</sub>	<input type="text" value="5.00"/>	m <sup>3</sup> /(h.m <sup>2</sup> ) @ 50 Pa
Property Tested ?	<input type="text"/>	
As Built AP <sub>50</sub>	<input type="text"/>	m <sup>3</sup> /(h.m <sup>2</sup> ) @ 50 Pa

### 19.0 Mechanical Ventilation

#### Summer Overheating

Windows open in hot weather	<input type="text" value="Windows half open"/>
Cross ventilation possible	<input type="text" value="Yes"/>
Night Ventilation	<input type="text" value="Yes"/>
Air change rate	<input type="text" value="4.00"/>

#### Mechanical Ventilation

Mechanical Ventilation System Present	<input type="text" value="Yes"/>
Approved Installation	<input type="text" value="No"/>
Mechanical Ventilation data Type	<input type="text" value="Database"/>



# SUMMARY FOR INPUT DATA

## Calculation Type: New Build (As Designed)

Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500352
Configuration	1
MVHR Duct Insulated	No
Manufacturer SFP	0.58
Duct Type	Rigid
MVHR Efficiency	93.00
Wet Rooms	1

### 20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				0
Number of passive vents				0
Number of flueless gas fires				0

### 21.0 Fixed Cooling System

No

### 22.0 Lighting

#### Internal

Total number of light fittings	17	
Total number of L.E.L. fittings	17	
Percentage of L.E.L. fittings	100.00	%

#### External

External lights fitted	Yes
Light and motion sensor	Yes

### 23.0 Electricity Tariff

Standard

### 24.0 Main Heating 1

Database	Database	
Description	Gas Combi	
Percentage of Heat	100	%
Database Ref. No.	17959	
Fuel Type	Mains gas	
Main Heating	BGW	
SAP Code	104	
In Winter	90.2	
In Summer	76.2	
Controls	CBE Programmer, room thermostat and TRVs	
PCDF Controls	0	
Delayed Start Stat	No	
Sap Code	2106	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heat Emitter	Radiators	
Flow Temperature	Normal (> 45°C)	
Combi boiler type	Standard Combi	
Combi keep hot type	None	

### 25.0 Main Heating 2

None

# SUMMARY FOR INPUT DATA

## Calculation Type: New Build (As Designed)

Community Heating	None	
<b>28.0 Water Heating</b>	HWP From main heating 1	
Water Heating	Main Heating 1	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
SAP Code	901	
<b>29.0 Hot Water Cylinder</b>	None	
<b>32.0 Photovoltaic Unit</b>	More Dwellings, One Block	
Apportioned	418.00	kWh/Year

### Recommendations

#### Lower cost measures

None

#### Further measures to achieve even higher standards

None

# BLOCK COMPLIANCE

## Calculation Type: New Build (As Designed)

<b>Block Reference</b>	SAP 0931 Block Ev	<b>Issued on Date</b>	08/02/2024
<b>Block Name</b>	Block EV		
<b>Assessor Details</b>	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com	<b>Assessor ID</b>	E477-0001
<b>Client</b>	Foreman Homes, FORE		

### Block Compliance Report - DER

Block Reference: SAP 0931 Block Ev		Block Name: Block EV			
Property-Assessment Reference	Multiplier	Floor Area (m <sup>2</sup> )	DER (kgCO <sub>2</sub> /m <sup>2</sup> )	TER (kgCO <sub>2</sub> /m <sup>2</sup> )	% DER/TER
SAP 0931 Plot 27-Rev B	1	60.9	14.29	19.11	25.23 %
SAP 0931 Plot 28-Rev B	1	60.63	13.08	18.14	27.90 %
SAP 0931 Plot 29-Rev B	1	60.9	14.99	20.24	25.93 %
SAP 0931 Plot 30-Rev B	1	60.63	14.65	19.99	26.73 %
SAP 0931 Plot 25-Rev B	1	60.9	18.29	21.22	13.83 %
SAP 0931 Plot 26-Rev B	1	60.63	17.22	20.63	16.52 %
Totals:	6	364.59	92.52	119.34	
Average DER = 15.42 kgCO <sub>2</sub> /m <sup>2</sup>		<b>% DER/TER</b>		<b>PASS</b>	
Average TER = 19.89 kgCO <sub>2</sub> /m <sup>2</sup>		22.47 %			

### Block Compliance Report - DFEE

Block Reference: SAP 0931 Block Ev		Block Name: Block EV			
Property-Assessment Reference	Multiplier	Floor Area (m <sup>2</sup> )	DFEE (kWh/m <sup>2</sup> /yr)	TFEE (kWh/m <sup>2</sup> /yr)	% DFEE/TFEE
SAP 0931 Plot 27-Rev B	1	60.9	42.94	48.50	11.46 %
SAP 0931 Plot 28-Rev B	1	60.63	38.24	43.76	12.61 %
SAP 0931 Plot 29-Rev B	1	60.9	45.83	54.30	15.60 %
SAP 0931 Plot 30-Rev B	1	60.63	43.78	52.78	17.06 %
SAP 0931 Plot 25-Rev B	1	60.9	52.47	59.51	11.84 %
SAP 0931 Plot 26-Rev B	1	60.63	48.79	56.59	13.79 %
Totals:	6	364.59	272.04	315.44	
Average DFEE = 45.34 kWh/m <sup>2</sup> /yr		<b>% DFEE/TFEE</b>		<b>PASS</b>	
Average TFEE = 52.58 kWh/m <sup>2</sup> /yr		13.77 %			