

PREDICTED ENERGY ASSESSMENT

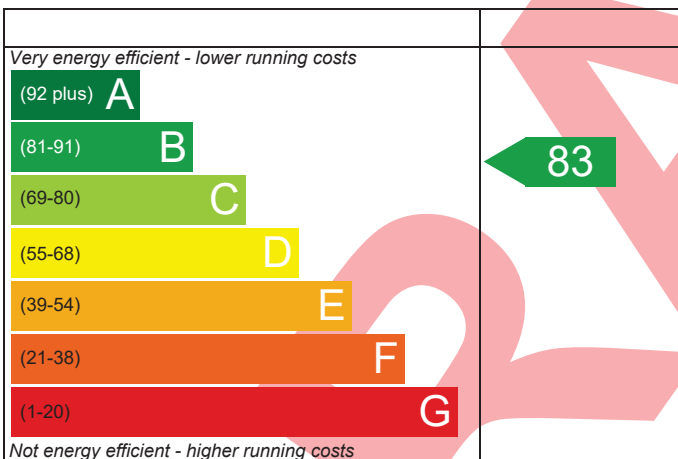
Cairnwell, Plot 82, Phase 4A ,
Tarland Road,
Aboyne

Dwelling type: House, Detached
Date of assessment: 31/01/2023
Produced by: Northern Energy
Total floor area: 150.3 m²

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

The energy performance has been assessed using the Government approved SAP2012 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.

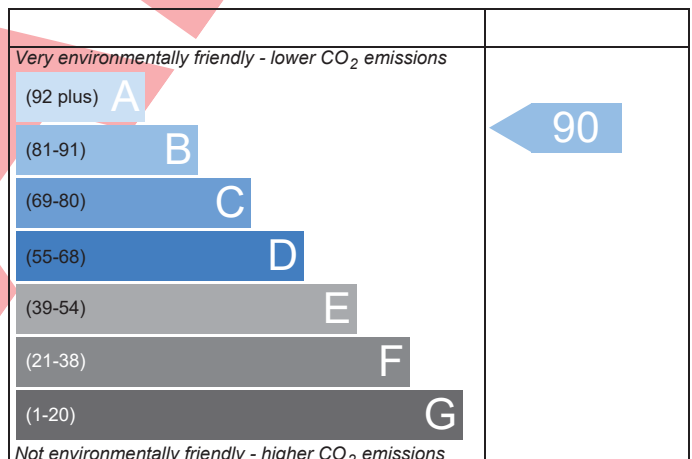
Energy Efficiency Rating



Scotland EU Directive 2002/91/EC

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

Environmental Impact (CO₂) Rating



Scotland EU Directive 2002/91/EC

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) 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 82 cairnwell	Issued on Date	31/01/2023
Assessment Reference	cairnwell	Prop Type Ref	
Property	Cairnwell, Plot 82, Phase 4A , Tarland Road, Aboyne		

SAP Rating	83 B	DER	10.85	TER	11.80
Environmental	90 B	% DER<TER	8.05		
CO ₂ Emissions (t/year)	1.77	FEE	45.38	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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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)	11.80	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	10.85	kgCO ₂ /m ²	Pass
	-0.95 (-8.1%)	kgCO ₂ /m ²	

6.2 Building insulation envelope

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.22)	0.19 (max. 0.70)	Pass
Floor	0.12 (max. 0.18)	0.12 (max. 0.70)	Pass
Roof	0.10 (max. 0.15)	0.10 (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	11.19 m ² , No overhang	
Windows facing East	4.32 m ² , No overhang	
Windows facing South	9.99 m ² , No overhang	
Windows facing West	4.56 m ² , 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	A 92	Recommended
Photovoltaic			0	0	Already installed
Wind turbine			0	0	Not applicable
Totals	£4,000 - £6,000	£100	B 86	A 92	

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THERMAL BRIDGING

Calculation Type: New Build (As Designed)

Property Reference	ajc 4A 82 cairnwell		Issued on Date	31/01/2023	
Assessment Reference	cairnwell	Prop Type Ref			
Property	Cairnwell, Plot 82, Phase 4A , Tarland Road, Aboyne				
SAP Rating	83 B	DER	10.85	TER	11.80
Environmental	90 B	% DER<TER	8.05		
CO ₂ Emissions (t/year)	1.77	FEE	45.38	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	25.10	0.93	
External wall	E3 Sill	Scotland ACD 2015	0.033	16.70	0.55	
External wall	E4 Jamb	Scotland ACD 2015	0.031	57.50	1.78	
External wall	E5 Ground floor (normal)	Scotland ACD 2015	0.173	40.50	7.01	
External wall	E6 Intermediate floor within a dwelling	Scotland ACD 2015	0.065	34.50	2.24	
External wall	E10 Eaves (insulation at ceiling level)	Scotland ACD 2015	0.043	19.84	0.85	
External wall	E12 Gable (insulation at ceiling level)	Scotland ACD 2015	0.051	20.66	1.05	
External wall	E16 Corner (normal)	Scotland ACD 2015	0.038	29.50	1.12	
External wall	E17 Corner (inverted – internal area greater than external area)	Scotland ACD 2015	0.003	9.93	0.03	

Total: **15.57** W/mK:
 Y-Value: **0.048** W/m²K:

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	ajc 4A 82 cairnwell			Issued on Date	31/01/2023
Assessment Reference	cairnwell	Prop Type Ref			
Property	Cairnwell, Plot 82, Phase 4A , Tarland Road, Aboyne				
SAP Rating	83 B	DER	10.85	TER	11.80
Environmental	90 B	% DER<TER	8.05		
CO₂ Emissions (t/year)	1.77	FEE	45.38	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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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 150 m²

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) 11.80 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 10.85 kgCO₂/m² OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.22)	0.19 (max. 0.70)	OK
Floor	0.12 (max. 0.18)	0.12 (max. 0.70)	OK
Roof	0.10 (max. 0.15)	0.10 (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: 11.19 m², No overhang
Windows facing East: 4.32 m², No overhang
Windows facing South: 9.99 m², No overhang
Windows facing West: 4.56 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

Roof U-value 0.10 W/m²K
Floor U-value 0.12 W/m²K
Photovoltaic array 1.68 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	79.3000 (1b)	2.5100 (2b)	199.0430 (1b) - (3b)
First floor	71.0000 (1c)	2.6500 (2c)	188.1500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	150.3000		(3a) + (3b) + (3c) + (3d) + (3e)...(3n) = 387.1930 (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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj inflt rate	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:	0.5000 (23a)											
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)			30.0600	1.3258	39.8523		(27)	
Insulated slab			79.0000	0.1200	9.4800		(28a)	
Main T/Frame ACDS	141.0300	34.2600	106.7700	0.1600	17.0832		(29a)	
House to garage wall	14.5600	1.8900	12.6700	0.1900	2.4073		(29a)	
Feature granite nominal area	5.0000		5.0000	0.1600	0.8000		(29a)	
Render /lathe nominal area	6.0000		6.0000	0.1600	0.9600		(29a)	
Horizontal ceiling	79.0000		79.0000	0.1000	7.9000		(30)	
Total net area of external elements Aum(A, m2)	324.5900						(31)	
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	87.0088	(33)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								15.5689 (36)
Total fabric heat loss								(33) + (36) = 102.5776 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	63.8868	63.8868	63.8868	63.8868	63.8868	63.8868	63.8868	63.8868	63.8868	63.8868	63.8868	63.8868 (38)
Average = Sum(39)m / 12 =	166.4645	166.4645	166.4645	166.4645	166.4645	166.4645	166.4645	166.4645	166.4645	166.4645	166.4645	166.4645 (39)
HLP	1.1075	1.1075	1.1075	1.1075	1.1075	1.1075	1.1075	1.1075	1.1075	1.1075	1.1075	1.1075 (40)
HLP (average)	1.1075 (40)											
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy	2.9347 (42)											
Average daily hot water use (litres/day)	109.3664 (43)											
Daily hot water use	120.3030	115.9284	111.5537	107.1791	102.8044	98.4298	98.4298	102.8044	107.1791	111.5537	115.9284	120.3030 (44)
Energy conte	178.4059	156.0350	161.0141	140.3760	134.6941	116.2308	107.7049	123.5929	125.0690	145.7559	159.1040	172.7766 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy content (annual)												Total = Sum(45)m =	1720.7592 (45)
Distribution loss (46)m = 0.15 x (45)m													
	26.7609	23.4052	24.1521	21.0564	20.2041	17.4346	16.1557	18.5389	18.7604	21.8634	23.8656	25.9165	(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	238.4963	210.3102	221.1045	198.5280	194.7845	174.3828	167.7953	183.6833	183.2210	205.8463	217.2560	232.8670	(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	-35.8915	-30.7497	-30.7377	-25.9560	-23.7610	-10.2193	-9.9102	-10.7427	-10.6824	-26.6190	-30.8760	-35.3667	eq. (G6)
Output from w/h	202.6048	179.5605	190.3668	172.5720	171.0235	164.1635	157.8851	172.9407	172.5386	179.2274	186.3800	197.5003	(64)
Heat gains from water heating, kWh/month	107.3923	95.3018	101.6095	93.1966	92.8581	85.1683	83.8842	89.1670	88.1071	96.5362	99.4237	105.5205	(65)
												Total per year (kWh/year) = Sum(64)m =	2146.7632 (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	146.7328	146.7328	146.7328	146.7328	146.7328	146.7328	146.7328	146.7328	146.7328	146.7328	146.7328	146.7328	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.8054	25.5847	20.8069	15.7521	11.7749	9.9409	10.7415	13.9622	18.7400	23.7947	27.7719	29.6060	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	320.8488	324.1782	315.7882	297.9269	275.3802	254.1895	240.0328	236.7034	245.0934	262.9547	285.5014	306.6921	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6733	37.6733	37.6733	37.6733	37.6733	37.6733	37.6733	37.6733	37.6733	37.6733	37.6733	37.6733	(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)	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	(71)
Water heating gains (Table 5)	144.3445	141.8181	136.5719	129.4397	124.8093	118.2894	112.7476	119.8481	122.3709	129.7529	138.0884	141.8287	(72)
Total internal gains	564.0185	561.6008	543.1868	513.1386	481.9842	452.4395	433.5416	440.5334	456.2241	486.5221	521.3816	548.1466	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains							
	m ²	Table 6a	Specific data	Specific data	factor	W							
		W/m ²	or Table 6b	or Table 6c	Table 6d								
North	11.1900	10.6334	0.6300	0.7000	0.7700	36.3642 (74)							
East	4.3200	19.6403	0.6300	0.7000	0.7700	25.9300 (76)							
South	9.9900	46.7521	0.6300	0.7000	0.7700	142.7375 (78)							
West	4.5600	19.6403	0.6300	0.7000	0.7700	27.3706 (80)							
Solar gains	232.4023	407.5283	587.5783	776.6654	913.1393	925.2284	884.2631	779.7974	652.7528	458.5851	280.5121	197.4851	(83)
Total gains	796.4208	969.1292	1130.7651	1289.8040	1395.1235	1377.6679	1317.8047	1220.3308	1108.9769	945.1072	801.8937	745.6317	(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	25.0804	25.0804	25.0804	25.0804	25.0804	25.0804	25.0804	25.0804	25.0804	25.0804	25.0804	25.0804	
alpha	2.6720	2.6720	2.6720	2.6720	2.6720	2.6720	2.6720	2.6720	2.6720	2.6720	2.6720	2.6720	
util living area	0.9745	0.9568	0.9253	0.8643	0.7643	0.6289	0.4977	0.5454	0.7403	0.8990	0.9607	0.9784	(86)
MIT	18.5825	18.8854	19.3503	19.9149	20.4188	20.7600	20.9076	20.8791	20.6048	19.9364	19.1379	18.5062	(87)
Th 2	19.9947	19.9947	19.9947	19.9947	19.9947	19.9947	19.9947	19.9947	19.9947	19.9947	19.9947	19.9947	(88)
util rest of house	0.9706	0.9503	0.9137	0.8422	0.7239	0.5605	0.4021	0.4502	0.6818	0.8778	0.9536	0.9751	(89)
MIT 2	16.7441	17.1821	17.8510	18.6507	19.3394	19.7724	19.9325	19.9081	19.5968	18.6972	17.5531	16.6335	(90)
Living area fraction												fLA = Living area / (4) =	0.2006 (91)
MIT	17.1129	17.5238	18.1518	18.9043	19.5559	19.9706	20.1281	20.1029	19.7990	18.9458	17.8710	17.0092	(92)
Temperature adjustment												-0.1500	
adjusted MIT	16.9629	17.3738	18.0018	18.7543	19.4059	19.8206	19.9781	19.9529	19.6490	18.7958	17.7210	16.8592	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9525	0.9259	0.8828	0.8083	0.6965	0.5475	0.4004	0.4459	0.6583	0.8444	0.9301	0.9588	(94)
Ext temp.	758.5841	897.2911	998.2612	1042.5542	971.6419	754.2204	527.6991	544.1174	730.0469	798.0070	745.8322	714.9470	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	2107.9168	2076.4432	1914.6382	1640.3912	1282.7635	869.0367	562.3388	591.4272	923.7125	1364.3019	1768.0209	2107.3015	(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)
	1003.9035	792.3902	681.7845	430.4426	231.4744	0.0000	0.0000	0.0000	0.0000	421.3234	735.9759	1035.9118	(98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Space heating 5333.2064 (98)
 Space heating per m2 (98) / (4) = 35.4837 (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	1003.9035	792.3902	681.7845	430.4426	231.4744	0.0000	0.0000	0.0000	0.0000	421.3234	735.9759	1035.9118	(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)	1100.7714	868.8489	747.5707	471.9766	253.8097	0.0000	0.0000	0.0000	0.0000	461.9775	806.9911	1135.8682	(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	202.6048	179.5605	190.3668	172.5720	171.0235	164.1635	157.8851	172.9407	172.5386	179.2274	186.3800	197.5003	(64)
Efficiency of water heater	89.2088	89.0142	88.6286	87.8580	86.3246	80.5000	80.5000	80.5000	80.5000	87.7203	88.8145	80.5000	(216)
Fuel for water heating, kWh/month	227.1130	201.7212	214.7915	196.4216	198.1169	203.9298	196.1306	214.8331	214.3337	204.3169	209.8530	221.1665	(219)
Water heating fuel used												2502.7279	(219)
Annual totals kWh/year													
Space heating fuel - main system												5847.8140	(211)
Space heating fuel - secondary												0.0000	(215)

Electricity for pumps and fans:

(MEV)Decentralised, Database: total watage = 11.0240, total flow = 45.0000, SFP = 0.2450
 mechanical ventilation fans (SFP = 0.2450) 115.7215 (230a)
 central heating pump 30.0000 (230c)
 main heating flue fan 45.0000 (230e)
 Total electricity for the above, kWh/year 190.7215 (231)
 Electricity for lighting (calculated in Appendix L) 508.7122 (232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV Unit 0 (0.80 * 1.68 * 1068 * 1.00) = -1435.4867 -1435.4867 (233)
 Total delivered energy for all uses 7614.4888 (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	5847.8140	0.2410	1409.3232	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2502.7279	0.2410	603.1574	(264)
Space and water heating			2012.4806	(265)
Pumps and fans	190.7215	0.5190	98.9845	(267)
Energy for lighting	508.7122	0.5190	264.0216	(268)
Energy saving/generation technologies				
PV Unit	-1435.4867	0.5190	-745.0176	(269)
Total CO2, kg/year			1630.4691	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			10.8500	(273)

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

	DER	TFA	N	EF	
Total Floor Area		150.3000			ZC1
Assumed number of occupants			2.9347		
CO2 emission factor in Table 12 for electricity displaced from grid				0.5190	
CO2 emissions from appliances, equation (L14)				12.6499	ZC2
CO2 emissions from cooking, equation (L16)				1.2604	ZC3
Total CO2 emissions				24.7603	ZC4
Residual CO2 emissions offset from biofuel CHP				0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year				0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation				0.0000	ZC7
Net CO2 emissions				24.7603	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	79.3000 (1b)	2.5100 (2b)	199.0430 (1b) - (3b)
First floor	71.0000 (1c)	2.6500 (2c)	188.1500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	150.3000		(3a) + (3b) + (3c) + (3d) + (3e)...(3n) = 387.1930 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour							
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)							
Number of open flues	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) =	0.1550 (8)							
Pressure test					Yes							
Measured/design AP50					7.0000							
Infiltration rate					0.5050 (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) =	0.4292 (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	0.5473	0.5365	0.5258	0.4721	0.4614	0.4078	0.4078	0.3970	0.4292	0.4614	0.4829	0.5043 (22b)
Effective ac	0.6497	0.6439	0.6382	0.6115	0.6064	0.5831	0.5831	0.5788	0.5921	0.6064	0.6166	0.6272 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K					
TER Opaque door			1.8500	1.4000	2.5900		(26)					
TER Opening Type (Uw = 1.40)			35.7300	1.3258	47.3693		(27)					
Insulated slab			79.0000	0.1500	11.8500		(28a)					
Main T/Frame ACDS	166.5900	37.5800	129.0100	0.1700	21.9317		(29a)					
Horizontal ceiling	79.0000		79.0000	0.1100	8.6900		(30)					
Total net area of external elements Aum(A, m ²)			324.5900				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 92.4310		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)					
Thermal bridges (User defined value 0.080 * total exposed area)							25.9672 (36)					
Total fabric heat loss							(33) + (36) = 118.3982 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 83.0200	Feb 82.2770	Mar 81.5488	Apr 78.1282	May 77.4882	Jun 74.5090	Jul 74.5090	Aug 73.9573	Sep 75.6566	Oct 77.4882	Nov 78.7829	Dec 80.1364 (38)
Heat transfer coeff	201.4182	200.6752	199.9470	196.5264	195.8864	192.9072	192.9072	192.3555	194.0548	195.8864	197.1811	198.5346 (39)
Average = Sum(39)m / 12 =												196.5233 (39)
HLP	Jan 1.3401	Feb 1.3352	Mar 1.3303	Apr 1.3076	May 1.3033	Jun 1.2835	Jul 1.2835	Aug 1.2798	Sep 1.2911	Oct 1.3033	Nov 1.3119	Dec 1.3209 (40)
HLP (average)												1.3075 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.9347 (42)
Average daily hot water use (litres/day)												109.3664 (43)
Daily hot water use	120.3030	115.9284	111.5537	107.1791	102.8044	98.4298	98.4298	102.8044	107.1791	111.5537	115.9284	120.3030 (44)
Energy conte	178.4059	156.0350	161.0141	140.3760	134.6941	116.2308	107.7049	123.5929	125.0690	145.7559	159.1040	172.7766 (45)
Energy content (annual)												Total = Sum(45)m = 1720.7592 (45)
Distribution loss (46)m = 0.15 x (45)m												25.9165 (46)
Water storage loss:												150.0000 (47)
Store volume												1.8900 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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	233.3069	205.6230	215.9151	193.5060	189.5951	169.3608	162.6059	178.4939	178.1990	200.6569	212.2340	227.6776 (62)
WWHRS	-43.7756	-38.5160	-39.3111	-32.3508	-30.0419	-24.7855	-20.9813	-25.4020	-26.1410	-32.3106	-37.4208	-42.3096 eq. (G10)
Total of WWHRS savings												-393.3462
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	189.5313	167.1070	176.6040	161.1552	159.5532	144.5752	141.6246	153.0920	152.0580	168.3463	174.8132	185.3680 (64)
Heat gains from water heating, kWh/month	103.2408	91.5520	97.4580	89.1790	88.7066	81.1507	79.7327	85.0155	84.0895	92.3846	95.4061	101.3690 (65)
											Total per year (kWh/year) = Sum(64)m =	1973.8280 (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	146.7328	146.7328	146.7328	146.7328	146.7328	146.7328	146.7328	146.7328	146.7328	146.7328	146.7328	146.7328 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.6039	25.4057	20.6613	15.6420	11.6925	9.8713	10.6663	13.8645	18.6089	23.6283	27.5777	29.3989 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	320.8488	324.1782	315.7882	297.9269	275.3802	254.1895	240.0328	236.7034	245.0934	262.9547	285.5014	306.6921 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6733	37.6733	37.6733	37.6733	37.6733	37.6733	37.6733	37.6733	37.6733	37.6733	37.6733	37.6733 (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)	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862 (71)
Water heating gains (Table 5)	138.7645	136.2381	130.9919	123.8597	119.2293	112.7094	107.1676	114.2681	116.7909	124.1729	132.5084	136.2487 (72)
Total internal gains	558.2370	555.8419	537.4613	507.4484	476.3218	446.7900	427.8865	434.8558	450.5130	480.7757	515.6073	542.3595 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
East	35.7300	19.6403	0.6300	0.7000	0.7700	214.4629 (76)						
Solar gains	214.4629	419.5349	690.9142	1007.6572	1234.9218	1264.1622	1203.5339	1033.8179	803.5619	497.8135	267.4100	176.3638 (83)
Total gains	772.6999	975.3768	1228.3755	1515.1056	1711.2436	1710.9522	1631.4204	1468.6736	1254.0749	978.5892	783.0173	718.7233 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor for gains for living area, nil,m (see Table 9a)	0.9767	0.9593	0.9219	0.8446	0.7295	0.5874	0.4637	0.5185	0.7317	0.9041	0.9647	0.9802 (86)
MIT	18.0904	18.4362	19.0233	19.7620	20.3528	20.7392	20.8952	20.8597	20.5224	19.6992	18.7653	18.0476 (87)
Th 2	19.8095	19.8134	19.8172	19.8349	19.8382	19.8538	19.8538	19.8567	19.8478	19.8382	19.8315	19.8245 (88)
util rest of house	0.9727	0.9525	0.9087	0.8181	0.6822	0.5119	0.3609	0.4146	0.6662	0.8819	0.9578	0.9769 (89)
MIT 2	15.9347	16.4372	17.2831	18.3335	19.1328	19.6247	19.7891	19.7634	19.3833	18.2733	16.9294	15.8800 (90)
Living area fraction	16.3671	16.8382	17.6322	18.6201	19.3775	19.8483	20.0110	19.9833	19.6118	18.5594	17.2977	16.3148 (92)
MIT	16.3671	16.8382	17.6322	18.6201	19.3775	19.8483	20.0110	19.9833	19.6118	18.5594	17.2977	16.3148 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.2171	16.6882	17.4822	18.4701	19.2275	19.6983	19.8610	19.8333	19.4618	18.4094	17.1477	16.1648 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	736.7002	902.5919	1071.6554	1180.5459	1118.1079	856.4967	589.9078	605.5136	802.8431	825.9217	730.3164	689.8477 (95)	
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	16.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)	
Heat loss rate W	2400.3283	2365.5984	2195.8593	1880.7751	1474.5332	983.4990	629.0611	660.4211	1040.4777	1529.7461	1981.2103	2375.4257 (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	1237.7393	983.1403	836.4078	504.1650	265.1804	0.0000	0.0000	0.0000	0.0000	523.6454	900.6436	1254.0700 (98)	
Space heating												6504.9918 (98)	
Space heating per m ²												(98) / (4) =	43.2801 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.1000 (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)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1237.7393	983.1403	836.4078	504.1650	265.1804	0.0000	0.0000	0.0000	0.0000	523.6454	900.6436	1254.0700	(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)	1210.8320	961.7677	818.2250	493.2049	259.4156	0.0000	0.0000	0.0000	0.0000	512.2618	881.0644	1226.8076	(211)
Water heating requirement	206.2899	163.8567	139.4013	84.0275	44.1967	0.0000	0.0000	0.0000	0.0000	87.2742	150.1073	209.0117	(215)
Water heating requirement	189.5313	167.1070	176.6040	161.1552	159.5532	144.5752	141.6246	153.0920	152.0580	168.3463	174.8132	185.3680	(64)
Efficiency of water heater (217)m	88.6789	88.5141	88.1346	87.2697	85.6530	79.3000	79.3000	79.3000	79.3000	87.2565	88.2879	88.7321	(217)
Fuel for water heating, kWh/month	213.7276	188.7914	200.3799	184.6635	186.2787	182.3143	178.5934	193.0542	191.7504	192.9328	198.0036	208.9074	(219)
Water heating fuel used													2319.3972 (219)
Annual totals kWh/year													
Space heating fuel - main system													6363.5790 (211)
Space heating fuel - secondary													1084.1653 (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)													505.1538 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.50 * 1029 * 1.00) =										-1235.0241			-1235.0241 (233)
Total delivered energy for all uses													9112.2712 (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	6363.5790	0.2410	1533.6225 (261)
Space heating - secondary	1084.1653	0.0190	20.5991 (263)
Water heating (other fuel)	2319.3972	0.2410	558.9747 (264)
Space and water heating			2113.1964 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	505.1538	0.5190	262.1748 (268)
Energy saving/generation technologies			
PV Unit	-1235.0241	0.5190	-640.9775 (269)
Total CO2, kg/m2/year			1773.3187 (272)
Target Carbon Dioxide Emission Rate (TER) = 1773.3187 / 150.30, rounded to 2 d.p.			11.8000 (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 ²)	Storey height (m)	Volume (m ³)
Ground floor	79.3000 (1b)	2.5100 (2b)	199.0430 (1b) - (3b)
First floor	71.0000 (1c)	2.6500 (2c)	188.1500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	150.3000		(3a) + (3b) + (3c) + (3d) + (3e)...(3n) = 387.1930 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				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) =	0.1033 (8)
Pressure test				Yes	
Measured/design AP50				4.0000	
Infiltration rate				0.3033 (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) =		0.2578 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3287	0.3223	0.3158	0.2836	0.2771	0.2449	0.2449	0.2385	0.2578	0.2771	0.2900	0.3029 (22b)
Effective ac	0.5540	0.5519	0.5499	0.5402	0.5384	0.5300	0.5300	0.5284	0.5332	0.5384	0.5421	0.5459 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
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)			30.0600	1.3258	39.8523		(27)
Insulated slab			79.0000	0.1200	9.4800		(28a)
Main T/Frame ACDS	141.0300	34.2600	106.7700	0.1600	17.0832		(29a)
House to garage wall	14.5600	1.8900	12.6700	0.1900	2.4073		(29a)
Feature granite nominal area	5.0000		5.0000	0.1600	0.8000		(29a)
Render /lathe nominal area	6.0000		6.0000	0.1600	0.9600		(29a)
Horizontal ceiling	79.0000		79.0000	0.1000	7.9000		(30)
Total net area of external elements Aum(A, m ²)			324.5900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	87.0088		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.5689 (36)
Total fabric heat loss						(33) + (36) =	102.5776 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	70.7898	70.5218	70.2590	69.0249	68.7940	67.7192	67.7192	67.5201	68.1332	68.7940	69.2611	69.7495 (38)
Heat transfer coeff	173.3675	173.0994	172.8367	171.6026	171.3717	170.2968	170.2968	170.0978	170.7108	171.3717	171.8388	172.3271 (39)
Average = Sum(39)m / 12 =												171.6015 (39)
HLP	1.1535	1.1517	1.1499	1.1417	1.1402	1.1330	1.1330	1.1317	1.1358	1.1402	1.1433	1.1466 (40)
HLP (average)												1.1417 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.9347 (42)
Average daily hot water use (litres/day)												109.3664 (43)
Daily hot water use	120.3030	115.9284	111.5537	107.1791	102.8044	98.4298	98.4298	102.8044	107.1791	111.5537	115.9284	120.3030 (44)
Energy conte	178.4059	156.0350	161.0141	140.3760	134.6941	116.2308	107.7049	123.5929	125.0690	145.7559	159.1040	172.7766 (45)
Energy content (annual)												Total = Sum(45)m = 1720.7592 (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)

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Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Heat gains from water heating, kWh/month	37.9113	33.1574	34.2155	29.8299	28.6225	24.6990	22.8873	26.2635	26.5772	30.9731	33.8096	36.7150	(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	146.7328	146.7328	146.7328	146.7328	146.7328	146.7328	146.7328	146.7328	146.7328	146.7328	146.7328	146.7328	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.8054	25.5847	20.8069	15.7521	11.7749	9.9409	10.7415	13.9622	18.7400	23.7947	27.7719	29.6060	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	320.8488	324.1782	315.7882	297.9269	275.3802	254.1895	240.0328	236.7034	245.0934	262.9547	285.5014	306.6921	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6733	37.6733	37.6733	37.6733	37.6733	37.6733	37.6733	37.6733	37.6733	37.6733	37.6733	37.6733	(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)	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	(71)
Water heating gains (Table 5)	50.9560	49.3414	45.9886	41.4304	38.4711	34.3042	30.7625	35.3004	36.9127	41.6306	46.9578	49.3482	(72)
Total internal gains	467.6300	466.1241	449.6035	422.1293	392.6460	365.4544	348.5566	352.9858	367.7659	395.3998	427.2509	452.6660	(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	11.1900	10.6334	0.6300	0.6300	0.7000	0.7700	36.3642	(74)
East	4.3200	19.6403	0.6300	0.6300	0.7000	0.7700	25.9300	(76)
South	9.9900	46.7521	0.6300	0.6300	0.7000	0.7700	142.7375	(78)
West	4.5600	19.6403	0.6300	0.6300	0.7000	0.7700	27.3706	(80)

Solar gains	232.4023	407.5283	587.5783	776.6654	913.1393	925.2284	884.2631	779.7974	652.7528	458.5851	280.5121	197.4851	(83)
Total gains	700.0323	873.6525	1037.1818	1198.7947	1305.7853	1290.6828	1232.8197	1132.7831	1020.5187	853.9849	707.7630	650.1512	(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	24.0818	24.1191	24.1558	24.3295	24.3623	24.5160	24.5160	24.5447	24.4566	24.3623	24.2960	24.2272	24.2272	
alpha	2.6055	2.6079	2.6104	2.6220	2.6242	2.6344	2.6344	2.6363	2.6304	2.6242	2.6197	2.6151	2.6151	
util living area	0.9811	0.9662	0.9389	0.8840	0.7918	0.6612	0.5310	0.5818	0.7743	0.9188	0.9706	0.9843	0.9843	(86)
MIT	18.3781	18.6920	19.1785	19.7881	20.3322	20.7172	20.8868	20.8524	20.5368	19.8101	18.9726	18.3162	18.3162	(87)
Th 2	19.9574	19.9588	19.9603	19.9669	19.9681	19.9739	19.9739	19.9750	19.9717	19.9681	19.9656	19.9630	19.9630	(88)
util rest of house	0.9781	0.9608	0.9289	0.8639	0.7530	0.5922	0.4305	0.4830	0.7180	0.9006	0.9650	0.9818	0.9818	(89)
MIT 2	17.5476	17.8594	18.3401	18.9376	19.4508	19.7935	19.9216	19.9021	19.6496	18.9706	18.1454	17.4899	17.4899	(90)
Living area fraction									fLA = Living area / (4) =			0.2006	0.2006	(91)
MIT	17.7142	18.0264	18.5082	19.1082	19.6276	19.9788	20.1152	20.0927	19.8276	19.1390	18.3113	17.6557	17.6557	(92)
Temperature adjustment												0.0000	0.0000	
adjusted MIT	17.7142	18.0264	18.5082	19.1082	19.6276	19.9788	20.1152	20.0927	19.8276	19.1390	18.3113	17.6557	17.6557	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9690	0.9474	0.9109	0.8437	0.7383	0.5925	0.4454	0.4954	0.7089	0.8819	0.9528	0.9739	(94)
Useful gains	678.3136	827.7289	944.7811	1011.3757	964.0109	764.7541	549.1297	561.1568	723.4176	753.1257	674.3840	633.1564	(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	2325.5795	2272.1726	2075.4653	1751.7537	1358.5703	915.9944	598.6284	628.1202	977.7639	1463.3468	1926.5363	2318.7744	(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	1225.5658	970.6662	841.2290	533.0722	293.5522	0.0000	0.0000	0.0000	0.0000	528.4045	901.5496	1254.0998	(98)
Space heating												6548.1392	(98)
Space heating per m2										(98) / (4) =		43.5671	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1600.7901	1260.1965	1292.7431	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7323	0.7977	0.7650	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1172.2559	1005.3093	988.9523	0.0000	0.0000	0.0000	0.0000	(102)

FULL SAP CALCULATION PRINTOUT

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Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1634.2152	1563.6640	1449.1816	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	332.6107	415.4159	342.4106	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												1090.4371 (104)
Cooled fraction												1.0000 (105)
Intermittency factor (Table 10b)												
Intermittency factor	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	83.1527	103.8540	85.6026	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												272.6093 (107)
Space cooling per m2												1.8138 (108)
Energy for space heating												43.5671 (99)
Energy for space cooling												1.8138 (108)
Total												45.3809 (109)
Dwelling Fabric Energy Efficiency (DFEE)												45.4 (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 (m ²)	Storey height (m)	Volume (m ³)
Ground floor	79.3000 (1b)	x 2.5100 (2b)	= 199.0430 (1b) - (3b)
First floor	71.0000 (1c)	x 2.6500 (2c)	= 188.1500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	150.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 387.1930 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.7000	5.8000	5.7000	5.0000	4.6000	4.4000	4.0000	4.1000	4.6000	5.2000	5.3000	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 inflt 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 m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
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)			30.0600	1.3258	39.8523		(27)
Insulated slab			79.0000	0.1200	9.4800		(28a)
Main T/Frame ACDS	141.0300	34.2600	106.7700	0.1600	17.0832		(29a)
House to garage wall	14.5600	1.8900	12.6700	0.1900	2.4073		(29a)
Feature granite nominal area	5.0000		5.0000	0.1600	0.8000		(29a)
Render /lathe nominal area	6.0000		6.0000	0.1600	0.9600		(29a)
Horizontal ceiling	79.0000		79.0000	0.1000	7.9000		(30)
Total net area of external elements Aum(A, m ²)			324.5900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		87.0088		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.5689 (36)
Total fabric heat loss						(33) + (36) =	102.5776 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	63.8868	63.8868	63.8868	63.8868	63.8868	63.8868	63.8868	63.8868	63.8868	63.8868	63.8868	63.8868 (38)
Average = Sum(39)m / 12 =	166.4645	166.4645	166.4645	166.4645	166.4645	166.4645	166.4645	166.4645	166.4645	166.4645	166.4645	166.4645 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1075	1.1075	1.1075	1.1075	1.1075	1.1075	1.1075	1.1075	1.1075	1.1075	1.1075	1.1075 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.9347 (42)
Average daily hot water use (litres/day)												109.3664 (43)
Daily hot water use	120.3030	115.9284	111.5537	107.1791	102.8044	98.4298	98.4298	102.8044	107.1791	111.5537	115.9284	120.3030 (44)
Energy conte	178.4059	156.0350	161.0141	140.3760	134.6941	116.2308	107.7049	123.5929	125.0690	145.7559	159.1040	172.7766 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Energy content (annual)												Total = Sum(45)m =	1720.7592 (45)
Distribution loss (46)m = 0.15 x (45)m													
	26.7609	23.4052	24.1521	21.0564	20.2041	17.4346	16.1557	18.5389	18.7604	21.8634	23.8656	25.9165	(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													
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	(62)
	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	238.4963	210.3102	221.1045	198.5280	194.7845	174.3828	167.7953	183.6833	183.2210	205.8463	217.2560	232.8670	(64)
													(64)
RHI water heating demand													2428.2752 (64)
Heat gains from water heating, kWh/month	107.3923	95.3018	101.6095	93.1966	92.8581	85.1683	83.8842	89.1670	88.1071	96.5362	99.4237	105.5205	(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	176.0793	176.0793	176.0793	176.0793	176.0793	176.0793	176.0793	176.0793	176.0793	176.0793	176.0793	176.0793	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	72.0135	63.9617	52.0172	39.3803	29.4373	24.8522	26.8537	34.9054	46.8500	59.4868	69.4299	74.0150	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	478.8788	483.8480	471.3256	444.6670	411.0152	379.3873	358.2579	353.2886	365.8110	392.4696	426.1214	457.7494	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.5426	55.5426	55.5426	55.5426	55.5426	55.5426	55.5426	55.5426	55.5426	55.5426	55.5426	55.5426	(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)	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	(71)
Water heating gains (Table 5)	144.3445	141.8181	136.5719	129.4397	124.8093	118.2894	112.7476	119.8481	122.3709	129.7529	138.0884	141.8287	(72)
Total internal gains	812.4724	806.8636	777.1504	730.7228	682.4975	639.7645	615.0948	625.2778	652.2676	698.9450	750.8754	790.8287	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains							
	m ²	Table 6a	Specific data	Specific data	factor	W							
		W/m ²	or Table 6b	or Table 6c	Table 6d								
North	11.1900	8.2005	0.6300	0.7000	0.7700	28.0442 (74)							
East	4.3200	14.7869	0.6300	0.7000	0.7700	19.5224 (76)							
South	9.9900	38.1750	0.6300	0.7000	0.7700	116.5510 (78)							
West	4.5600	14.7869	0.6300	0.7000	0.7700	20.6070 (80)							
Solar gains	184.7246	367.9398	582.8967	776.6246	951.8708	890.8871	850.8714	744.7345	608.8641	405.0115	230.9760	143.2596	(83)
Total gains	997.1970	1174.8034	1360.0471	1507.3474	1634.3682	1530.6516	1465.9662	1370.0123	1261.1316	1103.9565	981.8514	934.0883	(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	25.0804	25.0804	25.0804	25.0804	25.0804	25.0804	25.0804	25.0804	25.0804	25.0804	25.0804	25.0804	
alpha	2.6720	2.6720	2.6720	2.6720	2.6720	2.6720	2.6720	2.6720	2.6720	2.6720	2.6720	2.6720	
util living area	0.9627	0.9447	0.9113	0.8601	0.7880	0.7115	0.6399	0.6720	0.7870	0.8998	0.9504	0.9694	(86)
MIT	18.6036	18.8445	19.2820	19.7726	20.2040	20.5466	20.7259	20.6848	20.3899	19.7483	19.0531	18.4575	(87)
Th 2	19.9947	19.9947	19.9947	19.9947	19.9947	19.9947	19.9947	19.9947	19.9947	19.9947	19.9947	19.9947	(88)
util rest of house	0.9576	0.9373	0.8993	0.8407	0.7580	0.6652	0.5779	0.6117	0.7469	0.8822	0.9426	0.9652	(89)
MIT 2	16.7714	17.1180	17.7454	18.4410	19.0380	19.5010	19.7284	19.6827	19.3076	18.4227	17.4254	16.5595	(90)
Living area fraction												fLA = Living area / (4) =	
MIT	17.1389	17.4643	18.0536	18.7082	19.2719	19.7108	19.9284	19.8837	19.5247	18.6886	17.7519	16.9402	(92)
Temperature adjustment												-0.1500	
adjusted MIT	16.9889	17.3143	17.9036	18.5582	19.1219	19.5608	19.7784	19.7337	19.3747	18.5386	17.6019	16.7902	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	932.4522	1068.9447	1179.1494	1216.0724	1189.5089	983.6928	825.6147	813.9601	905.2427	937.1020	899.7297	882.8398	(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	2278.7161	2282.9481	2147.9948	1907.3762	1634.9914	1225.3046	961.9067	971.1053	1227.6259	1621.1289	1981.2469	2312.2319	(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	1001.6203	815.8103	720.8210	497.7387	331.4389	0.0000	0.0000	0.0000	0.0000	508.9160	778.6924	1063.4677	(98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Space heating
RHI space heating demand

5718.5054 (98)
5719 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	79.3000 (1b)	2.5100 (2b)	199.0430 (1b) - (3b)
First floor	71.0000 (1c)	2.6500 (2c)	188.1500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	150.3000		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 387.1930 (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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.2168	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)			30.0600	1.3258	39.8523		(27)
Insulated slab			79.0000	0.1200	9.4800		(28a)
Main T/Frame ACDS	141.0300	34.2600	106.7700	0.1600	17.0832		(29a)
House to garage wall	14.5600	1.8900	12.6700	0.1900	2.4073		(29a)
Feature granite nominal area	5.0000		5.0000	0.1600	0.8000		(29a)
Render /lathe nominal area	6.0000		6.0000	0.1600	0.9600		(29a)
Horizontal ceiling	79.0000		79.0000	0.1000	7.9000		(30)
Total net area of external elements Aum(A, m2)			324.5900				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	87.0088	(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.5689 (36)
Total fabric heat loss							(33) + (36) = 102.5776 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	63.8868	63.8868	63.8868	63.8868	63.8868	63.8868	63.8868	63.8868	63.8868	63.8868	63.8868	63.8868 (38)
Average = Sum(39)m / 12 =	166.4645	166.4645	166.4645	166.4645	166.4645	166.4645	166.4645	166.4645	166.4645	166.4645	166.4645	166.4645 (39)
HLP	1.1075	1.1075	1.1075	1.1075	1.1075	1.1075	1.1075	1.1075	1.1075	1.1075	1.1075	1.1075 (40)
HLP (average)												1.1075 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.9347 (42)
Average daily hot water use (litres/day)												109.3664 (43)
Daily hot water use	120.3030	115.9284	111.5537	107.1791	102.8044	98.4298	98.4298	102.8044	107.1791	111.5537	115.9284	120.3030 (44)
Energy conte	178.4059	156.0350	161.0141	140.3760	134.6941	116.2308	107.7049	123.5929	125.0690	145.7559	159.1040	172.7766 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Energy content (annual)												Total = Sum(45)m =	1720.7592 (45)
Distribution loss (46)m = 0.15 x (45)m													
	26.7609	23.4052	24.1521	21.0564	20.2041	17.4346	16.1557	18.5389	18.7604	21.8634	23.8656	25.9165	(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	238.4963	210.3102	221.1045	198.5280	194.7845	174.3828	167.7953	183.6833	183.2210	205.8463	217.2560	232.8670	(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	-34.8623	-29.9526	-29.9978	-25.4720	-23.2739	-10.2193	-9.9102	-10.7427	-10.6824	-26.0653	-30.0622	-34.4867	eq. (G6)
Output from w/h	203.6340	180.3575	191.1067	173.0560	171.5106	164.1635	157.8851	172.9407	172.5386	179.7810	187.1938	198.3803	(64)
Heat gains from water heating, kWh/month	107.3923	95.3018	101.6095	93.1966	92.8581	85.1683	83.8842	89.1670	88.1071	96.5362	99.4237	105.5205	(65)
												Total per year (kWh/year) = Sum(64)m =	2152.5479 (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	176.0793	176.0793	176.0793	176.0793	176.0793	176.0793	176.0793	176.0793	176.0793	176.0793	176.0793	176.0793	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	72.0135	63.9617	52.0172	39.3803	29.4373	24.8522	26.8537	34.9054	46.8500	59.4868	69.4299	74.0150	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	478.8788	483.8480	471.3256	444.6670	411.0152	379.3873	358.2579	353.2886	365.8110	392.4696	426.1214	457.7494	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.5426	55.5426	55.5426	55.5426	55.5426	55.5426	55.5426	55.5426	55.5426	55.5426	55.5426	55.5426	(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)	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	(71)
Water heating gains (Table 5)	144.3445	141.8181	136.5719	129.4397	124.8093	118.2894	112.7476	119.8481	122.3709	129.7529	138.0884	141.8287	(72)
Total internal gains	812.4724	806.8636	777.1504	730.7228	682.4975	639.7645	615.0948	625.2778	652.2676	698.9450	750.8754	790.8287	(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	11.1900	10.6334	0.6300	0.7000	0.7700	36.3642 (74)							
East	4.3200	19.6403	0.6300	0.7000	0.7700	25.9300 (76)							
South	9.9900	46.7521	0.6300	0.7000	0.7700	142.7375 (78)							
West	4.5600	19.6403	0.6300	0.7000	0.7700	27.3706 (80)							
Solar gains	232.4023	407.5283	587.5783	776.6654	913.1393	925.2284	884.2631	779.7974	652.7528	458.5851	280.5121	197.4851	(83)
Total gains	1044.8747	1214.3919	1364.7288	1507.3882	1595.6368	1564.9929	1499.3579	1405.0752	1305.0204	1157.5302	1031.3875	988.3138	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
alpha	2.6720	2.6720	2.6720	2.6720	2.6720	2.6720	2.6720	2.6720	2.6720	2.6720	2.6720	2.6720	
util living area	0.9530	0.9302	0.8920	0.8229	0.7166	0.5779	0.4488	0.4901	0.6797	0.8536	0.9325	0.9590	(86)
MIT	18.8476	19.1295	19.5566	20.0666	20.5117	20.8059	20.9282	20.9070	20.6845	20.1034	19.3689	18.7695	(87)
Th 2	19.9947	19.9947	19.9947	19.9947	19.9947	19.9947	19.9947	19.9947	19.9947	19.9947	19.9947	19.9947	(88)
util rest of house	0.9463	0.9205	0.8766	0.7968	0.6732	0.5101	0.3591	0.3998	0.6177	0.8261	0.9214	0.9530	(89)
MIT 2	17.1254	17.5299	18.1392	18.8535	19.4529	19.8184	19.9475	19.9298	19.6853	18.9210	17.8810	17.0131	(90)
Living area fraction												fLA = Living area / (4) =	0.2006 (91)
MIT	17.4709	17.8508	18.4235	19.0969	19.6653	20.0165	20.1442	20.1258	19.8857	19.1582	18.1795	17.3655	(92)
Temperature adjustment												-0.1500	
adjusted MIT	17.3209	17.7008	18.2735	18.9469	19.5153	19.8665	19.9942	19.9758	19.7357	19.0082	18.0295	17.2155	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	962.1853	1081.2449	1150.4354	1152.0902	1037.0143	783.6377	538.3251	559.1351	782.7113	917.4803	919.4274	918.4032	(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	2167.5096	2130.8711	1959.8709	1672.4465	1300.9713	876.6884	565.0165	595.2485	938.1514	1399.6641	1819.3690	2166.6118	(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	896.7613	705.3488	602.2200	374.6565	196.3840	0.0000	0.0000	0.0000	0.0000	358.7448	647.9579	928.6672	(98)

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Calculation Type: New Build (As Designed)

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Space heating 4710.7405 (98)
 Space heating per m2 (98) / (4) = 31.3423 (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	896.7613	705.3488	602.2200	374.6565	196.3840	0.0000	0.0000	0.0000	0.0000	358.7448	647.9579	928.6672	(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)	983.2908	773.4088	660.3289	410.8076	215.3333	0.0000	0.0000	0.0000	0.0000	393.3605	710.4802	1018.2755	(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	203.6340	180.3575	191.1067	173.0560	171.5106	164.1635	157.8851	172.9407	172.5386	179.7810	187.1938	198.3803	(64)
Efficiency of water heater (217)m	89.0106	88.7966	88.3704	87.5242	85.8784	80.5000	80.5000	80.5000	80.5000	87.3251	88.5615	80.5000	(216)
Fuel for water heating, kWh/month	228.7751	203.1131	216.2564	197.7236	199.7133	203.9298	196.1306	214.8331	214.3337	205.8756	211.3715	222.6114	(219)
Water heating fuel used												2514.6672	(219)
Annual totals kWh/year													
Space heating fuel - main system												5165.2856	(211)
Space heating fuel - secondary												0.0000	(215)

Electricity for pumps and fans:

(MEV)Decentralised, Database: total watage = 11.0240, total flow = 45.0000, SFP = 0.2450
 mechanical ventilation fans (SFP = 0.2450) 115.7215 (230a)
 central heating pump 30.0000 (230c)
 main heating flue fan 45.0000 (230e)
 Total electricity for the above, kWh/year 190.7215 (231)
 Electricity for lighting (calculated in Appendix L) 508.7122 (232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV Unit 0 (0.80 * 1.68 * 1068 * 1.00) = -1435.4867 -1435.4867 (233)
 Total delivered energy for all uses 6943.8998 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	5165.2856	7.6000	392.5617	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	2514.6672	7.6000	191.1147	(247)
Mechanical ventilation fans	115.7215	13.1900	15.2637	(249)
Pumps and fans for heating	75.0000	13.1900	9.8925	(249)
Energy for lighting	508.7122	13.1900	67.0991	(250)
Additional standing charges			70.0000	(251)
Energy saving/generation technologies				
PV Unit	-1435.4867	13.1900	-189.3407	(252)
Total energy cost			556.5910	(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] = 1.1970 (257)
 SAP value 83.3023
 SAP rating (Section 12) 83 (258)
 SAP band B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	5165.2856	0.2410	1244.8338	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2514.6672	0.2410	606.0348	(264)
Space and water heating			1850.8686	(265)
Pumps and fans	190.7215	0.5190	98.9845	(267)
Energy for lighting	508.7122	0.5190	264.0216	(268)
Energy saving/generation technologies				
PV Unit	-1435.4867	0.5190	-745.0176	(269)
Total kg/year			1468.8571	(272)
CO2 emissions per m2			9.7700	(273)

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Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

EI value
EI rating
EI band

89.9218
90 (274)
B

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	$7.60 / 0.8555 = 8.884$, stars = 3
Water heating environmental impact	$0.241 / 0.8555 = 0.2817$, stars = 5

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	79.3000 (1b)	x 2.5100 (2b)	= 199.0430 (1b) - (3b)
First floor	71.0000 (1c)	x 2.6500 (2c)	= 188.1500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	150.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 387.1930 (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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.7000	5.8000	5.7000	5.0000	4.6000	4.4000	4.0000	4.1000	4.6000	5.2000	5.3000	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 inflt 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)			30.0600	1.3258	39.8523		(27)
Insulated slab			79.0000	0.1200	9.4800		(28a)
Main T/Frame ACDS	141.0300	34.2600	106.7700	0.1600	17.0832		(29a)
House to garage wall	14.5600	1.8900	12.6700	0.1900	2.4073		(29a)
Feature granite nominal area	5.0000		5.0000	0.1600	0.8000		(29a)
Render /lathe nominal area	6.0000		6.0000	0.1600	0.9600		(29a)
Horizontal ceiling	79.0000		79.0000	0.1000	7.9000		(30)
Total net area of external elements Aum(A, m2)			324.5900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		87.0088		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.5689 (36)
Total fabric heat loss						(33) + (36) =	102.5776 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	63.8868	63.8868	63.8868	63.8868	63.8868	63.8868	63.8868	63.8868	63.8868	63.8868	63.8868	63.8868 (38)
Average = Sum(39)m / 12 =	166.4645	166.4645	166.4645	166.4645	166.4645	166.4645	166.4645	166.4645	166.4645	166.4645	166.4645	166.4645 (39)
HLP	1.1075	1.1075	1.1075	1.1075	1.1075	1.1075	1.1075	1.1075	1.1075	1.1075	1.1075	1.1075 (40)
HLP (average)												1.1075 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.9347 (42)
Average daily hot water use (litres/day)												109.3664 (43)
Daily hot water use	120.3030	115.9284	111.5537	107.1791	102.8044	98.4298	98.4298	102.8044	107.1791	111.5537	115.9284	120.3030 (44)
Energy conte	178.4059	156.0350	161.0141	140.3760	134.6941	116.2308	107.7049	123.5929	125.0690	145.7559	159.1040	172.7766 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Energy content (annual)												Total = Sum(45)m =	1720.7592 (45)
Distribution loss (46)m = 0.15 x (45)m													
	26.7609	23.4052	24.1521	21.0564	20.2041	17.4346	16.1557	18.5389	18.7604	21.8634	23.8656	25.9165	(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													
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	(62)
FGHRS	-35.8789	-30.9641	-31.1007	-26.5398	-24.6093	-10.2193	-9.9102	-10.7427	-10.6824	-27.3939	-31.2709	-35.5156	eq. (G6)
Output from w/h	202.6174	179.3460	190.0038	171.9882	170.1752	164.1635	157.8851	172.9407	172.5386	178.4524	185.9851	197.3514	(64)
Heat gains from water heating, kWh/month	107.3923	95.3018	101.6095	93.1966	92.8581	85.1683	83.8842	89.1670	88.1071	96.5362	99.4237	105.5205	(65)
												Total per year (kWh/year) = Sum(64)m =	2143.4475 (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	176.0793	176.0793	176.0793	176.0793	176.0793	176.0793	176.0793	176.0793	176.0793	176.0793	176.0793	176.0793	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	72.0135	63.9617	52.0172	39.3803	29.4373	24.8522	26.8537	34.9054	46.8500	59.4868	69.4299	74.0150	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	478.8788	483.8480	471.3256	444.6670	411.0152	379.3873	358.2579	353.2886	365.8110	392.4696	426.1214	457.7494	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.5426	55.5426	55.5426	55.5426	55.5426	55.5426	55.5426	55.5426	55.5426	55.5426	55.5426	55.5426	(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)	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	(71)
Water heating gains (Table 5)	144.3445	141.8181	136.5719	129.4397	124.8093	118.2894	112.7476	119.8481	122.3709	129.7529	138.0884	141.8287	(72)
Total internal gains	812.4724	806.8636	777.1504	730.7228	682.4975	639.7645	615.0948	625.2778	652.2676	698.9450	750.8754	790.8287	(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	11.1900	8.2005	0.6300	0.7000	0.7700	28.0442 (74)							
East	4.3200	14.7869	0.6300	0.7000	0.7700	19.5224 (76)							
South	9.9900	38.1750	0.6300	0.7000	0.7700	116.5510 (78)							
West	4.5600	14.7869	0.6300	0.7000	0.7700	20.6070 (80)							
Solar gains	184.7246	367.9398	582.8967	776.6246	951.8708	890.8871	850.8714	744.7345	608.8641	405.0115	230.9760	143.2596	(83)
Total gains	997.1970	1174.8034	1360.0471	1507.3474	1634.3682	1530.6516	1465.9662	1370.0123	1261.1316	1103.9565	981.8514	934.0883	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	25.0804	25.0804	25.0804	25.0804	25.0804	25.0804	25.0804	25.0804	25.0804	25.0804	25.0804	25.0804	
alpha	2.6720	2.6720	2.6720	2.6720	2.6720	2.6720	2.6720	2.6720	2.6720	2.6720	2.6720	2.6720	
util living area	0.9627	0.9447	0.9113	0.8601	0.7880	0.7115	0.6399	0.6720	0.7870	0.8998	0.9504	0.9694	(86)
MIT	18.6036	18.8445	19.2820	19.7726	20.2040	20.5466	20.7259	20.6848	20.3899	19.7483	19.0531	18.4575	(87)
Th 2	19.9947	19.9947	19.9947	19.9947	19.9947	19.9947	19.9947	19.9947	19.9947	19.9947	19.9947	19.9947	(88)
util rest of house	0.9576	0.9373	0.8993	0.8407	0.7580	0.6652	0.5779	0.6117	0.7469	0.8822	0.9426	0.9652	(89)
MIT 2	16.7714	17.1180	17.7454	18.4410	19.0380	19.5010	19.7284	19.6827	19.3076	18.4227	17.4254	16.5595	(90)
Living area fraction												fLA = Living area / (4) =	0.2006 (91)
MIT	17.1389	17.4643	18.0536	18.7082	19.2719	19.7108	19.9284	19.8837	19.5247	18.6886	17.7519	16.9402	(92)
Temperature adjustment												-0.1500	
adjusted MIT	16.9889	17.3143	17.9036	18.5582	19.1219	19.5608	19.7784	19.7337	19.3747	18.5386	17.6019	16.7902	(93)

8. Space heating requirement

Utilisation	0.9351	0.9099	0.8670	0.8068	0.7278	0.6427	0.5632	0.5941	0.7178	0.8489	0.9164	0.9451	(94)
Useful gains	932.4522	1068.9447	1179.1494	1216.0724	1189.5089	983.6928	825.6147	813.9601	905.2427	937.1020	899.7297	882.8398	(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	2278.7161	2282.9481	2147.9948	1907.3762	1634.9914	1225.3046	961.9067	971.1053	1227.6259	1621.1289	1981.2469	2312.2319	(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	1001.6203	815.8103	720.8210	497.7387	331.4389	0.0000	0.0000	0.0000	0.0000	508.9160	778.6924	1063.4677	(98)

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Calculation Type: New Build (As Designed)

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

Space heating 5718.5054 (98)
 Space heating per m2 (98) / (4) = 38.0473 (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	1001.6203	815.8103	720.8210	497.7387	331.4389	0.0000	0.0000	0.0000	0.0000	508.9160	778.6924	1063.4677	(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)	1098.2679	894.5288	790.3739	545.7661	363.4199	0.0000	0.0000	0.0000	0.0000	558.0219	853.8294	1166.0830	(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	202.6174	179.3460	190.0038	171.9882	170.1752	164.1635	157.8851	172.9407	172.5386	178.4524	185.9851	197.3514	(64)
Efficiency of water heater (217)m	89.2050	89.0665	88.7395	88.1897	87.2649	80.5000	80.5000	80.5000	80.5000	88.1578	88.9213	80.5000	(216)
Fuel for water heating, kWh/month	227.1368	201.3620	214.1143	195.0207	195.0099	203.9298	196.1306	214.8331	214.3337	202.4237	209.1570	220.8963	(219)
Water heating fuel used												2494.3479	(219)
Annual totals kWh/year													
Space heating fuel - main system												6270.2910	(211)
Space heating fuel - secondary												0.0000	(215)

Electricity for pumps and fans:

(MEV)Decentralised, Database: total watage = 11.0240, total flow = 45.0000, SFP = 0.2450)
 mechanical ventilation fans (SFP = 0.2450) 115.7215 (230a)
 central heating pump 30.0000 (230c)
 main heating flue fan 45.0000 (230e)
 Total electricity for the above, kWh/year 190.7215 (231)
 Electricity for lighting (calculated in Appendix L) 508.7122 (232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV Unit 0 (0.80 * 1.68 * 1017 * 1.00) = -1366.9468 (233)
 Total delivered energy for all uses 8097.1258 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	6270.2910	9.4500	592.5425	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	2494.3479	9.4500	235.7159	(247)
Mechanical ventilation fans	115.7215	25.0500	28.9882	(249)
Pumps and fans for heating	75.0000	25.0500	18.7875	(249)
Energy for lighting	508.7122	25.0500	127.4324	(250)
Additional standing charges			70.0000	(251)
Energy saving/generation technologies				
PV Unit	-1366.9468	25.0500	-342.4202	(252)
Total energy cost			731.0464	(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	6270.2910	0.2410	1511.1401	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2494.3479	0.2410	601.1378	(264)
Space and water heating			2112.2780	(265)
Pumps and fans	190.7215	0.5190	98.9845	(267)
Energy for lighting	508.7122	0.5190	264.0216	(268)
Energy saving/generation technologies				
PV Unit	-1366.9468	0.5190	-709.4454	(269)
Total kg/year			1765.8387	(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	6270.2910	1.0900	6834.6172	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2494.3479	1.0900	2718.8392	(264)
Space and water heating			9553.4564	(265)

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Pumps and fans	190.7215	3.0700	585.5150 (267)
Energy for lighting	508.7122	3.0700	1561.7465 (268)
Energy saving/generation technologies			
PV Unit	-1366.9468	3.0700	-4196.5266 (269)
Primary energy kWh/year			7504.1913 (272)
Primary energy kWh/m ² /year			49.9281 (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	+ 2.6	-£ 100	-262 kg (14.9%)

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

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£100 1.74 kg/m ²	B 86	A 92
Total Savings	£100 1.74 kg/m²		

Potential energy efficiency rating:	B 86
Potential environmental impact rating:	A 92

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	£175	£188	-£13
Bulk LPG	£898	£785	£113
Space heating	£710	£714	-£4
Water heating	£236	£131	£105
Lighting	£127	£127	£0
Generated (PV)	-£342	-£342	£0
Total cost of fuels	£731	£631	£100
Total cost of uses	£731	£630	£101
Delivered energy	54 kWh/m ²	46 kWh/m ²	8 kWh/m ²
Carbon dioxide emissions	1.8 tonnes	1.5 tonnes	0.3 tonnes
CO2 emissions per m ²	12 kg/m ²	10 kg/m ²	2 kg/m ²
Primary energy	50 kWh/m ²	42 kWh/m ²	8 kWh/m ²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	79.3000 (1b)	2.5100 (2b)	199.0430 (1b) - (3b)
First floor	71.0000 (1c)	2.6500 (2c)	188.1500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	150.3000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 387.1930 (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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.2168	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)			30.0600	1.3258	39.8523		(27)
Insulated slab			79.0000	0.1200	9.4800		(28a)
Main T/Frame ACDS	141.0300	34.2600	106.7700	0.1600	17.0832		(29a)
House to garage wall	14.5600	1.8900	12.6700	0.1900	2.4073		(29a)
Feature granite nominal area	5.0000		5.0000	0.1600	0.8000		(29a)
Render /lathe nominal area	6.0000		6.0000	0.1600	0.9600		(29a)
Horizontal ceiling	79.0000		79.0000	0.1000	7.9000		(30)
Total net area of external elements Aum(A, m2)			324.5900				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 87.0088		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.5689 (36)
Total fabric heat loss							(33) + (36) = 102.5776 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	63.8868	63.8868	63.8868	63.8868	63.8868	63.8868	63.8868	63.8868	63.8868	63.8868	63.8868	63.8868 (38)
Average = Sum(39)m / 12 =	166.4645	166.4645	166.4645	166.4645	166.4645	166.4645	166.4645	166.4645	166.4645	166.4645	166.4645	166.4645 (39)
HLP	1.1075	1.1075	1.1075	1.1075	1.1075	1.1075	1.1075	1.1075	1.1075	1.1075	1.1075	1.1075 (40)
HLP (average)												1.1075 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.9347 (42)
Average daily hot water use (litres/day)												109.3664 (43)
Daily hot water use	120.3030	115.9284	111.5537	107.1791	102.8044	98.4298	98.4298	102.8044	107.1791	111.5537	115.9284	120.3030 (44)
Energy conte	178.4059	156.0350	161.0141	140.3760	134.6941	116.2308	107.7049	123.5929	125.0690	145.7559	159.1040	172.7766 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Energy content (annual)												Total = Sum(45)m =	1720.7592 (45)
Distribution loss (46)m = 0.15 x (45)m													
	26.7609	23.4052	24.1521	21.0564	20.2041	17.4346	16.1557	18.5389	18.7604	21.8634	23.8656	25.9165	(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	227.4479	200.3310	208.6604	181.0824	170.9418	151.0841	143.7200	160.5385	167.1262	193.4022	206.5640	221.8186	(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												1.0540	(H8)
Utilisation factor												0.6128	(H9)
Collector performance factor												0.8793	(H10)
Dedicated solar storage volume												75.0000	(H11)
Effective solar volume												127.5000	(H13)
Daily hot water demand												109.3664	(H14)
Volume ratio Veff/V												1.1658	(H15)
Solar storage volume factor												1.0000	(H16)
Solar input	-28.3375	-47.2871	-80.5353	-107.9332	-133.3423	-131.0968	-129.3643	-113.0262	-88.5222	-60.4502	-33.6123	-23.7136	(63)
FGHRS	-30.6299	-23.4120	-19.1807	-8.7131	-2.7979	0.0000	0.0000	-3.1768	-4.9011	-18.2855	-25.3095	-30.7897	eq. (G6)
Output from w/h	168.4806	129.6319	108.9443	64.4361	34.8015	19.9873	14.3557	44.3355	73.7029	114.6664	147.6422	167.3153	(64)
Heat gains from water heating, kWh/month	98.5536	87.3184	91.6542	79.2401	73.7839	66.5294	64.6239	70.6511	75.2312	86.5808	90.8701	96.6818	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	176.0793	176.0793	176.0793	176.0793	176.0793	176.0793	176.0793	176.0793	176.0793	176.0793	176.0793	176.0793	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	72.0135	63.9617	52.0172	39.3803	29.4373	24.8522	26.8537	34.9054	46.8500	59.4868	69.4299	74.0150	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	478.8788	483.8480	471.3256	444.6670	411.0152	379.3873	358.2579	353.2886	365.8110	392.4696	426.1214	457.7494	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.5426	55.5426	55.5426	55.5426	55.5426	55.5426	55.5426	55.5426	55.5426	55.5426	55.5426	55.5426	(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)	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	(71)
Water heating gains (Table 5)	132.4645	129.9381	123.1911	110.0557	99.1720	92.4019	86.8601	94.9612	104.4877	116.3721	126.2084	129.9487	(72)
Total internal gains	800.5924	794.9836	763.7696	711.3388	656.8601	613.8770	589.2073	600.3909	634.3844	685.5642	738.9954	778.9487	(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	11.1900	10.6334	0.6300	0.7000	0.7700	36.3642 (74)							
East	4.3200	19.6403	0.6300	0.7000	0.7700	25.9300 (76)							
South	9.9900	46.7521	0.6300	0.7000	0.7700	142.7375 (78)							
West	4.5600	19.6403	0.6300	0.7000	0.7700	27.3706 (80)							
Solar gains	232.4023	407.5283	587.5783	776.6654	913.1393	925.2284	884.2631	779.7974	652.7528	458.5851	280.5121	197.4851	(83)
Total gains	1032.9947	1202.5119	1351.3480	1488.0042	1569.9994	1539.1054	1473.4704	1380.1882	1287.1372	1144.1494	1019.5075	976.4338	(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	25.0804	25.0804	25.0804	25.0804	25.0804	25.0804	25.0804	25.0804	25.0804	25.0804	25.0804	25.0804		
alpha	2.6720	2.6720	2.6720	2.6720	2.6720	2.6720	2.6720	2.6720	2.6720	2.6720	2.6720	2.6720		
util living area	0.9542	0.9316	0.8940	0.8267	0.7225	0.5846	0.4553	0.4970	0.6851	0.8565	0.9341	0.9600	(86)	
MIT	18.8353	19.1182	19.5455	20.0540	20.5009	20.8002	20.9256	20.9037	20.6781	20.0937	19.3575	18.7570	(87)	
Th 2	19.9947	19.9947	19.9947	19.9947	19.9947	19.9947	19.9947	19.9947	19.9947	19.9947	19.9947	19.9947	(88)	
util rest of house	0.9476	0.9220	0.8788	0.8008	0.6794	0.5166	0.3647	0.4059	0.6233	0.8294	0.9232	0.9542	(89)	
MIT 2	17.1079	17.5138	18.1237	18.8369	19.4398	19.8129	19.9457	19.9273	19.6783	18.9081	17.8649	16.9952	(90)	
Living area fraction												FLA = Living area / (4) =	0.2006	(91)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

MIT	17.4544	17.8357	18.4089	19.0810	19.6526	20.0109	20.1423	20.1232	19.8789	19.1460	18.1643	17.3487 (92)
Temperature adjustment												-0.1500
adjusted MIT	17.3044	17.6857	18.2589	18.9310	19.5026	19.8609	19.9923	19.9732	19.7289	18.9960	18.0143	17.1987 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9225	0.8921	0.8453	0.7681	0.6556	0.5068	0.3645	0.4039	0.6048	0.7958	0.8935	0.9308 (94)
Useful gains	952.9043	1072.7995	1142.2492	1143.0060	1029.3554	780.0241	537.0227	557.4057	778.4714	910.5552	910.9491	908.8797 (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	2164.7735	2128.3633	1957.4415	1669.8087	1298.8624	875.7583	564.6902	594.8119	937.0061	1397.6283	1816.8501	2163.8136 (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	901.6307	709.3389	606.5030	379.2980	200.5132	0.0000	0.0000	0.0000	0.0000	362.3824	652.2488	933.6709 (98)
Space heating per m2												(98) / (4) = 31.5741 (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	901.6307	709.3389	606.5030	379.2980	200.5132	0.0000	0.0000	0.0000	0.0000	362.3824	652.2488	933.6709 (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)	988.6301	777.7839	665.0252	415.8969	219.8609	0.0000	0.0000	0.0000	0.0000	397.3491	715.1850	1023.7619 (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	168.4806	129.6319	108.9443	64.4361	34.8015	19.9873	14.3557	44.3355	73.7029	114.6664	147.6422	167.3153 (64)
Efficiency of water heater (217)m	89.3306	89.3306	89.3907	89.4730	89.4418	80.5000	80.5000	80.5000	80.5000	88.3764	89.0161	80.5000 (216)
Fuel for water heating, kWh/month	188.6035	145.0594	121.8743	72.0174	38.9097	24.8289	17.8332	55.0751	91.5563	129.7478	165.8601	187.1655 (219)
Water heating fuel used												1238.5313 (219)
Annual totals kWh/year												
Space heating fuel - main system												5203.4931 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans: (MEVDecentralised, Database: total watage = 11.0240, total flow = 45.0000, SFP = 0.2450)												
mechanical ventilation fans (SFP = 0.2450)												115.7215 (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												240.7215 (231)
Electricity for lighting (calculated in Appendix L)												508.7122 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 1.68 * 1068 * 1.00) =										-1435.4867		-1435.4867 (233)
Total delivered energy for all uses												5755.9713 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	5203.4931	7.6000	395.4655 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1238.5313	7.6000	94.1284 (247)
Mechanical ventilation fans	115.7215	13.1900	15.2637 (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	508.7122	13.1900	67.0991 (250)
Additional standing charges			70.0000 (251)
Energy saving/generation technologies			
PV Unit	-1435.4867	13.1900	-189.3407 (252)
Total energy cost			469.1035 (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] =	1.0088 (257)
SAP value		85.9269

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

SAP rating (Section 12)
SAP band

86 (258)
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	5203.4931	0.2410	1254.0418 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1238.5313	0.2410	298.4860 (264)
Space and water heating			1552.5279 (265)
Pumps and fans	240.7215	0.5190	124.9345 (267)
Energy for lighting	508.7122	0.5190	264.0216 (268)
Energy saving/generation technologies			
PV Unit	-1435.4867	0.5190	-745.0176 (269)
Total kg/year			1196.4663 (272)
CO2 emissions per m2			7.9600 (273)
EI value			91.7908
EI rating			92 (274)
EI band			A

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	79.3000 (1b)	x 2.5100 (2b)	= 199.0430 (1b) - (3b)
First floor	71.0000 (1c)	x 2.6500 (2c)	= 188.1500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	150.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 387.1930 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.7000	5.8000	5.7000	5.0000	4.6000	4.4000	4.0000	4.1000	4.6000	5.2000	5.3000	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 m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
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)			30.0600	1.3258	39.8523		(27)
Insulated slab			79.0000	0.1200	9.4800		(28a)
Main T/Frame ACDS	141.0300	34.2600	106.7700	0.1600	17.0832		(29a)
House to garage wall	14.5600	1.8900	12.6700	0.1900	2.4073		(29a)
Feature granite nominal area	5.0000		5.0000	0.1600	0.8000		(29a)
Render /lathe nominal area	6.0000		6.0000	0.1600	0.9600		(29a)
Horizontal ceiling	79.0000		79.0000	0.1000	7.9000		(30)
Total net area of external elements Aum(A, m ²)			324.5900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		87.0088		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.5689 (36)
Total fabric heat loss						(33) + (36) =	102.5776 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	63.8868	63.8868	63.8868	63.8868	63.8868	63.8868	63.8868	63.8868	63.8868	63.8868	63.8868	63.8868 (38)
Average = Sum(39)m / 12 =	166.4645	166.4645	166.4645	166.4645	166.4645	166.4645	166.4645	166.4645	166.4645	166.4645	166.4645	166.4645 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1075	1.1075	1.1075	1.1075	1.1075	1.1075	1.1075	1.1075	1.1075	1.1075	1.1075	1.1075 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9347 (42)											
Average daily hot water use (litres/day)	109.3664 (43)											
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	120.3030	115.9284	111.5537	107.1791	102.8044	98.4298	98.4298	102.8044	107.1791	111.5537	115.9284	120.3030 (44)
	178.4059	156.0350	161.0141	140.3760	134.6941	116.2308	107.7049	123.5929	125.0690	145.7559	159.1040	172.7766 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Energy content (annual)													Total = Sum(45)m =	1720.7592 (45)
Distribution loss (46)m = 0.15 x (45)m														
	26.7609	23.4052	24.1521	21.0564	20.2041	17.4346	16.1557	18.5389	18.7604	21.8634	23.8656	25.9165	(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	227.4479	200.3310	208.6604	181.0824	170.9418	151.0841	143.7200	160.5385	167.1262	193.4022	206.5640	221.8186	(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													0.9931 (H8)	
Utilisation factor													0.6347 (H9)	
Collector performance factor													0.8793 (H10)	
Dedicated solar storage volume													75.0000 (H11)	
Effective solar volume													127.5000 (H13)	
Daily hot water demand													109.3664 (H14)	
Volume ratio Veff/V													1.1658 (H15)	
Solar storage volume factor													1.0000 (H16)	
Solar input													-953.6556 (H17)	
Solar input	-22.7458	-43.1309	-81.0523	-110.4232	-143.2330	-130.4509	-128.4860	-110.7939	-84.0254	-53.9916	-27.9469	-17.3756	(63)	
FGHRS	-32.2648	-24.7997	-19.8262	-8.5464	0.0000	0.0000	0.0000	-3.2938	-5.1367	-20.0710	-27.1009	-32.5392	eq. (G6)	
Output from w/h	172.4373	132.4003	107.7818	62.1128	27.7087	20.6331	15.2339	46.4508	77.9640	119.3396	151.5162	171.9038	(64)	
Heat gains from water heating, kWh/month	98.5536	87.3184	91.6542	79.2401	73.7839	66.5294	64.6239	70.6511	75.2312	86.5808	90.8701	96.6818	(65)	

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	176.0793	176.0793	176.0793	176.0793	176.0793	176.0793	176.0793	176.0793	176.0793	176.0793	176.0793	176.0793	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	72.0135	63.9617	52.0172	39.3803	29.4373	24.8522	26.8537	34.9054	46.8500	59.4868	69.4299	74.0150	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	478.8788	483.8480	471.3256	444.6670	411.0152	379.3873	358.2579	353.2886	365.8110	392.4696	426.1214	457.7494	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.5426	55.5426	55.5426	55.5426	55.5426	55.5426	55.5426	55.5426	55.5426	55.5426	55.5426	55.5426	(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)	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	-117.3862	(71)
Water heating gains (Table 5)	132.4645	129.9381	123.1911	110.0557	99.1720	92.4019	86.8601	94.9612	104.4877	116.3721	126.2084	129.9487	(72)
Total internal gains	800.5924	794.9836	763.7696	711.3388	656.8601	613.8770	589.2073	600.3909	634.3844	685.5642	738.9954	778.9487	(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	(74)						
North	11.1900	8.2005	0.6300	0.7000	0.7700	28.0442	(74)						
East	4.3200	14.7869	0.6300	0.7000	0.7700	19.5224	(76)						
South	9.9900	38.1750	0.6300	0.7000	0.7700	116.5510	(78)						
West	4.5600	14.7869	0.6300	0.7000	0.7700	20.6070	(80)						
Solar gains	184.7246	367.9398	582.8967	776.6246	951.8708	890.8871	850.8714	744.7345	608.8641	405.0115	230.9760	143.2596	(83)
Total gains	985.3170	1162.9234	1346.6663	1487.9634	1608.7309	1504.7641	1440.0787	1345.1253	1243.2484	1090.5757	969.9714	922.2083	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(85)
alpha	25.0804	25.0804	25.0804	25.0804	25.0804	25.0804	25.0804	25.0804	25.0804	25.0804	25.0804	25.0804	(85)
util living area	2.6720	2.6720	2.6720	2.6720	2.6720	2.6720	2.6720	2.6720	2.6720	2.6720	2.6720	2.6720	(85)
util living area	0.9637	0.9459	0.9130	0.8633	0.7930	0.7178	0.6469	0.6791	0.7915	0.9021	0.9517	0.9703	(86)
MIT	18.5909	18.8326	19.2700	19.7582	20.1894	20.5359	20.7181	20.6762	20.3798	19.7368	19.0410	18.4446	(87)
Th 2	19.9947	19.9947	19.9947	19.9947	19.9947	19.9947	19.9947	19.9947	19.9947	19.9947	19.9947	19.9947	(88)
util rest of house	0.9587	0.9386	0.9012	0.8442	0.7634	0.6718	0.5850	0.6190	0.7519	0.8848	0.9441	0.9662	(89)
MIT 2	16.7532	17.1010	17.7286	18.4214	19.0190	19.4882	19.7201	19.6732	19.2950	18.4069	17.4081	16.5409	(90)
Living area fraction													FLA = Living area / (4) = 0.2006 (91)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

MIT	17.1218	17.4484	18.0378	18.6895	19.2538	19.6984	19.9203	19.8744	19.5126	18.6737	17.7357	16.9227 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.9718	17.2984	17.8878	18.5395	19.1038	19.5484	19.7703	19.7244	19.3626	18.5237	17.5857	16.7727 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9365	0.9115	0.8690	0.8102	0.7329	0.6487	0.5698	0.6008	0.7225	0.8516	0.9181	0.9465 (94)
Useful gains	922.7585	1059.9733	1170.3089	1205.5397	1178.9933	976.1956	820.4880	808.1971	898.1873	928.7511	890.5741	872.8425 (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	2275.8758	2280.2946	2145.3670	1904.2748	1631.9864	1223.2456	960.5492	969.5543	1225.6113	1618.6456	1978.5430	2309.3187 (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	1006.7193	820.0559	725.4432	503.0893	337.0268	0.0000	0.0000	0.0000	0.0000	513.2815	783.3376	1068.7383 (98)
Space heating per m2												38.3080 (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	1006.7193	820.0559	725.4432	503.0893	337.0268	0.0000	0.0000	0.0000	0.0000	513.2815	783.3376	1068.7383 (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)	1103.8588	899.1841	795.4421	551.6330	369.5469	0.0000	0.0000	0.0000	0.0000	562.8087	858.9228	1171.8622 (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	172.4373	132.4003	107.7818	62.1128	27.7087	20.6331	15.2339	46.4508	77.9640	119.3396	151.5162	171.9038 (64)
Efficiency of water heater (217)m	89.4611	89.5455	89.6584	89.8870	90.2883	80.5000	80.5000	80.5000	80.5000	88.9692	89.2767	89.5507 (217)
Fuel for water heating, kWh/month	192.7513	147.8582	120.2138	69.1010	30.6892	25.6312	18.9241	57.7029	96.8497	134.1360	169.7152	191.9625 (219)
Water heating fuel used												1255.5350 (219)
Annual totals kWh/year												
Space heating fuel - main system												6313.2587 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans: (MEVDecentralised, Database: total watage = 11.0240, total flow = 45.0000, SFP = 0.2450)												
mechanical ventilation fans (SFP = 0.2450)												115.7215 (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												240.7215 (231)
Electricity for lighting (calculated in Appendix L)												508.7122 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 1.68 * 1017 * 1.00) =									-1366.9468			-1366.9468 (233)
Total delivered energy for all uses												6951.2806 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	6313.2587	9.4500	596.6029 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1255.5350	9.4500	118.6481 (247)
Mechanical ventilation fans	115.7215	25.0500	28.9882 (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	508.7122	25.0500	127.4324 (250)
Additional standing charges			70.0000 (251)
Energy saving/generation technologies			
PV Unit		-1366.9468	-342.4202 (252)
Total energy cost			630.5640 (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	6313.2587	0.2410	1521.4953 (261)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1255.5350	0.2410	302.5839 (264)
Space and water heating			1824.0793 (265)
Pumps and fans	240.7215	0.5190	124.9345 (267)
Energy for lighting	508.7122	0.5190	264.0216 (268)
Energy saving/generation technologies			
PV Unit	-1366.9468	0.5190	-709.4454 (269)
Total kg/year			1503.5900 (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	6313.2587	1.0900	6881.4520 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1255.5350	1.0900	1368.5332 (264)
Space and water heating			8249.9852 (265)
Pumps and fans	240.7215	3.0700	739.0150 (267)
Energy for lighting	508.7122	3.0700	1561.7465 (268)
Energy saving/generation technologies			
PV Unit	-1366.9468	3.0700	-4196.5266 (269)
Primary energy kWh/year			6354.2200 (272)
Primary energy kWh/m2/year			42.2769 (273)

U-VALUE CALCULATOR REPORT

Property Reference	ajc 4A 82 cairnwell		Issued on Date	31/01/2023
Assessment Reference	cairnwell	Prop Type Ref		
Project	Cairnwell, Plot 82, Phase 4A , Tarland Road, Aboyne			
Calculation Type	New Build (As Designed)			

SAP Rating	83 B	DER	10.85	TER	11.80
Environmental	90 B	% DER<TER	8.05		
CO ₂ Emissions (t/year)	1.77	FEE	45.38	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 ² K)	Resistance (m ² K/W)	Fraction (%)
Ext surface				0.0400	
Layer 1	Earthwool Loft Roll 40 over ceiling				
	Main construction	200	0.0400	5.0000	100.00
	Corrections - Air Gap: Level 0, Fasteners: None or plastic				
Layer 2	Earthwool Loft Roll 40 in ceiling				
	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	Plasterboard, standard				
	Main construction	12.5	0.2100	0.0595	100.00
Int surface				0.1000	

Total resistance: Upper limit = 9.805 m² K/W Lower limit = 9.450 m² K/W Average = 9.628 m² K/W
 Total correction = 0.0019 m² K/W U-value (unrounded) = 0.1 W/m² K

Unheated space: None

Total thickness: 413 mm

U-value: 0.10 W/m² K

Kappa: n/a

U-VALUE CALCULATOR REPORT

Property Reference	ajc 4A 82 cairnwell		Issued on Date	31/01/2023
Assessment Reference	cairnwell	Prop Type Ref		
Project	Cairnwell, Plot 82, Phase 4A , Tarland Road, Aboyne			
Calculation Type	New Build (As Designed)			

SAP Rating	83 B	DER	10.85	TER	11.80
Environmental	90 B	% DER<TER	8.05		
CO ₂ Emissions (t/year)	1.77	FEE	45.38	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 Masonry clad T/Frame

Wall Type: Standard Wall

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)
Ext surface				0.0400	
Layer 1	Render - Cement and Sand				
	Main construction	20	1.0000	0.0200	100.00
Layer 2	Blockwork, dense				
	Main construction	100	1.5900	0.0629	100.00
Layer 3	Low E perp vented cavity				
	Main construction	50	0.0648	0.7717	100.00
	Corrections - Cavity Unventilated, Emissivity: Normal				
Layer 4	Reflective breather membrane				
	Main construction	0.5	0.0000	0.0000	100.00
Layer 5	Orientated Strand Board				
	Main construction	9	0.1300	0.0692	100.00
Layer 6	Earthwool Frametherm Roll 35 in T/Frame				
	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	Reflective VCL				
	Main construction	0.4	0.0000	0.0000	100.00
Layer 8	PIR over T/Frame				
	Main construction	30	0.0220	1.3636	100.00
	Corrections - Air Gap: Level 0, Fasteners: None or plastic				
Layer 9	Low E battened cavity				
	Main construction	38	0.0571	0.6651	87.85
	Main construction	38	0.1300	0.2923	12.15
	Corrections - Cavity Unventilated, Emissivity: Normal				
Layer 10	Plasterboard				
	Main construction	12.5	0.2500	0.0500	100.00
Int surface				0.1300	

Total resistance:	Upper limit = 6.451 m² K/W	Lower limit = 5.926 m² K/W	Average = 6.189 m² K/W
	Total correction = 0.0021 m² K/W	U-value (unrounded) = 0.16 W/m² K	

U-VALUE CALCULATOR REPORT

Unheated space: None

Total thickness: 400 mm

U-value: 0.16 W/m² K

Kappa: n/a

U-VALUE CALCULATOR REPORT

Property Reference	ajc 4A 82 cairnwell		Issued on Date	31/01/2023
Assessment Reference	cairnwell	Prop Type Ref		
Project	Cairnwell, Plot 82, Phase 4A , Tarland Road, Aboyne			
Calculation Type	New Build (As Designed)			

SAP Rating	83 B	DER	10.85	TER	11.80
Environmental	90 B	% DER<TER	8.05		
CO ₂ Emissions (t/year)	1.77	FEE	45.38	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 Party wall to garage - From house to garage

Wall Type: Standard Wall

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

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

Unheated space: None

Total thickness: 255 mm

U-value: 0.19 W/m² K

Kappa: n/a

U-VALUE CALCULATOR REPORT

Property Reference	ajc 4A 82 cairnwell		Issued on Date	31/01/2023
Assessment Reference	cairnwell	Prop Type Ref		
Project	Cairnwell, Plot 82, Phase 4A , Tarland Road, Aboyne			
Calculation Type	New Build (As Designed)			

SAP Rating	83 B	DER	10.85	TER	11.80
Environmental	90 B	% DER<TER	8.05		
CO ₂ Emissions (t/year)	1.77	FEE	45.38	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 Granite wall cladding

Wall Type: Standard Wall

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)
Ext surface				0.0400	
Layer 1	Granite				
	Main construction	100	2.8000	0.0357	100.00
Layer 2	Low E cavity				
	Main construction	50	0.0649	0.7700	100.00
Layer 3	Reflective breather membrane				
	Main construction	0.5	0.0000	0.0000	100.00
Layer 4	Orientated Strand Board				
	Main construction	9	0.1300	0.0692	100.00
Layer 5	Earthwool Frametherm Roll 35 in T/F				
	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	Reflective VCL				
	Main construction	0.4	0.0000	0.0000	100.00
Layer 7	PIR over T/Frame				
	Main construction	30	0.0220	1.3636	100.00
	Corrections - Air Gap: Level 0, Fasteners: None or plastic				
Layer 8	Low E battened cavity				
	Main construction	38	0.0571	0.6651	87.85
	Main construction	38	0.1300	0.2923	12.15
	Corrections - Cavity Unventilated, Emissivity: Normal				
Layer 9	Plasterboard				
	Main construction	12.5	0.2500	0.0500	100.00
Int surface				0.1300	

Total resistance: Upper limit = 6.400 m² K/W Lower limit = 5.877 m² K/W Average = 6.138 m² K/W
 Total correction = 0.0021 m² K/W U-value (unrounded) = 0.16 W/m² K

Unheated space: None

Total thickness: 380 mm

U-value: 0.16 W/m² K

Kappa: n/a

U-VALUE CALCULATOR REPORT

Property Reference	ajc 4A 82 cairnwell		Issued on Date	31/01/2023	
Assessment Reference	cairnwell	Prop Type Ref			
Project	Cairnwell, Plot 82, Phase 4A , Tarland Road, Aboyne				
Calculation Type	New Build (As Designed)				

SAP Rating	83 B	DER	10.85	TER	11.80
Environmental	90 B	% DER<TER	8.05		
CO ₂ Emissions (t/year)	1.77	FEE	45.38	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 infil on gables

Wall Type: Standard Wall

U-VALUE CALCULATOR REPORT

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)
Ext surface				0.0400	
Layer 1	Render - on lathe				
	Main construction	19	1.0000	0.0190	100.00
Layer 2	Orientated Strand Board				
	Main construction	9	0.1300	0.0692	100.00
Layer 3	Frame cavity				
	Main construction	90	0.5000	0.1800	85.00
	Main construction	90	0.1300	0.6923	15.00
	Corrections - Cavity Unventilated, Emissivity: Normal				
Layer 4	Standard cavity				
	Main construction	50	0.0648	0.7717	100.00
	Corrections - Cavity Unventilated, Emissivity: Normal				
Layer 5	Reflective breather membrane				
	Main construction	0.5	0.0000	0.0000	100.00
Layer 6	Orientated Strand Board				
	Main construction	9	0.1300	0.0692	100.00
Layer 7	Earthwool Frametherm Roll 35 in T/F				
	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 8	Reflective VCL				
	Main construction	0.4	0.0000	0.0000	100.00
Layer 9	PIR over T/Frame				
	Main construction	30	0.0220	1.3636	100.00
	Corrections - Air Gap: Level 0, Fasteners: None or plastic				
Layer 10	Low E battened cavity				
	Main construction	38	0.0571	0.6651	87.85
	Main construction	38	0.1300	0.2923	12.15
	Corrections - Cavity Unventilated, Emissivity: Normal				
Layer 11	Plasterboard				
	Main construction	12.5	0.2500	0.0500	100.00
Int surface				0.1300	

Total resistance: **Upper limit =** 6.721 m² K/W **Lower limit =** 6.134 m² K/W **Average =** 6.427 m² K/W
Total correction = 0.0020 m² K/W **U-value (unrounded) =** 0.16 W/m² K

Unheated space: None

Total thickness: 398 mm

U-value: 0.16 W/m² K

Kappa: n/a

U-VALUE CALCULATOR REPORT

Property Reference	ajc 4A 82 cairnwell		Issued on Date	31/01/2023
Assessment Reference	cairnwell	Prop Type Ref		
Project	Cairnwell, Plot 82, Phase 4A , Tarland Road, Aboyne			
Calculation Type	New Build (As Designed)			

SAP Rating	83 B	DER	10.85	TER	11.80
Environmental	90 B	% DER<TER	8.05		
CO ₂ Emissions (t/year)	1.77	FEE	45.38	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 = 79.00 m², Perimeter = 40.50 m, Wall thickness = 382.00 mm, Soil: Unknown

Horizontal edge insulation: none

Vertical edge insulation: Width D = 150.0 mm, Thickness dn = 25.0 mm, Lambda = 0.022

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)
Ext surface				0.0400	
Layer 1	Sand blinded hardcore				
	Main construction	200	2.3000	0.0870	100.00
Layer 2	Polythene,1000 gauge				
	Main construction	0.4	0.0000	0.0000	100.00
Layer 3	Thermafloor TF70				
	Main construction	150	0.0220	6.8182	100.00
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
Layer 4	Concrete, reinforced (1% steel)				
	Main construction	150	2.3000	0.0652	100.00
Int surface				0.1700	

Total resistance: Upper limit = 6.970 m² K/W Lower limit = 6.970 m² K/W Average = 6.970 m² K/W

Total correction = 0.0096 m² K/W

U-value (unrounded) = 0.12 W/m² K

Unheated space: None

Total thickness: 500 mm

U-value: 0.12 W/m² K

Kappa: n/a

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Property Reference	ajc 4A 82 cairnwell		Issued on Date	31/01/2023	
Assessment Reference	cairnwell	Prop Type Ref			
Property	Cairnwell, Plot 82, Phase 4A , Tarland Road, Aboyne				
SAP Rating	83 B	DER	10.85	TER	11.80
Environmental	90 B	% DER<TER	8.05		
CO ₂ Emissions (t/year)	1.77	FEE	45.38	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	South				
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:	40.50 m	79.30 m ²	2.51 m	
	1st Storey:	34.50 m	71.00 m ²	2.65 m	
7.0 Living Area	30.15	m ²			
8.0 Thermal Mass Parameter	Simple calculation - Low				
Thermal Mass	100.00	kJ/m ² K			
9.0 External Walls	Description	Type	U-Value (W/m ² K)	Gross Area (m ²)	Nett Area (m ²)
	Main T/Frame ACDS	Timber Frame	0.16	141.03	106.77
	House to garage wall	Timber Frame	0.19	14.56	12.67
	Feature granite nominal area	Timber Frame	0.16	5.00	5.00
	Render /lathe nominal area	Timber Frame	0.16	6.00	6.00
10.0 External Roofs	Description	Type	U-Value (W/m ² K)	Gross Area (m ²)	Nett Area (m ²)
	Horizontal ceiling	External Plane Roof	0.10	79.00	79.00
11.0 Heat Loss Floors	Description	Type	Construction	U-Value (W/m ² K)	Area (m ²)
	Insulated slab	Ground Floor - Solid		0.12	79.00
12.0 Opening Types					

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m ² K)
Half hour door to garage	Manufacturer	Solid Door							1.40
Part glazed door	Manufacturer	Half Glazed Door	Double Low-E Soft	0.05		0.63		0.70	1.40
Windows / Patios	Manufacturer	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 ²)	Curtain Closed
Front door	Half Glazed Door	[1] Main T/Frame ACDS	South							2.10	
Front glass	Window	[1] Main T/Frame ACDS	South	None	0.00					9.99	
House to garage door	Solid Door	[2] House to garage wall	West							1.89	
Rear glass	Window	[1] Main T/Frame ACDS	North	None	0.00					11.19	
RHS glass	Window	[1] Main T/Frame ACDS	East	None	0.00					4.32	
LHS glass	Window	[1] Main T/Frame ACDS	West	None	0.00					4.56	
Rear door	Half Glazed Door	[1] Main T/Frame ACDS	North							2.10	

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)	25.10	0.037	No
Scotland ACD 2015	E3 Sill	16.70	0.033	No
Scotland ACD 2015	E4 Jamb	57.50	0.031	No
Scotland ACD 2015	E5 Ground floor (normal)	40.50	0.173	No
Scotland ACD 2015	E6 Intermediate floor within a dwelling	34.50	0.065	No
Scotland ACD 2015	E10 Eaves (insulation at ceiling level)	19.84	0.043	No
Scotland ACD 2015	E12 Gable (insulation at ceiling level)	20.66	0.051	No
Scotland ACD 2015	E16 Corner (normal)	29.50	0.038	No
Scotland ACD 2015	E17 Corner (inverted – internal area greater than external area)	9.93	0.003	No

Y-value	<input type="text" value="0.048"/>	W/m ² K
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18.0 Pressure Testing

Designed AP ₅₀	<input type="text" value="4.00"/>	m ³ /(h.m ²) @ 50 Pa
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Property Tested ?	<input type="text"/>
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As Built AP ₅₀	<input type="text"/>	m ³ /(h.m ²) @ 50 Pa
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19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	<input type="text" value="Windows half open"/>
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Cross ventilation possible	<input type="text" value="Yes"/>
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Night Ventilation	<input type="text" value="No"/>
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Air change rate	<input type="text" value="4.00"/>
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Mechanical Ventilation

Mechanical Ventilation System Present	<input type="text" value="Yes"/>
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Approved Installation	<input type="text" value="Yes"/>
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SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

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	4

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	Database	
	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	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heat Emitter	Radiators	
Flow Temperature	Normal (> 45°C)	

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

25.0 Main Heating 2

Community Heating

28.0 Water Heating

Water Heating

Flue Gas Heat Recovery System

Waste Water Heat Recovery Instantaneous System 1

Waste Water Heat Recovery Instantaneous System 2

Waste Water Heat Recovery Storage System

Solar Panel

SAP Code

28.1 Flue Gas Heat Recovery System

Database ID

Brand Model

Details

29.0 Hot Water Cylinder

Cylinder Stat

Cylinder In Heated Space

Independent Time Control

Insulation Type

Cylinder Volume L

Loss kWh/day

Pipes insulation

31.0 Thermal Store

32.0 Photovoltaic Unit

PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
1.68	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	