



elmhurst
energy



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: Plot 35

Contact: Tobias Whiting
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Report Issue Date: 08/02/2024

EXCELLENCE
IN ENERGY
ASSESSMENT

PREDICTED ENERGY ASSESSMENT

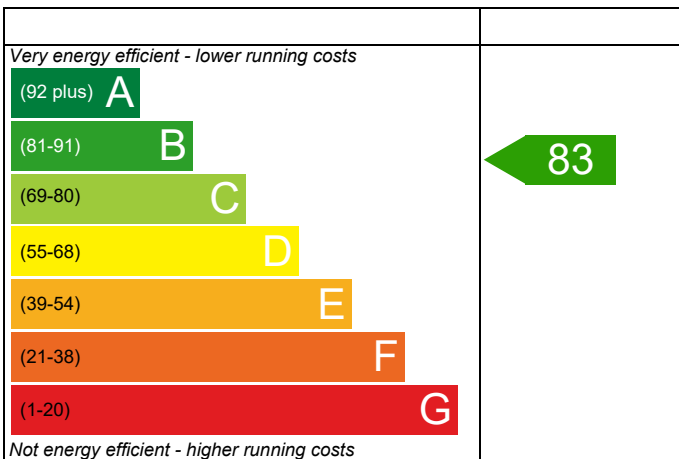
Plot 35

Dwelling type: Flat, Detached
 Date of assessment: 08/02/2024
 Produced by: Abacus Energy (UK) Ltd
 Total floor area: 61.4 m²
 DRRN: 5204-3427-8081

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.

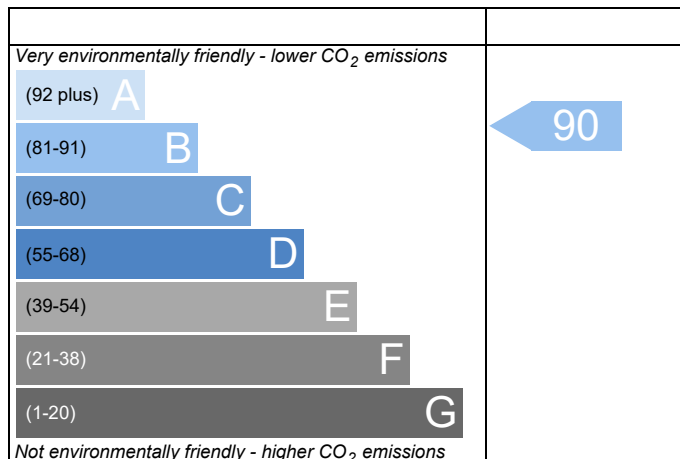
Energy Efficiency Rating



England EU Directive 2002/91/EC

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

Environmental Impact (CO₂) Rating



England EU Directive 2002/91/EC

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions. The higher the rating the less impact it has on the environment.

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



BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Designed)

Property Reference	SAP 0931 Plot 35	Issued on Date	08/02/2024
Assessment Reference	Rev B	Prop Type Ref	Block Ev1
Property	Plot 35		
SAP Rating	83 B	DER	15.14
Environmental	90 B	TER	19.66
CO ₂ Emissions (t/year)	0.73	% DER<TER	23.00
General Requirements Compliance	Pass	DLEE	43.79
		TFEE	51.58
		% DLEE<TFEE	15.11
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com	Assessor ID	E477-0001
Client	Foreman Homes, FORE		

SUMMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	19.66	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	15.14	kgCO ₂ /m ²	Pass
	-4.52 (-23.0%)	kgCO ₂ /m ²	

1b TFEE and DLEE

Target Fabric Energy Efficiency (TFEE)	51.58	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DLEE)	43.79	kWh/m ² /yr	
	-7.8 (-15.1%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.22 (max. 0.30)	0.23 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Roof	0.12 (max. 0.20)	0.17 (max. 0.35)	Pass
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	m ³ /(h.m ²) @ 50 Pa	
Maximum	10.0	m ³ /(h.m ²) @ 50 Pa	Pass

Limiting System Efficiencies

4 Heating efficiency

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BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Designed)

Main heating system

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

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Programmer, room thermostat and TRVs

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100 %

Minimum

75 %

Pass

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Southern England)

Medium

Pass

Based on:

Overshading

Average

Windows facing North East

1.68 m², No overhang

Windows facing South East

3.00 m², No overhang

Windows facing South West

4.89 m², No overhang

Air change rate

4.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

5.00 (design value) m³/(h.m²) @ 50 Pa

Maximum

10.0 m³/(h.m²) @ 50 Pa

Pass

10 Key features

Party wall U-value

0.00 W/m²K

Roof U-value

0.10 W/m²K

Door U-value

1.10 W/m²K

Photovoltaic array

420.00 kWh/Year

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RECOMMENDATIONS

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

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THERMAL BRIDGING

Calculation Type: New Build (As Designed)

Property Reference	SAP 0931 Plot 35	Issued on Date	08/02/2024
Assessment Reference	Rev B	Prop Type Ref	Block Ev1
Property	Plot 35		

SAP Rating	83 B	DER	15.14	TER	19.66
Environmental	90 B	% DER<TER	23.00		
CO ₂ Emissions (t/year)	0.73	DFEE	43.79	TFEE	51.58
General Requirements Compliance	Pass	% DFEE<TFEE	15.11		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com	Assessor ID	E477-0001
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Client	Foreman Homes, FORE
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	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.043	3.51	0.15	Catnic Thermally Broken
External wall	E3 Sill	Independently assessed	0.021	7.36	0.15	Knauf P5
External wall	E4 Jamb	Independently assessed	0.016	13.62	0.22	Knauf P6
External wall	E7 Party floor between dwellings (in blocks of flats)	Table K1 - Approved	0.070	33.54	2.35	
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	3.96	0.24	
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.087	18.45	1.61	Knauf P21
External wall	E13 Gable (insulation at rafter level)	Independently assessed	0.008	5.04	0.04	Knauf P20
External wall	E16 Corner (normal)	Independently assessed	0.061	11.94	0.73	Knauf P23
External wall	E17 Corner (inverted – internal area greater than external area)	Independently assessed	-0.113	4.70	-0.53	Knauf P24
External roof	R1 Head of roof window	Table K1 - Default	0.080	4.39	0.35	
External roof	R3 Jamb of roof window	Table K1 - Default	0.080	3.48	0.28	
External roof	R6 Flat ceiling	Table K1 - Default	0.060	16.07	0.96	
External roof	R8 Roof to wall (rafter)	Table K1 - Default	0.060	5.04	0.30	
External roof	R9 Roof to wall (flat ceiling)	Table K1 - Default	0.040	4.87	0.19	

Total: **7.04** W/mK:
 Y-Value: **0.047** W/m²K:

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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Property	Plot 35				
SAP Rating	83 B	DER	15.14	TER	19.66
Environmental	90 B	% DER<TER	23.00		
CO₂ Emissions (t/year)	0.73	DFEE	43.79	TFEE	51.58
General Requirements Compliance	Pass	% DFEE<TFEE	15.11		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com			Assessor ID	E477-0001
Client	Foreman Homes, FORE				

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

DWELLING AS DESIGNED

Top-floor flat, total floor area 61 m²

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

1a TER and DER

Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 19.66 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.14 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)51.6 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)43.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.22 (max. 0.30)	0.23 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.12 (max. 0.20)	0.17 (max. 0.35)	OK
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

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

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls:

No cylinder

Boiler interlock

Yes OK

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Southern England): Medium OK

Based on:

Overshading: Average
Windows facing North East: 1.68 m², No overhang
Windows facing South East: 3.00 m², No overhang
Windows facing South West: 4.89 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.10 W/m²K
Door U-value 1.10 W/m²K
Photovoltaic array 420.00 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	61.4000 (1b)	2.3000 (2b)	141.2200 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.4000		141.2200 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	141.2200 (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				2 * 10 =	20.0000 (7a)
Number of passive vents				1 * 10 =	10.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Air changes per hour					
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) =	0.2124 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4624 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.4278 (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	0.5454	0.5347	0.5240	0.4705	0.4598	0.4064	0.4064	0.3957	0.4278	0.4598	0.4812	0.5026 (22b)
Effective ac	0.6487	0.6429	0.6373	0.6107	0.6057	0.5826	0.5826	0.5783	0.5915	0.6057	0.6158	0.6263 (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
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			9.5700	1.1450	10.9580		(27)
Brick and Block	50.9900	3.0000	47.9900	0.2200	10.5578	42.2200	2026.1378 (29a)
Wall to Corridor	18.1200	2.1200	16.0000	0.2300	3.6796	113.5000	1816.0000 (29a)
Dormers	8.0300	6.5700	1.4600	0.2300	0.3358	9.1000	13.2860 (29a)
Pitched Roof	54.3200		54.3200	0.1000	5.4320	9.1000	494.3120 (30)
Sloping Roof	18.1900		18.1900	0.1700	3.0923	9.1000	165.5290 (30)
Total net area of external elements Aum(A, m ²)			149.6500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.3875		(33)
Party Floor 1			60.9000			70.0000	4263.0000 (32d)
Ground Floor Stud			94.4900			9.0000	850.4100 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	9628.6748 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							156.8188 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.0425 (36)
Total fabric heat loss						(33) + (36) =	43.4301 (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
(38)m	30.2321	29.9630	29.6992	28.4601	28.2283	27.1491	27.1491	26.9492	27.5648	28.2283	28.6973	29.1876 (38)
Heat transfer coeff	73.6622	73.3930	73.1292	71.8902	71.6583	70.5791	70.5791	70.3793	70.9948	71.6583	72.1273	72.6176 (39)
Average = Sum(39)m / 12 =	71.8891 (39)											
HLP	1.1997	1.1953	1.1910	1.1708	1.1671	1.1495	1.1495	1.1462	1.1563	1.1671	1.1747	1.1827 (40)
HLP (average)	1.1708 (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	2.0209 (42)											
Average daily hot water use (litres/day)	82.1971 (43)											
Daily hot water use	90.4168	87.1289	83.8410	80.5531	77.2652	73.9774	73.9774	77.2652	80.5531	83.8410	87.1289	90.4168 (44)
Energy conte	134.0854	117.2720	121.0142	105.5031	101.2327	87.3562	80.9483	92.8894	93.9988	109.5465	119.5786	129.8546 (45)
Energy content (annual)	Total = Sum(45)m = 1293.2798 (45)											
Distribution loss (46)m = 0.15 x (45)m	20.1128	17.5908	18.1521	15.8255	15.1849	13.1034	12.1422	13.9334	14.0998	16.4320	17.9368	19.4782 (46)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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	0.0000 (57)
Combi loss	1.3942	1.1750	1.1668	0.9773	0.8995	0.7432	0.6887	0.8254	0.8708	1.0562	1.1982	1.3502	0.0000 (61)
Total heat required for water heating calculated for each month	135.4797	118.4470	122.1810	106.4804	102.1322	88.0993	81.6370	93.7147	94.8695	110.6027	120.7767	131.2048	0.0000 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	135.4797	118.4470	122.1810	106.4804	102.1322	88.0993	81.6370	93.7147	94.8695	110.6027	120.7767	131.2048	0.0000 (64)
Heat gains from water heating, kWh/month	44.9320	39.2867	40.5289	35.3241	33.8848	29.2317	27.0875	31.0921	31.4723	36.6883	40.0594	43.5142	0.0000 (65)

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

Metabolic gains (Table 5), Watts													
(66)m	101.0464	101.0464	101.0464	101.0464	101.0464	101.0464	101.0464	101.0464	101.0464	101.0464	101.0464	101.0464	0.0000 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.4990	14.6543	11.9177	9.0224	6.7444	5.6939	6.1524	7.9972	10.7338	13.6290	15.9071	16.9576	0.0000 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	176.4635	178.2946	173.6802	163.8567	151.4562	139.8015	132.0155	130.1844	134.7988	144.6223	157.0227	168.6774	0.0000 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	0.0000 (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	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	0.0000 (71)
Water heating gains (Table 5)	60.3924	58.4623	54.4743	49.0613	45.5440	40.5996	36.4079	41.7904	43.7115	49.3122	55.6381	58.4868	0.0000 (72)
Total internal gains	309.6688	307.7251	296.3861	278.2543	260.0585	242.4090	230.8898	236.2859	245.5580	263.8774	284.8818	300.4358	0.0000 (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								
Northeast	1.6800	11.2829	0.6300	0.7700	0.7700	5.7930 (75)							
Southeast	3.0000	36.7938	0.6300	0.7700	0.7700	33.7340 (77)							
Southwest	4.8900	36.7938	0.6300	0.7700	0.7700	54.9865 (79)							
Solar gains	94.5135	162.9156	228.0193	291.0938	333.8687	334.8938	321.4420	289.0042	249.7802	181.4345	113.5558	80.6571	0.0000 (83)
Total gains	404.1823	470.6407	524.4054	569.3481	593.9273	577.3028	552.3318	525.2901	495.3382	445.3120	398.4376	381.0928	0.0000 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													
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	36.3094	36.4426	36.5740	37.2044	37.3248	37.8955	37.8955	38.0031	37.6736	37.3248	37.0821	36.8317	0.0000 (85)
alpha	3.4206	3.4295	3.4383	3.4803	3.4883	3.5264	3.5264	3.5335	3.5116	3.4883	3.4721	3.4554	
util living area	0.9850	0.9740	0.9530	0.9071	0.8197	0.6756	0.5274	0.5682	0.7740	0.9259	0.9751	0.9876	0.0000 (86)
MIT	19.2185	19.4498	19.7971	20.2377	20.6122	20.8662	20.9582	20.9451	20.7695	20.2812	19.6769	19.1859	0.0000 (87)
Th 2	19.9202	19.9237	19.9272	19.9434	19.9464	19.9606	19.9606	19.9632	19.9551	19.9464	19.9403	19.9339	0.0000 (88)
util rest of house	0.9817	0.9684	0.9425	0.8852	0.7752	0.5957	0.4167	0.4584	0.7058	0.9039	0.9688	0.9849	0.0000 (89)
MIT 2	18.3062	18.5372	18.8808	19.3180	19.6647	19.8858	19.9454	19.9416	19.8121	19.3695	18.7764	18.2840	0.0000 (90)
Living area fraction	fLA = Living area / (4) = 0.4801 (91)												
MIT	18.7443	18.9753	19.3207	19.7596	20.1196	20.3565	20.4317	20.4234	20.2718	19.8072	19.2088	18.7171	0.0000 (92)
Temperature adjustment	0.0000												
adjusted MIT	18.7443	18.9753	19.3207	19.7596	20.1196	20.3565	20.4317	20.4234	20.2718	19.8072	19.2088	18.7171	0.0000 (93)

8. Space heating requirement

Utilisation	0.9771	0.9621	0.9353	0.8808	0.7833	0.6279	0.4687	0.5093	0.7284	0.9005	0.9633	0.9808	0.0000 (94)
Useful gains	394.9094	452.8064	490.4856	501.4784	465.2038	362.4899	258.8542	267.5123	360.8009	400.9869	383.7977	373.7822	0.0000 (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	0.0000 (96)
Heat loss rate W	1063.9954	1033.0306	937.5690	780.6961	603.3366	406.2917	270.4364	283.1667	438.1633	659.7733	873.3723	1054.1939	0.0000 (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	0.0000 (97a)
Space heating kWh	497.8000	389.9107	332.6300	201.0368	102.7708	0.0000	0.0000	0.0000	0.0000	192.5371	352.4937	506.2263	0.0000 (98)
Space heating	2575.4053 (98)												
Space heating per m2	(98) / (4) = 41.9447 (99)												

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2855.2165 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	497.8000	389.9107	332.6300	201.0368	102.7708	0.0000	0.0000	0.0000	0.0000	192.5371	352.4937	506.2263	(98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)
Space heating fuel (main heating system)	551.8847	432.2735	368.7694	222.8789	113.9366	0.0000	0.0000	0.0000	0.0000	213.4557	390.7913	561.2265	(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	135.4797	118.4470	122.1810	106.4804	102.1322	88.0993	81.6370	93.7147	94.8695	110.6027	120.7767	131.2048	(64)
Efficiency of water heater (217)m	86.7887	86.4972	85.9574	84.8050	82.6327	76.2000	76.2000	76.2000	76.2000	84.5334	86.1603	76.2000	(216)
Fuel for water heating, kWh/month	156.1028	136.9374	142.1413	125.5592	123.5978	115.6159	107.1351	122.9852	124.5007	130.8391	140.1769	150.9608	(219)
Water heating fuel used													1576.5522 (219)
Annual totals kWh/year													
Space heating fuel - main system													2855.2165 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													75.0000 (231)
Electricity for lighting (calculated in Appendix L)													291.3776 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses													4798.1464 (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	2855.2165	0.2160	616.7268 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1576.5522	0.2160	340.5353 (264)
Space and water heating			957.2621 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	291.3776	0.5190	151.2250 (268)
Energy saving/generation technologies			
PV Unit	-420.0000	0.5190	-217.9800 (269)
Total CO2, kg/year			929.4320 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			15.1400 (273)

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

	DER	TFA	N	EF
Total Floor Area		61.4000		
Assumed number of occupants			2.0209	
CO2 emission factor in Table 12 for electricity displaced from grid				0.5190
CO2 emissions from appliances, equation (L14)				17.0307 ZC2
CO2 emissions from cooking, equation (L16)				2.7281 ZC3
Total CO2 emissions				34.8988 ZC4
Residual CO2 emissions offset from biofuel CHP				0.0000 ZC5
Additional allowable electricity generation, kWh/m ² /year				0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation				0.0000 ZC7
Net CO2 emissions				34.8988 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	61.4000 (1b)	x 2.3000 (2b)	= 141.2200 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 141.2200 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				2 * 10 =	20.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Air changes per hour					
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) =	0.1416 (8)
Pressure test				Yes	
Measured/design AP50					5.0000
Infiltration rate					0.3916 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3623 (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 infiltr rate	0.4619	0.4528	0.4438	0.3985	0.3894	0.3441	0.3441	0.3351	0.3623	0.3894	0.4075	0.4256 (22b)
Effective ac	0.6067	0.6025	0.5985	0.5794	0.5758	0.5592	0.5592	0.5561	0.5656	0.5758	0.5830	0.5906 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.40)			9.5700	1.3258	12.6875		(27)
Brick and Block	50.9900	3.0000	47.9900	0.1800	8.6382		(29a)
Wall to Corridor	18.1200	2.1200	16.0000	0.1800	2.8800		(29a)
Dormers	8.0300	6.5700	1.4600	0.1800	0.2628		(29a)
Pitched Roof	54.3200		54.3200	0.1300	7.0616		(30)
Sloping Roof	18.1900		18.1900	0.1300	2.3647		(30)
Total net area of external elements Aum(A, m2)			149.6500				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	36.0148	(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	8.0627 (36)
Total fabric heat loss	(33) + (36) = 44.0775 (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	28.2720	28.0790	27.8898	27.0012	26.8349	26.0609	26.0609	25.9176	26.3590	26.8349	27.1712	27.5229 (38)
Average = Sum(39)m / 12 =	72.3495	72.1565	71.9673	71.0787	70.9124	70.1384	70.1384	69.9951	70.4365	70.9124	71.2487	71.6004 (39)

HLP (average)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1783	1.1752	1.1721	1.1576	1.1549	1.1423	1.1423	1.1400	1.1472	1.1549	1.1604	1.1661 (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	2.0209 (42)
Average daily hot water use (litres/day)	82.1971 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	90.4168	87.1289	83.8410	80.5531	77.2652	73.9774	73.9774	77.2652	80.5531	83.8410	87.1289	90.4168 (44)
Energy content (annual)	134.0854	117.2720	121.0142	105.5031	101.2327	87.3562	80.9483	92.8894	93.9988	109.5465	119.5786	129.8546 (45)
Distribution loss (46)m = 0.15 x (45)m	20.1128	17.5908	18.1521	15.8255	15.1849	13.1034	12.1422	13.9334	14.0998	16.4320	17.9368	19.4782 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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 %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2595.3728 (211)
Space heating requirement	483.5840	373.9524	309.9897	175.0363	75.0787	0.0000	0.0000	0.0000	0.0000	171.4227	339.3933	495.6210	(98)
Space heating efficiency (main heating system 1)	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000	(210)
Space heating fuel (main heating system)	517.7559	400.3773	331.8948	187.4050	80.3840	0.0000	0.0000	0.0000	0.0000	183.5361	363.3761	530.6435	(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	180.1608	157.3751	163.7386	145.2279	140.6063	123.8381	118.6464	132.2629	133.7236	152.2710	162.5462	175.9300	(64)
Efficiency of water heater (217)m	87.4156	87.1531	86.6337	85.5222	83.5493	80.3000	80.3000	80.3000	80.3000	85.3500	86.8620	87.5163	(217)
Fuel for water heating, kWh/month	206.0968	180.5731	189.0011	169.8132	168.2913	154.2193	147.7539	164.7110	166.5300	178.4077	187.1317	201.0255	(219)
Water heating fuel used													2113.5546 (219)
Annual totals kWh/year													
Space heating fuel - main system													2595.3728 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													75.0000 (231)
Electricity for lighting (calculated in Appendix L)													291.3776 (232)
Total delivered energy for all uses													5075.3049 (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	2595.3728	0.2160	560.6005 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2113.5546	0.2160	456.5278 (264)
Space and water heating			1017.1283 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	291.3776	0.5190	151.2250 (268)
Total CO2, kg/m2/year			1207.2783 (272)
Emissions per m2 for space and water heating			16.5656 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4629 (272b)
Emissions per m2 for pumps and fans			0.6340 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.5656 * 1.00) + 2.4629 + 0.6340, rounded to 2 d.p.			19.6600 (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 (m2)	Storey height (m)	Volume (m3)
Ground floor	61.4000 (1b)	2.3000 (2b)	141.2200 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.4000		141.2200 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	141.2200 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				2 * 10 =	20.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Air changes per hour					
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) =	0.1416 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3916 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3623 (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	0.4619	0.4528	0.4438	0.3985	0.3894	0.3441	0.3441	0.3351	0.3623	0.3894	0.4075	0.4256 (22b)
Effective ac	0.6067	0.6025	0.5985	0.5794	0.5758	0.5592	0.5592	0.5561	0.5656	0.5758	0.5830	0.5906 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			9.5700	1.1450	10.9580		(27)
Brick and Block	50.9900	3.0000	47.9900	0.2200	10.5578	42.2200	2026.1378 (29a)
Wall to Corridor	18.1200	2.1200	16.0000	0.2300	3.6796	113.5000	1816.0000 (29a)
Dormers	8.0300	6.5700	1.4600	0.2300	0.3358	9.1000	13.2860 (29a)
Pitched Roof	54.3200		54.3200	0.1000	5.4320	9.1000	494.3120 (30)
Sloping Roof	18.1900		18.1900	0.1700	3.0923	9.1000	165.5290 (30)
Total net area of external elements Aum(A, m2)			149.6500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.3875		(33)
Party Floor 1			60.9000			70.0000	4263.0000 (32d)
Ground Floor Stud			94.4900			9.0000	850.4100 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	9628.6748 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							156.8188 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.0425 (36)
Total fabric heat loss						(33) + (36) =	43.4301 (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
(38)m	28.2720	28.0790	27.8898	27.0012	26.8349	26.0609	26.0609	25.9176	26.3590	26.8349	27.1712	27.5229 (38)
Heat transfer coeff	71.7021	71.5091	71.3199	70.4312	70.2650	69.4910	69.4910	69.3476	69.7891	70.2650	70.6013	70.9529 (39)
Average = Sum(39)m / 12 =												70.4304 (39)
HLP	1.1678	1.1646	1.1616	1.1471	1.1444	1.1318	1.1318	1.1294	1.1366	1.1444	1.1499	1.1556 (40)
HLP (average)												1.1471 (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												2.0209 (42)
Average daily hot water use (litres/day)												82.1971 (43)
Daily hot water use	90.4168	87.1289	83.8410	80.5531	77.2652	73.9774	73.9774	77.2652	80.5531	83.8410	87.1289	90.4168 (44)
Energy conte	134.0854	117.2720	121.0142	105.5031	101.2327	87.3562	80.9483	92.8894	93.9988	109.5465	119.5786	129.8546 (45)
Energy content (annual)										Total = Sum(45)m =		1293.2798 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Heat gains from water heating, kWh/month	28.4932	24.9203	25.7155	22.4194	21.5120	18.5632	17.2015	19.7390	19.9747	23.2786	25.4104	27.5941	(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	101.0464	101.0464	101.0464	101.0464	101.0464	101.0464	101.0464	101.0464	101.0464	101.0464	101.0464	101.0464	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.4990	14.6543	11.9177	9.0224	6.7444	5.6939	6.1524	7.9972	10.7338	13.6290	15.9071	16.9576	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	176.4635	178.2946	173.6802	163.8567	151.4562	139.8015	132.0155	130.1844	134.7988	144.6223	157.0227	168.6774	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	(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)	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	(71)
Water heating gains (Table 5)	38.2973	37.0838	34.5639	31.1381	28.9139	25.7822	23.1203	26.5309	27.7427	31.2885	35.2923	37.0888	(72)
Total internal gains	284.5736	283.3466	273.4756	257.3311	240.4284	224.5915	214.6022	218.0264	226.5892	242.8537	261.5360	276.0378	(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				
Northeast		1.6800	11.2829	0.6300		0.7000		0.7700	5.7930	(75)			
Southeast		3.0000	36.7938	0.6300		0.7000		0.7700	33.7340	(77)			
Southwest		4.8900	36.7938	0.6300		0.7000		0.7700	54.9865	(79)			
Solar gains	94.5135	162.9156	228.0193	291.0938	333.8687	334.8938	321.4420	289.0042	249.7802	181.4345	113.5558	80.6571	(83)
Total gains	379.0871	446.2622	501.4949	548.4249	574.2971	559.4854	536.0442	507.0306	476.3694	424.2883	375.0918	356.6949	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, T _{hl} (C)													21.0000	(85)
Utilisation factor for gains for living area, n _{ll,m} (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
tau	37.3020	37.4027	37.5019	37.9751	38.0650	38.4889	38.4889	38.5685	38.3245	38.0650	37.8836	37.6959		
alpha	3.4868	3.4935	3.5001	3.5317	3.5377	3.5659	3.5659	3.5712	3.5550	3.5377	3.5256	3.5131		
util living area	0.9875	0.9773	0.9575	0.9131	0.8270	0.6842	0.5345	0.5785	0.7847	0.9330	0.9789	0.9898	0.9898	(86)
MIT	19.2233	19.4550	19.8023	20.2372	20.6123	20.8650	20.9581	20.9440	20.7655	20.2727	19.6681	19.1833	19.1833	(87)
Th 2	19.9459	19.9484	19.9509	19.9626	19.9648	19.9750	19.9750	19.9769	19.9710	19.9648	19.9603	19.9557	19.9557	(88)
util rest of house	0.9848	0.9724	0.9479	0.8924	0.7839	0.6052	0.4243	0.4690	0.7183	0.9129	0.9735	0.9876	0.9876	(89)
MIT 2	18.3301	18.5611	18.9045	19.3338	19.6813	19.8989	19.9595	19.9545	19.8240	19.3769	18.7832	18.2978	18.2978	(90)
Living area fraction									fLA = Living area / (4) =				0.4801	(91)
MIT	18.7590	18.9903	19.3356	19.7676	20.1283	20.3628	20.4390	20.4296	20.2761	19.8070	19.2081	18.7230	18.7230	(92)
Temperature adjustment												0.0000	0.0000	
adjusted MIT	18.7590	18.9903	19.3356	19.7676	20.1283	20.3628	20.4390	20.4296	20.2761	19.8070	19.2081	18.7230	18.7230	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9808	0.9668	0.9411	0.8879	0.7914	0.6369	0.4760	0.5196	0.7399	0.9092	0.9685	0.9841	(94)
Ext temp.	371.8033	431.4294	471.9322	486.9541	454.5215	356.3317	255.1660	263.4513	352.4582	385.7747	363.2733	351.0346	(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	1036.7377	1007.5852	915.4301	765.4155	592.2151	400.4599	266.7748	279.4420	431.0223	646.9314	854.8448	1030.4470	(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	494.7112	387.1767	329.9624	200.4923	102.4441	0.0000	0.0000	0.0000	0.0000	194.3006	353.9315	505.4829	(98)
Space heating												2568.5016	(98)
Space heating per m2												41.8323	(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	653.2150	514.2331	527.0420	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8220	0.8833	0.8633	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	536.9570	454.2422	454.9767	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	729.6754	700.8160	668.1910	0.0000	0.0000	0.0000	0.0000	(103)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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	138.7572	183.4509	158.6315	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling Cooled fraction												480.8396 (104)
Intermittency factor (Table 10b)												1.0000 (105)
Space cooling kWh	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												
Space cooling per m2												120.2099 (107)
Energy for space heating												1.9578 (108)
Energy for space cooling												41.8323 (99)
Total												1.9578 (108)
Dwelling Fabric Energy Efficiency (DFEE)												43.7901 (109)
												43.8 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	61.4000 (1b)	2.3000 (2b)	141.2200 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	141.2200 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				2 * 10 =	20.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Air changes per hour					
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) =	0.1416 (8)
Pressure test				Yes	
Measured/design AP50					5.0000
Infiltration rate					0.3916 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3623 (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												
Effective ac	0.4619	0.4528	0.4438	0.3985	0.3894	0.3441	0.3441	0.3351	0.3623	0.3894	0.4075	0.4256 (22b)
	0.6067	0.6025	0.5985	0.5794	0.5758	0.5592	0.5592	0.5561	0.5656	0.5758	0.5830	0.5906 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			2.1200	1.0000	2.1200		(26)					
TER Opening Type (Uw = 1.40)			9.5700	1.3258	12.6875		(27)					
Brick and Block	50.9900	3.0000	47.9900	0.1800	8.6382		(29a)					
Wall to Corridor	18.1200	2.1200	16.0000	0.1800	2.8800		(29a)					
Dormers	8.0300	6.5700	1.4600	0.1800	0.2628		(29a)					
Pitched Roof	54.3200		54.3200	0.1300	7.0616		(30)					
Sloping Roof	18.1900		18.1900	0.1300	2.3647		(30)					
Total net area of external elements Aum(A, m2)			149.6500				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	36.0148	(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.0627 (36)					
Total fabric heat loss							(33) + (36) =	44.0775 (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	28.2720	28.0790	27.8898	27.0012	26.8349	26.0609	26.0609	25.9176	26.3590	26.8349	27.1712	27.5229 (38)
Average = Sum(39)m / 12 =	72.3495	72.1565	71.9673	71.0787	70.9124	70.1384	70.1384	69.9951	70.4365	70.9124	71.2487	71.6004 (39)
	71.0779											71.0779 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1783	1.1752	1.1721	1.1576	1.1549	1.1423	1.1423	1.1400	1.1472	1.1549	1.1604	1.1661 (40)
Days in month												1.1576 (40)
	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												2.0209 (42)
Average daily hot water use (litres/day)												82.1971 (43)
Daily hot water use	90.4168	87.1289	83.8410	80.5531	77.2652	73.9774	73.9774	77.2652	80.5531	83.8410	87.1289	90.4168 (44)
Energy conte	134.0854	117.2720	121.0142	105.5031	101.2327	87.3562	80.9483	92.8894	93.9988	109.5465	119.5786	129.8546 (45)
Energy content (annual)												Total = Sum(45)m =
Distribution loss (46)m = 0.15 x (45)m												1293.2798 (45)
Water 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 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Heat gains from water heating, kWh/month	28.4932	24.9203	25.7155	22.4194	21.5120	18.5632	17.2015	19.7390	19.9747	23.2786	25.4104	27.5941	(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	101.0464	101.0464	101.0464	101.0464	101.0464	101.0464	101.0464	101.0464	101.0464	101.0464	101.0464	101.0464	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.4990	14.6543	11.9177	9.0224	6.7444	5.6939	6.1524	7.9972	10.7338	13.6290	15.9071	16.9576	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	176.4635	178.2946	173.6802	163.8567	151.4562	139.8015	132.0155	130.1844	134.7988	144.6223	157.0227	168.6774	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	(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)	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	(71)
Water heating gains (Table 5)	38.2973	37.0838	34.5639	31.1381	28.9139	25.7822	23.1203	26.5309	27.7427	31.2885	35.2923	37.0888	(72)
Total internal gains	284.5736	283.3466	273.4756	257.3311	240.4284	224.5915	214.6022	218.0264	226.5892	242.8537	261.5360	276.0378	(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							
Northeast	1.6800	11.2829	0.6300	0.7000	0.7700	5.7930 (75)							
Southeast	3.0000	36.7938	0.6300	0.7000	0.7700	33.7340 (77)							
Southwest	4.8900	36.7938	0.6300	0.7000	0.7700	54.9865 (79)							
Solar gains	94.5135	162.9156	228.0193	291.0938	333.8687	334.8938	321.4420	289.0042	249.7802	181.4345	113.5558	80.6571	(83)
Total gains	379.0871	446.2622	501.4949	548.4249	574.2971	559.4854	536.0442	507.0306	476.3694	424.2883	375.0918	356.6949	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area, nil,m (see Table 9a)	58.9346	59.0922	59.2476	59.9883	60.1290	60.7925	60.7925	60.9170	60.5352	60.1290	59.8451	59.5512	(85)
tau	4.9290	4.9395	4.9498	4.9992	5.0086	5.0528	5.0528	5.0611	5.0357	5.0086	4.9897	4.9701	
util living area	0.9977	0.9945	0.9860	0.9590	0.8855	0.7315	0.5602	0.6102	0.8426	0.9724	0.9951	0.9983	(86)
MIT	19.7370	19.9069	20.1636	20.4897	20.7693	20.9393	20.9872	20.9807	20.8705	20.5034	20.0579	19.7086	(87)
Th 2	19.9374	19.9399	19.9424	19.9540	19.9562	19.9664	19.9664	19.9683	19.9625	19.9562	19.9518	19.9472	(88)
util rest of house	0.9970	0.9927	0.9810	0.9434	0.8415	0.6401	0.4365	0.4856	0.7696	0.9588	0.9931	0.9978	(89)
MIT 2	18.7909	18.9620	19.2181	19.5442	19.8000	19.9384	19.9632	19.9628	19.8916	19.5640	19.1226	18.7704	(90)
Living area fraction	19.2451	19.4157	19.6720	19.9982	20.2654	20.4190	20.4549	20.4515	20.3616	20.0150	19.5716	19.2208	(91)
MIT	19.2451	19.4157	19.6720	19.9982	20.2654	20.4190	20.4549	20.4515	20.3616	20.0150	19.5716	19.2208	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2451	19.4157	19.6720	19.9982	20.2654	20.4190	20.4549	20.4515	20.3616	20.0150	19.5716	19.2208	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9963	0.9915	0.9794	0.9442	0.8560	0.6824	0.4964	0.5459	0.8006	0.9597	0.9921	0.9972	(94)
Useful gains	377.6795	442.4515	491.1561	517.8120	491.6117	381.8020	266.0865	276.7850	381.3810	407.1991	372.1439	355.7048	(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	1081.2721	1047.4026	947.9548	788.8419	607.3956	408.1349	270.3737	283.5877	441.0439	667.6435	888.5880	1075.4985	(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	523.4729	406.5271	339.8582	195.1415	86.1432	0.0000	0.0000	0.0000	0.0000	193.7706	371.8397	535.5265	(98)
Space heating												2652.2799	(98)
Space heating per m2												(98) / (4) =	43.1967 (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	659.3010	519.0242	531.9626	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8741	0.9321	0.9141	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	576.2711	483.7746	486.2887	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	729.6754	700.8160	668.1910	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	110.4511	161.4788	135.3353	0.0000	0.0000	0.0000	0.0000	(104)

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Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling											407.2652 (104)	
Cooled fraction											FC = cooled area / (4) =	1.0000 (105)
Intermittency factor (Table 10b)												
	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	27.6128	40.3697	33.8338	0.0000	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												101.8163 (107)
Space cooling per m2												1.6582 (108)
Energy for space heating												43.1967 (99)
Energy for space cooling												1.6582 (108)
Total												44.8550 (109)
Target Fabric Energy Efficiency (TFEE)												51.6 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	61.4000 (1b)	2.3000 (2b)	141.2200 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.4000		141.2200 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	141.2200 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				2 * 10 =	20.0000 (7a)
Number of passive vents				1 * 10 =	10.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Air changes per hour					
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) =	0.2124 (8)
Pressure test				Yes	
Measured/design AP50					5.0000
Infiltration rate					0.4624 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.4278 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	4.7000	4.6000	4.3000	4.3000	4.0000	4.0000	3.9000	4.0000	4.5000	4.4000	4.7000 (22)
Wind factor	1.2750	1.1750	1.1500	1.0750	1.0750	1.0000	1.0000	0.9750	1.0000	1.1250	1.1000	1.1750 (22a)
Adj infilt rate	0.5454	0.5026	0.4919	0.4598	0.4598	0.4278	0.4278	0.4171	0.4278	0.4812	0.4705	0.5026 (22b)
Effective ac	0.6487	0.6263	0.6210	0.6057	0.6057	0.5915	0.5915	0.5870	0.5915	0.6158	0.6107	0.6263 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			9.5700	1.1450	10.9580		(27)
Brick and Block	50.9900	3.0000	47.9900	0.2200	10.5578	42.2200	2026.1378 (29a)
Wall to Corridor	18.1200	2.1200	16.0000	0.2300	3.6796	113.5000	1816.0000 (29a)
Dormers	8.0300	6.5700	1.4600	0.2300	0.3358	9.1000	13.2860 (29a)
Pitched Roof	54.3200		54.3200	0.1000	5.4320	9.1000	494.3120 (30)
Sloping Roof	18.1900		18.1900	0.1700	3.0923	9.1000	165.5290 (30)
Total net area of external elements Aum(A, m2)			149.6500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.3875		(33)
Party Floor 1			60.9000			70.0000	4263.0000 (32d)
Ground Floor Stud			94.4900			9.0000	850.4100 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	9628.6748 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							156.8188 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.0425 (36)
Total fabric heat loss						(33) + (36) =	43.4301 (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
(38)m	30.2321	29.1876	28.9398	28.2283	28.2283	27.5648	27.5648	27.3543	27.5648	28.6973	28.4601	29.1876 (38)
Heat transfer coeff	73.6622	72.6176	72.3698	71.6583	71.6583	70.9948	70.9948	70.7843	70.9948	72.1273	71.8902	72.6176 (39)
Average = Sum(39)m / 12 =												71.8642 (39)
HLP	1.1997	1.1827	1.1787	1.1671	1.1671	1.1563	1.1563	1.1528	1.1563	1.1747	1.1708	1.1827 (40)
HLP (average)												1.1704 (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												2.0209 (42)
Average daily hot water use (litres/day)												82.1971 (43)
Daily hot water use	90.4168	87.1289	83.8410	80.5531	77.2652	73.9774	73.9774	77.2652	80.5531	83.8410	87.1289	90.4168 (44)
Energy conte	134.0854	117.2720	121.0142	105.5031	101.2327	87.3562	80.9483	92.8894	93.9988	109.5465	119.5786	129.8546 (45)
Energy content (annual)										Total = Sum(45)m =		1293.2798 (45)
Distribution loss (46)m = 0.15 x (45)m	20.1128	17.5908	18.1521	15.8255	15.1849	13.1034	12.1422	13.9334	14.0998	16.4320	17.9368	19.4782 (46)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Water storage loss:														
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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	0.0000	(57)
Combi loss	1.3942	1.1750	1.1668	0.9773	0.8995	0.7432	0.6887	0.8254	0.8708	1.0562	1.1982	1.3502	1.3502	(61)
Total heat required for water heating calculated for each month	135.4797	118.4470	122.1810	106.4804	102.1322	88.0993	81.6370	93.7147	94.8695	110.6027	120.7767	131.2048	131.2048	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Output from w/h	135.4797	118.4470	122.1810	106.4804	102.1322	88.0993	81.6370	93.7147	94.8695	110.6027	120.7767	131.2048	131.2048	(64)
RHI water heating demand	44.9320	39.2867	40.5289	35.3241	33.8848	29.2317	27.0875	31.0921	31.4723	36.6883	40.0594	43.5142	43.5142	(65)
Heat gains from water heating, kWh/month														
	44.9320	39.2867	40.5289	35.3241	33.8848	29.2317	27.0875	31.0921	31.4723	36.6883	40.0594	43.5142	43.5142	(65)

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

Metabolic gains (Table 5), Watts														
(66)m	121.2557	121.2557	121.2557	121.2557	121.2557	121.2557	121.2557	121.2557	121.2557	121.2557	121.2557	121.2557	121.2557	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.2475	36.6357	29.7941	22.5561	16.8609	14.2347	15.3811	19.9929	26.8345	34.0725	39.7677	42.3939	42.3939	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	263.3783	266.1113	259.2242	244.5622	226.0540	208.6590	197.0381	194.3050	201.1922	215.8542	234.3623	251.7573	251.7573	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.1465	49.1465	49.1465	49.1465	49.1465	49.1465	49.1465	49.1465	49.1465	49.1465	49.1465	49.1465	49.1465	(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	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	(71)
Water heating gains (Table 5)	60.3924	58.4623	54.4743	49.0613	45.5440	40.5996	36.4079	41.7904	43.7115	49.3122	55.6381	58.4868	58.4868	(72)
Total internal gains	457.5833	453.7744	436.0577	408.7446	381.0241	356.0584	341.3921	348.6534	364.3033	391.8040	422.3332	445.2032	445.2032	(73)

6. Solar gains

[Jan]														
	Area	Solar flux	Specific data	Specific data	FF	Access	Gains							
	m2	Table 6a	g	or Table 6b	or Table 6c	factor	W							
		W/m2	or Table 6b			Table 6d								
Northeast	1.6800	15.0428	0.6300	0.7000	0.7700	7.7234	(75)							
Southeast	3.0000	46.3896	0.6300	0.7000	0.7700	42.5318	(77)							
Southwest	4.8900	46.3896	0.6300	0.7000	0.7700	69.3268	(79)							
Solar gains	119.5820	176.2628	246.1136	321.9507	354.8460	386.2399	361.4347	330.2406	286.4858	207.7681	142.3705	97.4474	97.4474	(83)
Total gains	577.1653	630.0372	682.1713	730.6953	735.8701	742.2983	702.8269	678.8941	650.7890	599.5720	564.7036	542.6506	542.6506	(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	36.3094	36.8317	36.9578	37.3248	37.3248	37.6736	37.6736	37.7857	37.6736	37.0821	37.2044	36.8317	36.8317		
alpha	3.4206	3.4554	3.4639	3.4883	3.4883	3.5116	3.5116	3.5190	3.5116	3.4721	3.4803	3.4554	3.4554		
util living area	0.9504	0.9337	0.8947	0.8184	0.6937	0.5061	0.3663	0.3774	0.5946	0.8140	0.9173	0.9567	0.9567	(86)	
MIT	19.7141	19.8759	20.1796	20.5274	20.8025	20.9525	20.9886	20.9876	20.9156	20.6218	20.1636	19.6960	19.6960	(87)	
Th 2	19.9202	19.9339	19.9371	19.9464	19.9464	19.9551	19.9551	19.9579	19.9551	19.9403	19.9434	19.9339	19.9339	(88)	
util rest of house	0.9403	0.9207	0.8739	0.7828	0.6340	0.4221	0.2663	0.2749	0.5100	0.7682	0.8982	0.9476	0.9476	(89)	
MIT 2	18.7921	18.9585	19.2517	19.5807	19.8171	19.9333	19.9522	19.9547	19.9121	19.6676	19.2474	18.7857	18.7857	(90)	
Living area fraction	19.2348	19.3990	19.6972	20.0352	20.2902	20.4227	20.4498	20.4506	20.3939	20.1257	19.6873	19.2228	19.2228	(91)	FLA = Living area / (4) =
MIT	19.2348	19.3990	19.6972	20.0352	20.2902	20.4227	20.4498	20.4506	20.3939	20.1257	19.6873	19.2228	19.2228	(92)	
Temperature adjustment												0.0000	0.0000		
adjusted MIT	19.2348	19.3990	19.6972	20.0352	20.2902	20.4227	20.4498	20.4506	20.3939	20.1257	19.6873	19.2228	19.2228	(93)	

8. Space heating requirement

Utilisation	0.9325	0.9130	0.8685	0.7861	0.6545	0.4606	0.3143	0.3241	0.5470	0.7770	0.8928	0.9403	0.9403	(94)
Useful gains	538.2149	575.2077	592.4853	574.3911	481.6445	341.9306	220.8715	220.0168	355.9965	465.8685	504.1423	510.2304	510.2304	(95)
Ext temp.	5.4000	5.7000	7.3000	9.6000	12.6000	15.4000	17.3000	17.3000	15.0000	11.8000	8.4000	5.5000	5.5000	(96)
Heat loss rate W	1019.1023	994.7865	897.1846	747.7701	551.0672	356.5824	223.6209	223.0152	382.9403	600.5131	811.4452	996.5137	996.5137	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	(98)
Space heating kWh	357.7802	281.9570	226.6962	124.8329	51.6505	0.0000	0.0000	0.0000	0.0000	100.1755	221.2581	361.7948	361.7948	(98)
Space heating												1726.1453	1726.1453	(98)
RHI space heating demand												1726	1726	(98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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	61.4000 (1b)	2.3000 (2b)	141.2200 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.4000		141.2200 (5)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	141.2200 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				2 * 10 =	20.0000 (7a)
Number of passive vents				1 * 10 =	10.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Air changes per hour					
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) =	0.2124 (8)
Pressure test				Yes	
Measured/design AP50					5.0000
Infiltration rate					0.4624 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.4278 (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	0.5454	0.5347	0.5240	0.4705	0.4598	0.4064	0.4064	0.3957	0.4278	0.4598	0.4812	0.5026 (22b)
Effective ac	0.6487	0.6429	0.6373	0.6107	0.6057	0.5826	0.5826	0.5783	0.5915	0.6057	0.6158	0.6263 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			9.5700	1.1450	10.9580		(27)
Brick and Block	50.9900	3.0000	47.9900	0.2200	10.5578	42.2200	2026.1378 (29a)
Wall to Corridor	18.1200	2.1200	16.0000	0.2300	3.6796	113.5000	1816.0000 (29a)
Dormers	8.0300	6.5700	1.4600	0.2300	0.3358	9.1000	13.2860 (29a)
Pitched Roof	54.3200		54.3200	0.1000	5.4320	9.1000	494.3120 (30)
Sloping Roof	18.1900		18.1900	0.1700	3.0923	9.1000	165.5290 (30)
Total net area of external elements Aum(A, m2)			149.6500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.3875		(33)
Party Floor 1			60.9000			70.0000	4263.0000 (32d)
Ground Floor Stud			94.4900			9.0000	850.4100 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	9628.6748 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							156.8188 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.0425 (36)
Total fabric heat loss						(33) + (36) =	43.4301 (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	30.2321	29.9630	29.6992	28.4601	28.2283	27.1491	27.1491	26.9492	27.5648	28.2283	28.6973	29.1876 (38)
Heat transfer coeff	73.6622	73.3930	73.1292	71.8902	71.6583	70.5791	70.5791	70.3793	70.9948	71.6583	72.1273	72.6176 (39)
Average = Sum(39)m / 12 =												71.8891 (39)
HLP	1.1997	1.1953	1.1910	1.1708	1.1671	1.1495	1.1495	1.1462	1.1563	1.1671	1.1747	1.1827 (40)
HLP (average)												1.1708 (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												2.0209 (42)
Average daily hot water use (litres/day)												82.1971 (43)
Daily hot water use	90.4168	87.1289	83.8410	80.5531	77.2652	73.9774	73.9774	77.2652	80.5531	83.8410	87.1289	90.4168 (44)
Energy conte	134.0854	117.2720	121.0142	105.5031	101.2327	87.3562	80.9483	92.8894	93.9988	109.5465	119.5786	129.8546 (45)
Energy content (annual)										Total = Sum(45)m =		1293.2798 (45)
Distribution loss (46)m = 0.15 x (45)m	20.1128	17.5908	18.1521	15.8255	15.1849	13.1034	12.1422	13.9334	14.0998	16.4320	17.9368	19.4782 (46)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	1.3942	1.1750	1.1668	0.9773	0.8995	0.7432	0.6887	0.8254	0.8708	1.0562	1.1982	1.3502	(61)
Total heat required for water heating calculated for each month	135.4797	118.4470	122.1810	106.4804	102.1322	88.0993	81.6370	93.7147	94.8695	110.6027	120.7767	131.2048	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Output from w/h	135.4797	118.4470	122.1810	106.4804	102.1322	88.0993	81.6370	93.7147	94.8695	110.6027	120.7767	131.2048	(64)
Heat gains from water heating, kWh/month	44.9320	39.2867	40.5289	35.3241	33.8848	29.2317	27.0875	31.0921	31.4723	36.6883	40.0594	43.5142	(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	121.2557	121.2557	121.2557	121.2557	121.2557	121.2557	121.2557	121.2557	121.2557	121.2557	121.2557	121.2557	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.2475	36.6357	29.7941	22.5561	16.8609	14.2347	15.3811	19.9929	26.8345	34.0725	39.7677	42.3939	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	263.3783	266.1113	259.2242	244.5622	226.0540	208.6590	197.0381	194.3050	201.1922	215.8542	234.3623	251.7573	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.1465	49.1465	49.1465	49.1465	49.1465	49.1465	49.1465	49.1465	49.1465	49.1465	49.1465	49.1465	(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)	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	(71)
Water heating gains (Table 5)	60.3924	58.4623	54.4743	49.0613	45.5440	40.5996	36.4079	41.7904	43.7115	49.3122	55.6381	58.4868	(72)
Total internal gains	457.5833	453.7744	436.0577	408.7446	381.0241	356.0584	341.3921	348.6534	364.3033	391.8040	422.3332	445.2032	(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
Northeast	1.6800	11.2829	0.6300	0.7700	0.7700	5.7930 (75)
Southeast	3.0000	36.7938	0.6300	0.7700	0.7700	33.7340 (77)
Southwest	4.8900	36.7938	0.6300	0.7700	0.7700	54.9865 (79)
Solar gains	94.5135	162.9156	228.0193	291.0938	333.8687	334.8938
Total gains	552.0968	616.6900	664.0770	699.8384	714.8928	690.9522

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	36.3094	36.4426	36.5740	37.2044	37.3248	37.8955	37.8955	38.0031	37.6736	37.3248	37.0821	36.8317	
alpha	3.4206	3.4295	3.4383	3.4803	3.4883	3.5264	3.5264	3.5335	3.5116	3.4883	3.4721	3.4554	
util living area	0.9634	0.9455	0.9145	0.8527	0.7492	0.5945	0.4508	0.4838	0.6836	0.8665	0.9437	0.9682	(86)
MIT	19.5049	19.7171	20.0278	20.4109	20.7175	20.9113	20.9745	20.9669	20.8482	20.4634	19.9294	19.4714	(87)
Th 2	19.9202	19.9237	19.9272	19.9434	19.9464	19.9606	19.9606	19.9632	19.9551	19.9464	19.9403	19.9339	(88)
util rest of house	0.9561	0.9350	0.8976	0.8230	0.6982	0.5159	0.3517	0.3843	0.6098	0.8334	0.9310	0.9618	(89)
MIT 2	18.5869	18.7962	19.0992	19.4733	19.7483	19.9131	19.9517	19.9509	19.8659	19.5319	19.0197	18.5646	(90)
Living area fraction									fLA = Living area / (4) =			0.4801	(91)
MIT	19.0277	19.2383	19.5451	19.9235	20.2136	20.3924	20.4428	20.4387	20.3376	19.9791	19.4565	19.0000	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0277	19.2383	19.5451	19.9235	20.2136	20.3924	20.4428	20.4387	20.3376	19.9791	19.4565	19.0000	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	523.7703	571.6235	591.4464	575.5536	509.0254	379.8992	264.2386	274.9355	392.0342	478.3938	495.1707	502.1620	(95)
Ext temp.	4.3000	4.9000	6.5000	8.0000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1084.8707	1052.3340	953.9755	792.4820	610.0728	408.8194	271.2197	284.2413	442.8353	672.0912	891.2378	1074.7392	(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	417.4587	323.0375	269.7217	156.1884	75.1793	0.0000	0.0000	0.0000	0.0000	144.1108	285.1683	425.9975	(98)
Space heating												2096.8622	(98)
Space heating per m2												(98) / (4) =	34.1509 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2324.6810 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	417.4587	323.0375	269.7217	156.1884	75.1793	0.0000	0.0000	0.0000	0.0000	144.1108	285.1683	425.9975	(98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)
Space heating fuel (main heating system)	462.8145	358.1347	299.0263	173.1579	83.3474	0.0000	0.0000	0.0000	0.0000	159.7681	316.1511	472.2810	(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	135.4797	118.4470	122.1810	106.4804	102.1322	88.0993	81.6370	93.7147	94.8695	110.6027	120.7767	131.2048	(64)
Efficiency of water heater (217)m	86.3144	85.9627	85.3133	83.9477	81.5679	76.2000	76.2000	76.2000	76.2000	83.5356	85.5250	76.2000	(216)
Fuel for water heating, kWh/month	156.9606	137.7889	143.2144	126.8415	125.2114	115.6159	107.1351	122.9852	124.5007	132.4018	141.2181	151.7528	(219)
Water heating fuel used													1585.6265 (219)
Annual totals kWh/year													
Space heating fuel - main system													2324.6810 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													75.0000 (231)
Electricity for lighting (calculated in Appendix L)													291.3776 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses													4276.6850 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2324.6810	3.4800	80.8989 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1585.6265	3.4800	55.1798 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	291.3776	13.1900	38.4327 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	0.0000	13.1900	0.0000 (252)
Total energy cost			304.4039 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.2016 (257)
SAP value		83.2378
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	2324.6810	0.2160	502.1311 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1585.6265	0.2160	342.4953 (264)
Space and water heating			844.6264 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	291.3776	0.5190	151.2250 (268)
Energy saving/generation technologies			
PV Unit	-420.0000	0.5190	-217.9800 (269)
Total kg/year			816.7964 (272)
CO2 emissions per m2			13.3000 (273)
EI value			89.7133
EI rating			90 (274)
EI band			B

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9020 = 3.858$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9020 = 0.2395$, stars = 4
Water heating energy efficiency	$3.48 / 0.8195 = 4.246$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Water heating environmental impact

$0.216 / 0.8195 = 0.2636$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	61.4000 (1b)	2.3000 (2b)	141.2200 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.4000		141.2200 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	141.2200 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				2 * 10 =	20.0000 (7a)
Number of passive vents				1 * 10 =	10.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Air changes per hour					
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) =	0.2124 (8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate				0.4624	(18)
Number of sides sheltered				1	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.4278 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	4.7000	4.6000	4.3000	4.3000	4.0000	4.0000	3.9000	4.0000	4.5000	4.4000	4.7000 (22)
Wind factor	1.2750	1.1750	1.1500	1.0750	1.0750	1.0000	1.0000	0.9750	1.0000	1.1250	1.1000	1.1750 (22a)
Adj infilt rate	0.5454	0.5026	0.4919	0.4598	0.4598	0.4278	0.4278	0.4171	0.4278	0.4812	0.4705	0.5026 (22b)
Effective ac	0.6487	0.6263	0.6210	0.6057	0.6057	0.5915	0.5915	0.5870	0.5915	0.6158	0.6107	0.6263 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			9.5700	1.1450	10.9580		(27)
Brick and Block	50.9900	3.0000	47.9900	0.2200	10.5578	42.2200	2026.1378 (29a)
Wall to Corridor	18.1200	2.1200	16.0000	0.2300	3.6796	113.5000	1816.0000 (29a)
Dormers	8.0300	6.5700	1.4600	0.2300	0.3358	9.1000	13.2860 (29a)
Pitched Roof	54.3200		54.3200	0.1000	5.4320	9.1000	494.3120 (30)
Sloping Roof	18.1900		18.1900	0.1700	3.0923	9.1000	165.5290 (30)
Total net area of external elements Aum(A, m2)			149.6500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.3875		(33)
Party Floor 1			60.9000			70.0000	4263.0000 (32d)
Ground Floor Stud			94.4900			9.0000	850.4100 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	9628.6748 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							156.8188 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.0425 (36)
Total fabric heat loss						(33) + (36) =	43.4301 (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	30.2321	29.1876	28.9398	28.2283	28.2283	27.5648	27.5648	27.3543	27.5648	28.6973	28.4601	29.1876 (38)
Heat transfer coeff	73.6622	72.6176	72.3698	71.6583	71.6583	70.9948	70.9948	70.7843	70.9948	72.1273	71.8902	72.6176 (39)
Average = Sum(39)m / 12 =												71.8642 (39)
HLP	1.1997	1.1827	1.1787	1.1671	1.1671	1.1563	1.1563	1.1528	1.1563	1.1747	1.1708	1.1827 (40)
HLP (average)												1.1704 (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												2.0209 (42)
Average daily hot water use (litres/day)												82.1971 (43)
Daily hot water use	90.4168	87.1289	83.8410	80.5531	77.2652	73.9774	73.9774	77.2652	80.5531	83.8410	87.1289	90.4168 (44)
Energy conte	134.0854	117.2720	121.0142	105.5031	101.2327	87.3562	80.9483	92.8894	93.9988	109.5465	119.5786	129.8546 (45)
Energy content (annual)										Total = Sum(45)m =		1293.2798 (45)
Distribution loss (46)m = 0.15 x (45)m	20.1128	17.5908	18.1521	15.8255	15.1849	13.1034	12.1422	13.9334	14.0998	16.4320	17.9368	19.4782 (46)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	1.3942	1.1750	1.1668	0.9773	0.8995	0.7432	0.6887	0.8254	0.8708	1.0562	1.1982	1.3502	(61)
Total heat required for water heating calculated for each month	135.4797	118.4470	122.1810	106.4804	102.1322	88.0993	81.6370	93.7147	94.8695	110.6027	120.7767	131.2048	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Output from w/h	135.4797	118.4470	122.1810	106.4804	102.1322	88.0993	81.6370	93.7147	94.8695	110.6027	120.7767	131.2048	(64)
Heat gains from water heating, kWh/month	44.9320	39.2867	40.5289	35.3241	33.8848	29.2317	27.0875	31.0921	31.4723	36.6883	40.0594	43.5142	(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	121.2557	121.2557	121.2557	121.2557	121.2557	121.2557	121.2557	121.2557	121.2557	121.2557	121.2557	121.2557	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.2475	36.6357	29.7941	22.5561	16.8609	14.2347	15.3811	19.9929	26.8345	34.0725	39.7677	42.3939	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	263.3783	266.1113	259.2242	244.5622	226.0540	208.6590	197.0381	194.3050	201.1922	215.8542	234.3623	251.7573	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.1465	49.1465	49.1465	49.1465	49.1465	49.1465	49.1465	49.1465	49.1465	49.1465	49.1465	49.1465	(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)	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	(71)
Water heating gains (Table 5)	60.3924	58.4623	54.4743	49.0613	45.5440	40.5996	36.4079	41.7904	43.7115	49.3122	55.6381	58.4868	(72)
Total internal gains	457.5833	453.7744	436.0577	408.7446	381.0241	356.0584	341.3921	348.6534	364.3033	391.8040	422.3332	445.2032	(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								
Northeast	1.6800	15.0428	0.6300	0.7000	0.7700	7.7234 (75)							
Southeast	3.0000	46.3896	0.6300	0.7000	0.7700	42.5318 (77)							
Southwest	4.8900	46.3896	0.6300	0.7000	0.7700	69.3268 (79)							
Solar gains	119.5820	176.2628	246.1136	321.9507	354.8460	386.2399	361.4347	330.2406	286.4858	207.7681	142.3705	97.4474	(83)
Total gains	577.1653	630.0372	682.1713	730.6953	735.8701	742.2983	702.8269	678.8941	650.7890	599.5720	564.7036	542.6506	(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	36.3094	36.8317	36.9578	37.3248	37.3248	37.6736	37.6736	37.7857	37.6736	37.0821	37.2044	36.8317	
alpha	3.4206	3.4554	3.4639	3.4883	3.4883	3.5116	3.5116	3.5190	3.5116	3.4721	3.4803	3.4554	
util living area	0.9504	0.9337	0.8947	0.8184	0.6937	0.5061	0.3663	0.3774	0.5946	0.8140	0.9173	0.9567	(86)
MIT	19.7141	19.8759	20.1796	20.5274	20.8025	20.9525	20.9886	20.9876	20.9156	20.6218	20.1636	19.6960	(87)
Th 2	19.9202	19.9339	19.9371	19.9464	19.9464	19.9551	19.9551	19.9579	19.9551	19.9403	19.9434	19.9339	(88)
util rest of house	0.9403	0.9207	0.8739	0.7828	0.6340	0.4221	0.2663	0.2749	0.5100	0.7682	0.8982	0.9476	(89)
MIT 2	18.7921	18.9585	19.2517	19.5807	19.8171	19.9333	19.9522	19.9547	19.9121	19.6676	19.2474	18.7857	(90)
Living area fraction									fLA = Living area / (4) =			0.4801	(91)
MIT	19.2348	19.3990	19.6972	20.0352	20.2902	20.4227	20.4498	20.4506	20.3939	20.1257	19.6873	19.2228	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2348	19.3990	19.6972	20.0352	20.2902	20.4227	20.4498	20.4506	20.3939	20.1257	19.6873	19.2228	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9325	0.9130	0.8685	0.7861	0.6545	0.4606	0.3143	0.3241	0.5470	0.7770	0.8928	0.9403	(94)
Useful gains	538.2149	575.2077	592.4853	574.3911	481.6445	341.9306	220.8715	220.0168	355.9965	465.8685	504.1423	510.2304	(95)
Ext temp.	5.4000	5.7000	7.3000	9.0000	12.6000	15.4000	17.3000	17.3000	15.0000	11.8000	8.4000	5.5000	(96)
Heat loss rate W	1019.1023	994.7865	897.1846	747.7701	551.0672	356.5824	223.6209	223.0152	382.9403	600.5131	811.4452	996.5137	(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	357.7802	281.9570	226.6962	124.8329	51.6505	0.0000	0.0000	0.0000	0.0000	100.1755	221.2581	361.7948	(98)
Space heating												1726.1453	(98)
Space heating per m ²												(98) / (4) =	28.1131 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1913.6865 (211)
Space heating requirement	357.7802	281.9570	226.6962	124.8329	51.6505	0.0000	0.0000	0.0000	0.0000	100.1755	221.2581	361.7948	(98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)
Space heating fuel (main heating system)	396.6522	312.5909	251.3262	138.3957	57.2622	0.0000	0.0000	0.0000	0.0000	111.0594	245.2972	401.1029	(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	135.4797	118.4470	122.1810	106.4804	102.1322	88.0993	81.6370	93.7147	94.8695	110.6027	120.7767	131.2048	(64)
Efficiency of water heater (217)m	85.8669	85.5503	84.7471	83.1662	80.3908	76.2000	76.2000	76.2000	76.2000	82.2686	84.7047	76.2000	(216)
Fuel for water heating, kWh/month	157.7786	138.4530	144.1713	128.0333	127.0447	115.6159	107.1351	122.9852	124.5007	134.4409	142.5857	152.5723	(219)
Water heating fuel used													1595.3169 (219)
Annual totals kWh/year													
Space heating fuel - main system													1913.6865 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													75.0000 (231)
Electricity for lighting (calculated in Appendix L)													291.3776 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses													3875.3810 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1913.6865	7.6100	145.6315 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1595.3169	7.6100	121.4036 (247)
Pumps and fans for heating	75.0000	31.0800	23.3100 (249)
Energy for lighting	291.3776	31.0800	90.5602 (250)
Additional standing charges			105.0000 (251)
Energy saving/generation technologies			
PV Unit	0.0000	31.0800	0.0000 (252)
Total energy cost			485.9053 (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	1913.6865	0.2160	413.3563 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1595.3169	0.2160	344.5885 (264)
Space and water heating			757.9447 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	291.3776	0.5190	151.2250 (268)
Energy saving/generation technologies			
PV Unit	-420.0000	0.5190	-217.9800 (269)
Total kg/year			730.1147 (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	1913.6865	1.2200	2334.6976 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1595.3169	1.2200	1946.2866 (264)
Space and water heating			4280.9842 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	291.3776	3.0700	894.5292 (268)
Energy saving/generation technologies			
PV Unit	-420.0000	3.0700	-1289.4000 (269)
Primary energy kWh/year			4116.3633 (272)
Primary energy kWh/m2/year			67.0417 (273)

SAP 2012 EPC IMPROVEMENTS

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

(For testing purposes):

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

Recommended measures: (none) SAP change Cost change CO2 change

Recommended measures (none)	Typical annual savings	Energy efficiency	Environmental impact
Total Savings	£0	0.00 kg/m ²	

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

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

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

	Current	Potential	Saving
Electricity	£114	£114	£0
Mains gas	£372	£372	£0
Space heating	£274	£274	£0
Water heating	£121	£121	£0
Lighting	£91	£91	£0
Total cost of fuels	£486	£486	£0
Total cost of uses	£486	£486	£0
Delivered energy	63 kWh/m ²	63 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	0.7 tonnes	0.7 tonnes	0.0 tonnes
CO2 emissions per m ²	12 kg/m ²	12 kg/m ²	0 kg/m ²
Primary energy	67 kWh/m ²	67 kWh/m ²	0 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

No improvements selected / applicable

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

No improvements selected / applicable

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0931 Plot 35		Issued on Date	08/02/2024
Assessment Reference	Rev B	Prop Type Ref	Block Ev1	
Project	Plot 35			
Calculation Type	New Build (As Designed)			

SAP Rating	83 B	DER	15.14	TER	19.66
Environmental	90 B	% DER<TER	23.00		
CO ₂ Emissions (t/year)	0.73	DFEE	43.79	TFEE	51.58
General Requirements Compliance	Pass	% DFEE<TFEE	15.11		

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

Building Elements

Roof 000006 - Mineral Wool between and above

Roof Type: Pitched Roof, insulated flat ceiling

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

Total resistance: Upper limit = 11.772 m² K/W Lower limit = 11.430 m² K/W Average = 11.601 m² K/W
 Total correction = 0.0096 m² K/W U-value (unrounded) = 0.1 W/m² K

Unheated space: None

Total thickness: 463 mm

U-value: 0.10 W/m² K

Kappa: 9.10 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0931 Plot 35	Issued on Date	08/02/2024
Assessment Reference	Rev B	Prop Type Ref	Block Ev1
Project	Plot 35		
Calculation Type	New Build (As Designed)		

SAP Rating	83 B	DER	15.14	TER	19.66
Environmental	90 B	% DER<TER	23.00		
CO ₂ Emissions (t/year)	0.73	DFEE	43.79	TFEE	51.58
General Requirements Compliance	Pass	% DFEE<TFEE	15.11		

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

Roof 000007 - Insulation between and below

Roof Type: Pitched Roof, insulated sloping ceiling

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

Total resistance: Upper limit = 6.480 m² K/W Lower limit = 5.595 m² K/W Average = 6.037 m² K/W
 Total correction = 0.0036 m² K/W U-value (unrounded) = 0.17 W/m² K

Unheated space: None

Total thickness: 269 mm

U-value: 0.17 W/m² K

Kappa: 9.10 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0931 Plot 35	Issued on Date	08/02/2024
Assessment Reference	Rev B	Prop Type Ref	Block Ev1
Project	Plot 35		
Calculation Type	New Build (As Designed)		

SAP Rating	83 B	DER	15.14	TER	19.66
Environmental	90 B	% DER<TER	23.00		
CO ₂ Emissions (t/year)	0.73	DFEE	43.79	TFEE	51.58
General Requirements Compliance	Pass	% DFEE<TFEE	15.11		

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

Wall 000001

Wall Type: Standard Wall

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

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

Unheated space:	None	
Total thickness: 370 mm	U-value: 0.22 W/m² K	Kappa: 42.22 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0931 Plot 35	Issued on Date	08/02/2024
Assessment Reference	Rev B	Prop Type Ref	Block Ev1
Project	Plot 35		
Calculation Type	New Build (As Designed)		

SAP Rating	83 B	DER	15.14	TER	19.66
Environmental	90 B	% DER<TER	23.00		
CO ₂ Emissions (t/year)	0.73	DFEE	43.79	TFEE	51.58
General Requirements Compliance	Pass	% DFEE<TFEE	15.11		

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

Wall Wall to Corridor

Wall Type: Standard Wall

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

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

Unheated space:	None	
Total thickness: 355 mm	U-value: 0.29 W/m² K	Kappa: 113.50 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0931 Plot 35	Issued on Date	08/02/2024
Assessment Reference	Rev B	Prop Type Ref	Block Ev1
Project	Plot 35		
Calculation Type	New Build (As Designed)		

SAP Rating	83 B	DER	15.14	TER	19.66
Environmental	90 B	% DER<TER	23.00		
CO ₂ Emissions (t/year)	0.73	DFEE	43.79	TFEE	51.58
General Requirements Compliance	Pass	% DFEE<TFEE	15.11		

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

Wall 000008

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	Code 5 Lead				
	Main construction	2	35.0000	0.0001	100.00
Layer 2	Breather membrane				
	Main construction	0.5	0.0000	0.0000	100.00
Layer 3	Orientated Strand Board				
	Main construction	9	0.1300	0.0692	100.00
Layer 4	Celotex GA4000				
	Main construction	100	0.0220	4.5455	87.50
	Main construction	100	0.1300	0.7692	12.50
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
Layer 5	Celotex TB4000				
	Main construction	20	0.0220	0.9091	100.00
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
Layer 6	Plasterboard, standard				
	Main construction	12.5	0.2100	0.0595	100.00
Int surface				0.1300	

Total resistance: Upper limit = 4.645 m² K/W Lower limit = 4.025 m² K/W Average = 4.335 m² K/W
 Total correction = 0.0047 m² K/W U-value (unrounded) = 0.23 W/m² K

Unheated space:	None
Total thickness: 144 mm	U-value: 0.23 W/m² K
	Kappa: n/a

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Property Reference	SAP 0931 Plot 35	Issued on Date	08/02/2024
Assessment Reference	Rev B	Prop Type Ref	Block Ev1
Property	Plot 35		

SAP Rating	83 B	DER	15.14	TER	19.66
Environmental	90 B	% DER<TER	23.00		
CO ₂ Emissions (t/year)	0.73	DFEE	43.79	TFEE	51.58
General Requirements Compliance	Pass	% DFEE<TFEE	15.11		

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

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

6.0 Measurements		Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	Ground Floor:	33.54 m	61.40 m ²	2.30 m

7.0 Living Area	29.48	m ²
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8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	156.82	kJ/m ² K

9.0 External Walls	Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
	Brick and Block	Cavity Wall	Other	0.22	42.22	50.99	47.99
	Wall to Corridor	Cavity Wall	Other	0.29	113.50	18.12	16.00
	Dormers	Timber Frame	Other	0.23	9.10	8.03	1.46

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

9.2 Internal Walls	Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
	Ground Floor Stud	Plasterboard on timber frame	9.00	94.49

10.0 External Roofs	Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
	Pitched Roof	External Plane Roof	Other	0.10	9.10	54.32	54.32
	Sloping Roof	External Slope Roof	Other	0.17	9.10	18.19	18.19

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

11.1 Party Floors

Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
Party Floor 1	Precast concrete plank floor (screed laid on rubber), carpeted	70.00	60.90

12.0 Opening Types

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

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m ²)	Curtain Closed
Front Door	Solid Door	[2] Wall to Corridor	North East							2.12	
Windows	Window	[3] Dormers	South West	None	0.00					4.89	
Side Elevation	Window	[3] Dormers	North East	None	0.00					1.68	
East Elevation	Window	[1] Brick and Block	South East	None	0.00					3.00	

14.0 Conservatory

15.0 Draught Proofing

 %

16.0 Draught Lobby

17.0 Thermal Bridging

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	3.51	0.043	No	Catnic Thermally Broken
Independently assessed	E3 Sill	7.36	0.021	No	Knauf P5
Independently assessed	E4 Jamb	13.62	0.016	No	Knauf P6
Table K1 - Approved	E7 Party floor between dwellings (in blocks of flats)	33.54	0.070	No	
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	3.96	0.060	No	
Independently assessed	E12 Gable (insulation at ceiling level)	18.45	0.087	No	Knauf P21
Independently assessed	E13 Gable (insulation at rafter level)	5.04	0.008	No	Knauf P20
Independently assessed	E16 Corner (normal)	11.94	0.061	No	Knauf P23
Independently assessed	E17 Corner (inverted – internal area greater than external area)	4.70	-0.113	No	Knauf P24
Table K1 - Default	R1 Head of roof window	4.39	0.080	No	
Table K1 - Default	R3 Jamb of roof window	3.48	0.080	No	
Table K1 - Default	R6 Flat ceiling	16.07	0.060	No	
Table K1 - Default	R8 Roof to wall (rafter)	5.04	0.060	No	
Table K1 - Default	R9 Roof to wall (flat ceiling)	4.87	0.040	No	

Y-value W/m²K

18.0 Pressure Testing

Designed AP₅₀ m³/(h.m²) @ 50 Pa

Property Tested ?

As Built AP₅₀ m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather

Cross ventilation possible

Night Ventilation

Air change rate

Mechanical Ventilation

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Mechanical Ventilation System Present

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				2
Number of passive vents				1
Number of flueless gas fires				0

21.0 Fixed Cooling System

22.0 Lighting

Internal

Total number of light fittings	<input type="text" value="9"/>	
Total number of L.E.L. fittings	<input type="text" value="9"/>	
Percentage of L.E.L. fittings	<input type="text" value="100.00"/>	%

External

External lights fitted	<input type="text" value="Yes"/>
Light and motion sensor	<input type="text" value="Yes"/>

23.0 Electricity Tariff

24.0 Main Heating 1

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

25.0 Main Heating 2

Community Heating

28.0 Water Heating

Water Heating	<input type="text" value="HWP From main heating 1"/>
Flue Gas Heat Recovery System	<input type="text" value="No"/>
Waste Water Heat Recovery	<input type="text" value="No"/>

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Instantaneous System 1		
Waste Water Heat Recovery	<input type="text" value="No"/>	
Instantaneous System 2		
Waste Water Heat Recovery	<input type="text" value="No"/>	
Storage System		
Solar Panel	<input type="text" value="No"/>	
Water use <= 125 litres/person/day	<input type="text" value="Yes"/>	
SAP Code	<input type="text" value="901"/>	
<hr/>		
29.0 Hot Water Cylinder	<input type="text" value="None"/>	
<hr/>		
32.0 Photovoltaic Unit	<input type="text" value="More Dwellings, One Block"/>	
Apportioned	<input type="text" value="420.00"/>	kWh/Year

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

BLOCK COMPLIANCE

Calculation Type: New Build (As Designed)

Block Reference	SAP 0931 EV1	Issued on Date	08/02/2024
Block Name	Block Ev1		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com	Assessor ID	E477-0001
Client	Foreman Homes, FORE		

Block Compliance Report - DER

Block Reference: SAP 0931 EV1		Block Name: Block Ev1			
Property-Assessment Reference	Multiplier	Floor Area (m ²)	DER (kgCO ₂ /m ²)	TER (kgCO ₂ /m ²)	% DER/TER
SAP 0931 Plot 31-Rev B	1	61.4	16.69	20.60	18.98 %
SAP 0931 Plot 32-Rev B	1	61.36	16.21	20.36	20.40 %
SAP 0931 Plot 35-Rev B	1	61.4	15.14	19.66	23.00 %
SAP 0931 Plot 36-Rev B	1	61.36	15.07	19.77	23.76 %
SAP 0931 Plot 33-Rev B	1	61.4	13.93	18.04	22.80 %
SAP 0931 Plot 34-Rev B	1	61.36	15.24	17.89	14.80 %
Totals:	6	368.28	92.28	116.32	
Average DER = 15.38 kgCO ₂ /m ²		% DER/TER		PASS	
Average TER = 19.39 kgCO ₂ /m ²		20.68 %			

Block Compliance Report - DFEE

Block Reference: SAP 0931 EV1		Block Name: Block Ev1			
Property-Assessment Reference	Multiplier	Floor Area (m ²)	DFEE (kWh/m ² /yr)	TFEE (kWh/m ² /yr)	% DFEE/TFEE
SAP 0931 Plot 31-Rev B	1	61.4	49.89	56.54	11.76 %
SAP 0931 Plot 32-Rev B	1	61.36	47.85	55.48	13.75 %
SAP 0931 Plot 35-Rev B	1	61.4	43.79	51.58	15.11 %
SAP 0931 Plot 36-Rev B	1	61.36	43.05	51.84	16.97 %
SAP 0931 Plot 33-Rev B	1	61.4	38.67	43.34	10.78 %
SAP 0931 Plot 34-Rev B	1	61.36	37.36	42.70	12.49 %
Totals:	6	368.28	260.61	301.49	
Average DFEE = 43.44 kWh/m ² /yr		% DFEE/TFEE		PASS	
Average TFEE = 50.25 kWh/m ² /yr		13.55 %			