

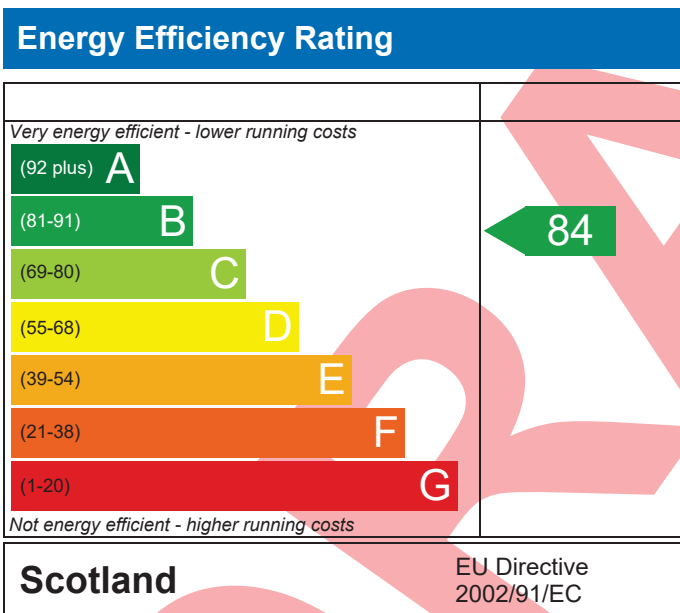
# PREDICTED ENERGY ASSESSMENT

Lochnagar, Plot 89, Phase 4A ,  
Tarland Road,  
Aboyne

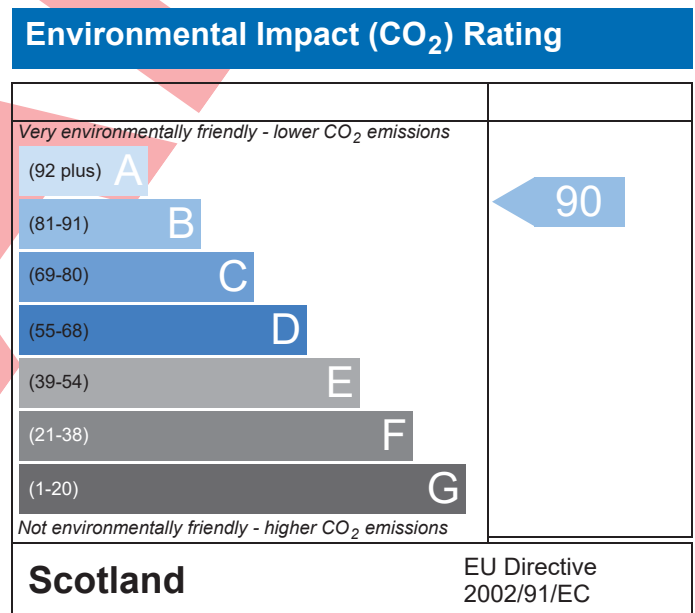
Dwelling type: House, Detached  
Date of assessment: 31/01/2023  
Produced by: Northern Energy  
Total floor area: 205.1 m<sup>2</sup>

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP2012 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO<sub>2</sub>) emissions.



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO<sub>2</sub>) emissions. The higher the rating the less impact it has on the environment.

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

# BUILDING REGULATION COMPLIANCE

## Calculation Type: New Build (As Designed)

Property Reference	ajc 4A 89 lochnagar		Issued on Date	31/01/2023	
Assessment Reference	lochnagar	Prop Type Ref			
Property	Lochnagar, Plot 89, Phase 4A , Tarland Road, Aboyne				
SAP Rating	84 B	DER	10.40	TER	11.06
Environmental	90 B	% DER<TER	5.97		
CO <sub>2</sub> Emissions (t/year)	2.31	FEE	44.55	TFEE	N/A
General Requirements Compliance	Pass	% DFEE<TFEE	N/A		
Assessor Details	Mr. William MacDougall, Northern Energy, Tel: 019755 81400, n.energy@btinternet.com			Assessor ID	1910-0001
Client					

### SUMMARY FOR INPUT DATA FOR New Build (As Designed)

#### 6.1 Carbon Dioxide Emissions

##### 1a TER and DER

Fuel for main heating	Bulk LPG		
Fuel package for TER	LPG		
Target Carbon Dioxide Emission Rate (TER)	11.06	kgCO <sub>2</sub> /m <sup>2</sup>	
Dwelling Carbon Dioxide Emission Rate (DER)	10.40	kgCO <sub>2</sub> /m <sup>2</sup>	Pass
	-0.66 (-6.0%)	kgCO <sub>2</sub> /m <sup>2</sup>	

#### 6.2 Building insulation envelope

##### 2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.22)	0.20 (max. 0.70)	Pass
Floor	0.12 (max. 0.18)	0.15 (max. 0.70)	Pass
Roof	0.10 (max. 0.15)	0.15 (max. 0.35)	Pass
Openings	1.40 (max. 1.60)	1.40 (max. 3.30)	Pass

##### 2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

##### 3 Air permeability

Air permeability at 50 pascals	4.00 (design value)
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#### 6.3 Heating System

##### 4 Heating efficiency

Main heating system	Boiler system with radiators or underfloor - Bulk LPG Data from database Baxi ASSURE 18 SYSTEM LPG Efficiency: 90.2% SEDBUK2009 Minimum: 88.0%	Pass
Secondary heating system	None	

##### 6 Controls

Space heating controls	Time and temperature zone control	Pass
Hot water controls	Cylinderstat	Pass
	Independent timer for DHW	Pass
Boiler interlock	Yes	Pass

#### 6.4 Insulation of pipes, ducts and vessels

# BUILDING REGULATION COMPLIANCE

## Calculation Type: New Build (As Designed)

### 5 Cylinder insulation

Hot water storage	Measured cylinder loss: 2.20 kWh/day Permitted by DBSCG 2.56	Pass
Primary pipework insulated	Yes	Pass

### 6.5 Artificial and display lighting

#### 7 Low energy lights

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

### 6.6 Mechanical ventilation and air conditioning

#### 8 Mechanical ventilation

Continuous extract system (decentralised)			
Specific fan power	0.1600 0.2000		
Maximum	0.7		Pass

#### 9 Summertime temperature

Overheating risk (North East Scotland)	Not significant	Pass
Based on:		
Overshading	Average	
Windows facing North	10.67 m <sup>2</sup> , No overhang	
Windows facing East	0.72 m <sup>2</sup> , No overhang	
Windows facing South	14.99 m <sup>2</sup> , No overhang	
Windows facing West	0.72 m <sup>2</sup> , No overhang	
Air change rate	4.00 ach	
Blinds/curtains	None	

# RECOMMENDATIONS

	Typical cost	Typical savings per year	Energy efficiency	Environmental impact	Result
Low energy lights			0	0	Already installed
Solar water heating	£4,000 - £6,000	£100	B 86	B 91	Recommended
Photovoltaic			0	0	Already installed
Wind turbine			0	0	Not applicable
<b>Totals</b>	<b>£4,000 - £6,000</b>	<b>£100</b>	<b>B 86</b>	<b>B 91</b>	

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# THERMAL BRIDGING

## Calculation Type: New Build (As Designed)

Property Reference	ajc 4A 89 lochnagar		Issued on Date	31/01/2023	
Assessment Reference	lochnagar	Prop Type Ref			
Property	Lochnagar, Plot 89, Phase 4A , Tarland Road, Aboyne				
SAP Rating	84 B	DER	10.40	TER	11.06
Environmental	90 B	% DER<TER	5.97		
CO <sub>2</sub> Emissions (t/year)	2.31	FEE	44.55	TFEE	N/A
General Requirements Compliance	Pass	% DFEE<TFEE	N/A		
Assessor Details	Mr. William MacDougall, Northern Energy, Tel: 019755 81400, n.energy@btinternet.com			Assessor ID	1910-0001
Client					

	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Scotland ACD 2015	0.037	23.85	0.88	
External wall	E3 Sill	Scotland ACD 2015	0.033	19.45	0.64	
External wall	E4 Jamb	Scotland ACD 2015	0.031	72.90	2.26	
External wall	E5 Ground floor (normal)	Scotland ACD 2015	0.173	45.00	7.79	
External wall	E6 Intermediate floor within a dwelling	Scotland ACD 2015	0.065	48.10	3.13	
External wall	E10 Eaves (insulation at ceiling level)	Scotland ACD 2015	0.043	19.40	0.83	
External wall	E11 Eaves (insulation at rafter level)	Scotland ACD 2015	0.018	1.55	0.03	
External wall	E12 Gable (insulation at ceiling level)	Scotland ACD 2015	0.051	29.90	1.52	
External wall	E13 Gable (insulation at rafter level)	Scotland ACD 2015	0.036	5.80	0.21	
External wall	E16 Corner (normal)	Scotland ACD 2015	0.038	37.50	1.43	
External wall	E17 Corner (inverted – internal area greater than external area)	Scotland ACD 2015	0.003	19.56	0.06	

Total: **18.78** W/mK:  
 Y-Value: **0.040** W/m<sup>2</sup>K:

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)

<b>Property Reference</b>	ajc 4A 89 lochnagar			<b>Issued on Date</b>	31/01/2023
<b>Assessment Reference</b>	lochnagar	<b>Prop Type Ref</b>			
<b>Property</b>	Lochnagar, Plot 89, Phase 4A , Tarland Road, Aboyne				
<b>SAP Rating</b>	84 B	<b>DER</b>	10.40	<b>TER</b>	11.06
<b>Environmental</b>	90 B	<b>% DER&lt;TER</b>	5.97		
<b>CO<sub>2</sub> Emissions (t/year)</b>	2.31	<b>FEE</b>	44.55	<b>TFEE</b>	N/A
<b>General Requirements Compliance</b>	Pass	<b>% DFEE&lt;TFEE</b>	N/A		
<b>Assessor Details</b>	Mr. William MacDougall, Northern Energy, Tel: 019755 81400, n.energy@btinternet.com			<b>Assessor ID</b>	1910-0001
<b>Client</b>					

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)

### REGULATIONS COMPLIANCE REPORT - Domestic Handbook Section 6, 2015 Edition

REGULATIONS COMPLIANCE REPORT - Domestic Handbook Section 6, 2015 Edition

Detached House, total floor area 205 m<sup>2</sup>

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

#### 1 TER and DER

Fuel for main heating: Bulk LPG  
Fuel package for TER: LPG  
Target Carbon Dioxide Emission Rate (TER) 11.06 kgCO<sub>2</sub>/m<sup>2</sup>  
Dwelling Carbon Dioxide Emission Rate (DER) 10.40 kgCO<sub>2</sub>/m<sup>2</sup> OK

#### 2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.22)	0.20 (max. 0.70)	OK
Floor	0.12 (max. 0.18)	0.15 (max. 0.70)	OK
Roof	0.10 (max. 0.15)	0.15 (max. 0.35)	OK
Openings	1.40 (max. 1.60)	1.40 (max. 3.30)	OK

#### 2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

#### 3 Air permeability

Air permeability at 50 pascals: 4.00 (design value)

#### 4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Bulk LPG  
Data from database  
Baxi ASSURE 18 SYSTEM LPG

Efficiency: 90.2% SEDBUK2009  
Minimum: 88.0% OK

Secondary heating system: None

#### 5 Cylinder insulation

Hot water storage Measured cylinder loss: 2.20 kWh/day  
Permitted by DBSCG 2.56 OK  
Primary pipework insulated: Yes OK

#### 6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls: Cylinderstat OK  
Independent timer for DHW OK

Boiler interlock Yes OK

#### 7 Low energy lights

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

#### 8 Mechanical ventilation

Continuous extract system (decentralised)  
Specific fan power: 0.1600 0.2000  
Maximum 0.7 OK

#### 9 Summertime temperature

Overheating risk (North East Scotland): Not significant OK

#### Based on:

Overshading: Average  
Windows facing North: 10.67 m<sup>2</sup>, No overhang  
Windows facing East: 0.72 m<sup>2</sup>, No overhang  
Windows facing South: 14.99 m<sup>2</sup>, No overhang  
Windows facing West: 0.72 m<sup>2</sup>, No overhang  
Air change rate: 4.00 ach  
Blinds/curtains: None

#### 10 Key features

Roof U-value 0.10 W/m<sup>2</sup>K  
Floor U-value 0.12 W/m<sup>2</sup>K  
Photovoltaic array 2.01 kW

# 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	96.7000 (1b)	2.4800 (2b)	239.8160 (1b) - (3b)
First floor	108.4000 (1c)	2.6400 (2c)	286.1760 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	205.1000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 525.9920 (5)

#### 2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour							
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)							
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)							
Number of intermittent fans				0 * 10 =	0.0000 (7a)							
Number of passive vents				0 * 10 =	0.0000 (7b)							
Number of flueless gas fires				0 * 40 =	0.0000 (7c)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)				0.0000 / (5) =	0.0000 (8)							
Pressure test				Yes	4.0000							
Measured/design AP50					0.2000 (18)							
Infiltration rate					2 (19)							
Number of sides sheltered												
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)							
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.1700 (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	0.2168	0.2125	0.2083	0.1870	0.1828	0.1615	0.1615	0.1573	0.1700	0.1828	0.1913	0.1998 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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					
Half hour door to garage			1.8900	1.4000	2.6460		(26)					
Part glazed door			4.2000	1.4000	5.8800		(26a)					
Windows / Patios (Uw = 1.40)			27.1000	1.3258	35.9280		(27)					
Insulated slab			96.4000	0.1200	11.5680		(28a)					
Floor over garage			14.7400	0.1500	2.2110		(28b)					
Main T/Frame ACDS	209.4000	29.5000	179.9000	0.1600	28.7840		(29a)					
House to garage wall	16.8600	1.8900	14.9700	0.1900	2.8443		(29a)					
Hanging posts	6.1500		6.1500	0.1700	1.0455		(29a)					
Dormer walls	6.5000	1.8000	4.7000	0.2000	0.9400		(29a)					
Stone clad T/Frame	5.0000		5.0000	0.1600	0.8000		(29a)					
Render /lathe nominal area	6.0000		6.0000	0.1600	0.9600		(29a)					
Horizontal ceiling	106.6000		106.6000	0.1000	10.6600		(30)					
Sloping ceiling	2.9000		2.9000	0.1500	0.4350		(30)					
Total net area of external elements Aum(A, m2)			470.5500				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 104.7018		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							18.7752 (36)					
Total fabric heat loss							(33) + (36) = 123.4770 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 86.7887	Feb 86.7887	Mar 86.7887	Apr 86.7887	May 86.7887	Jun 86.7887	Jul 86.7887	Aug 86.7887	Sep 86.7887	Oct 86.7887	Nov 86.7887	Dec 86.7887 (38)
Heat transfer coeff	210.2657	210.2657	210.2657	210.2657	210.2657	210.2657	210.2657	210.2657	210.2657	210.2657	210.2657	210.2657 (39)
Average = Sum(39)m / 12 =												210.2657 (39)
HLP	Jan 1.0252	Feb 1.0252	Mar 1.0252	Apr 1.0252	May 1.0252	Jun 1.0252	Jul 1.0252	Aug 1.0252	Sep 1.0252	Oct 1.0252	Nov 1.0252	Dec 1.0252 (40)
HLP (average)												1.0252 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

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

Assumed occupancy	3.0086 (42)
Average daily hot water use (litres/day)	111.2139 (43)



# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	122.3353	117.8867	113.4382	108.9896	104.5410	100.0925	100.0925	104.5410	108.9896	113.4382	117.8867	122.3353	(44)
Energy conte	181.4197	158.6708	163.7340	142.7473	136.9694	118.1942	109.5243	125.6807	127.1818	148.2181	161.7916	175.6953	(45)
Energy content (annual)	Total = Sum(45)m =											1749.8273 (45)	
Distribution loss (46)m = 0.15 x (45)m	27.2129	23.8006	24.5601	21.4121	20.5454	17.7291	16.4286	18.8521	19.0773	22.2327	24.2687	26.3543	(46)
Water storage loss:													
Store volume												250.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):												2.2000 (48)	
Temperature factor from Table 2b												0.5400 (49)	
Enter (49) or (54) in (55)												1.1880 (55)	
Total storage loss	36.8280	33.2640	36.8280	35.6400	36.8280	35.6400	36.8280	36.8280	35.6400	36.8280	35.6400	36.8280	(56)
If cylinder contains dedicated solar storage	36.8280	33.2640	36.8280	35.6400	36.8280	35.6400	36.8280	36.8280	35.6400	36.8280	35.6400	36.8280	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month	241.5101	212.9460	223.8244	200.8993	197.0598	176.3462	169.6147	185.7711	185.3338	208.3085	219.9436	235.7857	(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)
FGHRS	-38.2160	-33.4223	-33.7466	-28.1728	-25.3286	-10.3222	-10.0055	-10.8521	-10.7931	-28.5120	-33.6768	-37.6731	eq. (G6)
Output from w/h	203.2941	179.5237	190.0779	172.7265	171.7313	166.0240	159.6092	174.9191	174.5407	179.7965	186.2668	198.1126	(64)
Heat gains from water heating, kWh/month	108.3944	96.1782	102.5139	93.9851	93.6147	85.8212	84.4892	89.8612	88.8095	97.3548	100.3173	106.4910	(65)
Total per year (kWh/year) = Sum(64)m =												2156.6224 (64)	

#### 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	150.4277	150.4277	150.4277	150.4277	150.4277	150.4277	150.4277	150.4277	150.4277	150.4277	150.4277	150.4277	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	36.4081	32.3374	26.2985	19.9097	14.8827	12.5646	13.5765	17.6473	23.6861	30.0750	35.1019	37.4200	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	375.8668	379.7672	369.9385	349.0144	322.6014	297.7770	281.1928	277.2925	287.1211	308.0453	334.4582	359.2826	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.0428	38.0428	38.0428	38.0428	38.0428	38.0428	38.0428	38.0428	38.0428	38.0428	38.0428	38.0428	(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)	-120.3422	-120.3422	-120.3422	-120.3422	-120.3422	-120.3422	-120.3422	-120.3422	-120.3422	-120.3422	-120.3422	-120.3422	(71)
Water heating gains (Table 5)	145.6913	143.1223	137.7875	130.5348	125.8262	119.1961	113.5607	120.7811	123.3466	130.8533	139.3296	143.1331	(72)
Total internal gains	629.0946	626.3552	605.1528	570.5872	534.4386	500.6660	479.4583	486.8492	505.2822	540.1018	580.0180	610.9640	(73)

#### 6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W					
North	10.6700	10.6334	0.6300	0.7000	0.7700	34.6743 (74)							
East	0.7200	19.6403	0.6300	0.7000	0.7700	4.3217 (76)							
South	14.9900	46.7521	0.6300	0.7000	0.7700	214.1777 (78)							
West	0.7200	19.6403	0.6300	0.7000	0.7700	4.3217 (80)							
Solar gains	257.4954	433.9405	587.2609	726.4736	819.6503	818.2070	786.8349	715.3975	634.5185	477.2782	307.4261	221.0833	(83)
Total gains	886.5900	1060.2957	1192.4137	1297.0608	1354.0889	1318.8730	1266.2932	1202.2466	1139.8007	1017.3800	887.4441	832.0473	(84)

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

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	27.0953	27.0953	27.0953	27.0953	27.0953	27.0953	27.0953	27.0953	27.0953	27.0953	27.0953	27.0953	
alpha	2.8064	2.8064	2.8064	2.8064	2.8064	2.8064	2.8064	2.8064	2.8064	2.8064	2.8064	2.8064	
util living area	0.9842	0.9733	0.9551	0.9198	0.8544	0.7447	0.6136	0.6528	0.8187	0.9340	0.9752	0.9867	(86)
MIT	18.5975	18.8574	19.2610	19.7699	20.2730	20.6690	20.8651	20.8340	20.5287	19.8742	19.1270	18.5314	(87)
Th 2	20.0624	20.0624	20.0624	20.0624	20.0624	20.0624	20.0624	20.0624	20.0624	20.0624	20.0624	20.0624	(88)
util rest of house	0.9818	0.9691	0.9477	0.9054	0.8247	0.6844	0.5161	0.5597	0.7713	0.9193	0.9707	0.9847	(89)
MIT 2	16.8036	17.1813	17.7667	18.4986	19.2068	19.7345	19.9630	19.9329	19.5629	18.6565	17.5766	16.7073	(90)
Living area fraction	fLA = Living area / (4) =											0.2121 (91)	
MIT	17.1840	17.5368	18.0836	18.7682	19.4329	19.9327	20.1543	20.1240	19.7678	18.9147	17.9054	17.0942	(92)
Temperature adjustment												-0.1500	
adjusted MIT	17.0340	17.3868	17.9336	18.6182	19.2829	19.7827	20.0043	19.9740	19.6178	18.7647	17.7554	16.9442	(93)

#### 8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9695	0.9517	0.9243	0.8760	0.7942	0.6635	0.5093	0.5498	0.7438	0.8913	0.9537	0.9738	(94)
Ext temp.	859.5192	1009.0499	1102.1612	1136.2450	1075.4283	875.1229	644.9630	660.9915	847.7668	906.8354	846.3878	810.2536	(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)

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)

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

Month fraction	2677.5292	2625.5498	2404.0950	2043.4132	1594.4333	1089.7459	715.8172	751.4884	1160.1989	1716.7654	2240.4680	2679.6650 (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 requirement	1352.5994	1086.2879	968.6388	653.1611	386.1398	0.0000	0.0000	0.0000	0.0000	602.5879	1003.7377	1390.8421 (98)
Space heating efficiency (main heating system 1)												7443.9948 (98)
Space heating per m2												(98) / (4) = 36.2945 (99)

#### 8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												91.2000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	1352.5994	1086.2879	968.6388	653.1611	386.1398	0.0000	0.0000	0.0000	0.0000	602.5879	1003.7377	1390.8421 (98)
Space heating efficiency (main heating system 1)	91.2000	91.2000	91.2000	91.2000	91.2000	0.0000	0.0000	0.0000	0.0000	91.2000	91.2000	91.2000 (210)
Space heating fuel (main heating system)	1483.1134	1191.1052	1062.1039	716.1854	423.3989	0.0000	0.0000	0.0000	0.0000	660.7324	1100.5896	1525.0461 (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	203.2941	179.5237	190.0779	172.7265	171.7313	166.0240	159.6092	174.9191	174.5407	179.7965	186.2668	198.1126 (64)
Efficiency of water heater	89.6431	89.5126	89.2539	88.7333	87.6151	80.5000	80.5000	80.5000	80.5000	88.4968	89.3412	80.5000 (216)
Fuel for water heating, kWh/month	226.7815	200.5570	212.9632	194.6580	196.0066	206.2410	198.2723	217.2908	216.8207	203.1672	208.4892	220.8288 (219)
Water heating fuel used												2502.0762 (219)
Annual totals kWh/year												
Space heating fuel - main system												8162.2750 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
(MEV)Decentralised, Database: total watage = 13.1040, total flow = 53.0000, SFP = 0.2472)												
mechanical ventilation fans (SFP = 0.2472)												158.6598 (230a)
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												233.6598 (231)
Electricity for lighting (calculated in Appendix L)												642.9789 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 2.01 * 1068 * 1.00) =										-1717.4573		-1717.4573 (233)
Total delivered energy for all uses												9823.5326 (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	8162.2750	0.2410	1967.1083 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2502.0762	0.2410	603.0004 (264)
Space and water heating			2570.1086 (265)
Pumps and fans	233.6598	0.5190	121.2695 (267)
Energy for lighting	642.9789	0.5190	333.7060 (268)
Energy saving/generation technologies			
PV Unit	-1717.4573	0.5190	-891.3604 (269)
Total CO2, kg/year			2133.7238 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			10.4000 (273)

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

DER			
Total Floor Area		TFA	10.4000 ZC1
Assumed number of occupants		N	205.1000
CO2 emission factor in Table 12 for electricity displaced from grid		EF	3.0086
CO2 emissions from appliances, equation (L14)			0.5190
CO2 emissions from cooking, equation (L16)			10.8596 ZC2
Total CO2 emissions			0.9323 ZC3
Residual CO2 emissions offset from biofuel CHP			22.1919 ZC4
Additional allowable electricity generation, kWh/m²/year			0.0000 ZC5
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000 ZC6
Net CO2 emissions			0.0000 ZC7
			22.1919 ZC8

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)

### CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

#### 1. Overall dwelling dimensions

	Area (m <sup>2</sup> )	Storey height (m)	Volume (m <sup>3</sup> )
Ground floor	96.7000 (1b)	2.4800 (2b)	239.8160 (1b) - (3b)
First floor	108.4000 (1c)	2.6400 (2c)	286.1760 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	205.1000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 525.9920 (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	1	0	0	1 * 20 =	20.0000 (6b)							
Number of intermittent fans				4 * 10 =	40.0000 (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) =				60.0000 / (5) =	0.1141 (8)							
Pressure test				Yes								
Measured/design AP50					7.0000							
Infiltration rate					0.4641 (18)							
Number of sides sheltered					2 (19)							
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)							
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3945 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.5029	0.4931	0.4832	0.4339	0.4240	0.3747	0.3747	0.3649	0.3945	0.4240	0.4438	0.4635 (22b)
	0.6265	0.6216	0.6167	0.5941	0.5899	0.5702	0.5702	0.5666	0.5778	0.5899	0.5985	0.6074 (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			1.8500	1.4000	2.5900		(26)					
TER Opening Type (Uw = 1.40)			49.4300	1.3258	65.5322		(27)					
Insulated slab			96.4000	0.1500	14.4600		(28a)					
Floor over garage			14.7400	0.1500	2.2110		(28b)					
Main T/Frame ACDS	249.9100	51.2800	198.6300	0.1700	33.7671		(29a)					
Horizontal ceiling	109.5000		109.5000	0.1100	12.0450		(30)					
Total net area of external elements Aum(A, m <sup>2</sup> )			470.5500				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =		130.6053 (33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m <sup>2</sup> K							100.0000 (35)					
Thermal bridges (User defined value 0.080 * total exposed area)							37.6440 (36)					
Total fabric heat loss							(33) + (36) = 168.2493 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 108.7414	Feb 107.8890	Mar 107.0534	Apr 103.1287	May 102.3944	Jun 98.9762	Jul 98.9762	Aug 98.3432	Sep 100.2929	Oct 102.3944	Nov 103.8799	Dec 105.4329 (38)
Heat transfer coeff	276.9907	276.1383	275.3027	271.3780	270.6437	267.2255	267.2255	266.5925	268.5422	270.6437	272.1292	273.6822 (39)
Average = Sum(39)m / 12 =												271.3745 (39)
HLP	Jan 1.3505	Feb 1.3464	Mar 1.3423	Apr 1.3231	May 1.3196	Jun 1.3029	Jul 1.3029	Aug 1.2998	Sep 1.3093	Oct 1.3196	Nov 1.3268	Dec 1.3344 (40)
HLP (average)												1.3231 (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												3.0086 (42)
Average daily hot water use (litres/day)												111.2139 (43)
Daily hot water use	122.3353	117.8867	113.4382	108.9896	104.5410	100.0925	100.0925	104.5410	108.9896	113.4382	117.8867	122.3353 (44)
Energy conte	181.4197	158.6708	163.7340	142.7473	136.9694	118.1942	109.5243	125.6807	127.1818	148.2181	161.7916	175.6953 (45)
Energy content (annual)												Total = Sum(45)m = 1749.8273 (45)
Distribution loss (46)m = 0.15 x (45)m	27.2129	23.8006	24.5601	21.4121	20.5454	17.7291	16.4286	18.8521	19.0773	22.2327	24.2687	26.3543 (46)
Water storage loss:												150.0000 (47)
Store volume												1.8900 (48)
a) If manufacturer declared loss factor is known (kWh/day):												

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)

### CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0206 (55)
Total storage loss	31.6386	28.5768	31.6386	30.6180	31.6386	30.6180	31.6386	31.6386	30.6180	31.6386	30.6180	31.6386 (56)
If cylinder contains dedicated solar storage	31.6386	28.5768	31.6386	30.6180	31.6386	30.6180	31.6386	31.6386	30.6180	31.6386	30.6180	31.6386 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	236.3207	208.2588	218.6350	195.8773	191.8704	171.3242	164.4253	180.5817	180.3118	203.1191	214.9216	230.5963 (62)
WWHRS	-44.7325	-39.3582	-40.1705	-33.0552	-30.6945	-25.3229	-21.4343	-25.9511	-26.7070	-33.0122	-38.2361	-43.2350 eq. (G10)
Total of WWHRS savings	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-401.9095
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	191.5882	168.9006	178.4645	162.8221	161.1759	146.0013	142.9910	154.6306	153.6048	170.1069	176.6855	187.3612 (64)
Heat gains from water heating, kWh/month	104.2428	92.4284	98.3624	89.9675	89.4631	81.8036	80.3376	85.7096	84.7919	93.2033	96.2997	102.3395 (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	150.4277	150.4277	150.4277	150.4277	150.4277	150.4277	150.4277	150.4277	150.4277	150.4277	150.4277	150.4277 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	33.5088	29.7622	24.2043	18.3242	13.6975	11.5640	12.4954	16.2419	21.7999	27.6800	32.3066	34.4401 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	375.8668	379.7672	369.9385	349.0144	322.6014	297.7770	281.1928	277.2925	287.1211	308.0453	334.4582	359.2826 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.0428	38.0428	38.0428	38.0428	38.0428	38.0428	38.0428	38.0428	38.0428	38.0428	38.0428	38.0428 (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)	-120.3422	-120.3422	-120.3422	-120.3422	-120.3422	-120.3422	-120.3422	-120.3422	-120.3422	-120.3422	-120.3422	-120.3422 (71)
Water heating gains (Table 5)	140.1113	137.5423	132.2075	124.9548	120.2462	113.6161	107.9807	115.2011	117.7666	125.2733	133.7496	137.5531 (72)
Total internal gains	620.6153	618.2000	597.4786	563.4217	527.6735	494.0855	472.7972	479.8639	497.8159	532.1268	571.6427	602.4041 (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						
East	49.4300	19.6403	0.6300	0.7000	0.7700	296.6947 (76)						
Solar gains	296.6947	580.3977	955.8324	1394.0245	1708.4294	1748.8815	1665.0065	1430.2160	1111.6726	688.6908	369.9434	243.9873 (83)
Total gains	917.3100	1198.5977	1553.3109	1957.4463	2236.1029	2242.9670	2137.8036	1910.0798	1609.4886	1220.8176	941.5861	846.3914 (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	20.5683	20.6318	20.6944	20.9937	21.0506	21.3199	21.3199	21.3705	21.2154	21.0506	20.9357	20.8169
alpha	2.3712	2.3755	2.3796	2.3996	2.4034	2.4213	2.4213	2.4247	2.4144	2.4034	2.3957	2.3878
util living area	0.9826	0.9672	0.9326	0.8590	0.7467	0.6071	0.4832	0.5415	0.7551	0.9192	0.9729	0.9856 (86)
MIT	17.9666	18.3195	18.9230	19.6833	20.3029	20.7117	20.8818	20.8410	20.4736	19.6075	18.6472	17.9185 (87)
Th 2	19.8015	19.8047	19.8079	19.8227	19.8255	19.8386	19.8386	19.8410	19.8335	19.8255	19.8199	19.8140 (88)
util rest of house	0.9797	0.9616	0.9209	0.8340	0.7003	0.5305	0.3766	0.4344	0.6913	0.8997	0.9674	0.9831 (89)
MIT 2	15.7513	16.2650	17.1366	18.2200	19.0624	19.5843	19.7654	19.7347	19.3172	18.1403	16.7537	15.6874 (90)
Living area fraction	16.2211	16.7007	17.5155	18.5303	19.3255	19.8234	20.0022	19.9693	19.5624	18.4515	17.1553	16.1606 (92)
Temperature adjustment	16.0711	16.5507	17.3655	18.3803	19.1755	19.6734	19.8522	19.8193	19.4124	18.3015	17.0053	-0.1500
adjusted MIT												16.0106 (93)

#### 8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	884.2631	1123.8803	1377.0642	1555.9553	1498.3983	1162.7969	807.9144	825.4558	1067.7237	1053.9691	890.8529	820.6394 (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	3260.4987	3217.2172	2991.2950	2572.7585	2023.2051	1355.7416	869.0585	911.5640	1426.6153	2084.3626	2695.5238	3232.3383 (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	1767.9193	1406.7224	1200.9877	732.0983	390.4563	0.0000	0.0000	0.0000	0.0000	766.6128	1299.3631	1794.3040 (98)
Space heating per m2												9358.4639 (98)
												(98) / (4) = 45.6288 (99)

#### 8c. Space cooling requirement

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)

### CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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)													0.1000 (201)
Fraction of space heat from main system(s)													0.9000 (202)
Efficiency of main space heating system 1 (in %)													92.0000 (206)
Efficiency of secondary/supplementary heating system, %													60.0000 (208)
Space heating requirement	1767.9193	1406.7224	1200.9877	732.0983	390.4563	0.0000	0.0000	0.0000	0.0000	766.6128	1299.3631	1794.3040	(98)
Space heating efficiency (main heating system 1)	92.0000	92.0000	92.0000	92.0000	92.0000	0.0000	0.0000	0.0000	0.0000	92.0000	92.0000	92.0000	(210)
Space heating fuel (main heating system)	1729.4863	1376.1415	1174.8793	716.1831	381.9681	0.0000	0.0000	0.0000	0.0000	749.9473	1271.1161	1755.2974	(211)
Water heating requirement	294.6532	234.4537	200.1646	122.0164	65.0760	0.0000	0.0000	0.0000	0.0000	127.7688	216.5605	299.0507	(215)
Water heating requirement	191.5882	168.9006	178.4645	162.8221	161.1759	146.0013	142.9910	154.6306	153.6048	170.1069	176.6855	187.3612	(64)
Efficiency of water heater (217)m	89.1469	89.0201	88.7242	88.0362	86.6518	79.3000	79.3000	79.3000	79.3000	88.0406	88.8528	79.3000	(216)
Fuel for water heating, kWh/month	214.9130	189.7330	201.1452	184.9490	186.0041	184.1126	180.3165	194.9945	193.7009	193.2141	198.8519	210.0688	(219)
Water heating fuel used												2332.0036	(219)
Annual totals kWh/year													
Space heating fuel - main system													9155.0190 (211)
Space heating fuel - secondary													1559.7440 (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)													591.7759 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 2.05 * 1029 * 1.00) =										-1687.8662			-1687.8662 (233)
Total delivered energy for all uses													12025.6763 (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	9155.0190	0.2410	2206.3596	(261)
Space heating - secondary	1559.7440	0.0190	29.6351	(263)
Water heating (other fuel)	2332.0036	0.2410	562.0129	(264)
Space and water heating			2798.0076	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	591.7759	0.5190	307.1317	(268)
Energy saving/generation technologies				
PV Unit	-1687.8662	0.5190	-876.0026	(269)
Total CO2, kg/m2/year			2268.0617	(272)
Target Carbon Dioxide Emission Rate (TER) = 2268.0617 / 205.10, rounded to 2 d.p.			11.0600	(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	96.7000 (1b)	2.4800 (2b)	239.8160 (1b) - (3b)
First floor	108.4000 (1c)	2.6400 (2c)	286.1760 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	205.1000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 525.9920 (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				4 * 10 =	40.0000 (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) =				40.0000 / (5) =	0.0760 (8)							
Pressure test				Yes	4.0000							
Measured/design AP50					0.2760 (18)							
Infiltration rate					2 (19)							
Number of sides sheltered												
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)							
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.2346 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.2992	0.2933	0.2874	0.2581	0.2522	0.2229	0.2229	0.2170	0.2346	0.2522	0.2640	0.2757 (22b)
	0.5448	0.5430	0.5413	0.5333	0.5318	0.5248	0.5248	0.5236	0.5275	0.5318	0.5348	0.5380 (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					
Half hour door to garage			1.8900	1.4000	2.6460		(26)					
Part glazed door			4.2000	1.4000	5.8800		(26a)					
Windows / Patios (Uw = 1.40)			27.1000	1.3258	35.9280		(27)					
Insulated slab			96.4000	0.1200	11.5680		(28a)					
Floor over garage			14.7400	0.1500	2.2110		(28b)					
Main T/Frame ACDS	209.4000	29.5000	179.9000	0.1600	28.7840		(29a)					
House to garage wall	16.8600	1.8900	14.9700	0.1900	2.8443		(29a)					
Hanging posts	6.1500		6.1500	0.1700	1.0455		(29a)					
Dormer walls	6.5000	1.8000	4.7000	0.2000	0.9400		(29a)					
Stone clad T/Frame	5.0000		5.0000	0.1600	0.8000		(29a)					
Render /lathe nominal area	6.0000		6.0000	0.1600	0.9600		(29a)					
Horizontal ceiling	106.6000		106.6000	0.1000	10.6600		(30)					
Sloping ceiling	2.9000		2.9000	0.1500	0.4350		(30)					
Total net area of external elements Aum(A, m <sup>2</sup> )			470.5500				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 104.7018		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m <sup>2</sup> K							100.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							18.7752 (36)					
Total fabric heat loss							(33) + (36) = 123.4770 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 94.5563	Feb 94.2547	Mar 93.9590	Apr 92.5703	May 92.3105	Jun 91.1010	Jul 91.1010	Aug 90.8770	Sep 91.5669	Oct 92.3105	Nov 92.8361	Dec 93.3856 (38)
Heat transfer coeff	218.0333	217.7317	217.4360	216.0473	215.7875	214.5780	214.5780	214.3541	215.0439	215.7875	216.3131	216.8626 (39)
Average = Sum(39)m / 12 =												216.0461 (39)
HLP	Jan 1.0631	Feb 1.0616	Mar 1.0601	Apr 1.0534	May 1.0521	Jun 1.0462	Jul 1.0462	Aug 1.0451	Sep 1.0485	Oct 1.0521	Nov 1.0547	Dec 1.0574 (40)
HLP (average)												1.0534 (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												3.0086 (42)
Average daily hot water use (litres/day)												111.2139 (43)
Daily hot water use	122.3353	117.8867	113.4382	108.9896	104.5410	100.0925	100.0925	104.5410	108.9896	113.4382	117.8867	122.3353 (44)

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### CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Energy conte	181.4197	158.6708	163.7340	142.7473	136.9694	118.1942	109.5243	125.6807	127.1818	148.2181	161.7916	175.6953 (45)
Energy content (annual)												Total = Sum(45)m = 1749.8273 (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)
If cylinder contains dedicated solar storage												
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Heat gains from water heating, kWh/month	38.5517	33.7175	34.7935	30.3338	29.1060	25.1163	23.2739	26.7072	27.0261	31.4963	34.3807	37.3352 (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	150.4277	150.4277	150.4277	150.4277	150.4277	150.4277	150.4277	150.4277	150.4277	150.4277	150.4277	150.4277 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	36.4081	32.3374	26.2985	19.9097	14.8827	12.5646	13.5765	17.6473	23.6861	30.0750	35.1019	37.4200 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	375.8668	379.7672	369.9385	349.0144	322.6014	297.7770	281.1928	277.2925	287.1211	308.0453	334.4582	359.2826 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.0428	38.0428	38.0428	38.0428	38.0428	38.0428	38.0428	38.0428	38.0428	38.0428	38.0428	38.0428 (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)	-120.3422	-120.3422	-120.3422	-120.3422	-120.3422	-120.3422	-120.3422	-120.3422	-120.3422	-120.3422	-120.3422	-120.3422 (71)
Water heating gains (Table 5)	51.8168	50.1749	46.7654	42.1303	39.1210	34.8837	31.2821	35.8967	37.5363	42.3338	47.7510	50.1818 (72)
Total internal gains	532.2201	530.4078	511.1308	479.1827	444.7335	413.3537	394.1798	398.9648	416.4719	448.5823	485.4394	515.0127 (73)

#### 6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	Specific data	Specific data	factor	W						
		W/m2	or Table 6b	or Table 6c	Table 6d							
North	10.6700	10.6334	0.6300	0.7000	0.7700	34.6743 (74)						
East	0.7200	19.6403	0.6300	0.7000	0.7700	4.3217 (76)						
South	14.9900	46.7521	0.6300	0.7000	0.7700	214.1777 (78)						
West	0.7200	19.6403	0.6300	0.7000	0.7700	4.3217 (80)						
Solar gains	257.4954	433.9405	587.2609	726.4736	819.6503	818.2070	786.8349	715.3975	634.5185	477.2782	307.4261	221.0833 (83)
Total gains	789.7154	964.3483	1098.3917	1205.6563	1264.3838	1231.5606	1181.0147	1114.3622	1050.9904	925.8606	792.8655	736.0961 (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	26.1301	26.1663	26.2018	26.3702	26.4020	26.5508	26.5508	26.5786	26.4933	26.4020	26.3378	26.2711
alpha	2.7420	2.7444	2.7468	2.7580	2.7601	2.7701	2.7701	2.7719	2.7662	2.7601	2.7559	2.7514
util living area	0.9881	0.9788	0.9633	0.9326	0.8745	0.7734	0.6481	0.6885	0.8455	0.9471	0.9812	0.9902 (86)
MIT	18.4306	18.6982	19.1167	19.6573	20.1876	20.6197	20.8385	20.8022	20.4626	19.7672	18.9922	18.3771 (87)
Th 2	20.0311	20.0323	20.0335	20.0391	20.0401	20.0450	20.0450	20.0459	20.0431	20.0401	20.0380	20.0358 (88)
util rest of house	0.9862	0.9755	0.9571	0.9199	0.8472	0.7151	0.5488	0.5951	0.8016	0.9348	0.9776	0.9886 (89)
MIT 2	17.6501	17.9169	18.3330	18.8697	19.3833	19.7851	19.9627	19.9389	19.6499	18.9837	18.2152	17.6001 (90)
Living area fraction												fLA = Living area / (4) = 0.2121 (91)
MIT	17.8156	18.0826	18.4992	19.0367	19.5539	19.9621	20.1484	20.1220	19.8223	19.1499	18.3800	17.7649 (92)
Temperature adjustment												0.0000
adjusted MIT	17.8156	18.0826	18.4992	19.0367	19.5539	19.9621	20.1484	20.1220	19.8223	19.1499	18.3800	17.7649 (93)

#### 8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9801	0.9662	0.9440	0.9031	0.8306	0.7093	0.5608	0.6035	0.7894	0.9197	0.9691	0.9833 (94)
Useful gains	773.9747	931.7054	1036.9133	1088.7840	1050.1447	873.5380	662.2773	672.5531	829.6614	851.5245	768.3426	723.8261 (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	2946.8603	2870.2775	2609.0649	2190.0162	1694.7696	1150.5890	761.4188	797.8300	1230.5395	1844.9616	2440.0062	2941.7163 (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	1616.6269	1302.7205	1169.6808	792.8872	479.6010	0.0000	0.0000	0.0000	0.0000	739.1172	1203.5978	1650.1103 (98)
Space heating												8954.3418 (98)
Space heating per m2												(98) / (4) = 43.6584 (99)

#### 8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000

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### CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	2017.0335	1587.8775	1629.0908	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6408	0.7187	0.6898	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1292.4595	1141.2168	1123.6873	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1583.3154	1520.8223	1446.2940	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh													
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	209.4162	282.4265	240.0194	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling Cooled fraction												731.8621	(104)
Intermittency factor (Table 10b)												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													
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	52.3540	70.6066	60.0049	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling per m2												182.9655	(107)
Energy for space heating												0.8921	(108)
Energy for space cooling												43.6584	(99)
Total												0.8921	(108)
Dwelling Fabric Energy Efficiency (DFEE)												44.5505	(109)
												44.6	(109)



# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)

### CALCULATION OF HEAT DEMAND 09 Jan 2014

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

#### 1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	96.7000 (1b)	2.4800 (2b)	239.8160 (1b) - (3b)
First floor	108.4000 (1c)	2.6400 (2c)	286.1760 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	205.1000		(3a) + (3b) + (3c) + (3d) + (3e)...(3n) = 525.9920 (5)

#### 2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour							
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)							
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)							
Number of intermittent fans				0 * 10 =	0.0000 (7a)							
Number of passive vents				0 * 10 =	0.0000 (7b)							
Number of flueless gas fires				0 * 40 =	0.0000 (7c)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)				0.0000 / (5) =	0.0000 (8)							
Pressure test				Yes	4.0000							
Measured/design AP50					0.2000 (18)							
Infiltration rate					2 (19)							
Number of sides sheltered												
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)							
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.1700 (21)							
Wind speed	Jan 5.7000	Feb 5.8000	Mar 5.7000	Apr 5.0000	May 4.6000	Jun 4.4000	Jul 4.0000	Aug 4.1000	Sep 4.6000	Oct 5.2000	Nov 5.3000	Dec 5.1000 (22)
Wind factor	1.4250	1.4500	1.4250	1.2500	1.1500	1.1000	1.0000	1.0250	1.1500	1.3000	1.3250	1.2750 (22a)
Adj infilt rate	0.2423	0.2465	0.2423	0.2125	0.1955	0.1870	0.1700	0.1743	0.1955	0.2210	0.2253	0.2168 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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					
Half hour door to garage			1.8900	1.4000	2.6460		(26)					
Part glazed door			4.2000	1.4000	5.8800		(26a)					
Windows / Patios (Uw = 1.40)			27.1000	1.3258	35.9280		(27)					
Insulated slab			96.4000	0.1200	11.5680		(28a)					
Floor over garage			14.7400	0.1500	2.2110		(28b)					
Main T/Frame ACDS	209.4000	29.5000	179.9000	0.1600	28.7840		(29a)					
House to garage wall	16.8600	1.8900	14.9700	0.1900	2.8443		(29a)					
Hanging posts	6.1500		6.1500	0.1700	1.0455		(29a)					
Dormer walls	6.5000	1.8000	4.7000	0.2000	0.9400		(29a)					
Stone clad T/Frame	5.0000		5.0000	0.1600	0.8000		(29a)					
Render /lathe nominal area	6.0000		6.0000	0.1600	0.9600		(29a)					
Horizontal ceiling	106.6000		106.6000	0.1000	10.6600		(30)					
Sloping ceiling	2.9000		2.9000	0.1500	0.4350		(30)					
Total net area of external elements Aum(A, m2)			470.5500				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 104.7018		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							18.7752 (36)					
Total fabric heat loss						(33) + (36) =	123.4770 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 86.7887	Feb 86.7887	Mar 86.7887	Apr 86.7887	May 86.7887	Jun 86.7887	Jul 86.7887	Aug 86.7887	Sep 86.7887	Oct 86.7887	Nov 86.7887	Dec 86.7887 (38)
Heat transfer coeff	210.2657	210.2657	210.2657	210.2657	210.2657	210.2657	210.2657	210.2657	210.2657	210.2657	210.2657	210.2657 (39)
Average = Sum(39)m / 12 =												210.2657 (39)
HLP	Jan 1.0252	Feb 1.0252	Mar 1.0252	Apr 1.0252	May 1.0252	Jun 1.0252	Jul 1.0252	Aug 1.0252	Sep 1.0252	Oct 1.0252	Nov 1.0252	Dec 1.0252 (40)
HLP (average)												1.0252 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

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

Assumed occupancy	3.0086 (42)
Average daily hot water use (litres/day)	111.2139 (43)



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### CALCULATION OF HEAT DEMAND 09 Jan 2014

Month fracti	2891.2335	2886.9976	2700.9275	2382.8307	2034.8425	1529.6337	1208.1371	1220.8800	1541.5507	2043.7321	2510.0672	2936.9893	(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	1351.2200	1114.9946	1015.7088	739.0726	527.5728	0.0000	0.0000	0.0000	0.0000	715.1061	1059.3091	1429.1523	(98)
RHI space heating demand												7952.1365	(98)
												7952	(98)

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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	96.7000 (1b)	x 2.4800 (2b)	= 239.8160 (1b) - (3b)
First floor	108.4000 (1c)	x 2.6400 (2c)	= 286.1760 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	205.1000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 525.9920 (5)

#### 2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour							
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)							
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)							
Number of intermittent fans					0 * 10 = 0.0000 (7a)							
Number of passive vents					0 * 10 = 0.0000 (7b)							
Number of flueless gas fires					0 * 40 = 0.0000 (7c)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					0.0000 / (5) = 0.0000 (8)							
Pressure test					Yes							
Measured/design AP50					4.0000							
Infiltration rate					0.2000 (18)							
Number of sides sheltered					2 (19)							
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)							
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.1700 (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	0.2168	0.2125	0.2083	0.1870	0.1828	0.1615	0.1615	0.1573	0.1700	0.1828	0.1913	0.1998 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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					
Half hour door to garage			1.8900	1.4000	2.6460		(26)					
Part glazed door			4.2000	1.4000	5.8800		(26a)					
Windows / Patios (Uw = 1.40)			27.1000	1.3258	35.9280		(27)					
Insulated slab			96.4000	0.1200	11.5680		(28a)					
Floor over garage			14.7400	0.1500	2.2110		(28b)					
Main T/Frame ACDS	209.4000	29.5000	179.9000	0.1600	28.7840		(29a)					
House to garage wall	16.8600	1.8900	14.9700	0.1900	2.8443		(29a)					
Hanging posts	6.1500		6.1500	0.1700	1.0455		(29a)					
Dormer walls	6.5000	1.8000	4.7000	0.2000	0.9400		(29a)					
Stone clad T/Frame	5.0000		5.0000	0.1600	0.8000		(29a)					
Render /lathe nominal area	6.0000		6.0000	0.1600	0.9600		(29a)					
Horizontal ceiling	106.6000		106.6000	0.1000	10.6600		(30)					
Sloping ceiling	2.9000		2.9000	0.1500	0.4350		(30)					
Total net area of external elements Aum(A, m2)			470.5500				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		104.7018		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							18.7752 (36)					
Total fabric heat loss						(33) + (36) =	123.4770 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 86.7887	Feb 86.7887	Mar 86.7887	Apr 86.7887	May 86.7887	Jun 86.7887	Jul 86.7887	Aug 86.7887	Sep 86.7887	Oct 86.7887	Nov 86.7887	Dec 86.7887 (38)
Heat transfer coeff	210.2657	210.2657	210.2657	210.2657	210.2657	210.2657	210.2657	210.2657	210.2657	210.2657	210.2657	210.2657 (39)
Average = Sum(39)m / 12 =												210.2657 (39)
HLP	Jan 1.0252	Feb 1.0252	Mar 1.0252	Apr 1.0252	May 1.0252	Jun 1.0252	Jul 1.0252	Aug 1.0252	Sep 1.0252	Oct 1.0252	Nov 1.0252	Dec 1.0252 (40)
HLP (average)												1.0252 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

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

Assumed occupancy	3.0086 (42)
Average daily hot water use (litres/day)	111.2139 (43)



# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)

### CALCULATION OF ENERGY RATINGS 09 Jan 2014

Month fraction	2746.1613	2689.7751	2460.1917	2087.4515	1623.7504	1104.5129	721.6542	759.1166	1182.8099	1761.8491	2300.7426	2747.5886	(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 requirement	1217.3683	973.8144	861.3984	571.9877	328.6697	0.0000	0.0000	0.0000	0.0000	516.9618	890.6243	1256.2840	(98)	
Space heating requirement per m2												6617.1087	(98)	
												(98) / (4) =	32.2628	(99)

#### 8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)	
Fraction of space heat from main system(s)														1.0000	(202)
Efficiency of main space heating system 1 (in %)														91.2000	(206)
Efficiency of secondary/supplementary heating system, %														0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Space heating requirement	1217.3683	973.8144	861.3984	571.9877	328.6697	0.0000	0.0000	0.0000	0.0000	516.9618	890.6243	1256.2840	(98)		
Space heating efficiency (main heating system 1)	91.2000	91.2000	91.2000	91.2000	91.2000	0.0000	0.0000	0.0000	0.0000	91.2000	91.2000	91.2000	(210)		
Space heating fuel (main heating system)	1334.8337	1067.7789	944.5158	627.1795	360.3834	0.0000	0.0000	0.0000	0.0000	566.8440	976.5618	1377.5044	(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	204.0515	180.2011	191.0833	173.4370	172.2234	166.0240	159.6092	174.9191	174.5407	180.5606	187.3055	198.8487	(64)		
Efficiency of water heater	89.4924	89.3456	89.0510	88.4641	87.2141	80.5000	80.5000	80.5000	80.5000	88.1664	89.1411	80.5000	(216)		
Fuel for water heating, kWh/month	228.0100	201.6900	214.5773	196.0534	197.4719	206.2410	198.2723	217.2908	216.8207	204.7952	210.1224	221.9962	(219)		
Water heating fuel used												2513.3412	(219)		
Annual totals kWh/year															
Space heating fuel - main system													7255.6016	(211)	
Space heating fuel - secondary													0.0000	(215)	
Electricity for pumps and fans:															
(MEV)Decentralised, Database: total watage = 13.1040, total flow = 53.0000, SFP = 0.2472)															
mechanical ventilation fans (SFP = 0.2472)														158.6598	(230a)
central heating pump														30.0000	(230c)
main heating flue fan														45.0000	(230e)
Total electricity for the above, kWh/year														233.6598	(231)
Electricity for lighting (calculated in Appendix L)														642.9789	(232)
Energy saving/generation technologies (Appendices M ,N and Q)															
PV Unit 0 (0.80 * 2.01 * 1068 * 1.00) =										-1717.4573				-1717.4573	(233)
Total delivered energy for all uses														8928.1242	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	7255.6016	7.6000	551.4257	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	2513.3412	7.6000	191.0139	(247)
Mechanical ventilation fans	158.6598	13.1900	20.9272	(249)
Pumps and fans for heating	75.0000	13.1900	9.8925	(249)
Energy for lighting	642.9789	13.1900	84.8089	(250)
Additional standing charges			70.0000	(251)
Energy saving/generation technologies				
PV Unit	-1717.4573	13.1900	-226.5326	(252)
Total energy cost			701.5357	(255)

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

Energy cost deflator (Table 12):		0.4200	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.1781	(257)
SAP value		83.5654	
SAP rating (Section 12)		84	(258)
SAP band		B	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	7255.6016	0.2410	1748.6000	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2513.3412	0.2410	605.7152	(264)
Space and water heating			2354.3152	(265)
Pumps and fans	233.6598	0.5190	121.2695	(267)
Energy for lighting	642.9789	0.5190	333.7060	(268)

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)

### CALCULATION OF ENERGY RATINGS 09 Jan 2014

Energy saving/generation technologies			
PV Unit	-1717.4573	0.5190	-891.3604 (269)
Total kg/year			1917.9303 (272)
CO2 emissions per m2			9.3500 (273)
EI value			89.7240
EI rating			90 (274)
EI band			B

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 Calculation of stars for heating and DHW  
 -----

Main heating energy efficiency	$7.60 \times (1 + 0.29 \times 0.00) / 0.9120 = 8.333$ , stars = 2
Main heating environmental impact	$0.241 \times (1 + 0.29 \times 0.00) / 0.9120 = 0.2643$ , stars = 4
Water heating energy efficiency	$7.60 / 0.8604 = 8.833$ , stars = 3
Water heating environmental impact	$0.241 / 0.8604 = 0.2801$ , stars = 5

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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	96.7000 (1b)	x 2.4800 (2b)	= 239.8160 (1b) - (3b)
First floor	108.4000 (1c)	x 2.6400 (2c)	= 286.1760 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	205.1000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 525.9920 (5)

#### 2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour							
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)							
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)							
Number of intermittent fans					0 * 10 = 0.0000 (7a)							
Number of passive vents					0 * 10 = 0.0000 (7b)							
Number of flueless gas fires					0 * 40 = 0.0000 (7c)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					0.0000 / (5) = 0.0000 (8)							
Pressure test					Yes							
Measured/design AP50					4.0000							
Infiltration rate					0.2000 (18)							
Number of sides sheltered					2 (19)							
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)							
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.1700 (21)							
Wind speed	Jan 5.7000	Feb 5.8000	Mar 5.7000	Apr 5.0000	May 4.6000	Jun 4.4000	Jul 4.0000	Aug 4.1000	Sep 4.6000	Oct 5.2000	Nov 5.3000	Dec 5.1000 (22)
Wind factor	1.4250	1.4500	1.4250	1.2500	1.1500	1.1000	1.0000	1.0250	1.1500	1.3000	1.3250	1.2750 (22a)
Adj infilt rate	0.2423	0.2465	0.2423	0.2125	0.1955	0.1870	0.1700	0.1743	0.1955	0.2210	0.2253	0.2168 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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					
Half hour door to garage			1.8900	1.4000	2.6460		(26)					
Part glazed door			4.2000	1.4000	5.8800		(26a)					
Windows / Patios (Uw = 1.40)			27.1000	1.3258	35.9280		(27)					
Insulated slab			96.4000	0.1200	11.5680		(28a)					
Floor over garage			14.7400	0.1500	2.2110		(28b)					
Main T/Frame ACDS	209.4000	29.5000	179.9000	0.1600	28.7840		(29a)					
House to garage wall	16.8600	1.8900	14.9700	0.1900	2.8443		(29a)					
Hanging posts	6.1500		6.1500	0.1700	1.0455		(29a)					
Dormer walls	6.5000	1.8000	4.7000	0.2000	0.9400		(29a)					
Stone clad T/Frame	5.0000		5.0000	0.1600	0.8000		(29a)					
Render /lathe nominal area	6.0000		6.0000	0.1600	0.9600		(29a)					
Horizontal ceiling	106.6000		106.6000	0.1000	10.6600		(30)					
Sloping ceiling	2.9000		2.9000	0.1500	0.4350		(30)					
Total net area of external elements Aum(A, m2)			470.5500				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	104.7018		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							18.7752 (36)					
Total fabric heat loss						(33) + (36) =	123.4770 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 86.7887	Feb 86.7887	Mar 86.7887	Apr 86.7887	May 86.7887	Jun 86.7887	Jul 86.7887	Aug 86.7887	Sep 86.7887	Oct 86.7887	Nov 86.7887	Dec 86.7887 (38)
Heat transfer coeff	210.2657	210.2657	210.2657	210.2657	210.2657	210.2657	210.2657	210.2657	210.2657	210.2657	210.2657	210.2657 (39)
Average = Sum(39)m / 12 =												210.2657 (39)
HLP	Jan 1.0252	Feb 1.0252	Mar 1.0252	Apr 1.0252	May 1.0252	Jun 1.0252	Jul 1.0252	Aug 1.0252	Sep 1.0252	Oct 1.0252	Nov 1.0252	Dec 1.0252 (40)
HLP (average)												1.0252 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

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

Assumed occupancy	3.0086 (42)
Average daily hot water use (litres/day)	111.2139 (43)



# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	122.3353	117.8867	113.4382	108.9896	104.5410	100.0925	100.0925	104.5410	108.9896	113.4382	117.8867	122.3353	(44)
Energy conte	181.4197	158.6708	163.7340	142.7473	136.9694	118.1942	109.5243	125.6807	127.1818	148.2181	161.7916	175.6953	(45)
Energy content (annual)	Total = Sum(45)m =											1749.8273 (45)	
Distribution loss (46)m = 0.15 x (45)m	27.2129	23.8006	24.5601	21.4121	20.5454	17.7291	16.4286	18.8521	19.0773	22.2327	24.2687	26.3543	(46)
Water storage loss:													
Store volume													250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													2.2000 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													1.1880 (55)
Total storage loss	36.8280	33.2640	36.8280	35.6400	36.8280	35.6400	36.8280	36.8280	35.6400	36.8280	35.6400	36.8280	(56)
If cylinder contains dedicated solar storage	36.8280	33.2640	36.8280	35.6400	36.8280	35.6400	36.8280	36.8280	35.6400	36.8280	35.6400	36.8280	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month	241.5101	212.9460	223.8244	200.8993	197.0598	176.3462	169.6147	185.7711	185.3338	208.3085	219.9436	235.7857	(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)
FGHRS	-38.2083	-33.5672	-34.1219	-28.9247	-26.5396	-10.3222	-10.0055	-10.8521	-10.7931	-29.5161	-33.9619	-37.8826	eq. (66)
Output from w/h	203.3018	179.3788	189.7025	171.9746	170.5202	166.0240	159.6092	174.9191	174.5407	178.7924	185.9818	197.9030	(64)
Heat gains from water heating, kWh/month	108.3944	96.1782	102.5139	93.9851	93.6147	85.8212	84.4892	89.8612	88.8095	97.3548	100.3173	106.4910	(65)
Total per year (kWh/year) = Sum(64)m =												2152.6481 (64)	

#### 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	180.5133	180.5133	180.5133	180.5133	180.5133	180.5133	180.5133	180.5133	180.5133	180.5133	180.5133	180.5133	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	91.0203	80.8434	65.7463	49.7742	37.2068	31.4115	33.9413	44.1181	59.2153	75.1874	87.7548	93.5501	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	560.9953	566.8167	552.1470	520.9170	481.4947	444.4433	419.6907	413.8693	428.5390	459.7690	499.1913	536.2427	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	56.0599	56.0599	56.0599	56.0599	56.0599	56.0599	56.0599	56.0599	56.0599	56.0599	56.0599	56.0599	(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)	-120.3422	-120.3422	-120.3422	-120.3422	-120.3422	-120.3422	-120.3422	-120.3422	-120.3422	-120.3422	-120.3422	-120.3422	(71)
Water heating gains (Table 5)	145.6913	143.1223	137.7875	130.5348	125.8262	119.1961	113.5607	120.7811	123.3466	130.8533	139.3296	143.1331	(72)
Total internal gains	916.9379	910.0134	874.9118	820.4570	763.7586	714.2819	686.4237	697.9996	730.3319	785.0407	845.5067	892.1568	(73)

#### 6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W							
North	10.6700	8.2005	0.6300	0.7000	0.7700	26.7410 (74)							
East	0.7200	14.7869	0.6300	0.7000	0.7700	3.2537 (76)							
South	14.9900	38.1750	0.6300	0.7000	0.7700	174.8849 (78)							
West	0.7200	14.7869	0.6300	0.7000	0.7700	3.2537 (80)							
Solar gains	208.1333	399.6580	595.8434	741.6139	868.0654	798.1574	768.0114	696.2422	605.2858	430.5596	257.6642	162.9372	(83)
Total gains	1125.0712	1309.6714	1470.7552	1562.0709	1631.8240	1512.4393	1454.4351	1394.2419	1335.6177	1215.6003	1103.1710	1055.0939	(84)

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

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	27.0953	27.0953	27.0953	27.0953	27.0953	27.0953	27.0953	27.0953	27.0953	27.0953	27.0953	27.0953	
alpha	2.8064	2.8064	2.8064	2.8064	2.8064	2.8064	2.8064	2.8064	2.8064	2.8064	2.8064	2.8064	
util living area	0.9754	0.9633	0.9423	0.9116	0.8654	0.8065	0.7417	0.7619	0.8494	0.9313	0.9668	0.9801	(86)
MIT	18.6107	18.8177	19.1988	19.6355	20.0459	20.4259	20.6420	20.6080	20.3099	19.6952	19.0421	18.4765	(87)
Th 2	20.0624	20.0624	20.0624	20.0624	20.0624	20.0624	20.0624	20.0624	20.0624	20.0624	20.0624	20.0624	(88)
util rest of house	0.9720	0.9583	0.9342	0.8983	0.8435	0.7691	0.6869	0.7097	0.8179	0.9187	0.9616	0.9773	(89)
MIT 2	16.8207	17.1202	17.6713	18.2990	18.8803	19.4091	19.6949	19.6540	19.2584	18.3937	17.4499	16.6254	(90)
Living area fraction	fLA = Living area / (4) =												0.2121 (91)
MIT	17.2004	17.4802	17.9953	18.5825	19.1275	19.6248	19.8958	19.8564	19.4814	18.6698	17.7876	17.0180	(92)
Temperature adjustment													-0.1500
adjusted MIT	17.0504	17.3302	17.8453	18.4325	18.9775	19.4748	19.7458	19.7064	19.3314	18.5198	17.6376	16.8680	(93)

#### 8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	1075.0775	1227.7793	1335.7275	1356.3409	1325.7392	1121.3748	968.1566	957.2738	1051.9673	1082.5680	1038.8046	1016.0857	(94)
Ext temp.	3.3000	3.6000	5.0000	7.1000	9.3000	12.2000	14.0000	13.9000	12.0000	8.8000	5.7000	2.9000	(96)
Heat loss rate W													

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)

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

Month fraction	2891.2335	2886.9976	2700.9275	2382.8307	2034.8425	1529.6337	1208.1371	1220.8800	1541.5507	2043.7321	2510.0672	2936.9893	(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 requirement	1351.2200	1114.9946	1015.7088	739.0726	527.5728	0.0000	0.0000	0.0000	0.0000	715.1061	1059.3091	1429.1523	(98)
Space heating per m2												7952.1365	(98)
												38.7720	(99)

#### 8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)	
Fraction of space heat from main system(s)														1.0000	(202)
Efficiency of main space heating system 1 (in %)														91.2000	(206)
Efficiency of secondary/supplementary heating system, %														0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Space heating requirement	1351.2200	1114.9946	1015.7088	739.0726	527.5728	0.0000	0.0000	0.0000	0.0000	715.1061	1059.3091	1429.1523	(98)		
Space heating efficiency (main heating system 1)	91.2000	91.2000	91.2000	91.2000	91.2000	0.0000	0.0000	0.0000	0.0000	91.2000	91.2000	91.2000	(210)		
Space heating fuel (main heating system)	1481.6009	1222.5818	1113.7158	810.3867	578.4790	0.0000	0.0000	0.0000	0.0000	784.1076	1161.5231	1567.0529	(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	203.3018	179.3788	189.7025	171.9746	170.5202	166.0240	159.6092	174.9191	174.5407	178.7924	185.9818	197.9030	(64)		
Efficiency of water heater (217)m	89.6417	89.5504	89.3313	88.9677	88.3321	80.5000	80.5000	80.5000	80.5000	88.8382	89.4248	80.5000	(216)		
Fuel for water heating, kWh/month	226.7937	200.3104	212.3583	193.2999	193.0445	206.2410	198.2723	217.2908	216.8207	201.2563	207.9756	220.5072	(219)		
Water heating fuel used												2494.1707	(219)		
Annual totals kWh/year															
Space heating fuel - main system													8719.4479	(211)	
Space heating fuel - secondary													0.0000	(215)	
Electricity for pumps and fans:															
(MEV)Decentralised, Database: total watage = 13.1040, total flow = 53.0000, SFP = 0.2472)															
mechanical ventilation fans (SFP = 0.2472)														158.6598	(230a)
central heating pump														30.0000	(230c)
main heating flue fan														45.0000	(230e)
Total electricity for the above, kWh/year														233.6598	(231)
Electricity for lighting (calculated in Appendix L)														642.9789	(232)
Energy saving/generation technologies (Appendices M ,N and Q)															
PV Unit 0 (0.80 * 2.01 * 1017 * 1.00) =										-1635.4542				-1635.4542	(233)
Total delivered energy for all uses														10454.8031	(238)

#### 10a. Fuel costs - using BEDF prices (554)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	8719.4479	9.4500	823.9878	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	2494.1707	9.4500	235.6991	(247)
Mechanical ventilation fans	158.6598	25.0500	39.7443	(249)
Pumps and fans for heating	75.0000	25.0500	18.7875	(249)
Energy for lighting	642.9789	25.0500	161.0662	(250)
Additional standing charges			70.0000	(251)
Energy saving/generation technologies				
PV Unit	-1635.4542	25.0500	-409.6813	(252)
Total energy cost			939.6037	(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	8719.4479	0.2410	2101.3869	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2494.1707	0.2410	601.0951	(264)
Space and water heating			2702.4821	(265)
Pumps and fans	233.6598	0.5190	121.2695	(267)
Energy for lighting	642.9789	0.5190	333.7060	(268)
Energy saving/generation technologies				
PV Unit	-1635.4542	0.5190	-848.8007	(269)
Total kg/year			2308.6569	(272)

#### 13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
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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

Space heating - main system 1	8719.4479	1.0900	9504.1982 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2494.1707	1.0900	2718.6461 (264)
Space and water heating			12222.8443 (265)
Pumps and fans	233.6598	3.0700	717.3357 (267)
Energy for lighting	642.9789	3.0700	1973.9452 (268)
Energy saving/generation technologies			
PV Unit			
Primary energy kWh/year	-1635.4542	3.0700	-5020.8443 (269)
Primary energy kWh/m <sup>2</sup> /year			48.2364 (273)

#### SAP 2012 EPC IMPROVEMENTS

(For testing purposes):

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

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 2.0	-£ 100	-260 kg (11.3%)

Current energy efficiency rating:	B 84
Current environmental impact rating:	B 90

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£100	1.27 kg/m <sup>2</sup>	B 86 B 91
Total Savings	£100	1.27 kg/m <sup>2</sup>	

Potential energy efficiency rating:	B 86
Potential environmental impact rating:	B 91

Fuel prices for cost data on this page from database revision number 554 TEST (31 Oct 2024)  
 Recommendation texts revision number 4.9c (22 Feb 2014)

Typical heating and lighting costs of this home (per year, North East Scotland):

	Current	Potential	Saving
Electricity	£220	£232	-£13
Bulk LPG	£1130	£1018	£112
Space heating	£953	£957	-£5
Water heating	£236	£131	£104
Lighting	£161	£161	£0
Generated (PV)	-£410	-£410	£0
Total cost of fuels	£940	£840	£99
Total cost of uses	£940	£839	£99
Delivered energy	51 kWh/m <sup>2</sup>	45 kWh/m <sup>2</sup>	6 kWh/m <sup>2</sup>
Carbon dioxide emissions	2.3 tonnes	2.0 tonnes	0.3 tonnes
CO2 emissions per m <sup>2</sup>	11 kg/m <sup>2</sup>	10 kg/m <sup>2</sup>	1 kg/m <sup>2</sup>
Primary energy	48 kWh/m <sup>2</sup>	43 kWh/m <sup>2</sup>	6 kWh/m <sup>2</sup>

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)

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

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)

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

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

#### 1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	96.7000 (1b)	2.4800 (2b)	239.8160 (1b) - (3b)
First floor	108.4000 (1c)	2.6400 (2c)	286.1760 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	205.1000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 525.9920 (5)

#### 2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour								
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)								
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)								
Number of intermittent fans				0 * 10 =	0.0000 (7a)								
Number of passive vents				0 * 10 =	0.0000 (7b)								
Number of flueless gas fires				0 * 40 =	0.0000 (7c)								
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)				0.0000 / (5) =	0.0000 (8)								
Pressure test				Yes									
Measured/design AP50				4.0000									
Infiltration rate				0.2000	(18)								
Number of sides sheltered				2	(19)								
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)								
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.1700 (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	0.2168	0.2125	0.2083	0.1870	0.1828	0.1615	0.1615	0.1573	0.1700	0.1828	0.1913	0.1998	(22b)
Mechanical extract ventilation - decentralised													0.5000 (23a)
If mechanical ventilation:													
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(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						
Half hour door to garage			1.8900	1.4000	2.6460		(26)						
Part glazed door			4.2000	1.4000	5.8800		(26a)						
Windows / Patios (Uw = 1.40)			27.1000	1.3258	35.9280		(27)						
Insulated slab			96.4000	0.1200	11.5680		(28a)						
Floor over garage			14.7400	0.1500	2.2110		(28b)						
Main T/Frame ACDS	209.4000	29.5000	179.9000	0.1600	28.7840		(29a)						
House to garage wall	16.8600	1.8900	14.9700	0.1900	2.8443		(29a)						
Hanging posts	6.1500		6.1500	0.1700	1.0455		(29a)						
Dormer walls	6.5000	1.8000	4.7000	0.2000	0.9400		(29a)						
Stone clad T/Frame	5.0000		5.0000	0.1600	0.8000		(29a)						
Render /lathe nominal area	6.0000		6.0000	0.1600	0.9600		(29a)						
Horizontal ceiling	106.6000		106.6000	0.1000	10.6600		(30)						
Sloping ceiling	2.9000		2.9000	0.1500	0.4350		(30)						
Total net area of external elements Aum(A, m2)			470.5500				(31)						
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		104.7018		(33)						
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000 (35)						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							18.7752 (36)						
Total fabric heat loss						(33) + (36) =	123.4770 (37)						
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 86.7887	Feb 86.7887	Mar 86.7887	Apr 86.7887	May 86.7887	Jun 86.7887	Jul 86.7887	Aug 86.7887	Sep 86.7887	Oct 86.7887	Nov 86.7887	Dec 86.7887	(38)
Heat transfer coeff	210.2657	210.2657	210.2657	210.2657	210.2657	210.2657	210.2657	210.2657	210.2657	210.2657	210.2657	210.2657	(39)
Average = Sum(39)m / 12 =													210.2657 (39)
HLP	Jan 1.0252	Feb 1.0252	Mar 1.0252	Apr 1.0252	May 1.0252	Jun 1.0252	Jul 1.0252	Aug 1.0252	Sep 1.0252	Oct 1.0252	Nov 1.0252	Dec 1.0252	(40)
HLP (average)													1.0252 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

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

Assumed occupancy	3.0086 (42)
Average daily hot water use (litres/day)	111.2139 (43)

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	122.3353	117.8867	113.4382	108.9896	104.5410	100.0925	100.0925	104.5410	108.9896	113.4382	117.8867	122.3353	(44)
Energy conte	181.4197	158.6708	163.7340	142.7473	136.9694	118.1942	109.5243	125.6807	127.1818	148.2181	161.7916	175.6953	(45)
Energy content (annual)	Total = Sum(45)m =											1749.8273	(45)
Distribution loss (46)m = 0.15 x (45)m	27.2129	23.8006	24.5601	21.4121	20.5454	17.7291	16.4286	18.8521	19.0773	22.2327	24.2687	26.3543	(46)
Water storage loss:													
Store volume												250.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												2.2000	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.1880	(55)
Total storage loss	36.8280	33.2640	36.8280	35.6400	36.8280	35.6400	36.8280	36.8280	35.6400	36.8280	35.6400	36.8280	(56)
If cylinder contains dedicated solar storage	25.7796	23.2848	25.7796	24.9480	25.7796	24.9480	25.7796	25.7796	24.9480	25.7796	24.9480	25.7796	(57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month	230.4617	202.9668	211.3803	183.4537	173.2171	153.0475	145.5394	162.6263	169.2389	195.8644	209.2516	224.7373	(62)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.7000	(H2)
Collector heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0050	(H3a)
Collector effective heat loss coefficient												1.8063	(H3b)
Collector performance ratio												2.5804	(H4)
Annual solar radiation per m2												1079.5246	(H5)
Overshading factor												0.8000	(H6)
Solar energy available												1813.6014	(H7)
Adjustment factor for showers												1.0000	(H7a)
Solar-to-load ratio												1.0364	(H8)
Utilisation factor												0.6190	(H9)
Collector performance factor												0.8793	(H10)
Dedicated solar storage volume												75.0000	(H11)
Effective solar volume												127.5000	(H13)
Daily hot water demand												111.2139	(H14)
Volume ratio Veff/V												1.1464	(H15)
Solar storage volume factor												1.0000	(H16)
Solar input												-987.0387	(H17)
Solar input	-28.6222	-47.7621	-81.3444	-109.0175	-134.6820	-132.4138	-130.6639	-114.1617	-89.4115	-61.0576	-33.9500	-23.9519	(63)
FGHRS	-32.9535	-25.7331	-21.0492	-9.4503	-2.9764	0.0000	0.0000	-3.2267	-4.9652	-19.5348	-27.6038	-33.0011	eq. (G6)
Output from w/h	168.8860	129.4716	108.9867	64.9859	35.5587	20.6337	14.8754	45.2378	74.8621	115.2720	147.6978	167.7843	(64)
Heat gains from water heating, kWh/month	99.5556	88.1948	92.5586	80.0286	74.5405	67.1822	65.2289	71.3453	75.9336	87.3995	91.7637	97.6523	(65)
Total per year (kWh/year) = Sum(64)m =												1094.2522	(64)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts	180.5133	180.5133	180.5133	180.5133	180.5133	180.5133	180.5133	180.5133	180.5133	180.5133	180.5133	180.5133	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	91.0203	80.8434	65.7463	49.7742	37.2068	31.4115	33.9413	44.1181	59.2153	75.1874	87.7548	93.5501	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	560.9953	566.8167	552.1470	520.9170	481.4947	444.4433	419.6907	413.8693	428.5390	459.7690	499.1913	536.2427	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	56.0599	56.0599	56.0599	56.0599	56.0599	56.0599	56.0599	56.0599	56.0599	56.0599	56.0599	56.0599	(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)	-120.3422	-120.3422	-120.3422	-120.3422	-120.3422	-120.3422	-120.3422	-120.3422	-120.3422	-120.3422	-120.3422	-120.3422	(71)
Water heating gains (Table 5)	133.8113	131.2423	124.4067	111.1508	100.1888	93.3086	87.6732	95.8942	105.4634	117.4725	127.4496	131.2531	(72)
Total internal gains	905.0579	898.1334	861.5310	801.0730	738.1213	688.3944	660.5362	673.1127	712.4487	771.6599	833.6267	880.2768	(73)

#### 6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W							
North	10.6700	10.6334	0.6300	0.7000	0.7700	34.6743	(74)						
East	0.7200	19.6403	0.6300	0.7000	0.7700	4.3217	(76)						
South	14.9900	46.7521	0.6300	0.7000	0.7700	214.1777	(78)						
West	0.7200	19.6403	0.6300	0.7000	0.7700	4.3217	(80)						
Solar gains	257.4954	433.9405	587.2609	726.4736	819.6503	818.2070	786.8349	715.3975	634.5185	477.2782	307.4261	221.0833	(83)
Total gains	1162.5533	1332.0739	1448.7919	1527.5466	1557.7716	1506.6014	1447.3711	1388.5101	1346.9672	1248.9381	1141.0528	1101.3601	(84)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	27.0953	27.0953	27.0953	27.0953	27.0953	27.0953	27.0953	27.0953	27.0953	27.0953	27.0953	27.0953	
alpha	2.8064	2.8064	2.8064	2.8064	2.8064	2.8064	2.8064	2.8064	2.8064	2.8064	2.8064	2.8064	
util living area	0.9695	0.9544	0.9309	0.8885	0.8145	0.6944	0.5589	0.5941	0.7640	0.8990	0.9552	0.9735	(86)
MIT	18.8292	19.0754	19.4521	19.9194	20.3748	20.7273	20.8942	20.8704	20.6160	20.0313	19.3314	18.7601	(87)
Th 2	20.0624	20.0624	20.0624	20.0624	20.0624	20.0624	20.0624	20.0624	20.0624	20.0624	20.0624	20.0624	(88)

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)

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

util rest of house	0.9650	0.9478	0.9204	0.8701	0.7802	0.6310	0.4638	0.5018	0.7103	0.8786	0.9476	0.9697 (89)
MIT 2	17.1389	17.4947	18.0379	18.7049	19.3383	19.7985	19.9867	19.9646	19.6664	18.8725	17.8698	17.0389 (90)
Living area fraction									fLA = Living area / (4) =			0.2121 (91)
MIT	17.4974	17.8300	18.3378	18.9625	19.5581	19.9955	20.1792	20.1567	19.8678	19.1183	18.1798	17.4039 (92)
Temperature adjustment												-0.1500
adjusted MIT	17.3474	17.6800	18.1878	18.8125	19.4081	19.8455	20.0292	20.0067	19.7178	18.9683	18.0298	17.2539 (93)

#### 8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9462	0.9244	0.8924	0.8390	0.7517	0.6144	0.4601	0.4957	0.6872	0.8478	0.9241	0.9524 (94)
Useful gains	1099.9718	1231.3703	1292.9709	1281.6027	1170.9971	925.7108	665.9596	688.3148	925.6012	1058.8766	1054.4987	1048.8948 (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	2743.4143	2687.1871	2457.5436	2084.2521	1620.7534	1102.9416	721.0402	758.3628	1181.2352	1759.5643	2298.1560	2744.7972 (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	1222.7212	978.3089	866.4421	577.9076	334.6187	0.0000	0.0000	0.0000	0.0000	521.3117	895.4333	1261.7514 (98)
Space heating												6658.4948 (98)
Space heating per m2												(98) / (4) = 32.4646 (99)

#### 8c. Space cooling requirement

Not applicable

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												91.2000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	1222.7212	978.3089	866.4421	577.9076	334.6187	0.0000	0.0000	0.0000	0.0000	521.3117	895.4333	1261.7514 (98)
Space heating efficiency (main heating system 1)	91.2000	91.2000	91.2000	91.2000	91.2000	0.0000	0.0000	0.0000	0.0000	91.2000	91.2000	91.2000 (210)
Space heating fuel (main heating system)	1340.7031	1072.7071	950.0461	633.6706	366.9065	0.0000	0.0000	0.0000	0.0000	571.6137	981.8347	1383.4993 (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	168.8860	129.4716	108.9867	64.9859	35.5587	20.6337	14.8754	45.2378	74.8621	115.2720	147.6978	167.7843 (64)
Efficiency of water heater (217)m	89.7522	89.8049	89.8654	89.9909	90.0502	80.5000	80.5000	80.5000	80.5000	89.0565	89.5153	80.5000 (216)
Fuel for water heating, kWh/month	188.1692	144.1698	121.2778	72.2138	39.4876	25.6319	18.4788	56.1961	92.9965	129.4370	164.9973	186.8442 (219)
Water heating fuel used												1239.8999 (219)
Annual totals kWh/year												
Space heating fuel - main system												7300.9812 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
(MEV)Decentralised, Database: total watage = 13.1040, total flow = 53.0000, SFP = 0.2472)												
mechanical ventilation fans (SFP = 0.2472)												158.6598 (230a)
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
pump for solar water heating												50.0000 (230g)
Total electricity for the above, kWh/year												283.6598 (231)
Electricity for lighting (calculated in Appendix L)												642.9789 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 2.01 + 1068 * 1.00) =										-1717.4573		-1717.4573 (233)
Total delivered energy for all uses												7750.0624 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	7300.9812	7.6000	554.8746 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1239.8999	7.6000	94.2324 (247)
Mechanical ventilation fans	158.6598	13.1900	20.9272 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Pump for solar water heating	50.0000	13.1900	6.5950 (249)
Energy for lighting	642.9789	13.1900	84.8089 (250)
Additional standing charges			70.0000 (251)
Energy saving/generation technologies			
PV Unit	-1717.4573	13.1900	-226.5326 (252)
Total energy cost			614.7980 (255)

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

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)

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

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.0324 (257)
SAP value		85.5974
SAP rating (Section 12)		86 (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	7300.9812	0.2410	1759.5365 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1239.8999	0.2410	298.8159 (264)
Space and water heating			2058.3523 (265)
Pumps and fans	283.6598	0.5190	147.2195 (267)
Energy for lighting	642.9789	0.5190	333.7060 (268)
Energy saving/generation technologies			
PV Unit	-1717.4573	0.5190	-891.3604 (269)
Total kg/year			1647.9175 (272)
CO2 emissions per m2			8.0300 (273)
EI value			91.1707
EI rating			91 (274)
EI band			B



# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)

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

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

#### 1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	96.7000 (1b)	2.4800 (2b)	239.8160 (1b) - (3b)
First floor	108.4000 (1c)	2.6400 (2c)	286.1760 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	205.1000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 525.9920 (5)

#### 2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour							
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)							
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)							
Number of intermittent fans				0 * 10 =	0.0000 (7a)							
Number of passive vents				0 * 10 =	0.0000 (7b)							
Number of flueless gas fires				0 * 40 =	0.0000 (7c)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)				0.0000 / (5) =	0.0000 (8)							
Pressure test				Yes	4.0000							
Measured/design AP50					0.2000 (18)							
Infiltration rate					2 (19)							
Number of sides sheltered												
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)							
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.1700 (21)							
Wind speed	Jan 5.7000	Feb 5.8000	Mar 5.7000	Apr 5.0000	May 4.6000	Jun 4.4000	Jul 4.0000	Aug 4.1000	Sep 4.6000	Oct 5.2000	Nov 5.3000	Dec 5.1000 (22)
Wind factor	1.4250	1.4500	1.4250	1.2500	1.1500	1.1000	1.0000	1.0250	1.1500	1.3000	1.3250	1.2750 (22a)
Adj infilt rate	0.2423	0.2465	0.2423	0.2125	0.1955	0.1870	0.1700	0.1743	0.1955	0.2210	0.2253	0.2168 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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					
Half hour door to garage			1.8900	1.4000	2.6460		(26)					
Part glazed door			4.2000	1.4000	5.8800		(26a)					
Windows / Patios (Uw = 1.40)			27.1000	1.3258	35.9280		(27)					
Insulated slab			96.4000	0.1200	11.5680		(28a)					
Floor over garage			14.7400	0.1500	2.2110		(28b)					
Main T/Frame ACDS	209.4000	29.5000	179.9000	0.1600	28.7840		(29a)					
House to garage wall	16.8600	1.8900	14.9700	0.1900	2.8443		(29a)					
Hanging posts	6.1500		6.1500	0.1700	1.0455		(29a)					
Dormer walls	6.5000	1.8000	4.7000	0.2000	0.9400		(29a)					
Stone clad T/Frame	5.0000		5.0000	0.1600	0.8000		(29a)					
Render /lathe nominal area	6.0000		6.0000	0.1600	0.9600		(29a)					
Horizontal ceiling	106.6000		106.6000	0.1000	10.6600		(30)					
Sloping ceiling	2.9000		2.9000	0.1500	0.4350		(30)					
Total net area of external elements Aum(A, m2)			470.5500				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 104.7018		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							18.7752 (36)					
Total fabric heat loss							(33) + (36) = 123.4770 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 86.7887	Feb 86.7887	Mar 86.7887	Apr 86.7887	May 86.7887	Jun 86.7887	Jul 86.7887	Aug 86.7887	Sep 86.7887	Oct 86.7887	Nov 86.7887	Dec 86.7887 (38)
Heat transfer coeff	210.2657	210.2657	210.2657	210.2657	210.2657	210.2657	210.2657	210.2657	210.2657	210.2657	210.2657	210.2657 (39)
Average = Sum(39)m / 12 =												210.2657 (39)
HLP	Jan 1.0252	Feb 1.0252	Mar 1.0252	Apr 1.0252	May 1.0252	Jun 1.0252	Jul 1.0252	Aug 1.0252	Sep 1.0252	Oct 1.0252	Nov 1.0252	Dec 1.0252 (40)
HLP (average)												1.0252 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

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

Assumed occupancy	3.0086 (42)
Average daily hot water use (litres/day)	111.2139 (43)

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	122.3353	117.8867	113.4382	108.9896	104.5410	100.0925	100.0925	104.5410	108.9896	113.4382	117.8867	122.3353	(44)
Energy conte	181.4197	158.6708	163.7340	142.7473	136.9694	118.1942	109.5243	125.6807	127.1818	148.2181	161.7916	175.6953	(45)
Energy content (annual)	Total = Sum(45)m =											1749.8273 (45)	
Distribution loss (46)m = 0.15 x (45)m	27.2129	23.8006	24.5601	21.4121	20.5454	17.7291	16.4286	18.8521	19.0773	22.2327	24.2687	26.3543	(46)
Water storage loss:													
Store volume												250.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):												2.2000 (48)	
Temperature factor from Table 2b												0.5400 (49)	
Enter (49) or (54) in (55)												1.1880 (55)	
Total storage loss	36.8280	33.2640	36.8280	35.6400	36.8280	35.6400	36.8280	36.8280	35.6400	36.8280	35.6400	36.8280	(56)
If cylinder contains dedicated solar storage	25.7796	23.2848	25.7796	24.9480	25.7796	24.9480	25.7796	25.7796	24.9480	25.7796	24.9480	25.7796	(57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month	230.4617	202.9668	211.3803	183.4537	173.2171	153.0475	145.5394	162.6263	169.2389	195.8644	209.2516	224.7373	(62)
Aperture area of solar collector												3.0000 (H1)	
Zero-loss collector efficiency												0.7000 (H2)	
Collector heat loss coefficient												1.8000 (H3)	
Collector 2nd order heat loss coefficient												0.0050 (H3a)	
Collector effective heat loss coefficient												1.8063 (H3b)	
Collector performance ratio												2.5804 (H4)	
Annual solar radiation per m2												1017.1843 (H5)	
Overshading factor												0.8000 (H6)	
Solar energy available												1708.8697 (H7)	
Adjustment factor for showers												1.0000 (H7a)	
Solar-to-load ratio												0.9766 (H8)	
Utilisation factor												0.6408 (H9)	
Collector performance factor												0.8793 (H10)	
Dedicated solar storage volume												75.0000 (H11)	
Effective solar volume												127.5000 (H13)	
Daily hot water demand												111.2139 (H14)	
Volume ratio Veff/V												1.1464 (H15)	
Solar storage volume factor												1.0000 (H16)	
Solar input	-22.9667	-43.5497	-81.8392	-111.4952	-144.6236	-131.7174	-129.7334	-111.8695	-84.8412	-54.5157	-28.2182	-962.9142	(H17)
FGHRS	-34.3863	-26.9285	-21.8407	-9.3646	0.0000	0.0000	0.0000	-3.3468	-5.2047	-21.7218	-29.5142	-34.7381	eq. (G6)
Output from w/h	173.1087	132.4886	107.7004	62.5939	28.5935	21.3301	15.8059	47.4099	79.1930	119.6268	151.5192	172.4549	(64)
Heat gains from water heating, kWh/month	99.5556	88.1948	92.5586	80.0286	74.5405	67.1822	65.2289	71.3453	75.9336	87.3995	91.7637	97.6523	(65)
Total per year (kWh/year) = Sum(64)m =													1111.8250 (64)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts	180.5133	180.5133	180.5133	180.5133	180.5133	180.5133	180.5133	180.5133	180.5133	180.5133	180.5133	180.5133	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	91.0203	80.8434	65.7463	49.7742	37.2068	31.4115	33.9413	44.1181	59.2153	75.1874	87.7548	93.5501	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	560.9953	566.8167	552.1470	520.9170	481.4947	444.4433	419.6907	413.8693	428.5390	459.7690	499.1913	536.2427	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	56.0599	56.0599	56.0599	56.0599	56.0599	56.0599	56.0599	56.0599	56.0599	56.0599	56.0599	56.0599	(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)	-120.3422	-120.3422	-120.3422	-120.3422	-120.3422	-120.3422	-120.3422	-120.3422	-120.3422	-120.3422	-120.3422	-120.3422	(71)
Water heating gains (Table 5)	133.8113	131.2423	124.4067	111.1508	100.1888	93.3086	87.6732	95.8942	105.4634	117.4725	127.4496	131.2531	(72)
Total internal gains	905.0579	898.1334	861.5310	801.0730	738.1213	688.3944	660.5362	673.1127	712.4487	771.6599	833.6267	880.2768	(73)

#### 6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W							
North	10.6700	8.2005	0.6300	0.7000	0.7700	26.7410	(74)						
East	0.7200	14.7869	0.6300	0.7000	0.7700	3.2537	(76)						
South	14.9900	38.1750	0.6300	0.7000	0.7700	174.8849	(78)						
West	0.7200	14.7869	0.6300	0.7000	0.7700	3.2537	(80)						
Solar gains	208.1333	399.6580	595.8434	741.6139	868.0654	798.1574	768.0114	696.2422	605.2858	430.5596	257.6642	162.9372	(83)
Total gains	1113.1912	1297.7914	1457.3744	1542.6869	1606.1867	1486.5518	1428.5476	1369.3549	1317.7345	1202.2195	1091.2910	1043.2139	(84)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	27.0953	27.0953	27.0953	27.0953	27.0953	27.0953	27.0953	27.0953	27.0953	27.0953	27.0953	27.0953	
alpha	2.8064	2.8064	2.8064	2.8064	2.8064	2.8064	2.8064	2.8064	2.8064	2.8064	2.8064	2.8064	
util living area	0.9761	0.9641	0.9435	0.9139	0.8693	0.8119	0.7482	0.7682	0.8529	0.9329	0.9677	0.9807	(86)
MIT	18.6008	18.8082	19.1889	19.6226	20.0314	20.4142	20.6331	20.5986	20.3004	19.6856	19.0325	18.4664	(87)
Th 2	20.0624	20.0624	20.0624	20.0624	20.0624	20.0624	20.0624	20.0624	20.0624	20.0624	20.0624	20.0624	(88)

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## Calculation Type: New Build (As Designed)

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

util rest of house	0.9727	0.9592	0.9355	0.9008	0.8478	0.7751	0.6940	0.7166	0.8219	0.9205	0.9625	0.9780 (89)
MIT 2	16.8064	17.1065	17.6572	18.2809	18.8607	19.3944	19.6846	19.6430	19.2461	18.3803	17.4361	16.6108 (90)
Living area fraction									fLA = Living area / (4) =			0.2121 (91)
MIT	17.1870	17.4674	17.9820	18.5655	19.1090	19.6107	19.8857	19.8457	19.4697	18.6572	17.7746	17.0043 (92)
Temperature adjustment												-0.1500
adjusted MIT	17.0370	17.3174	17.8320	18.4155	18.9590	19.4607	19.7357	19.6957	19.3197	18.5072	17.6246	16.8543 (93)

#### 8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9565	0.9386	0.9097	0.8710	0.8167	0.7470	0.6721	0.6929	0.7915	0.8926	0.9429	0.9639 (94)
Useful gains	1064.8007	1218.0742	1325.7609	1343.6252	1311.7760	1110.4800	960.1672	948.8684	1043.0514	1073.1401	1028.9678	1005.5625 (95)
Ext temp.	3.3000	3.6000	5.0000	7.1000	9.3000	12.2000	14.0000	13.9000	12.0000	8.8000	5.7000	2.9000 (96)
Heat loss rate W	2888.4124	2884.3058	2698.1359	2379.2571	2030.9522	1526.6669	1206.0283	1218.6388	1539.0785	2041.0814	2507.3439	2934.1163 (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	1356.7671	1119.7077	1021.0470	745.6550	535.0671	0.0000	0.0000	0.0000	0.0000	720.1483	1064.4308	1434.8441 (98)
Space heating per m2												38.9940 (99)

#### 8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												91.2000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	1356.7671	1119.7077	1021.0470	745.6550	535.0671	0.0000	0.0000	0.0000	0.0000	720.1483	1064.4308	1434.8441 (98)
Space heating efficiency (main heating system 1)	91.2000	91.2000	91.2000	91.2000	91.2000	0.0000	0.0000	0.0000	0.0000	91.2000	91.2000	91.2000 (210)
Space heating fuel (main heating system)	1487.6832	1227.7496	1119.5691	817.6041	586.6964	0.0000	0.0000	0.0000	0.0000	789.6363	1167.1390	1573.2939 (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	173.1087	132.4886	107.7004	62.5939	28.5935	21.3301	15.8059	47.4099	79.1930	119.6268	151.5192	172.4549 (64)
Efficiency of water heater (217)m	89.8487	89.9352	90.0578	90.2708	90.5892	80.5000	80.5000	80.5000	80.5000	89.5053	89.7141	80.5000 (216)
Fuel for water heating, kWh/month	192.6670	147.3157	119.5903	69.3402	31.5639	26.4970	19.6347	58.8943	98.3764	133.6534	168.8913	191.7921 (219)
Water heating fuel used												1258.2161 (219)
Annual totals kWh/year												
Space heating fuel - main system												8769.3717 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
(MEV)Decentralised, Database: total watage = 13.1040, total flow = 53.0000, SFP = 0.2472)												
mechanical ventilation fans (SFP = 0.2472)												158.6598 (230a)
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
pump for solar water heating												50.0000 (230g)
Total electricity for the above, kWh/year												283.6598 (231)
Electricity for lighting (calculated in Appendix L)												642.9789 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 2.01 * 1017 * 1.00) =										-1635.4542		-1635.4542 (233)
Total delivered energy for all uses												9318.7724 (238)

#### 10a. Fuel costs - using BEDF prices (554)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	8769.3717	9.4500	828.7056 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1258.2161	9.4500	118.9014 (247)
Mechanical ventilation fans	158.6598	25.0500	39.7443 (249)
Pumps and fans for heating	75.0000	25.0500	18.7875 (249)
Pump for solar water heating	50.0000	25.0500	12.5250 (249)
Energy for lighting	642.9789	25.0500	161.0662 (250)
Additional standing charges			70.0000 (251)
Energy saving/generation technologies			
PV Unit	-1635.4542	25.0500	-409.6813 (252)
Total energy cost			840.0488 (255)

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

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	8769.3717	0.2410	2113.4186 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1258.2161	0.2410	303.2301 (264)
Space and water heating			2416.6487 (265)
Pumps and fans	283.6598	0.5190	147.2195 (267)
Energy for lighting	642.9789	0.5190	333.7060 (268)
Energy saving/generation technologies			
PV Unit	-1635.4542	0.5190	-848.8007 (269)
Total kg/year			2048.7734 (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	8769.3717	1.0900	9558.6152 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1258.2161	1.0900	1371.4556 (264)
Space and water heating			10930.0707 (265)
Pumps and fans	283.6598	3.0700	870.8357 (267)
Energy for lighting	642.9789	3.0700	1973.9452 (268)
Energy saving/generation technologies			
PV Unit	-1635.4542	3.0700	-5020.8443 (269)
Primary energy kWh/year			8754.0073 (272)
Primary energy kWh/m2/year			42.6817 (273)

# U-VALUE CALCULATOR REPORT

Property Reference	ajc 4A 89 lochnagar		Issued on Date	31/01/2023
Assessment Reference	lochnagar	Prop Type Ref		
Project	Lochnagar, Plot 89, Phase 4A , Tarland Road, Aboyne			
Calculation Type	New Build (As Designed)			

SAP Rating	84 B	DER	10.40	TER	11.06
Environmental	90 B	% DER<TER	5.97		
CO <sub>2</sub> Emissions (t/year)	2.31	FEE	44.55	TFEE	N/A
General Requirements Compliance	Pass	% DFEE<TFEE	N/A		

Assessor Details	Mr. William MacDougall, Northern Energy, Tel: 019755 81400, n.energy@btinternet.com	Assessor ID	1910-0001
Client			

## Building Elements

### Roof Horizontal ceiling

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 (%)
Ext surface				0.0400	
Layer 1	<b>Earthwool Loft Roll 40 over ceiling</b>				
	Main construction	200	0.0400	5.0000	100.00
	Corrections - Air Gap: Level 0, Fasteners: None or plastic				
Layer 2	<b>Earthwool Loft Roll 40 in ceiling</b>				
	Main construction	200	0.0400	5.0000	92.17
	Main construction	200	0.1300	1.5385	7.83
	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
Int surface				0.1000	

Total resistance: Upper limit = 9.805 m<sup>2</sup> K/W Lower limit = 9.450 m<sup>2</sup> K/W Average = 9.628 m<sup>2</sup> K/W  
 Total correction = 0.0019 m<sup>2</sup> K/W U-value (unrounded) = 0.1 W/m<sup>2</sup> K

Unheated space: None

**Total thickness: 413 mm**

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

**Kappa: n/a**

# U-VALUE CALCULATOR REPORT

Property Reference	ajc 4A 89 lochnagar		Issued on Date	31/01/2023
Assessment Reference	lochnagar	Prop Type Ref		
Project	Lochnagar, Plot 89, Phase 4A , Tarland Road, Aboyne			
Calculation Type	New Build (As Designed)			

SAP Rating	84 B	DER	10.40	TER	11.06
Environmental	90 B	% DER<TER	5.97		
CO <sub>2</sub> Emissions (t/year)	2.31	FEE	44.55	TFEE	N/A
General Requirements Compliance	Pass	% DFEE<TFEE	N/A		

Assessor Details	Mr. William MacDougall, Northern Energy, Tel: 019755 81400, n.energy@btinternet.com	Assessor ID	1910-0001
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## Building Elements

### Roof Vented lie ins

#### 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 (%)
Ext surface				0.1000	
Layer 1	<b>Tiling, concrete</b>				
	Main construction	20	1.5000	0.0000	100.00
Layer 2	<b>Batten / counter batten cavity</b>				
	Main construction	37	0.0000	0.0000	81.80
	Main construction	37	0.1300	0.0000	18.20
	Corrections - Cavity Ventilated, Emissivity: Normal				
Layer 3	<b>Sarking felt</b>				
	Main construction	2	0.2300	0.0000	100.00
Layer 4	<b>Orientated Strand Board</b>				
	Main construction	9	0.1300	0.0000	100.00
Layer 5	<b>Vented rafters cavity</b>				
	Main construction	25	0.0000	0.0000	92.17
	Main construction	25	0.1300	0.0000	7.83
	Corrections - Cavity Ventilated, Emissivity: Normal				
Layer 6	<b>PIR in rafters</b>				
	Main construction	75	0.0220	3.4091	92.17
	Main construction	75	0.1300	0.5769	7.83
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
Layer 7	<b>PIR in rafters</b>				
	Main construction	100	0.0220	4.5455	92.17
	Main construction	100	0.1300	0.7692	7.83
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
Layer 8	<b>VCL</b>				
	Main construction	0.4	0.0000	0.0000	100.00
Layer 9	<b>Plasterboard, standard</b>				
	Main construction	12.5	0.2100	0.0595	100.00
Int surface				0.1000	

<b>Total resistance:</b>	<b>Upper limit =</b> 7.303 m <sup>2</sup> K/W	<b>Lower limit =</b> 6.005 m <sup>2</sup> K/W	<b>Average =</b> 6.654 m <sup>2</sup> K/W
	<b>Total correction =</b> 0.0038 m <sup>2</sup> K/W	<b>U-value (unrounded) =</b> 0.15 W/m <sup>2</sup> K	

# U-VALUE CALCULATOR REPORT

Unheated space: None

**Total thickness: 281 mm**

**U-value: 0.15 W/m<sup>2</sup> K**

**Kappa: n/a**

# U-VALUE CALCULATOR REPORT

Property Reference	ajc 4A 89 lochnagar		Issued on Date	31/01/2023
Assessment Reference	lochnagar	Prop Type Ref		
Project	Lochnagar, Plot 89, Phase 4A , Tarland Road, Aboyne			
Calculation Type	New Build (As Designed)			

SAP Rating	84 B	DER	10.40	TER	11.06
Environmental	90 B	% DER<TER	5.97		
CO <sub>2</sub> Emissions (t/year)	2.31	FEE	44.55	TFEE	N/A
General Requirements Compliance	Pass	% DFEE<TFEE	N/A		

Assessor Details	Mr. William MacDougall, Northern Energy, Tel: 019755 81400, n.energy@btinternet.com	Assessor ID	1910-0001
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## Building Elements

### Wall Masonry clad T/Frame

#### Wall Type: Standard Wall

Layer	Description	Thickness (mm)	Conductivity (W/m <sup>2</sup> K)	Resistance (m <sup>2</sup> K/W)	Fraction (%)
Ext surface				0.0400	
Layer 1	<b>Render - Cement and Sand</b>				
	Main construction	20	1.0000	0.0200	100.00
Layer 2	<b>Blockwork, dense</b>				
	Main construction	100	1.5900	0.0629	100.00
Layer 3	<b>Low E perp vented cavity</b>				
	Main construction	50	0.0648	0.7717	100.00
	Corrections - Cavity Unventilated, Emissivity: Normal				
Layer 4	<b>Reflective breather membrane</b>				
	Main construction	0.5	0.0000	0.0000	100.00
Layer 5	<b>Orientated Strand Board</b>				
	Main construction	9	0.1300	0.0692	100.00
Layer 6	<b>Earthwool Frametherm Roll 35 in T/Frame</b>				
	Main construction	140	0.0350	4.0000	85.00
	Main construction	140	0.1300	1.0769	15.00
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
Layer 7	<b>Reflective VCL</b>				
	Main construction	0.4	0.0000	0.0000	100.00
Layer 8	<b>PIR over T/Frame</b>				
	Main construction	30	0.0220	1.3636	100.00
	Corrections - Air Gap: Level 0, Fasteners: None or plastic				
Layer 9	<b>Low E battened cavity</b>				
	Main construction	38	0.0571	0.6651	89.03
	Main construction	38	0.1300	0.2923	10.97
	Corrections - Cavity Unventilated, Emissivity: Normal				
Layer 10	<b>Plasterboard, standard</b>				
	Main construction	12.5	0.2100	0.0595	100.00
Int surface				0.1300	

<b>Total resistance:</b>	<b>Upper limit =</b> 6.466 m <sup>2</sup> K/W	<b>Lower limit =</b> 5.943 m <sup>2</sup> K/W	<b>Average =</b> 6.205 m <sup>2</sup> K/W
	<b>Total correction =</b> 0.0021 m <sup>2</sup> K/W	<b>U-value (unrounded) =</b> 0.16 W/m <sup>2</sup> K	



# U-VALUE CALCULATOR REPORT

Unheated space: None

Total thickness: 400 mm

U-value: 0.16 W/m<sup>2</sup> K

Kappa: n/a

# U-VALUE CALCULATOR REPORT

Property Reference	ajc 4A 89 lochnagar		Issued on Date	31/01/2023
Assessment Reference	lochnagar	Prop Type Ref		
Project	Lochnagar, Plot 89, Phase 4A , Tarland Road, Aboyne			
Calculation Type	New Build (As Designed)			

SAP Rating	84 B	DER	10.40	TER	11.06
Environmental	90 B	% DER<TER	5.97		
CO <sub>2</sub> Emissions (t/year)	2.31	FEE	44.55	TFEE	N/A
General Requirements Compliance	Pass	% DFEE<TFEE	N/A		

Assessor Details	Mr. William MacDougall, Northern Energy, Tel: 019755 81400, n.energy@btinternet.com	Assessor ID	1910-0001
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## Building Elements

### Wall Party wall to garage

#### Wall Type: Standard Wall

Layer	Description	Thickness (mm)	Conductivity (W/m <sup>2</sup> K)	Resistance (m <sup>2</sup> K/W)	Fraction (%)
Ext surface				0.0400	
Layer 1	<b>Plasterboard</b>				
	Main construction	12.5	0.2500	0.0500	100.00
Layer 2	<b>Orientated Strand Board</b>				
	Main construction	9	0.1300	0.0692	100.00
Layer 3	<b>Frametherm Roll 35 in T/Frame</b>				
	Main construction	140	0.0350	4.0000	85.00
	Main construction	140	0.1300	1.0769	15.00
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
Layer 4	<b>Plasterboard</b>				
	Main construction	12.5	0.2500	0.0500	100.00
Layer 5	<b>V.C.L</b>				
	Main construction	0.4	0.0000	0.0000	100.00
Layer 6	<b>PIR over Timber Frame</b>				
	Main construction	30	0.0220	1.3636	100.00
	Corrections - Air Gap: Level 0, Fasteners: None or plastic				
Layer 7	<b>Low E battened cavity</b>				
	Main construction	38	0.0571	0.6651	87.85
	Main construction	38	0.1300	0.2923	12.15
	Corrections - Cavity Unventilated, Emissivity: Normal				
Layer 8	<b>Plasterboard</b>				
	Main construction	12.5	0.2500	0.0500	100.00
Int surface				0.1300	

Total resistance:	Upper limit = 5.650 m <sup>2</sup> K/W	Lower limit = 5.171 m <sup>2</sup> K/W	Average = 5.411 m <sup>2</sup> K/W
	Total correction = 0.0028 m <sup>2</sup> K/W	U-value (unrounded) = 0.19 W/m <sup>2</sup> K	

Unheated space:	None
Total thickness:	255 mm
U-value:	0.19 W/m <sup>2</sup> K
Kappa:	n/a

# U-VALUE CALCULATOR REPORT

Property Reference	ajc 4A 89 lochnagar		Issued on Date	31/01/2023
Assessment Reference	lochnagar	Prop Type Ref		
Project	Lochnagar, Plot 89, Phase 4A , Tarland Road, Aboyne			
Calculation Type	New Build (As Designed)			

SAP Rating	84 B	DER	10.40	TER	11.06
Environmental	90 B	% DER<TER	5.97		
CO <sub>2</sub> Emissions (t/year)	2.31	FEE	44.55	TFEE	N/A
General Requirements Compliance	Pass	% DFEE<TFEE	N/A		

Assessor Details	Mr. William MacDougall, Northern Energy, Tel: 019755 81400, n.energy@btinternet.com	Assessor ID	1910-0001
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## Building Elements

### Wall Hanging posts

#### Wall Type: Standard Wall

Layer	Description	Thickness (mm)	Conductivity (W/m <sup>2</sup> K)	Resistance (m <sup>2</sup> K/W)	Fraction (%)
Ext surface				0.0400	
Layer 1	<b>Earthwool Frametherm Roll 35 in posts</b>				
	Main construction	140	0.0350	4.0000	88.56
	Main construction	140	0.1300	1.0769	11.44
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
Layer 2	<b>Reflective VCL</b>				
	Main construction	0.2	0.0000	0.0000	100.00
Layer 3	<b>PIR over posts</b>				
	Main construction	30	0.0220	1.3636	100.00
	Corrections - Air Gap: Level 0, Fasteners: None or plastic				
Layer 4	<b>Low E battened cavity</b>				
	Main construction	38	0.0571	0.6651	89.03
	Main construction	38	0.1300	0.2923	10.97
	Corrections - Cavity Unventilated, Emissivity: Normal				
Layer 5	<b>Plasterboard</b>				
	Main construction	12.5	0.2500	0.0500	100.00
Int surface				0.1300	

Total resistance:	Upper limit = 5.631 m <sup>2</sup> K/W	Lower limit = 5.219 m <sup>2</sup> K/W	Average = 5.425 m <sup>2</sup> K/W
	Total correction = 0.0032 m <sup>2</sup> K/W	U-value (unrounded) = 0.17 W/m <sup>2</sup> K	

Unheated space:	RoomInRoof	
<b>Total thickness: 221 mm</b>	<b>U-value: 0.17 W/m<sup>2</sup> K</b>	<b>Kappa: n/a</b>

# U-VALUE CALCULATOR REPORT

Property Reference	ajc 4A 89 lochnagar		Issued on Date	31/01/2023
Assessment Reference	lochnagar	Prop Type Ref		
Project	Lochnagar, Plot 89, Phase 4A , Tarland Road, Aboyne			
Calculation Type	New Build (As Designed)			

SAP Rating	84 B	DER	10.40	TER	11.06
Environmental	90 B	% DER<TER	5.97		
CO <sub>2</sub> Emissions (t/year)	2.31	FEE	44.55	TFEE	N/A
General Requirements Compliance	Pass	% DFEE<TFEE	N/A		

Assessor Details	Mr. William MacDougall, Northern Energy, Tel: 019755 81400, n.energy@btinternet.com	Assessor ID	1910-0001
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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 (%)
Ext surface				0.0400	
Layer 1	<b>Concrete tiles</b>				
	Main construction	20	1.5000	0.0133	100.00
Layer 2	<b>Tile batten cavity</b>				
	Main construction	25	0.0324	0.7717	87.33
	Main construction	25	0.1300	0.1923	12.67
	Corrections - Cavity Unventilated, Emissivity: Normal				
Layer 3	<b>Reflective breather membrane</b>				
	Main construction	0.5	0.0000	0.0000	100.00
Layer 4	<b>Orientated Strand Board</b>				
	Main construction	9	0.1300	0.0692	100.00
Layer 5	<b>Phenolic in T/Frame</b>				
	Main construction	140	0.0200	7.0000	85.00
	Main construction	140	0.1300	1.0769	15.00
Layer 6	<b>VCL</b>				
	Main construction	0.4	0.0000	0.0000	100.00
Layer 7	<b>Plasterboard</b>				
	Main construction	12.5	0.2500	0.0500	100.00
Int surface				0.1300	

Total resistance: Upper limit = 5.578 m<sup>2</sup> K/W Lower limit = 4.697 m<sup>2</sup> K/W Average = 5.137 m<sup>2</sup> K/W  
 Total correction = 0.0000 m<sup>2</sup> K/W U-value (unrounded) = 0.2 W/m<sup>2</sup> K

Unheated space: None

**Total thickness: 207 mm**

**U-value: 0.20 W/m<sup>2</sup> K**

**Kappa: n/a**

# U-VALUE CALCULATOR REPORT

Property Reference	ajc 4A 89 lochnagar		Issued on Date	31/01/2023
Assessment Reference	lochnagar	Prop Type Ref		
Project	Lochnagar, Plot 89, Phase 4A , Tarland Road, Aboyne			
Calculation Type	New Build (As Designed)			

SAP Rating	84 B	DER	10.40	TER	11.06
Environmental	90 B	% DER<TER	5.97		
CO <sub>2</sub> Emissions (t/year)	2.31	FEE	44.55	TFEE	N/A
General Requirements Compliance	Pass	% DFEE<TFEE	N/A		

Assessor Details	Mr. William MacDougall, Northern Energy, Tel: 019755 81400, n.energy@btinternet.com	Assessor ID	1910-0001
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## Building Elements

### Wall Feature gable

#### Wall Type: Standard Wall

Layer	Description	Thickness (mm)	Conductivity (W/m <sup>2</sup> K)	Resistance (m <sup>2</sup> K/W)	Fraction (%)
Ext surface				0.0400	
Layer 1	<b>Granite</b>				
	Main construction	100	2.8000	0.0357	100.00
Layer 2	<b>Low E cavity</b>				
	Main construction	50	0.0648	0.7719	100.00
Layer 3	<b>Reflective breather membrane</b>				
	Main construction	0.5	0.0000	0.0000	100.00
Layer 4	<b>Orientated Strand Board</b>				
	Main construction	9	0.1300	0.0692	100.00
Layer 5	<b>Earthwool Frametherm Roll 35 in T/Frame</b>				
	Main construction	140	0.0350	4.0000	85.00
	Main construction	140	0.1300	1.0769	15.00
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
Layer 6	<b>VCL</b>				
	Main construction	0.4	0.0000	0.0000	100.00
Layer 7	<b>PIR over T/Frame</b>				
	Main construction	30	0.0220	1.3636	100.00
	Corrections - Air Gap: Level 0, Fasteners: None or plastic				
Layer 8	<b>Low E battened cavity</b>				
	Main construction	38	0.0492	0.7717	89.03
	Main construction	38	0.1300	0.2923	10.97
	Corrections - Cavity Unventilated, Emissivity: Normal				
Layer 9	<b>Plasterboard</b>				
	Main construction	12.5	0.2500	0.0500	100.00
Int surface				0.1300	

Total resistance:	Upper limit = 6.505 m <sup>2</sup> K/W	Lower limit = 5.957 m <sup>2</sup> K/W	Average = 6.231 m <sup>2</sup> K/W
	Total correction = 0.0021 m <sup>2</sup> K/W	U-value (unrounded) = 0.16 W/m <sup>2</sup> K	

Unheated space: None

Total thickness: 380 mm

U-value: 0.16 W/m<sup>2</sup> K

Kappa: n/a

# U-VALUE CALCULATOR REPORT

Property Reference	ajc 4A 89 lochnagar	Issued on Date	31/01/2023
Assessment Reference	lochnagar	Prop Type Ref	
Project	Lochnagar, Plot 89, Phase 4A , Tarland Road, Aboyne		
Calculation Type	New Build (As Designed)		

SAP Rating	84 B	DER	10.40	TER	11.06
Environmental	90 B	% DER<TER	5.97		
CO <sub>2</sub> Emissions (t/year)	2.31	FEE	44.55	TFEE	N/A
General Requirements Compliance	Pass	% DFEE<TFEE	N/A		

Assessor Details	Mr. William MacDougall, Northern Energy, Tel: 019755 81400, n.energy@btinternet.com	Assessor ID	1910-0001
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Client	
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## Building Elements

### Wall Render on lathe over T/Frame

Wall Type: Standard Wall

# U-VALUE CALCULATOR REPORT

Layer	Description	Thickness (mm)	Conductivity (W/m <sup>2</sup> K)	Resistance (m <sup>2</sup> K/W)	Fraction (%)
<b>Ext surface</b>				0.0400	
<b>Layer 1</b>	<b>Render on lathe</b>				
	Main construction	20	1.0000	0.0200	100.00
<b>Layer 2</b>	<b>Breather membrane</b>				
	Main construction	0.5	0.0000	0.0000	100.00
<b>Layer 3</b>	<b>Board</b>				
	Main construction	9	0.1300	0.0692	100.00
<b>Layer 4</b>	<b>Open timber frame</b>				
	Main construction	90	1.0000	0.0900	85.00
	Main construction	90	0.1300	0.6923	15.00
	Corrections - Cavity Slightly ventilated, Openings Area: 1000 mm, Emissivity: Normal				
<b>Layer 5</b>	<b>Low E cavity</b>				
	Main construction	50	0.0648	0.7719	100.00
<b>Layer 6</b>	<b>Reflective breather membrane</b>				
	Main construction	0.5	0.0000	0.0000	100.00
<b>Layer 7</b>	<b>Orientated Strand Board</b>				
	Main construction	9	0.1300	0.0692	100.00
<b>Layer 8</b>	<b>Earthwool Frametherm Roll 35 in T/Frame</b>				
	Main construction	140	0.0350	4.0000	85.00
	Main construction	140	0.1300	1.0769	15.00
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
<b>Layer 9</b>	<b>VCL</b>				
	Main construction	0.4	0.0000	0.0000	100.00
<b>Layer 10</b>	<b>PIR over T/Frame</b>				
	Main construction	30	0.0220	1.3636	100.00
	Corrections - Air Gap: Level 0, Fasteners: None or plastic				
<b>Layer 11</b>	<b>Low E battened cavity</b>				
	Main construction	38	0.0571	0.6651	89.03
	Main construction	38	0.1300	0.2923	10.97
	Corrections - Cavity Unventilated, Emissivity: Normal				
<b>Layer 12</b>	<b>Plasterboard</b>				
	Main construction	12.5	0.2500	0.0500	100.00
<b>Int surface</b>				0.1300	

**Total resistance:** Upper limit = 6.645 m<sup>2</sup> K/W Lower limit = 6.044 m<sup>2</sup> K/W Average = 6.344 m<sup>2</sup> K/W  
 Total correction = 0.0020 m<sup>2</sup> K/W U-value (unrounded) = 0.16 W/m<sup>2</sup> K

Unheated space: None

**Total thickness: 400 mm**

**U-value: 0.16 W/m<sup>2</sup> K**

**Kappa: n/a**

# U-VALUE CALCULATOR REPORT

Property Reference	ajc 4A 89 lochnagar		Issued on Date	31/01/2023
Assessment Reference	lochnagar	Prop Type Ref		
Project	Lochnagar, Plot 89, Phase 4A , Tarland Road, Aboyne			
Calculation Type	New Build (As Designed)			

SAP Rating	84 B	DER	10.40	TER	11.06
Environmental	90 B	% DER<TER	5.97		
CO <sub>2</sub> Emissions (t/year)	2.31	FEE	44.55	TFEE	N/A
General Requirements Compliance	Pass	% DFEE<TFEE	N/A		

Assessor Details	Mr. William MacDougall, Northern Energy, Tel: 019755 81400, n.energy@btinternet.com	Assessor ID	1910-0001
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Client	
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## Building Elements

### Floor Ground floor

Floor Type: Slab On Ground Floor

Area = 96.40 m<sup>2</sup>, Perimeter = 45.00 m, Wall thickness = 379.00 mm, Soil: Unknown

Horizontal edge insulation: none

Vertical edge insulation: Width D = 125.0 mm, Thickness dn = 25.0 mm, Lambda = 0.022

Layer	Description	Thickness (mm)	Conductivity (W/m <sup>2</sup> K)	Resistance (m <sup>2</sup> K/W)	Fraction (%)
Ext surface				0.0400	
Layer 1	<b>Sand blinded hardcore</b>				
	Main construction	200	2.3000	0.0870	100.00
Layer 2	<b>Polythene,1000 gauge</b>				
	Main construction	0.4	0.0000	0.0000	100.00
Layer 3	<b>Thermafloor TF70</b>				
	Main construction	150	0.0220	6.8182	100.00
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
Layer 4	<b>Concrete, reinforced (1% steel)</b>				
	Main construction	125	2.3000	0.0543	100.00
Int surface				0.1700	

Total resistance: Upper limit = 6.959 m<sup>2</sup> K/W Lower limit = 6.959 m<sup>2</sup> K/W Average = 6.959 m<sup>2</sup> K/W

Total correction = 0.0096 m<sup>2</sup> K/W

U-value (unrounded) = 0.12 W/m<sup>2</sup> K

Unheated space: None

Total thickness: 475 mm

U-value: 0.12 W/m<sup>2</sup> K

Kappa: n/a



# U-VALUE CALCULATOR REPORT

Property Reference	ajc 4A 89 lochnagar		Issued on Date	31/01/2023
Assessment Reference	lochnagar	Prop Type Ref		
Project	Lochnagar, Plot 89, Phase 4A , Tarland Road, Aboyne			
Calculation Type	New Build (As Designed)			

SAP Rating	84 B	DER	10.40	TER	11.06
Environmental	90 B	% DER<TER	5.97		
CO <sub>2</sub> Emissions (t/year)	2.31	FEE	44.55	TFEE	N/A
General Requirements Compliance	Pass	% DFEE<TFEE	N/A		

Assessor Details	Mr. William MacDougall, Northern Energy, Tel: 019755 81400, n.energy@btinternet.com	Assessor ID	1910-0001
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Client	
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## Building Elements

### Floor Ceiling /floor over garage

#### Floor Type: Exposed Floor

Layer	Description	Thickness (mm)	Conductivity (W/m <sup>2</sup> K)	Resistance (m <sup>2</sup> K/W)	Fraction (%)
Ext surface				0.0400	
Layer 1	<b>Plasterboard, high density</b>				
	Main construction	15	0.2500	0.0600	100.00
Layer 2	<b>Frametherm Roll 35 in flanges of I joists</b>				
	Main construction	90	0.0350	2.5714	92.50
	Main construction	90	0.1300	0.6923	7.50
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
Layer 3	<b>Frametherm Roll 35 comp'sed 10mm in webs</b>				
	Main construction	130	0.0320	4.0625	98.50
	Main construction	130	0.1300	1.0000	1.50
Layer 4	<b>Chipboard</b>				
	Main construction	22	0.1300	0.1692	100.00
Int surface				0.1700	

Total resistance: Upper limit = 6.802 m<sup>2</sup> K/W Lower limit = 6.460 m<sup>2</sup> K/W Average = 6.631 m<sup>2</sup> K/W  
 Total correction = 0.0010 m<sup>2</sup> K/W U-value (unrounded) = 0.15 W/m<sup>2</sup> K

Unheated space: None

**Total thickness: 257 mm**

**U-value: 0.15 W/m<sup>2</sup> K**

**Kappa: n/a**

# SUMMARY FOR INPUT DATA

## Calculation Type: New Build (As Designed)

Property Reference	ajc 4A 89 lochnagar		Issued on Date	31/01/2023	
Assessment Reference	lochnagar	Prop Type Ref			
Property	Lochnagar, Plot 89, Phase 4A , Tarland Road, Aboyne				
SAP Rating	84 B	DER	10.40	TER	11.06
Environmental	90 B	% DER<TER	5.97		
CO <sub>2</sub> Emissions (t/year)	2.31	FEE	44.55	TFEE	N/A
General Requirements Compliance	Pass	% DFEE<TFEE	N/A		
Assessor Details	Mr. William MacDougall, Northern Energy, Tel: 019755 81400, n.energy@btinternet.com			Assessor ID	1910-0001
Client					

### SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	North
Property Tenure	Owner-occupied
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	House, Detached
2.0 Number of Storeys	2
3.0 Date Built	2021
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	45.00 m	96.70 m <sup>2</sup>	2.48 m
1st Storey:	48.10 m	108.40 m <sup>2</sup>	2.64 m

7.0 Living Area	43.50	m <sup>2</sup>
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8.0 Thermal Mass Parameter	Simple calculation - Low	
Thermal Mass	100.00	kJ/m <sup>2</sup> K

9.0 External Walls		U-Value (W/m <sup>2</sup> K)	Gross Area (m <sup>2</sup> )	Nett Area (m <sup>2</sup> )
Description	Type			
Main T/Frame ACDS	Timber Frame	0.16	209.40	179.90
House to garage wall	Timber Frame	0.19	16.86	14.97
Hanging posts	Timber Frame	0.17	6.15	6.15
Dormer walls	Timber Frame	0.20	6.50	4.70
Stone clad T/Frame	Timber Frame	0.16	5.00	5.00
Render /lathe nominal area	Timber Frame	0.16	6.00	6.00

10.0 External Roofs		U-Value (W/m <sup>2</sup> K)	Gross Area (m <sup>2</sup> )	Nett Area (m <sup>2</sup> )
Description	Type			
Horizontal ceiling	External Plane Roof	0.10	106.60	106.60
Sloping ceiling	External Slope Roof	0.15	2.90	2.90

11.0 Heat Loss Floors		U-Value (W/m <sup>2</sup> K)	Area (m <sup>2</sup> )
Description	Type	Construction	
Insulated slab	Ground Floor - Solid		0.12 96.40
Floor over garage	Exposed Floor - Timber		0.15 14.74

# SUMMARY FOR INPUT DATA

## Calculation Type: New Build (As Designed)

### 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)
Half hour door to garage	Manufacture	Solid Door							1.40
Part glazed door	Manufacture	Half Glazed Door	Double Low-E Soft	0.05		0.63		0.70	1.40
Rooflights	Manufacture	Roof Window	Double Low-E Soft	0.05		0.63		0.70	1.30
Windows / Patios	Manufacture	Window	Double Low-E Soft	0.05		0.63		0.70	1.40

### 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	Half Glazed Door	[1] Main T/Frame ACDS	North							2.10	
Front glass	Window	[1] Main T/Frame ACDS	North	None	0.00					8.87	
House to garage door	Solid Door	[2] House to garage wall	North							1.89	
Front dormer	Window	[4] Dormer walls	North	None	0.00					1.80	
Rear glass	Window	[1] Main T/Frame ACDS	South	None	0.00					14.99	
RHS door	Half Glazed Door	[1] Main T/Frame ACDS	West							2.10	
RHS glass	Window	[1] Main T/Frame ACDS	West	None	0.00					0.72	
LHS glass	Window	[1] Main T/Frame ACDS	East	None	0.00					0.72	

### 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
Scotland ACD 2015	E2 Other lintels (including other steel lintels)	23.85	0.037	No
Scotland ACD 2015	E3 Sill	19.45	0.033	No
Scotland ACD 2015	E4 Jamb	72.90	0.031	No
Scotland ACD 2015	E5 Ground floor (normal)	45.00	0.173	No
Scotland ACD 2015	E6 Intermediate floor within a dwelling	48.10	0.065	No
Scotland ACD 2015	E10 Eaves (insulation at ceiling level)	19.40	0.043	No
Scotland ACD 2015	E11 Eaves (insulation at rafter level)	1.55	0.018	No
Scotland ACD 2015	E12 Gable (insulation at ceiling level)	29.90	0.051	No
Scotland ACD 2015	E13 Gable (insulation at rafter level)	5.80	0.036	No
Scotland ACD 2015	E16 Corner (normal)	37.50	0.038	No
Scotland ACD 2015	E17 Corner (inverted – internal area greater than external area)	19.56	0.003	No

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

### 18.0 Pressure Testing

Designed AP<sub>50</sub>  m<sup>3</sup>/(h.m<sup>2</sup>) @ 50 Pa

Property Tested ?

As Built AP<sub>50</sub>  m<sup>3</sup>/(h.m<sup>2</sup>) @ 50 Pa

### 19.0 Mechanical Ventilation

#### Summer Overheating

Windows open in hot weather

Cross ventilation possible

# SUMMARY FOR INPUT DATA

## Calculation Type: New Build (As Designed)

Night Ventilation	No
Air change rate	4.00
<b>Mechanical Ventilation</b>	
Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - decentralised
MV Reference Number	500339
Duct Type	Rigid

### 19.1 Mechanical extract ventilation - Decentralised

SFP	Fan/Room Type	Count
0.16	In Room Fan Kitchen	1
0.20	In Room Fan Other Wet Room	5

### 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	36	
Total number of L.E.L. fittings	36	
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

Description	LPG condensing system	
Percentage of Heat	100	%
Database Ref. No.	18746	
Fuel Type	Bulk LPG	
Main Heating	BLB	
SAP Code	102	
In Winter	91.2	
In Summer	80.5	
Controls	CBI Time and temperature zone control	
PCDF Controls	0	
Delayed Start Stat	Yes	
Sap Code	2110	

# SUMMARY FOR INPUT DATA

## Calculation Type: New Build (As Designed)

Flue Type	Balanced
Fan Assisted Flue	Yes
Is MHS Pumped	Pump in heated space
Heat Emitter	Radiators
Flow Temperature	Normal (> 45°C)
<b>25.0 Main Heating 2</b>	None

Community Heating	None
<b>28.0 Water Heating</b>	HWP From main heating 1
Water Heating	Main Heating 1
Flue Gas Heat Recovery System	Yes
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
SAP Code	901

<b>28.1 Flue Gas Heat Recovery System</b>	
Database ID	60048
Brand Model	Baxi, Assure
Details	Year: 2021 + current Applicable Fuel: 2 Boiler Types: RCSK Heat Store Volume: 0 PV module: 0

<b>29.0 Hot Water Cylinder</b>	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	250.00	L
Loss	2.20	kWh/day
Pipes insulation	Fully insulated primary pipework	

<b>31.0 Thermal Store</b>	None
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<b>32.0 Photovoltaic Unit</b>	One Dwelling			
PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
2.01	South	45°	None Or Little	Yes

### Recommendations

#### Lower cost measures

None

#### Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar water heating	£4,000 - £6,000	£100	B 86	