



elmhurst
energy



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: Plot 31

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

EXCELLENCE
IN ENERGY
ASSESSMENT

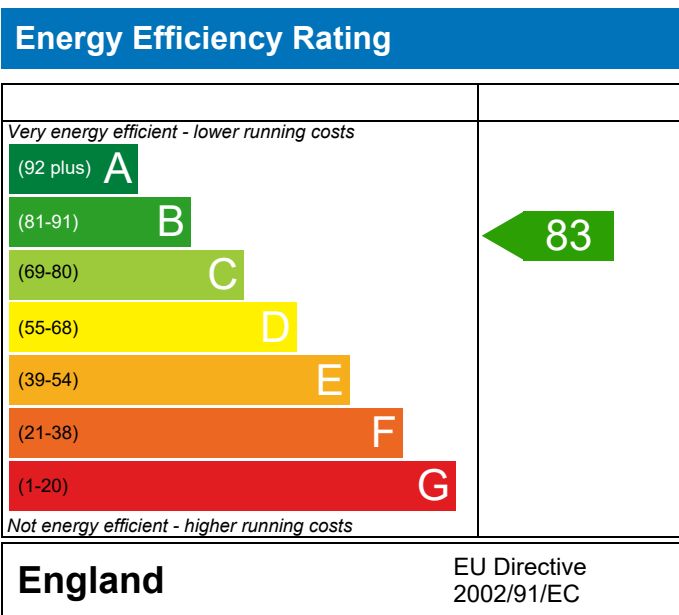
PREDICTED ENERGY ASSESSMENT

Plot 31

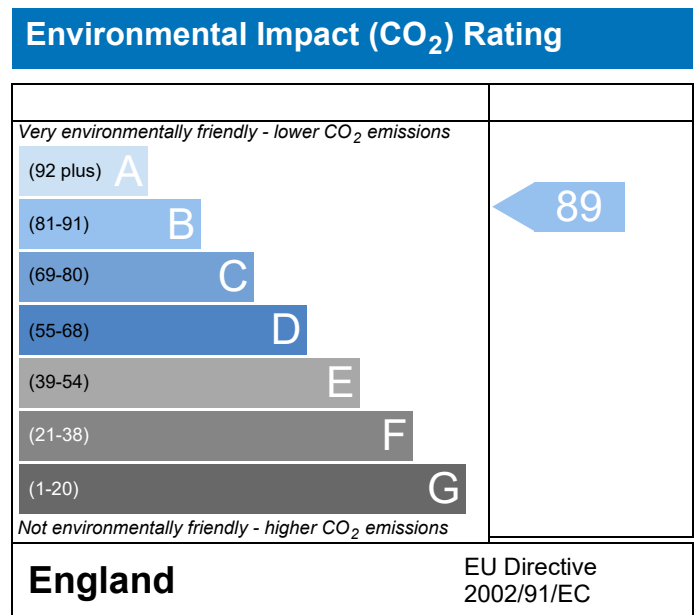
Dwelling type: Flat, Detached
 Date of assessment: 08/02/2024
 Produced by: Abacus Energy (UK) Ltd
 Total floor area: 61.4 m²
 DRRN: 3523-8259-0046

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.



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



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (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 31	Issued on Date	08/02/2024
Assessment Reference	Rev B	Prop Type Ref	Block Ev1
Property	Plot 31		

SAP Rating	83 B	DER	16.69	TER	20.60
Environmental	89 B	% DER<TER	18.98		
CO ₂ Emissions (t/year)	0.78	DFEE	49.89	TFEE	56.54
General Requirements Compliance	Pass	% DFEE<TFEE	11.76		

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)	20.60	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.69	kgCO ₂ /m ²	Pass
	-3.91 (-19.0%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	56.54	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	49.89	kWh/m ² /yr	
	-6.6 (-11.7%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.27 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	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)

Slight

Pass

Based on:

Overshading

Average

Windows facing North East

1.68 m², No overhang

Windows facing South East

3.37 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

Floor U-value

0.12 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 89	

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THERMAL BRIDGING

Calculation Type: New Build (As Designed)

Property Reference	SAP 0931 Plot 31	Issued on Date	08/02/2024
Assessment Reference	Rev B	Prop Type Ref	Block Ev1
Property	Plot 31		

SAP Rating	83 B	DER	16.69	TER	20.60
Environmental	89 B	% DER<TER	18.98		
CO ₂ Emissions (t/year)	0.78	DFEE	49.89	TFEE	56.54
General Requirements Compliance	Pass	% DFEE<TFEE	11.76		

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	8.39	0.36	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	17.70	0.28	Knauf P6
External wall	E5 Ground floor (normal)	Table K1 - Approved	0.160	33.54	5.37	
External wall	E7 Party floor between dwellings (in blocks of flats)	Table K1 - Approved	0.070	33.54	2.35	Knauf P15
External wall	E16 Corner (normal)	Independently assessed	0.061	14.12	0.86	Knauf P23
External wall	E17 Corner (inverted – internal area greater than external area)	Independently assessed	-0.113	4.71	-0.53	Knauf P24

Total:	8.84	W/mK:
Y-Value:	0.060	W/m ² K:

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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SAP Rating	83 B	DER	16.69	TER	20.60
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CO₂ Emissions (t/year)	0.78	DFEE	49.89	TFEE	56.54
General Requirements Compliance	Pass	% DFEE<TFEE	11.76		
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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

Ground-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) 20.60 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 16.69 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)56.5 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)49.9 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.27 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof (no roof)			
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): Slight OK

Based on:

Overshading: Average
Windows facing North East: 1.68 m², No overhang
Windows facing South East: 3.37 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
Floor U-value 0.12 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 (m2)	Storey height (m)	Volume (m3)
Ground floor	61.4000 (1b)	2.5300 (2b)	155.3420 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	155.3420 (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) =	0.1931 (8)
Pressure test				Yes	
Measured/design AP50					5.0000
Infiltration rate					0.4431 (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) =		0.4099 (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	0.5226	0.5124	0.5021	0.4509	0.4406	0.3894	0.3894	0.3791	0.4099	0.4406	0.4611	0.4816 (22b)
Effective ac	0.6366	0.6313	0.6261	0.6016	0.5971	0.5758	0.5758	0.5719	0.5840	0.5971	0.6063	0.6160 (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			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.20)			9.9400	1.1450	11.3817		(27)
Ground Floor			61.4000	0.1200	7.3680	90.0000	5526.0000 (28a)
Brick and Block	30.0000	3.3700	26.6300	0.2200	5.8586	42.2200	1124.3186 (29a)
10.4N Brick and Block	35.5800	8.7200	26.8600	0.2700	7.2522	113.5000	3048.6100 (29a)
Wall to Corridor	19.2800		19.2800	0.2300	4.4339	113.5000	2188.2800 (29a)
Total net area of external elements Aum(A, m2)			146.2600				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	38.6594	(33)
Party Ceilings 1			61.4000			70.0000	4298.0000 (32b)
Ground Floor Stud			102.0700			9.0000	918.6300 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17103.8386 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							278.5641 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.8418 (36)
Total fabric heat loss						(33) + (36) =	47.5012 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	32.6318	32.3600	32.0936	30.8420	30.6079	29.5179	29.5179	29.3160	29.9377	30.6079	31.0816	31.5768 (38)
Heat transfer coeff	80.1331	79.8613	79.5948	78.3433	78.1091	77.0191	77.0191	76.8172	77.4390	78.1091	78.5828	79.0780 (39)
Average = Sum(39)m / 12 =												78.3422 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3051	1.3007	1.2963	1.2759	1.2721	1.2544	1.2544	1.2511	1.2612	1.2721	1.2799	1.2879 (40)
HLP (average)												1.2759 (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)
Water storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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)
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	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	16.3750	14.5441	11.8281	8.9546	6.6937	5.6511	6.1062	7.9371	10.6531	13.5266	15.7875	16.8301	(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	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	309.5448	307.6150	296.2966	278.1865	260.0079	242.3662	230.8435	236.2258	245.4773	263.7750	284.7623	300.3083	(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	3.3700	36.7938	0.6300	0.7000	0.7700	37.8945 (77)							
Southwest	4.8900	36.7938	0.6300	0.7000	0.7700	54.9865 (79)							
Solar gains	98.6740	170.0025	237.7159	303.1084	347.3261	348.2539	334.3225	300.8083	260.2796	189.2671	118.5391	84.2176	(83)
Total gains	408.2188	477.6175	534.0124	581.2949	607.3339	590.6200	565.1661	537.0341	505.7569	453.0421	403.3014	384.5260	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.2897	59.4915	59.6907	60.6442	60.8260	61.6869	61.6869	61.8490	61.3524	60.8260	60.4593	60.0807	
alpha	4.9526	4.9661	4.9794	5.0429	5.0551	5.1125	5.1125	5.1233	5.0902	5.0551	5.0306	5.0054	
util living area	0.9981	0.9954	0.9883	0.9654	0.8998	0.7527	0.5812	0.6294	0.8579	0.9762	0.9958	0.9986	(86)
MIT	19.7272	19.8911	20.1423	20.4686	20.7526	20.9333	20.9857	20.9788	20.8617	20.4912	20.0516	19.7048	(87)
Th 2	19.8368	19.8403	19.8437	19.8597	19.8627	19.8767	19.8767	19.8793	19.8713	19.8627	19.8567	19.8503	(88)
util rest of house	0.9973	0.9936	0.9835	0.9501	0.8545	0.6528	0.4425	0.4906	0.7802	0.9627	0.9938	0.9980	(89)
MIT 2	18.6911	18.8570	19.1085	19.4388	19.6996	19.8480	19.8736	19.8741	19.7992	19.4677	19.0306	18.6795	(90)
Living area fraction	19.1885	19.3535	19.6049	19.9332	20.2052	20.3691	20.4075	20.4045	20.3093	19.9591	19.5208	19.1718	(92)
Temperature adjustment	19.1885	19.3535	19.6049	19.9332	20.2052	20.3691	20.4075	20.4045	20.3093	19.9591	19.5208	19.1718	(93)
adjusted MIT	19.1885	19.3535	19.6049	19.9332	20.2052	20.3691	20.4075	20.4045	20.3093	19.9591	19.5208	19.1718	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	406.8916	474.1000	524.5462	552.9761	528.3280	413.1722	288.2330	299.7918	411.6804	436.8072	400.5137	383.5922	(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	1193.0654	1154.2741	1043.0783	864.3800	664.3333	444.3286	293.2534	307.6153	480.8439	731.0321	976.0616	1183.9372	(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	584.9133	457.0770	385.7879	224.2108	101.1879	0.0000	0.0000	0.0000	0.0000	218.9033	414.3945	595.4567	(98)
Space heating												2981.9313 (98)	
Space heating per m2												48.5657 (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

	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													3305.9105 (211)
Space heating requirement	584.9133	457.0770	385.7879	224.2108	101.1879	0.0000	0.0000	0.0000	0.0000	218.9033	414.3945	595.4567	(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)	648.4626	506.7372	427.7028	248.5707	112.1817	0.0000	0.0000	0.0000	0.0000	242.6866	459.4174	660.1515	(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	87.1875	86.9136	86.3826	85.1619	82.5788	76.2000	76.2000	76.2000	76.2000	84.9605	86.6089	87.3038	(216)
Fuel for water heating, kWh/month	155.3889	136.2814	141.4416	125.0329	123.6785	115.6159	107.1351	122.9852	124.5007	130.1814	139.4507	150.2853	(219)
Water heating fuel used													1571.9778 (219)
Annual totals kWh/year													
Space heating fuel - main system													3305.9105 (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)													289.1879 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses													5242.0761 (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	3305.9105	0.2160	714.0767	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1571.9778	0.2160	339.5472	(264)
Space and water heating			1053.6239	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	289.1879	0.5190	150.0885	(268)
Energy saving/generation technologies				
PV Unit	-420.0000	0.5190	-217.9800	(269)
Total CO2, kg/year			1024.6574	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			16.6900	(273)

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

DER			16.6900	ZC1
Total Floor Area		TFA	61.4000	
Assumed number of occupants		N	2.0209	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			17.0307	ZC2
CO2 emissions from cooking, equation (L16)			2.7281	ZC3
Total CO2 emissions			36.4488	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			36.4488	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)	2.5300 (2b)	155.3420 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	155.3420 (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) =	0.1287 (8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate				0.3787	(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) =		0.3503 (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	0.4467	0.4379	0.4292	0.3854	0.3766	0.3328	0.3328	0.3241	0.3503	0.3766	0.3941	0.4117 (22b)
Effective ac	0.5998	0.5959	0.5921	0.5743	0.5709	0.5554	0.5554	0.5525	0.5614	0.5709	0.5777	0.5847 (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			2.1500	1.0000	2.1500		(26)					
TER Opening Type (Uw = 1.40)			9.9400	1.3258	13.1780		(27)					
Ground Floor			61.4000	0.1300	7.9820		(28a)					
Brick and Block	30.0000	3.3700	26.6300	0.1800	4.7934		(29a)					
10.4N Brick and Block	35.5800	8.7200	26.8600	0.1800	4.8348		(29a)					
Wall to Corridor	19.2800		19.2800	0.1800	3.4704		(29a)					
Total net area of external elements Aum(A, m2)			146.2600				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	36.4086	(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.2336 (36)					
Total fabric heat loss						(33) + (36) =	46.6422 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	30.7456	30.5470	30.3524	29.4381	29.2670	28.4707	28.4707	28.3232	28.7774	29.2670	29.6131	29.9749 (38)
Heat transfer coeff	77.3879	77.1893	76.9946	76.0803	75.9092	75.1129	75.1129	74.9654	75.4197	75.9092	76.2553	76.6171 (39)
Average = Sum(39)m / 12 =												76.0795 (39)
HLP	1.2604	1.2572	1.2540	1.2391	1.2363	1.2233	1.2233	1.2209	1.2283	1.2363	1.2419	1.2478 (40)
HLP (average)												1.2391 (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												
Water storage loss:	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)
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												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi 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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)	
Total heat required for water heating calculated for each month	46.0754	40.1032	42.7245	39.7248	39.3735	36.4820	37.6980	39.3735	39.7248	42.7245	42.9677	46.0754	46.0754	46.0754	46.0754	46.0754	46.0754	46.0754	46.0754	46.0754	46.0754	46.0754	46.0754	46.0754	(61)
Solar input	180.1608	157.3751	163.7386	145.2279	140.6063	123.8381	118.6464	132.2629	133.7236	152.2710	162.5462	175.9300	175.9300	175.9300	175.9300	175.9300	175.9300	175.9300	175.9300	175.9300	175.9300	175.9300	175.9300	175.9300	(62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Heat gains from water heating, kWh/month	180.1608	157.3751	163.7386	145.2279	140.6063	123.8381	118.6464	132.2629	133.7236	152.2710	162.5462	175.9300	175.9300	175.9300	175.9300	175.9300	175.9300	175.9300	175.9300	175.9300	175.9300	175.9300	175.9300	175.9300	(64)
	56.1023	49.0187	50.9183	45.0110	43.5033	38.1664	36.3398	40.7291	41.1858	47.1053	50.5018	54.6955	54.6955	54.6955	54.6955	54.6955	54.6955	54.6955	54.6955	54.6955	54.6955	54.6955	54.6955	54.6955	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	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	16.3750	14.5441	11.8281	8.9546	6.6937	5.6511	6.1062	7.9371	10.6531	13.5266	15.7875	16.8301	(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	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)	75.4063	72.9445	68.4386	62.5153	58.4721	53.0089	48.8439	54.7434	57.2025	63.3136	70.1414	73.5155	(72)
Total internal gains	324.5587	322.0972	310.2608	291.6405	272.9360	254.7755	243.2795	249.1788	258.9683	277.7764	299.2656	315.3369	(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	(75)						
Northeast	1.6800	11.2829	0.6300	0.7000	0.7700	5.7930	(75)						
Southeast	3.3700	36.7938	0.6300	0.7000	0.7700	37.8945	(77)						
Southwest	4.8900	36.7938	0.6300	0.7000	0.7700	54.9865	(79)						
Solar gains	98.6740	170.0025	237.7159	303.1084	347.3261	348.2539	334.3225	300.8083	260.2796	189.2671	118.5391	84.2176	(83)
Total gains	423.2327	492.0997	547.9767	594.7488	620.2620	603.0294	577.6020	549.9871	519.2479	467.0435	417.8047	399.5546	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)	0.9963	0.9921	0.9816	0.9513	0.8748	0.7224	0.5546	0.6002	0.8276	0.9644	0.9925	0.9972	(86)	
MIT	19.6945	19.8680	20.1316	20.4660	20.7540	20.9319	20.9846	20.9778	20.8632	20.4895	20.0293	19.6644	(87)	
Th 2	19.8720	19.8745	19.8771	19.8889	19.8911	19.9014	19.9014	19.9033	19.8974	19.8911	19.8866	19.8819	(88)	
util rest of house	0.9951	0.9894	0.9751	0.9330	0.8269	0.6265	0.4250	0.4702	0.7489	0.9473	0.9895	0.9963	(89)	
MIT 2	18.1504	18.4045	18.7873	19.2690	19.6510	19.8562	19.8959	19.8944	19.7906	19.3113	18.6491	18.1135	(90)	
Living area fraction	18.8917	19.1071	19.4327	19.8437	20.1805	20.3727	20.4186	20.4145	fLA = Living area / (4) =	20.3056	19.8770	19.3118	0.4801	(91)
MIT	18.8917	19.1071	19.4327	19.8437	20.1805	20.3727	20.4186	20.4145	20.3056	19.8770	19.3118	18.8581	(92)	
Temperature adjustment												0.0000	(93)	
adjusted MIT	18.8917	19.1071	19.4327	19.8437	20.1805	20.3727	20.4186	20.4145	20.3056	19.8770	19.3118	18.8581	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(94)	
Useful gains	420.5253	485.6668	532.5105	554.3532	521.5868	404.0814	281.6666	293.1350	405.6040	442.2903	412.5420	397.5695	(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	1129.2242	1096.6389	995.7507	832.6038	643.7519	433.6033	286.8269	300.9523	468.0245	704.2072	931.2129	1123.0640	(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	527.2720	410.5733	344.6507	200.3404	90.8909	0.0000	0.0000	0.0000	0.0000	194.8662	373.4430	539.7678	(98)	
Space heating												2681.8043	(98)	
Space heating per m2												(98) / (4) =	43.6776	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2871.3108 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	527.2720	410.5733	344.6507	200.3404	90.8909	0.0000	0.0000	0.0000	0.0000	194.8662	373.4430	539.7678	(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)	564.5310	439.5859	369.0050	214.4972	97.3136	0.0000	0.0000	0.0000	0.0000	208.6362	399.8319	577.9099	(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	87.5942	87.3555	86.8805	85.8614	83.9840	80.3000	80.3000	80.3000	80.3000	85.6732	87.0785	80.3000	(216)
Fuel for water heating, kWh/month	205.6767	180.1549	188.4642	169.1422	167.4202	154.2193	147.7539	164.7110	166.5300	177.7346	186.6664	200.6299	(219)
Water heating fuel used													2109.1034 (219)
Annual totals kWh/year													
Space heating fuel - main system													2871.3108 (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)													289.1879 (232)
Total delivered energy for all uses													5344.6021 (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	2871.3108	0.2160	620.2031 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2109.1034	0.2160	455.5663 (264)
Space and water heating			1075.7695 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	289.1879	0.5190	150.0885 (268)
Total CO2, kg/m2/year			1264.7830 (272)
Emissions per m2 for space and water heating			17.5207 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4444 (272b)
Emissions per m2 for pumps and fans			0.6340 (272c)
Target Carbon Dioxide Emission Rate (TER) = (17.5207 * 1.00) + 2.4444 + 0.6340, rounded to 2 d.p.			20.6000 (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)	2.5300 (2b)	155.3420 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	155.3420 (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) =	0.1287 (8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate				0.3787	(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) =		0.3503 (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	0.4467	0.4379	0.4292	0.3854	0.3766	0.3328	0.3328	0.3241	0.3503	0.3766	0.3941	0.4117 (22b)
Effective ac	0.5998	0.5959	0.5921	0.5743	0.5709	0.5554	0.5554	0.5525	0.5614	0.5709	0.5777	0.5847 (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			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.20)			9.9400	1.1450	11.3817		(27)
Ground Floor			61.4000	0.1200	7.3680	90.0000	5526.0000 (28a)
Brick and Block	30.0000	3.3700	26.6300	0.2200	5.8586	42.2200	1124.3186 (29a)
10.4N Brick and Block	35.5800	8.7200	26.8600	0.2700	7.2522	113.5000	3048.6100 (29a)
Wall to Corridor	19.2800		19.2800	0.2300	4.4339	113.5000	2188.2800 (29a)
Total net area of external elements Aum(A, m2)			146.2600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	38.6594		(33)
Party Ceilings 1			61.4000			30.0000	1842.0000 (32b)
Ground Floor Stud			102.0700			9.0000	918.6300 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	14647.8386 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							238.5641 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.8418 (36)
Total fabric heat loss						(33) + (36) =	47.5012 (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	30.7456	30.5470	30.3524	29.4381	29.2670	28.4707	28.4707	28.3232	28.7774	29.2670	29.6131	29.9749 (38)
Average = Sum(39)m / 12 =	78.2469	78.0483	77.8536	76.9393	76.7683	75.9719	75.9719	75.8245	76.2787	76.7683	77.1143	77.4761 (39)
												76.9385 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2744	1.2711	1.2680	1.2531	1.2503	1.2373	1.2373	1.2349	1.2423	1.2503	1.2559	1.2618 (40)
HLP (average)												1.2531 (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)
Water storage loss:												

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Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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)
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	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	16.3750	14.5441	11.8281	8.9546	6.6937	5.6511	6.1062	7.9371	10.6531	13.5266	15.7875	16.8301	(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	284.4497	283.2364	273.3861	257.2633	240.3777	224.5488	214.5560	217.9663	226.5085	242.7513	261.4165	275.9103	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
	m2	Table 6a	Specific data	Specific data	factor	W
		W/m2	or Table 6b	or Table 6c	Table 6d	
Northeast	1.6800	11.2829	0.6300	0.7000	0.7700	5.7930 (75)
Southeast	3.3700	36.7938	0.6300	0.7000	0.7700	37.8945 (77)
Southwest	4.8900	36.7938	0.6300	0.7000	0.7700	54.9865 (79)

Solar gains	98.6740	170.0025	237.7159	303.1084	347.3261	348.2539	334.3225	300.8083	260.2796	189.2671	118.5391	84.2176	(83)
Total gains	383.1237	453.2390	511.1020	560.3716	587.7038	572.8026	548.8785	518.7746	486.7881	432.0184	379.9556	360.1280	(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	52.0001	52.1324	52.2627	52.8838	53.0016	53.5572	53.5572	53.6614	53.3418	53.0016	52.7638	52.5174		
alpha	4.4667	4.4755	4.4842	4.5256	4.5334	4.5705	4.5705	4.5774	4.5561	4.5334	4.5176	4.5012		
util living area	0.9971	0.9933	0.9841	0.9574	0.8890	0.7475	0.5827	0.6322	0.8505	0.9707	0.9940	0.9978	(86)	
MIT	19.5662	19.7490	20.0284	20.3860	20.7018	20.9094	20.9774	20.9674	20.8248	20.4097	19.9199	19.5356	(87)	
Th 2	19.8610	19.8635	19.8660	19.8778	19.8800	19.8903	19.8903	19.8922	19.8863	19.8800	19.8755	19.8709	(88)	
util rest of house	0.9961	0.9911	0.9786	0.9414	0.8453	0.6535	0.4485	0.4986	0.7777	0.9565	0.9917	0.9970	(89)	
MIT 2	18.5648	18.7485	19.0271	19.3841	19.6757	19.8472	19.8843	19.8826	19.7883	19.4140	18.9290	18.5420	(90)	
Living area fraction										fLA = Living area / (4) =		0.4801	(91)	
MIT	19.0456	19.2289	19.5078	19.8651	20.1683	20.3572	20.4092	20.4035	20.2860	19.8921	19.4048	19.0191	(92)	
Temperature adjustment												0.0000		
adjusted MIT	19.0456	19.2289	19.5078	19.8651	20.1683	20.3572	20.4092	20.4035	20.2860	19.8921	19.4048	19.0191	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains	381.2593	448.4720	499.0231	527.3942	504.2610	398.6157	281.8382	292.1520	392.8456	413.3107	376.2850	358.7875	(94)	
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)	
Heat loss rate W	1153.7952	1118.3433	1012.7066	843.6510	650.1003	437.3842	289.3895	303.5612	471.8584	713.3350	948.8736	1148.1223	(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	574.7667	450.1535	382.1805	227.7049	108.5044	0.0000	0.0000	0.0000	0.0000	223.2181	412.2638	587.2651	(98)	
Space heating												2966.0569	(98)	
Space heating per m2												(98) / (4) =	48.3071	(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	714.1361	562.1923	576.2659	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8375	0.9038	0.8822	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	598.0801	508.1038	508.3959	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	745.1840	715.7556	681.8378	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)

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Calculation Type: New Build (As Designed)

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Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	105.9148	154.4929	129.0408	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												389.4485 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	26.4787	38.6232	32.2602	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												97.3621 (107)
Space cooling per m2												1.5857 (108)
Energy for space heating												48.3071 (99)
Energy for space cooling												1.5857 (108)
Total												49.8928 (109)
Dwelling Fabric Energy Efficiency (DFEE)												49.9 (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)	2.5300 (2b)	155.3420 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	155.3420 (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) =	0.1287 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3787 (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) =	0.3503 (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	0.4467	0.4379	0.4292	0.3854	0.3766	0.3328	0.3328	0.3241	0.3503	0.3766	0.3941	0.4117 (22b)
Effective ac	0.5998	0.5959	0.5921	0.5743	0.5709	0.5554	0.5554	0.5525	0.5614	0.5709	0.5777	0.5847 (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			2.1500	1.0000	2.1500		(26)					
TER Opening Type (Uw = 1.40)			9.9400	1.3258	13.1780		(27)					
Ground Floor			61.4000	0.1300	7.9820		(28a)					
Brick and Block	30.0000	3.3700	26.6300	0.1800	4.7934		(29a)					
10.4N Brick and Block	35.5800	8.7200	26.8600	0.1800	4.8348		(29a)					
Wall to Corridor	19.2800		19.2800	0.1800	3.4704		(29a)					
Total net area of external elements Aum(A, m2)			146.2600				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	36.4086	(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.2336 (36)					
Total fabric heat loss							(33) + (36) =	46.6422 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	30.7456	30.5470	30.3524	29.4381	29.2670	28.4707	28.4707	28.3232	28.7774	29.2670	29.6131	29.9749 (38)
Heat transfer coeff	77.3879	77.1893	76.9946	76.0803	75.9092	75.1129	75.1129	74.9654	75.4197	75.9092	76.2553	76.6171 (39)
Average = Sum(39)m / 12 =												76.0795 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2604	1.2572	1.2540	1.2391	1.2363	1.2233	1.2233	1.2209	1.2283	1.2363	1.2419	1.2478 (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)	
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 (46)	
If cylinder contains dedicated solar storage													

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Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Cooled fraction											FC = cooled area / (4) =	1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	26.2783	38.7111	32.2438	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											97.2333 (107)	
Space cooling per m2											1.5836 (108)	
Energy for space heating											47.5842 (99)	
Energy for space cooling											1.5836 (108)	
Total											49.1678 (109)	
Target Fabric Energy Efficiency (TFEE)											56.5 (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)	2.5300 (2b)	155.3420 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	155.3420 (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) =	0.1931 (8)
Pressure test				Yes	
Measured/design AP50					5.0000
Infiltration rate					0.4431 (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) =		0.4099 (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	0.5226	0.4816	0.4714	0.4406	0.4406	0.4099	0.4099	0.3996	0.4099	0.4611	0.4509	0.4816 (22b)
Effective ac	0.6366	0.6160	0.6111	0.5971	0.5971	0.5840	0.5840	0.5799	0.5840	0.6063	0.6016	0.6160 (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			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.20)			9.9400	1.1450	11.3817		(27)
Ground Floor			61.4000	0.1200	7.3680	90.0000	5526.0000 (28a)
Brick and Block	30.0000	3.3700	26.6300	0.2200	5.8586	42.2200	1124.3186 (29a)
10.4N Brick and Block	35.5800	8.7200	26.8600	0.2700	7.2522	113.5000	3048.6100 (29a)
Wall to Corridor	19.2800		19.2800	0.2300	4.4339	113.5000	2188.2800 (29a)
Total net area of external elements Aum(A, m2)			146.2600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	38.6594		(33)
Party Ceilings 1			61.4000			70.0000	4298.0000 (32b)
Ground Floor Stud			102.0700			9.0000	918.6300 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	17103.8386 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							278.5641 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.8418 (36)
Total fabric heat loss						(33) + (36) =	47.5012 (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	32.6318	31.5768	31.3265	30.6079	30.6079	29.9377	29.9377	29.7251	29.9377	31.0816	30.8420	31.5768 (38)
Average = Sum(39)m / 12 =	80.1331	79.0780	78.8277	78.1091	78.1091	77.4390	77.4390	77.2263	77.4390	78.5828	78.3433	79.0780 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.3051	1.2879	1.2838	1.2721	1.2721	1.2612	1.2612	1.2578	1.2612	1.2799	1.2759	1.2879 (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:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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)

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	40.9375	36.3604	29.5702	22.3866	16.7342	14.1277	15.2655	19.8427	26.6328	33.8165	39.4688	42.0753	(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	457.2733	453.4991	435.8338	408.5751	380.8974	355.9514	341.2766	348.5032	364.1016	391.5479	422.0343	444.8846	(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	15.0428	0.6300	0.6300	0.7000	0.7700	7.7234	(75)					
Southeast	3.3700	46.3896	0.6300	0.6300	0.7000	0.7700	47.7774	(77)					
Southwest	4.8900	46.3896	0.6300	0.6300	0.7000	0.7700	69.3268	(79)					
Solar gains	124.8276	183.8942	256.5139	335.1463	369.0583	401.5603	375.8307	343.6370	298.4469	216.6895	148.5943	101.7354	(83)
Total gains	582.1010	637.3933	692.3477	743.7214	749.9557	757.5117	717.1073	692.1402	662.5485	608.2375	570.6286	546.6200	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation factor for gains for living area, nil,m (see Table 9a)	59.2897	60.0807	60.2715	60.8260	60.8260	61.3524	61.3524	61.5213	61.3524	60.4593	60.6442	60.0807	21.0000	(85)
alpha	4.9526	5.0054	5.0181	5.0551	5.0551	5.0902	5.0902	5.1014	5.0902	5.0306	5.0429	5.0054		
util living area	0.9877	0.9804	0.9586	0.9001	0.7745	0.5577	0.3973	0.4102	0.6624	0.8972	0.9724	0.9902	(86)	
MIT	20.0768	20.1979	20.4288	20.6961	20.8965	20.9846	20.9978	20.9975	20.9645	20.7566	20.4061	20.0614	(87)	
Th 2	19.8368	19.8503	19.8535	19.8627	19.8627	19.8713	19.8713	19.8741	19.8713	19.8567	19.8597	19.8503	(88)	
util rest of house	0.9832	0.9734	0.9434	0.8645	0.7013	0.4524	0.2774	0.2869	0.5550	0.8504	0.9604	0.9864	(89)	
MIT 2	19.0375	19.1666	19.3919	19.6446	19.8059	19.8665	19.8710	19.8737	19.8582	19.6976	19.3791	19.0336	(90)	
Living area fraction	19.5365	19.6618	19.8897	20.1495	20.3295	20.4033	20.4120	20.4133	20.3894	20.2061	19.8722	19.5271	(91)	
MIT	19.5365	19.6618	19.8897	20.1495	20.3295	20.4033	20.4120	20.4133	20.3894	20.2061	19.8722	19.5271	(92)	
Temperature adjustment												0.0000		
adjusted MIT	19.5365	19.6618	19.8897	20.1495	20.3295	20.4033	20.4120	20.4133	20.3894	20.2061	19.8722	19.5271	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	571.4349	619.5065	653.5330	650.3959	549.9482	381.1064	240.3691	239.7122	401.7176	527.1053	548.1045	538.4773	(95)
Ext temp.	5.4000	5.7000	7.3000	9.6000	12.6000	15.4000	17.3000	17.3000	15.0000	11.8000	8.4000	5.5000	(96)
Heat loss rate W	1132.8017	1104.0687	992.4209	824.0098	603.7480	387.4504	240.9916	240.4262	417.3468	660.5722	898.7712	1109.2352	(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	417.6570	325.6258	252.1326	125.0020	40.0271	0.0000	0.0000	0.0000	0.0000	99.2994	252.4800	424.6439	(98)
Space heating												1936.8677	(98)
RHI space heating demand												1937	(98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	61.4000 (1b)	2.5300 (2b)	155.3420 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	61.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)... (3n)	155.3420 (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) =	0.1931 (8)
Pressure test				Yes	
Measured/design AP50					5.0000
Infiltration rate					0.4431 (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) =	0.4099 (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	0.5226	0.5124	0.5021	0.4509	0.4406	0.3894	0.3894	0.3791	0.4099	0.4406	0.4611	0.4816 (22b)
Effective ac	0.6366	0.6313	0.6261	0.6016	0.5971	0.5758	0.5758	0.5719	0.5840	0.5971	0.6063	0.6160 (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			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.20)			9.9400	1.1450	11.3817		(27)
Ground Floor			61.4000	0.1200	7.3680	90.0000	5526.0000 (28a)
Brick and Block	30.0000	3.3700	26.6300	0.2200	5.8586	42.2200	1124.3186 (29a)
10.4N Brick and Block	35.5800	8.7200	26.8600	0.2700	7.2522	113.5000	3048.6100 (29a)
Wall to Corridor	19.2800		19.2800	0.2300	4.4339	113.5000	2188.2800 (29a)
Total net area of external elements Aum(A, m2)			146.2600				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	38.6594	(33)
Party Ceilings 1			61.4000			70.0000	4298.0000 (32b)
Ground Floor Stud			102.0700			9.0000	918.6300 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 17103.8386 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							278.5641 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.8418 (36)
Total fabric heat loss							(33) + (36) = 47.5012 (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	32.6318	32.3600	32.0936	30.8420	30.6079	29.5179	29.5179	29.3160	29.9377	30.6079	31.0816	31.5768 (38)
Average = Sum(39)m / 12 =	80.1331	79.8613	79.5948	78.3433	78.1091	77.0191	77.0191	76.8172	77.4390	78.1091	78.5828	79.0780 (39)
												78.3422 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.3051	1.3007	1.2963	1.2759	1.2721	1.2544	1.2544	1.2511	1.2612	1.2721	1.2799	1.2879 (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)
Water storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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)
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	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	40.9375	36.3604	29.5702	22.3866	16.7342	14.1277	15.2655	19.8427	26.6328	33.8165	39.4688	42.0753	(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	457.2733	453.4991	435.8338	408.5751	380.8974	355.9514	341.2766	348.5032	364.1016	391.5479	422.0343	444.8846	(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	3.3700	36.7938	0.6300	0.7000	0.7700	37.8945 (77)							
Southwest	4.8900	36.7938	0.6300	0.7000	0.7700	54.9865 (79)							
Solar gains	98.6740	170.0025	237.7159	303.1084	347.3261	348.2539	334.3225	300.8083	260.2796	189.2671	118.5391	84.2176	(83)
Total gains	555.9473	623.5016	673.5497	711.6835	728.2234	704.2053	675.5991	649.3115	624.3812	580.8150	540.5734	529.1022	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.2897	59.4915	59.6907	60.6442	60.8260	61.6869	61.6869	61.8490	61.3524	60.8260	60.4593	60.0807	
alpha	4.9526	4.9661	4.9794	5.0429	5.0551	5.1125	5.1125	5.1233	5.0902	5.0551	5.0306	5.0054	
util living area	0.9924	0.9857	0.9703	0.9287	0.8338	0.6617	0.4941	0.5330	0.7646	0.9398	0.9851	0.9940	(86)
MIT	19.9245	20.0815	20.3145	20.6056	20.8361	20.9629	20.9931	20.9899	20.9216	20.6337	20.2314	19.8994	(87)
Th 2	19.8368	19.8403	19.8437	19.8597	19.8627	19.8767	19.8767	19.8793	19.8713	19.8627	19.8567	19.8503	(88)
util rest of house	0.9897	0.9806	0.9595	0.9021	0.7749	0.5619	0.3720	0.4090	0.6731	0.9117	0.9789	0.9918	(89)
MIT 2	18.8868	19.0442	19.2743	19.5621	19.7619	19.8620	19.8753	19.8770	19.8347	19.5960	19.2068	18.8728	(90)
Living area fraction	19.3850	19.5422	19.7737	20.0631	20.2777	20.3906	20.4120	20.4114	20.3565	20.0942	19.6987	19.3657	(92)
Temperature adjustment	19.3850	19.5422	19.7737	20.0631	20.2777	20.3906	20.4120	20.4114	20.3565	20.0942	19.6987	0.0000	
adjusted MIT	19.3850	19.5422	19.7737	20.0631	20.2777	20.3906	20.4120	20.4114	20.3565	20.0942	19.6987	19.3657	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9884	0.9790	0.9587	0.9075	0.7982	0.6094	0.4311	0.4690	0.7152	0.9184	0.9778	0.9906	(94)
Ext temp.	549.4739	610.3794	645.7126	645.8537	581.2791	429.1227	291.2378	304.5493	446.5573	533.4070	528.5701	524.1455	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	1208.8095	1169.3483	1056.5188	874.5560	669.9947	445.9831	293.5950	308.1418	484.4990	741.5856	990.0428	1199.2763	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating per m2	490.5457	375.6271	305.6398	164.6656	66.0045	0.0000	0.0000	0.0000	0.0000	154.8849	332.2604	502.2973	(98)
												2391.9252 (98)	
												38.9564 (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

	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													2651.8018 (211)
Space heating requirement	490.5457	375.6271	305.6398	164.6656	66.0045	0.0000	0.0000	0.0000	0.0000	154.8849	332.2604	502.2973	(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)	543.8422	416.4380	338.8468	182.5561	73.1757	0.0000	0.0000	0.0000	0.0000	171.7127	368.3596	556.8706	(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	86.7507	86.3947	85.7031	84.1300	81.1441	76.2000	76.2000	76.2000	76.2000	83.7869	85.9883	86.8935	(216)
Fuel for water heating, kWh/month	156.1712	137.0999	142.5630	126.5666	125.8652	115.6159	107.1351	122.9852	124.5007	132.0049	140.4572	150.9949	(219)
Water heating fuel used													1581.9600 (219)
Annual totals kWh/year													
Space heating fuel - main system													2651.8018 (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)													289.1879 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses													4597.9497 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2651.8018	3.4800	92.2827 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1581.9600	3.4800	55.0522 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	289.1879	13.1900	38.1439 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	0.0000	13.1900	0.0000 (252)
Total energy cost			315.3713 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.2449 (257)
SAP value		82.6338
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	2651.8018	0.2160	572.7892 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1581.9600	0.2160	341.7034 (264)
Space and water heating			914.4925 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	289.1879	0.5190	150.0885 (268)
Energy saving/generation technologies			
PV Unit	-420.0000	0.5190	-217.9800 (269)
Total kg/year			885.5261 (272)
CO2 emissions per m2			14.4200 (273)
EI value			88.8477
EI rating			89 (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	$3.48 / 0.8213 = 4.237$, stars = 4
Water heating environmental impact	$0.216 / 0.8213 = 0.2630$, stars = 4

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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	61.4000 (1b)	2.5300 (2b)	155.3420 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	155.3420 (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) =	0.1931 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4431 (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) =	0.4099 (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	0.5226	0.4816	0.4714	0.4406	0.4406	0.4099	0.4099	0.3996	0.4099	0.4611	0.4509	0.4816 (22b)
Effective ac	0.6366	0.6160	0.6111	0.5971	0.5971	0.5840	0.5840	0.5799	0.5840	0.6063	0.6016	0.6160 (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			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.20)			9.9400	1.1450	11.3817		(27)
Ground Floor			61.4000	0.1200	7.3680	90.0000	5526.0000 (28a)
Brick and Block	30.0000	3.3700	26.6300	0.2200	5.8586	42.2200	1124.3186 (29a)
10.4N Brick and Block	35.5800	8.7200	26.8600	0.2700	7.2522	113.5000	3048.6100 (29a)
Wall to Corridor	19.2800		19.2800	0.2300	4.4339	113.5000	2188.2800 (29a)
Total net area of external elements Aum(A, m2)			146.2600				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	38.6594	(33)
Party Ceilings 1			61.4000			70.0000	4298.0000 (32b)
Ground Floor Stud			102.0700			9.0000	918.6300 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 17103.8386 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							278.5641 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.8418 (36)
Total fabric heat loss							(33) + (36) = 47.5012 (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	32.6318	31.5768	31.3265	30.6079	30.6079	29.9377	29.9377	29.7251	29.9377	31.0816	30.8420	31.5768 (38)
Average = Sum(39)m / 12 =	80.1331	79.0780	78.8277	78.1091	78.1091	77.4390	77.4390	77.2263	77.4390	78.5828	78.3433	79.0780 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3051	1.2879	1.2838	1.2721	1.2721	1.2612	1.2612	1.2578	1.2612	1.2799	1.2759	1.2879 (40)
HLP (average)												1.2755 (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)
Water storage loss:												

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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)
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	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	40.9375	36.3604	29.5702	22.3866	16.7342	14.1277	15.2655	19.8427	26.6328	33.8165	39.4688	42.0753	(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	457.2733	453.4991	435.8338	408.5751	380.8974	355.9514	341.2766	348.5032	364.1016	391.5479	422.0343	444.8846	(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	15.0428	0.6300	0.6300	0.7000	0.7700	7.7234	(75)					
Southeast	3.3700	46.3896	0.6300	0.6300	0.7000	0.7700	47.7774	(77)					
Southwest	4.8900	46.3896	0.6300	0.6300	0.7000	0.7700	69.3268	(79)					
Solar gains	124.8276	183.8942	256.5139	335.1463	369.0583	401.5603	375.8307	343.6370	298.4469	216.6895	148.5943	101.7354	(83)
Total gains	582.1010	637.3933	692.3477	743.7214	749.9557	757.5117	717.1073	692.1402	662.5485	608.2375	570.6286	546.6200	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
tau	59.2897	60.0807	60.2715	60.8260	60.8260	61.3524	61.3524	61.5213	61.3524	60.4593	60.6442	60.0807		
alpha	4.9526	5.0054	5.0181	5.0551	5.0551	5.0902	5.0902	5.1014	5.0902	5.0306	5.0429	5.0054		
util living area	0.9877	0.9804	0.9586	0.9001	0.7745	0.5577	0.3973	0.4102	0.6624	0.8972	0.9724	0.9902	(86)	
MIT	20.0768	20.1979	20.4288	20.6961	20.8965	20.9846	20.9978	20.9975	20.9645	20.7566	20.4061	20.0614	(87)	
Th 2	19.8368	19.8503	19.8535	19.8627	19.8627	19.8713	19.8713	19.8741	19.8713	19.8567	19.8597	19.8503	(88)	
util rest of house	0.9832	0.9734	0.9434	0.8645	0.7013	0.4524	0.2774	0.2869	0.5550	0.8504	0.9604	0.9864	(89)	
MIT 2	19.0375	19.1666	19.3919	19.6446	19.8059	19.8665	19.8710	19.8737	19.8582	19.6976	19.3791	19.0336	(90)	
Living area fraction	19.5365	19.6618	19.8897	20.1495	20.3295	20.4033	20.4120	20.4133	20.3894	20.2061	19.8722	19.5271	(92)	
Temperature adjustment	19.5365	19.6618	19.8897	20.1495	20.3295	20.4033	20.4120	20.4133	20.3894	20.2061	19.8722	19.5271	(93)	
adjusted MIT	19.5365	19.6618	19.8897	20.1495	20.3295	20.4033	20.4120	20.4133	20.3894	20.2061	19.8722	19.5271	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains	571.4349	619.5065	653.5330	650.3959	549.9482	381.1064	240.3691	239.7122	401.7176	527.1053	548.1045	538.4773	(95)	
Ext temp.	5.4000	5.7000	7.3000	9.6000	12.6000	15.4000	17.3000	17.3000	15.0000	11.8000	8.4000	5.5000	(96)	
Heat loss rate W	1132.8017	1104.0687	992.4209	824.0098	603.7480	387.4504	240.9916	240.4262	417.3468	660.5722	898.7712	1109.2352	(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	417.6570	325.6258	252.1326	125.0020	40.0271	0.0000	0.0000	0.0000	0.0000	99.2994	252.4800	424.6439	(98)	
Space heating													1936.8677	(98)
Space heating per m2													31.5451	(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													2147.3034 (211)
Space heating requirement	417.6570	325.6258	252.1326	125.0020	40.0271	0.0000	0.0000	0.0000	0.0000	99.2994	252.4800	424.6439	(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)	463.0343	361.0042	279.5261	138.5831	44.3759	0.0000	0.0000	0.0000	0.0000	110.0880	279.9113	470.7804	(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	86.3158	85.9862	85.0967	83.1710	79.6823	76.2000	76.2000	76.2000	76.2000	82.2385	85.1386	86.4508	(216)
Fuel for water heating, kWh/month	156.9582	137.7512	143.5790	128.0260	128.1744	115.6159	107.1351	122.9852	124.5007	134.4903	141.8590	151.7681	(219)
Water heating fuel used													1592.8432 (219)
Annual totals kWh/year													
Space heating fuel - main system													2147.3034 (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)													289.1879 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses													4104.3345 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2147.3034	7.6100	163.4098 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1592.8432	7.6100	121.2154 (247)
Pumps and fans for heating	75.0000	31.0800	23.3100 (249)
Energy for lighting	289.1879	31.0800	89.8796 (250)
Additional standing charges			105.0000 (251)
Energy saving/generation technologies			
PV Unit	0.0000	31.0800	0.0000 (252)
Total energy cost			502.8148 (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	2147.3034	0.2160	463.8175 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1592.8432	0.2160	344.0541 (264)
Space and water heating			807.8717 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	289.1879	0.5190	150.0885 (268)
Energy saving/generation technologies			
PV Unit	-420.0000	0.5190	-217.9800 (269)
Total kg/year			778.9052 (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	2147.3034	1.2200	2619.7102 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1592.8432	1.2200	1943.2687 (264)
Space and water heating			4562.9789 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	289.1879	3.0700	887.8068 (268)
Energy saving/generation technologies			
PV Unit	-420.0000	3.0700	-1289.4000 (269)
Primary energy kWh/year			4391.6357 (272)
Primary energy kWh/m2/year			71.5250 (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 89

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

Recommended measures: (none)	SAP change	Cost change	CO2 change
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Recommended measures (none)	Typical annual savings	Energy efficiency	Environmental impact
	Total Savings £0	0.00 kg/m ²	

Potential energy efficiency rating: B 83
 Potential environmental impact rating: B 89

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	£113	£113	£0
Mains gas	£390	£390	£0
Space heating	£292	£292	£0
Water heating	£121	£121	£0
Lighting	£90	£90	£0
Total cost of fuels	£503	£503	£0
Total cost of uses	£503	£503	£0
Delivered energy	67 kWh/m ²	67 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	0.8 tonnes	0.8 tonnes	0.0 tonnes
CO2 emissions per m ²	13 kg/m ²	13 kg/m ²	0 kg/m ²
Primary energy	72 kWh/m ²	72 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 31		Issued on Date	08/02/2024
Assessment Reference	Rev B	Prop Type Ref	Block Ev1	
Project	Plot 31			
Calculation Type	New Build (As Designed)			

SAP Rating	83 B	DER	16.69	TER	20.60
Environmental	89 B	% DER<TER	18.98		
CO ₂ Emissions (t/year)	0.78	DFEE	49.89	TFEE	56.54
General Requirements Compliance	Pass	% DFEE<TFEE	11.76		

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

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 m² K/W Lower limit = 4.366 m² K/W Average = 4.511 m² K/W
 Total correction = 0.0004 m² K/W U-value (unrounded) = 0.22 W/m² 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 31		Issued on Date	08/02/2024
Assessment Reference	Rev B	Prop Type Ref	Block Ev1	
Project	Plot 31			
Calculation Type	New Build (As Designed)			

SAP Rating	83 B	DER	16.69	TER	20.60
Environmental	89 B	% DER<TER	18.98		
CO ₂ Emissions (t/year)	0.78	DFEE	49.89	TFEE	56.54
General Requirements Compliance	Pass	% DFEE<TFEE	11.76		

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 000004

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	Hemelite standard solid 10.4N						
	Main construction	140	0.4900	0.2857	93.43	1450	1000
	Main construction	140	0.8803	0.1590	6.57	1450	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 = 3.746 m ² K/W	Lower limit = 3.740 m ² K/W	Average = 3.743 m ² K/W
	Total correction = 0.0001 m ² K/W	U-value (unrounded) = 0.27 W/m ² K	

Unheated space:	None	
Total thickness: 370 mm	U-value: 0.27 W/m² K	Kappa: 113.50 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0931 Plot 31	Issued on Date	08/02/2024
Assessment Reference	Rev B	Prop Type Ref	Block Ev1
Project	Plot 31		
Calculation Type	New Build (As Designed)		

SAP Rating	83 B	DER	16.69	TER	20.60
Environmental	89 B	% DER<TER	18.98		
CO ₂ Emissions (t/year)	0.78	DFEE	49.89	TFEE	56.54
General Requirements Compliance	Pass	% DFEE<TFEE	11.76		

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 31	Issued on Date	08/02/2024
Assessment Reference	Rev B	Prop Type Ref	Block Ev1
Project	Plot 31		
Calculation Type	New Build (As Designed)		

SAP Rating	83 B	DER	16.69	TER	20.60
Environmental	89 B	% DER<TER	18.98		
CO ₂ Emissions (t/year)	0.78	DFEE	49.89	TFEE	56.54
General Requirements Compliance	Pass	% DFEE<TFEE	11.76		

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

Floor 000003

Floor Type: Suspended Floor

Area = 43.48 m², Perimeter = 19.02 m, Wall thickness = 275.00 mm, Soil: Unknown

Depth of underfloor space below ground: 0.200 m Floor wind shielding: Average (suburban)

Floor height above ground: h = 0.200 m

U-value of walls above ground: U_w = 1.500 m

Ventilation openings per perimeter length: e = 0.0015 %

Mean wind speed: v = 5.000 m/s

Resistance on solum: R_g = 0.000 m²K/W

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				0.1700			
Layer 1	EPS 200 Lower portion						
	Main construction	55	0.0340	1.6176	80.65		
	Main construction	55	2.0000	0.0275	19.35		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 2	EPS Upper portion						
	Main construction	100	0.0340	2.9412	87.10		
	Main construction	100	2.0000	0.0500	12.90		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 3	Grey EPS 100 Topsheet						
	Main construction	155	0.0300	5.1667	100.00	15	1450
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 4	Screed						
	Main construction	75	1.1500	0.0652	100.00	1200	1000
Int surface				0.1700			

Total resistance: Upper limit = 9.271 m² K/W Lower limit = 6.052 m² K/W Average = 7.661 m² K/W
 Total correction = 0.0046 m² K/W U-value (unrounded) = 0.12 W/m² K

Unheated space: None

Total thickness: 385 mm

U-value: 0.12 W/m² K

Kappa: 90.00 kJ/m² K

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Property Reference	SAP 0931 Plot 31	Issued on Date	08/02/2024
Assessment Reference	Rev B	Prop Type Ref	Block Ev1
Property	Plot 31		

SAP Rating	83 B	DER	16.69	TER	20.60
Environmental	89 B	% DER<TER	18.98		
CO ₂ Emissions (t/year)	0.78	DFEE	49.89	TFEE	56.54
General Requirements Compliance	Pass	% DFEE<TFEE	11.76		

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

Orientation	South West
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	2.53 m

7.0 Living Area	29.48	m ²
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8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	278.56	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	30.00	26.63
	10.4N Brick and Block	Cavity Wall	Other	0.27	113.50	35.58	26.86
	Wall to Corridor	Cavity Wall	Other	0.29	113.50	19.28	19.28

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	102.07

10.1 Party Ceilings	Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
	Party Ceilings 1	Precast concrete plank floor (screed laid on rubber), carpeted	30.00	61.40

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)
Ground Floor	Ground Floor - Solid	Other	0.12	90.00	61.40

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] 10.4N Brick and Block	South West							2.15	
Windows	Window	[2] 10.4N Brick and Block	South West	None	0.00					4.89	
Side Elevation	Window	[2] 10.4N Brick and Block	North East	None	0.00					1.68	
East Elevation	Window	[1] Brick and Block	South East	None	0.00					3.37	

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)	8.39	0.043	No	Catnic Thermally Broken
Independently assessed	E3 Sill	7.36	0.021	No	Knauf P5
Independently assessed	E4 Jamb	17.70	0.016	No	Knauf P6
Table K1 - Approved	E5 Ground floor (normal)	33.54	0.160	No	
Table K1 - Approved	E7 Party floor between dwellings (in blocks of flats)	33.54	0.070	No	Knauf P15
Independently assessed	E16 Corner (normal)	14.12	0.061	No	Knauf P23
Independently assessed	E17 Corner (inverted – internal area greater than external area)	4.71	-0.113	No	Knauf P24

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

Mechanical Ventilation System Present

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

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

24.0 Main Heating 1	<input type="text" value="Database"/>	
Description	<input type="text" value="Gas Combi"/>	
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

28.0 Water Heating	<input type="text" value="HWP From main heating 1"/>
Water Heating	<input type="text" value="Main Heating 1"/>
Flue Gas Heat Recovery System	<input type="text" value="No"/>
Waste Water Heat Recovery Instantaneous System 1	<input type="text" value="No"/>
Waste Water Heat Recovery Instantaneous System 2	<input type="text" value="No"/>
Waste Water Heat Recovery Storage System	<input type="text" value="No"/>

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

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 %			