



elmhurst
energy



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: Plot 33

Contact: Tobias Whiting
Abacus Energy (UK) Ltd
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Report Issue Date: 08/02/2024

EXCELLENCE
IN ENERGY
ASSESSMENT

PREDICTED ENERGY ASSESSMENT

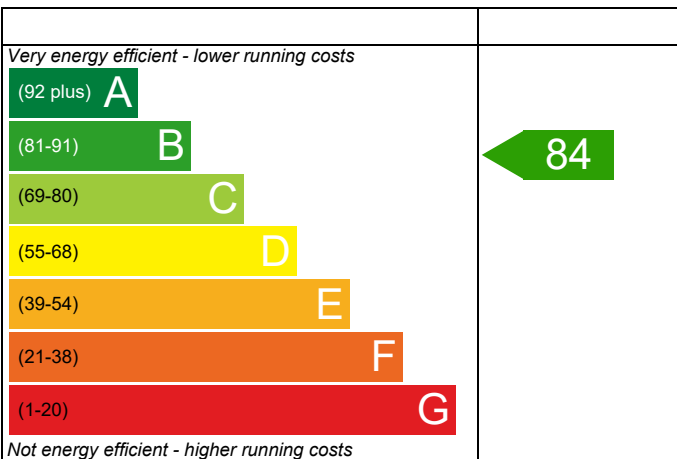
Plot 33

Dwelling type: Flat, Detached
 Date of assessment: 08/02/2024
 Produced by: Abacus Energy (UK) Ltd
 Total floor area: 61.4 m²
 DRRN: 4204-0928-8061

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

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

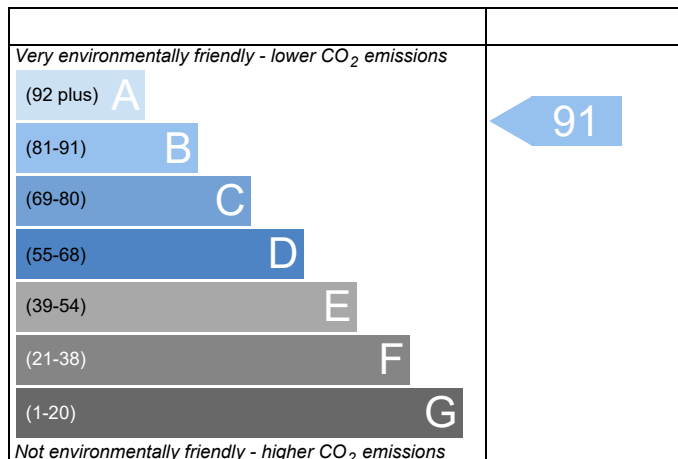
Energy Efficiency Rating



England EU Directive 2002/91/EC

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

Environmental Impact (CO₂) Rating



England EU Directive 2002/91/EC

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

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



BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Designed)

Property Reference	SAP 0931 Plot 33	Issued on Date	08/02/2024
Assessment Reference	Rev B	Prop Type Ref	Block Ev1
Property	Plot 33		

SAP Rating	84 B	DER	13.93	TER	18.04
Environmental	91 B	% DER<TER	22.80		
CO ₂ Emissions (t/year)	0.64	DFEE	38.67	TFEE	43.34
General Requirements Compliance	Pass	% DFEE<TFEE	10.78		

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)	18.04	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	13.93	kgCO ₂ /m ²	Pass
	-4.11 (-22.8%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	43.34	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	38.67	kWh/m ² /yr	
	-4.6 (-10.6%)	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
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

3.00 m², No overhang

Windows facing South West

4.89 m², No overhang

Air change rate

4.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

5.00 (design value) m³/(h.m²) @ 50 Pa

Maximum

10.0 m³/(h.m²) @ 50 Pa

Pass

10 Key features

Party wall U-value

0.00 W/m²K

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 84	B 91	

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THERMAL BRIDGING

Calculation Type: New Build (As Designed)

Property Reference	SAP 0931 Plot 33	Issued on Date	08/02/2024
Assessment Reference	Rev B	Prop Type Ref	Block Ev1
Property	Plot 33		

SAP Rating	84 B	DER	13.93	TER	18.04
Environmental	91 B	% DER<TER	22.80		
CO ₂ Emissions (t/year)	0.64	DFEE	38.67	TFEE	43.34
General Requirements Compliance	Pass	% DFEE<TFEE	10.78		

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	8.37	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	E7 Party floor between dwellings (in blocks of flats)	Table K1 - Approved	0.070	67.08	4.70	
External wall	E16 Corner (normal)	Independently assessed	0.061	14.75	0.90	Knauf P23
External wall	E17 Corner (inverted – internal area greater than external area)	Independently assessed	-0.113	4.92	-0.56	Knauf P24

Total: **5.84** W/mK:
 Y-Value: **0.071** W/m²K:

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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Property	Plot 33				
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Environmental	91 B	% DER<TER	22.80		
CO₂ Emissions (t/year)	0.64	DFEE	38.67	TFEE	43.34
General Requirements Compliance	Pass	% DFEE<TFEE	10.78		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com			Assessor ID	E477-0001
Client	Foreman Homes, FORE				

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

DWELLING AS DESIGNED

Mid-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) 18.04 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 13.93 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)43.3 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)38.7 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	(no floor)		
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: 3.00 m², No overhang
Windows facing South West: 4.89 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
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)	x 2.4600 (2b)	= 151.0440 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 151.0440 (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) =	0.1986 (8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate				0.4486	(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) =		0.4150 (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	0.5291	0.5187	0.5083	0.4565	0.4461	0.3942	0.3942	0.3838	0.4150	0.4461	0.4668	0.4876 (22b)
	0.6400	0.6345	0.6292	0.6042	0.5995	0.5777	0.5777	0.5737	0.5861	0.5995	0.6090	0.6189 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			9.5700	1.1450	10.9580		(27)
Brick and Block	38.5500	4.6800	33.8700	0.2200	7.4514	42.2200	1429.9914 (29a)
7.3N Brick and Block	25.8400	4.8900	20.9500	0.2700	5.6565	113.5000	2377.8250 (29a)
Wall to Corridor	18.1200	2.1200	16.0000	0.2300	3.6796	113.5000	1816.0000 (29a)
Total net area of external elements Aum, m2)			82.5100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.0775		(33)
Party Floor 1			61.4000			70.0000	4298.0000 (32d)
Party Ceilings 1			61.4000			70.0000	4298.0000 (32b)
Ground Floor Stud			95.5100			9.0000	859.5900 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	15079.4064 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							245.5929 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.8371 (36)
Total fabric heat loss						(33) + (36) =	35.9146 (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	31.8989	31.6280	31.3624	30.1151	29.8818	28.7955	28.7955	28.5943	29.2139	29.8818	30.3539	30.8474 (38)
Average = Sum(39)m / 12 =	67.8135	67.5425	67.2770	66.0297	65.7964	64.7101	64.7101	64.5089	65.1285	65.7964	66.2685	66.7620 (39)
												66.0286 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1045	1.1000	1.0957	1.0754	1.0716	1.0539	1.0539	1.0506	1.0607	1.0716	1.0793	1.0873 (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	16.4990	14.6543	11.9177	9.0224	6.7444	5.6939	6.1524	7.9972	10.7338	13.6290	15.9071	16.9576	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	176.4635	178.2946	173.6802	163.8567	151.4562	139.8015	132.0155	130.1844	134.7988	144.6223	157.0227	168.6774	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	(69)
Pumps, fans	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	309.6688	307.7251	296.3861	278.2543	260.0585	242.4090	230.8898	236.2859	245.5580	263.8774	284.8818	300.4358	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W					
Northeast	1.6800	11.2829	0.6300	0.7000	0.7700	5.7930	(75)						
Southeast	3.0000	36.7938	0.6300	0.7000	0.7700	33.7340	(77)						
Southwest	4.8900	36.7938	0.6300	0.7000	0.7700	54.9865	(79)						
Solar gains	94.5135	162.9156	228.0193	291.0938	333.8687	334.8938	321.4420	289.0042	249.7802	181.4345	113.5558	80.6571	(83)
Total gains	404.1823	470.6407	524.4054	569.3481	593.9273	577.3028	552.3318	525.2901	495.3382	445.3120	398.4376	381.0928	(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	61.7683	62.0161	62.2609	63.4369	63.6619	64.7306	64.7306	64.9325	64.3148	63.6619	63.2084	62.7411		
alpha	5.1179	5.1344	5.1507	5.2291	5.2441	5.3154	5.3154	5.3288	5.2877	5.2441	5.2139	5.1827		
util living area	0.9967	0.9923	0.9807	0.9444	0.8521	0.6778	0.5080	0.5529	0.7974	0.9606	0.9928	0.9975	(86)	
MIT	19.8586	20.0286	20.2773	20.5891	20.8334	20.9639	20.9935	20.9900	20.9142	20.5962	20.1739	19.8364	(87)	
Th 2	19.9972	20.0008	20.0043	20.0210	20.0241	20.0387	20.0387	20.0414	20.0330	20.0241	20.0178	20.0112	(88)	
util rest of house	0.9956	0.9898	0.9742	0.9253	0.8040	0.5917	0.4009	0.4438	0.7217	0.9431	0.9900	0.9967	(89)	
MIT 2	18.9615	19.1332	19.3812	19.6946	19.9136	20.0223	20.0370	20.0385	19.9874	19.7092	19.2923	18.9507	(90)	
Living area fraction	19.3922	19.5631	19.8114	20.1241	20.3553	20.4744	20.4962	20.4954	20.4324	20.1351	19.7156	19.3760	(92)	
Temperature adjustment	19.3922	19.5631	19.8114	20.1241	20.3553	20.4744	20.4962	20.4954	20.4324	20.1351	19.7156	0.0000		
adjusted MIT	19.3922	19.5631	19.8114	20.1241	20.3553	20.4744	20.4962	20.4954	20.4324	20.1351	19.7156	19.3760	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	402.0696	465.1678	510.0694	528.1339	488.0251	364.9635	249.9884	260.7720	374.1047	421.0431	394.0173	379.5922	(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	1023.4551	990.3855	895.5543	741.1219	569.4842	380.1339	252.1243	264.1868	412.4183	627.3741	836.0166	1013.1778	(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	462.3108	352.9463	286.8007	153.3514	60.6056	0.0000	0.0000	0.0000	0.0000	153.5103	318.2395	471.3877	(98)
Space heating												2259.1522	(98)
Space heating per m2												36.7940	(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													2504.6033 (211)
Space heating requirement	462.3108	352.9463	286.8007	153.3514	60.6056	0.0000	0.0000	0.0000	0.0000	153.5103	318.2395	471.3877	(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)	512.5397	391.2930	317.9609	170.0126	67.1902	0.0000	0.0000	0.0000	0.0000	170.1888	352.8154	522.6027	(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	86.5943	86.2197	85.5068	83.8842	80.8748	76.2000	76.2000	76.2000	76.2000	83.7559	85.8602	86.7305	(216)
Fuel for water heating, kWh/month	156.4533	137.3782	142.8904	126.9375	126.2845	115.6159	107.1351	122.9852	124.5007	132.0537	140.6667	151.2788	(219)
Water heating fuel used													1584.1801 (219)
Annual totals kWh/year													
Space heating fuel - main system													2504.6033 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													75.0000 (231)
Electricity for lighting (calculated in Appendix L)													291.3776 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses													4455.1609 (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	2504.6033	0.2160	540.9943	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1584.1801	0.2160	342.1829	(264)
Space and water heating			883.1772	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	291.3776	0.5190	151.2250	(268)
Energy saving/generation technologies				
PV Unit	-420.0000	0.5190	-217.9800	(269)
Total CO2, kg/year			855.3472	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			13.9300	(273)

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

DER			13.9300	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			33.6888	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			33.6888	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	61.4000 (1b)	2.4600 (2b)	151.0440 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	151.0440 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				2 * 10 =	20.0000 (7a)
Number of passive vents				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) =	0.1324 (8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate				0.3824	0.3824 (18)
Number of sides sheltered				1	1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3537 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate												
Effective ac	0.4510	0.4422	0.4333	0.3891	0.3803	0.3360	0.3360	0.3272	0.3537	0.3803	0.3979	0.4156 (22b)
Effective ac	0.6017	0.5978	0.5939	0.5757	0.5723	0.5565	0.5565	0.5535	0.5626	0.5723	0.5792	0.5864 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K					
TER Opaque door			2.1200	1.0000	2.1200		(26)					
TER Opening Type (Uw = 1.40)			9.5700	1.3258	12.6875		(27)					
Brick and Block	38.5500	4.6800	33.8700	0.1800	6.0966		(29a)					
7.3N Brick and Block	25.8400	4.8900	20.9500	0.1800	3.7710		(29a)					
Wall to Corridor	18.1200	2.1200	16.0000	0.1800	2.8800		(29a)					
Total net area of external elements Aum(A, m ²)			82.5100				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	27.5551	(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.2518 (36)					
Total fabric heat loss							(33) + (36) =					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	29.9916	29.7948	29.6018	28.6955	28.5260	27.7366	27.7366	27.5905	28.0407	28.5260	28.8690	29.2276 (38)
Heat transfer coeff	64.7985	64.6017	64.4087	63.5024	63.3329	62.5435	62.5435	62.3974	62.8476	63.3329	63.6759	64.0345 (39)
Average = Sum(39)m / 12 =												63.5016 (39)
HLP	1.0554	1.0521	1.0490	1.0342	1.0315	1.0186	1.0186	1.0162	1.0236	1.0315	1.0371	1.0429 (40)
HLP (average)												1.0342 (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 =
Distribution loss (46)m = 0.15 x (45)m	20.1128	17.5908	18.1521	15.8255	15.1849	13.1034	12.1422	13.9334	14.0998	16.4320	17.9368	19.4782 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi loss	46.0754	40.1032	42.7245	39.7248	39.3735	36.4820	37.6980	39.3735	39.7248	42.7245	42.9677	46.0754 (61)
Total heat required for water heating calculated for each 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 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	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)
Heat gains from water heating, kWh/month	56.1023	49.0187	50.9183	45.0110	43.5033	38.1664	36.3398	40.7291	41.1858	47.1053	50.5018	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)m	101.0464	101.0464	101.0464	101.0464	101.0464	101.0464	101.0464	101.0464	101.0464	101.0464	101.0464	101.0464 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.4990	14.6543	11.9177	9.0224	6.7444	5.6939	6.1524	7.9972	10.7338	13.6290	15.9071	16.9576 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	176.4635	178.2946	173.6802	163.8567	151.4562	139.8015	132.0155	130.1844	134.7988	144.6223	157.0227	168.6774 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046 (69)
Pumps, fans	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	324.6827	322.2073	310.3504	291.7083	272.9866	254.8183	243.3257	249.2389	259.0490	277.8789	299.3851	315.4644 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	1.6800	11.2829	0.6300	0.7000	0.7700	5.7930 (75)
Southeast	3.0000	36.7938	0.6300	0.7000	0.7700	33.7340 (77)
Southwest	4.8900	36.7938	0.6300	0.7000	0.7700	54.9865 (79)

Solar gains	94.5135	162.9156	228.0193	291.0938	333.8687	334.8938	321.4420	289.0042	249.7802	181.4345	113.5558	80.6571 (83)
Total gains	419.1961	485.1229	538.3696	582.8020	606.8553	589.7121	564.7678	538.2431	508.8292	459.3134	412.9409	396.1215 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, T _{hl} (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	65.8023	66.0028	66.2005	67.1453	67.3251	68.1747	68.1747	68.3345	67.8449	67.3251	66.9624	66.5874
alpha	5.3868	5.4002	5.4134	5.4764	5.4883	5.5450	5.5450	5.5556	5.5230	5.4883	5.4642	5.4392
util living area	0.9963	0.9913	0.9779	0.9362	0.8330	0.6511	0.4826	0.5256	0.7718	0.9537	0.9917	0.9972 (86)
MIT	19.9658	20.1291	20.3651	20.6519	20.8695	20.9745	20.9959	20.9935	20.9359	20.6551	20.2573	19.9380 (87)
Th 2	20.0375	20.0401	20.0427	20.0549	20.0572	20.0678	20.0678	20.0698	20.0637	20.0572	20.0526	20.0477 (88)
util rest of house	0.9951	0.9884	0.9706	0.9151	0.7827	0.5677	0.3829	0.4233	0.6951	0.9339	0.9885	0.9963 (89)
MIT 2	18.6637	18.9029	19.2445	19.6543	19.9329	20.0513	20.0663	20.0672	20.0153	19.6679	19.0997	18.6308 (90)
Living area fraction	fLA = Living area / (4) =											0.4801 (91)
MIT	19.2889	19.4917	19.7825	20.1333	20.3826	20.4945	20.5126	20.5119	20.4573	20.1419	19.6555	19.2584 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2889	19.4917	19.7825	20.1333	20.3826	20.4945	20.5126	20.5119	20.4573	20.1419	19.6555	19.2584 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	416.6057	478.5128	521.2261	534.4954	486.2893	357.9552	243.3607	254.3676	371.0931	429.9060	407.4631	394.2679 (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	971.2569	942.6456	855.5104	713.3426	549.8909	368.6657	244.7090	256.5744	399.5426	604.3150	799.4811	964.2603 (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	412.6605	311.8972	248.7075	128.7700	47.3196	0.0000	0.0000	0.0000	0.0000	129.7603	282.2529	424.0743 (98)
Space heating												1985.4424 (98)
Space heating per m2												32.3362 (99)

8c. Space cooling requirement

Not applicable

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2125.7413 (211)
Space heating requirement	412.6605	311.8972	248.7075	128.7700	47.3196	0.0000	0.0000	0.0000	0.0000	129.7603	282.2529	424.0743	(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)	441.8206	333.9371	266.2822	137.8694	50.6634	0.0000	0.0000	0.0000	0.0000	138.9296	302.1980	454.0410	(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	87.0717	86.7412	86.1007	84.7500	82.6244	80.3000	80.3000	80.3000	80.3000	84.6514	86.4274	87.1846	(216)
Fuel for water heating, kWh/month	206.9108	181.4307	190.1711	171.3604	170.1752	154.2193	147.7539	164.7110	166.5300	179.8800	188.0725	201.7901	(219)
Water heating fuel used													2123.0050 (219)
Annual totals kWh/year													
Space heating fuel - main system													2125.7413 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													75.0000 (231)
Electricity for lighting (calculated in Appendix L)													291.3776 (232)
Total delivered energy for all uses													4615.1238 (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	2125.7413	0.2160	459.1601 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2123.0050	0.2160	458.5691 (264)
Space and water heating			917.7292 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	291.3776	0.5190	151.2250 (268)
Total CO2, kg/m2/year			1107.8792 (272)
Emissions per m2 for space and water heating			14.9467 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4629 (272b)
Emissions per m2 for pumps and fans			0.6340 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.9467 * 1.00) + 2.4629 + 0.6340, rounded to 2 d.p.			18.0400 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	61.4000 (1b)	2.4600 (2b)	151.0440 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.4000		151.0440 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	151.0440 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				2 * 10 =	20.0000 (7a)
Number of passive vents				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) =	0.1324 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3824 (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) =	0.3537 (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	0.4510	0.4422	0.4333	0.3891	0.3803	0.3360	0.3360	0.3272	0.3537	0.3803	0.3979	0.4156 (22b)
Effective ac	0.6017	0.5978	0.5939	0.5757	0.5723	0.5565	0.5565	0.5535	0.5626	0.5723	0.5792	0.5864 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			9.5700	1.1450	10.9580		(27)
Brick and Block	38.5500	4.6800	33.8700	0.2200	7.4514	42.2200	1429.9914 (29a)
7.3N Brick and Block	25.8400	4.8900	20.9500	0.2700	5.6565	113.5000	2377.8250 (29a)
Wall to Corridor	18.1200	2.1200	16.0000	0.2300	3.6796	113.5000	1816.0000 (29a)
Total net area of external elements Aum, m ²			82.5100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.0775		(33)
Party Floor 1			61.4000			70.0000	4298.0000 (32d)
Party Ceilings 1			61.4000			30.0000	1842.0000 (32b)
Ground Floor Stud			95.5100			9.0000	859.5900 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	12623.4064 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							205.5929 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.8371 (36)
Total fabric heat loss						(33) + (36) =	35.9146 (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	29.9916	29.7948	29.6018	28.6955	28.5260	27.7366	27.7366	27.5905	28.0407	28.5260	28.8690	29.2276 (38)
Heat transfer coeff	65.9062	65.7094	65.5164	64.6101	64.4406	63.6512	63.6512	63.5050	63.9553	64.4406	64.7836	65.1422 (39)
Average = Sum(39)m / 12 =												64.6093 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0734	1.0702	1.0670	1.0523	1.0495	1.0367	1.0367	1.0343	1.0416	1.0495	1.0551	1.0609 (40)
HLP (average)												1.0523 (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:												

FULL SAP CALCULATION PRINTOUT

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	16.4990	14.6543	11.9177	9.0224	6.7444	5.6939	6.1524	7.9972	10.7338	13.6290	15.9071	16.9576	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	176.4635	178.2946	173.6802	163.8567	151.4562	139.8015	132.0155	130.1844	134.7988	144.6223	157.0227	168.6774	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	(71)
Water heating gains (Table 5)	38.2973	37.0838	34.5639	31.1381	28.9139	25.7822	23.1203	26.5309	27.7427	31.2885	35.2923	37.0888	(72)
Total internal gains	284.5736	283.3466	273.4756	257.3311	240.4284	224.5915	214.6022	218.0264	226.5892	242.8537	261.5360	276.0378	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	1.6800	11.2829	0.6300	0.7000	0.7700	5.7930 (75)
Southeast	3.0000	36.7938	0.6300	0.7000	0.7700	33.7340 (77)
Southwest	4.8900	36.7938	0.6300	0.7000	0.7700	54.9865 (79)

Solar gains	94.5135	162.9156	228.0193	291.0938	333.8687	334.8938	321.4420	289.0042	249.7802	181.4345	113.5558	80.6571	(83)
Total gains	379.0871	446.2622	501.4949	548.4249	574.2971	559.4854	536.0442	507.0306	476.3694	424.2883	375.0918	356.6949	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, 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)	53.2044	53.3638	53.5210	54.2717	54.4145	55.0893	55.0893	55.2161	54.8274	54.4145	54.1264	53.8284	(85)
tau	4.5470	4.5576	4.5681	4.6181	4.6276	4.6726	4.6726	4.6811	4.6552	4.6276	4.6084	4.5886	
util living area	0.9948	0.9886	0.9737	0.9328	0.8394	0.6743	0.5101	0.5568	0.7903	0.9521	0.9896	0.9961	(86)
MIT	19.6913	19.8836	20.1638	20.5090	20.7868	20.9451	20.9880	20.9821	20.8820	20.5160	20.0388	19.6595	(87)
Th 2	20.0226	20.0253	20.0278	20.0400	20.0423	20.0529	20.0529	20.0549	20.0488	20.0423	20.0377	20.0329	(88)
util rest of house	0.9934	0.9855	0.9664	0.9134	0.7941	0.5933	0.4062	0.4513	0.7202	0.9343	0.9863	0.9950	(89)
MIT 2	18.8295	19.0223	19.3003	19.6423	19.8940	20.0252	20.0492	20.0489	19.9807	19.6567	19.1874	18.8059	(90)
Living area fraction	19.2433	19.4359	19.7149	20.0584	20.3227	20.4669	20.4999	20.4970	20.4134	20.0693	19.5962	19.2158	(92)
MIT	19.2433	19.4359	19.7149	20.0584	20.3227	20.4669	20.4999	20.4970	20.4134	20.0693	19.5962	19.2158	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2433	19.4359	19.7149	20.0584	20.3227	20.4669	20.4999	20.4970	20.4134	20.0693	19.5962	19.2158	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains	376.0355	438.7403	483.2020	501.1450	464.3018	352.5473	244.5360	254.4732	356.8566	396.6591	369.2035	354.4739	(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	984.8548	955.1433	865.7931	720.9478	555.6508	373.4340	248.2350	260.1772	403.7769	610.2053	809.5486	978.1600	(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	452.9616	347.0228	284.6478	158.2580	67.9637	0.0000	0.0000	0.0000	0.0000	158.8783	317.0484	464.0225	(98)	
Space heating												2250.8030	(98)	
Space heating per m2												(98) / (4) =	36.6580	(99)

8c. Space cooling requirement

Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	598.3215	471.0190	482.6383	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8946	0.9428	0.9281	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	535.2569	444.0657	447.9406	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	729.6754	700.8160	668.1910	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	139.9813	191.0222	163.8663	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												494.8698 (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	34.9953	47.7556	40.9666	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												123.7175 (107)
Space cooling per m2												2.0149 (108)
Energy for space heating												36.6580 (99)
Energy for space cooling												2.0149 (108)
Total												38.6730 (109)
Dwelling Fabric Energy Efficiency (DFEE)												38.7 (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)	x 2.4600 (2b)	= 151.0440 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 151.0440 (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) =	0.1324 (8)
Pressure test				Yes	
Measured/design AP50					5.0000
Infiltration rate					0.3824 (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) =		0.3537 (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	0.4510	0.4422	0.4333	0.3891	0.3803	0.3360	0.3360	0.3272	0.3537	0.3803	0.3979	0.4156 (22b)
Effective ac	0.6017	0.5978	0.5939	0.5757	0.5723	0.5565	0.5565	0.5535	0.5626	0.5723	0.5792	0.5864 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.40)			9.5700	1.3258	12.6875		(27)
Brick and Block	38.5500	4.6800	33.8700	0.1800	6.0966		(29a)
7.3N Brick and Block	25.8400	4.8900	20.9500	0.1800	3.7710		(29a)
Wall to Corridor	18.1200	2.1200	16.0000	0.1800	2.8800		(29a)
Total net area of external elements Aum(A, m2)			82.5100				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	27.5551	(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.2518 (36)
Total fabric heat loss							(33) + (36) = 34.8069 (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	29.9916	29.7948	29.6018	28.6955	28.5260	27.7366	27.7366	27.5905	28.0407	28.5260	28.8690	29.2276 (38)
Average = Sum(39)m / 12 =	64.7985	64.6017	64.4087	63.5024	63.3329	62.5435	62.5435	62.3974	62.8476	63.3329	63.6759	64.0345 (39)
												63.5016 (39)
HLP	1.0554	1.0521	1.0490	1.0342	1.0315	1.0186	1.0186	1.0162	1.0236	1.0315	1.0371	1.0429 (40)
HLP (average)												1.0342 (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												
Average daily hot water use (litres/day)												2.0209 (42)
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												Total = Sum(45)m = 1293.2798 (45)
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Total storage loss												0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	28.4932	24.9203	25.7155	22.4194	21.5120	18.5632	17.2015	19.7390	19.9747	23.2786	25.4104	27.5941 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	101.0464	101.0464	101.0464	101.0464	101.0464	101.0464	101.0464	101.0464	101.0464	101.0464	101.0464	101.0464 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.4990	14.6543	11.9177	9.0224	6.7444	5.6939	6.1524	7.9972	10.7338	13.6290	15.9071	16.9576 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	176.4635	178.2946	173.6802	163.8567	151.4562	139.8015	132.0155	130.1844	134.7988	144.6223	157.0227	168.6774 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371 (71)
Water heating gains (Table 5)	38.2973	37.0838	34.5639	31.1381	28.9139	25.7822	23.1203	26.5309	27.7427	31.2885	35.2923	37.0888 (72)
Total internal gains	284.5736	283.3466	273.4756	257.3311	240.4284	224.5915	214.6022	218.0264	226.5892	242.8537	261.5360	276.0378 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
Northeast	1.6800	11.2829	0.6300	0.7000	0.7700	5.7930 (75)						
Southeast	3.0000	36.7938	0.6300	0.7000	0.7700	33.7340 (77)						
Southwest	4.8900	36.7938	0.6300	0.7000	0.7700	54.9865 (79)						
Solar gains	94.5135	162.9156	228.0193	291.0938	333.8687	334.8938	321.4420	289.0042	249.7802	181.4345	113.5558	80.6571 (83)
Total gains	379.0871	446.2622	501.4949	548.4249	574.2971	559.4854	536.0442	507.0306	476.3694	424.2883	375.0918	356.6949 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, 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	65.8023	66.0028	66.2005	67.1453	67.3251	68.1747	68.1747	68.3345	67.8449	67.3251	66.9624	66.5874	
alpha	5.3868	5.4002	5.4134	5.4764	5.4883	5.5450	5.5450	5.5556	5.5230	5.4883	5.4642	5.4392	
util living area	0.9977	0.9941	0.9837	0.9491	0.8564	0.6796	0.5071	0.5554	0.8043	0.9662	0.9947	0.9983 (86)	
MIT	19.9044	20.0711	20.3134	20.6127	20.8481	20.9686	20.9947	20.9915	20.9209	20.6112	20.2004	19.8773 (87)	
Th 2	20.0375	20.0401	20.0427	20.0549	20.0572	20.0678	20.0678	20.0698	20.0637	20.0572	20.0526	20.0477 (88)	
util rest of house	0.9970	0.9921	0.9781	0.9313	0.8094	0.5951	0.4030	0.4486	0.7304	0.9508	0.9926	0.9978 (89)	
MIT 2	19.0385	19.2064	19.4479	19.7461	19.9564	20.0537	20.0665	20.0674	20.0216	19.7515	19.3460	19.0199 (90)	
Living area fraction	fLA = Living area / (4) =												
MIT	19.4543	19.6216	19.8634	20.1622	20.3845	20.4930	20.5122	20.5111	20.4534	20.1643	19.7562	19.4315 (92)	
Temperature adjustment	0.0000												
adjusted MIT	19.4543	19.6216	19.8634	20.1622	20.3845	20.4930	20.5122	20.5111	20.4534	20.1643	19.7562	19.4315 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9963	0.9910	0.9769	0.9336	0.8270	0.6350	0.4532	0.5002	0.7634	0.9529	0.9918	0.9973 (94)
Useful gains	377.7030	442.2499	489.8905	512.0228	474.9621	355.2731	242.9520	253.6121	363.6495	404.2933	371.9989	355.7418 (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	981.9737	951.0376	860.7226	715.1771	550.0151	368.5672	244.6809	256.5226	399.2967	605.7317	805.8958	975.3445 (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	449.5774	341.9053	275.8991	146.2711	55.8394	0.0000	0.0000	0.0000	0.0000	149.8702	312.4058	460.9843 (98)
Space heating	2192.7526 (98)											
Space heating per m ²	(98) / (4) = 35.7126 (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	587.9091	462.8221	474.2199	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9225	0.9636	0.9517	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	542.3536	445.9582	451.3142	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	729.6754	700.8160	668.1910	0.0000	0.0000	0.0000	0.0000 (103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	134.8717	189.6142	161.3564	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling	485.8423 (104)											
Cooled fraction	fC = cooled area / (4) = 1.0000 (105)											

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	33.7179	47.4036	40.3391	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling											121.4606	(107)
Space cooling per m2											1.9782	(108)
Energy for space heating											35.7126	(99)
Energy for space cooling											1.9782	(108)
Total											37.6908	(109)
Target Fabric Energy Efficiency (TFEE)											43.3	(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)	2.4600 (2b)	151.0440 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	151.0440 (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) =	0.1986 (8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate				0.4486	(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) =		0.4150 (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	0.5291	0.4876	0.4772	0.4461	0.4461	0.4150	0.4150	0.4046	0.4150	0.4668	0.4565	0.4876 (22b)
Effective ac	0.6400	0.6189	0.6139	0.5995	0.5995	0.5861	0.5861	0.5818	0.5861	0.6090	0.6042	0.6189 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			9.5700	1.1450	10.9580		(27)
Brick and Block	38.5500	4.6800	33.8700	0.2200	7.4514	42.2200	1429.9914 (29a)
7.3N Brick and Block	25.8400	4.8900	20.9500	0.2700	5.6565	113.5000	2377.8250 (29a)
Wall to Corridor	18.1200	2.1200	16.0000	0.2300	3.6796	113.5000	1816.0000 (29a)
Total net area of external elements Aum, m2)			82.5100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.0775		(33)
Party Floor 1			61.4000			70.0000	4298.0000 (32d)
Party Ceilings 1			61.4000			70.0000	4298.0000 (32b)
Ground Floor Stud			95.5100			9.0000	859.5900 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	15079.4064 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							245.5929 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.8371 (36)
Total fabric heat loss						(33) + (36) =	35.9146 (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	31.8989	30.8474	30.5980	29.8818	29.8818	29.2139	29.2139	29.0020	29.2139	30.3539	30.1151	30.8474 (38)
Average = Sum(39)m / 12 =	67.8135	66.7620	66.5126	65.7964	65.7964	65.1285	65.1285	64.9166	65.1285	66.2685	66.0297	66.7620 (39)
												66.0036 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1045	1.0873	1.0833	1.0716	1.0716	1.0607	1.0607	1.0573	1.0607	1.0793	1.0754	1.0873 (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 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	41.2475	36.6357	29.7941	22.5561	16.8609	14.2347	15.3811	19.9929	26.8345	34.0725	39.7677	42.3939	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	263.3783	266.1113	259.2242	244.5622	226.0540	208.6590	197.0381	194.3050	201.1922	215.8542	234.3623	251.7573	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.1465	49.1465	49.1465	49.1465	49.1465	49.1465	49.1465	49.1465	49.1465	49.1465	49.1465	49.1465	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	(71)
Water heating gains (Table 5)	60.3924	58.4623	54.4743	49.0613	45.5440	40.5996	36.4079	41.7904	43.7115	49.3122	55.6381	58.4868	(72)
Total internal gains	457.5833	453.7744	436.0577	408.7446	381.0241	356.0584	341.3921	348.6534	364.3033	391.8040	422.3332	445.2032	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
Northeast	1.6800	15.0428	0.6300	0.7700	0.7700	7.7234	(75)						
Southeast	3.0000	46.3896	0.6300	0.7700	0.7700	42.5318	(77)						
Southwest	4.8900	46.3896	0.6300	0.7700	0.7700	69.3268	(79)						
Solar gains	119.5820	176.2628	246.1136	321.9507	354.8460	386.2399	361.4347	330.2406	286.4858	207.7681	142.3705	97.4474	(83)
Total gains	577.1653	630.0372	682.1713	730.6953	735.8701	742.2983	702.8269	678.8941	650.7890	599.5720	564.7036	542.6506	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area, nil,m (see Table 9a)	0.9790	0.9670	0.9331	0.8506	0.7010	0.4854	0.3421	0.3529	0.5836	0.8460	0.9535	0.9829	(86)
MIT	20.2290	20.3531	20.5686	20.7977	20.9420	20.9931	20.9991	20.9990	20.9827	20.8390	20.5383	20.2131	(87)
Th 2	19.9972	20.0112	20.0145	20.0241	20.0241	20.0330	20.0330	20.0359	20.0330	20.0178	20.0210	20.0112	(88)
util rest of house	0.9726	0.9574	0.9140	0.8121	0.6356	0.4044	0.2531	0.2614	0.4969	0.7962	0.9376	0.9776	(89)
MIT 2	19.3268	19.4584	19.6656	19.8786	19.9914	20.0306	20.0329	20.0357	20.0261	19.9121	19.6469	19.3233	(90)
Living area fraction	19.7600	19.8880	20.0991	20.3199	20.4478	20.4927	20.4968	20.4982	20.4854	20.3571	20.0749	19.7505	(92)
MIT	19.7600	19.8880	20.0991	20.3199	20.4478	20.4927	20.4968	20.4982	20.4854	20.3571	20.0749	19.7505	(93)
Temperature adjustment												0.0000	
adjusted MIT	19.7600	19.8880	20.0991	20.3199	20.4478	20.4927	20.4968	20.4982	20.4854	20.3571	20.0749	19.7505	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	560.3130	602.3145	624.7740	602.5682	489.3720	329.0730	207.9678	207.3476	350.3362	488.5351	530.0520	529.5418	(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	973.8023	947.2175	851.3036	705.3291	516.3593	331.6816	208.2035	207.6174	357.2559	567.0691	770.8890	951.3929	(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	307.6360	231.7748	168.5380	73.9879	20.0786	0.0000	0.0000	0.0000	0.0000	58.4293	173.4026	313.8572	(98)
Space heating												1347.7045	(98)
RHI space heating demand												1348	(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)	2.4600 (2b)	151.0440 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	151.0440 (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) =	0.1986 (8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate				0.4486	(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) =		0.4150 (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	0.5291	0.5187	0.5083	0.4565	0.4461	0.3942	0.3942	0.3838	0.4150	0.4461	0.4668	0.4876 (22b)
	0.6400	0.6345	0.6292	0.6042	0.5995	0.5777	0.5777	0.5737	0.5861	0.5995	0.6090	0.6189 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			9.5700	1.1450	10.9580		(27)
Brick and Block	38.5500	4.6800	33.8700	0.2200	7.4514	42.2200	1429.9914 (29a)
7.3N Brick and Block	25.8400	4.8900	20.9500	0.2700	5.6565	113.5000	2377.8250 (29a)
Wall to Corridor	18.1200	2.1200	16.0000	0.2300	3.6796	113.5000	1816.0000 (29a)
Total net area of external elements Aum, m2)			82.5100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.0775		(33)
Party Floor 1			61.4000			70.0000	4298.0000 (32d)
Party Ceilings 1			61.4000			70.0000	4298.0000 (32b)
Ground Floor Stud			95.5100			9.0000	859.5900 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	15079.4064 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							245.5929 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.8371 (36)
Total fabric heat loss						(33) + (36) =	35.9146 (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	31.8989	31.6280	31.3624	30.1151	29.8818	28.7955	28.7955	28.5943	29.2139	29.8818	30.3539	30.8474 (38)
Average = Sum(39)m / 12 =	67.8135	67.5425	67.2770	66.0297	65.7964	64.7101	64.7101	64.5089	65.1285	65.7964	66.2685	66.7620 (39)
												66.0286 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1045	1.1000	1.0957	1.0754	1.0716	1.0539	1.0539	1.0506	1.0607	1.0716	1.0793	1.0873 (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												Total = Sum(45)m = 1293.2798 (45)
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)

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	41.2475	36.6357	29.7941	22.5561	16.8609	14.2347	15.3811	19.9929	26.8345	34.0725	39.7677	42.3939	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	263.3783	266.1113	259.2242	244.5622	226.0540	208.6590	197.0381	194.3050	201.1922	215.8542	234.3623	251.7573	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.1465	49.1465	49.1465	49.1465	49.1465	49.1465	49.1465	49.1465	49.1465	49.1465	49.1465	49.1465	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	(71)
Water heating gains (Table 5)	60.3924	58.4623	54.4743	49.0613	45.5440	40.5996	36.4079	41.7904	43.7115	49.3122	55.6381	58.4868	(72)
Total internal gains	457.5833	453.7744	436.0577	408.7446	381.0241	356.0584	341.3921	348.6534	364.3033	391.8040	422.3332	445.2032	(73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W					
Northeast	1.6800	11.2829	0.6300	0.7000	0.7700	5.7930	(75)						
Southeast	3.0000	36.7938	0.6300	0.7000	0.7700	33.7340	(77)						
Southwest	4.8900	36.7938	0.6300	0.7000	0.7700	54.9865	(79)						
Solar gains	94.5135	162.9156	228.0193	291.0938	333.8687	334.8938	321.4420	289.0042	249.7802	181.4345	113.5558	80.6571	(83)
Total gains	552.0968	616.6900	664.0770	699.8384	714.8928	690.9522	662.8342	637.6576	614.0834	573.2385	535.8889	525.8603	(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	61.7683	62.0161	62.2609	63.4369	63.6619	64.7306	64.7306	64.9325	64.3148	63.6619	63.2084	62.7411	
alpha	5.1179	5.1344	5.1507	5.2291	5.2441	5.3154	5.3154	5.3288	5.2877	5.2441	5.2139	5.1827	
util living area	0.9869	0.9757	0.9514	0.8895	0.7682	0.5829	0.4268	0.4611	0.6880	0.9042	0.9743	0.9894	(86)
MIT	20.0807	20.2395	20.4614	20.7225	20.9012	20.9820	20.9971	20.9957	20.9576	20.7387	20.3728	20.0563	(87)
Th 2	19.9972	20.0008	20.0043	20.0210	20.0241	20.0387	20.0387	20.0414	20.0330	20.0241	20.0178	20.0112	(88)
util rest of house	0.9830	0.9687	0.9373	0.8589	0.7115	0.5023	0.3350	0.3672	0.6079	0.8709	0.9656	0.9863	(89)
MIT 2	19.1809	19.3392	19.5561	19.8115	19.9626	20.0310	20.0379	20.0402	20.0124	19.8339	19.4856	19.1685	(90)
Living area fraction	19.6130	19.7715	19.9908	20.2489	20.4133	20.4876	20.4985	20.4990	20.4662	20.2683	19.9116	19.5948	(92)
Temperature adjustment	19.6130	19.7715	19.9908	20.2489	20.4133	20.4876	20.4985	20.4990	20.4662	20.2683	19.9116	0.0000	(91)
adjusted MIT	19.6130	19.7715	19.9908	20.2489	20.4133	20.4876	20.4985	20.4990	20.4662	20.2683	19.9116	19.5948	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9811	0.9668	0.9371	0.8667	0.7352	0.5407	0.3792	0.4124	0.6452	0.8802	0.9645	0.9846	(94)
Useful gains	541.6825	596.2136	622.3189	606.5693	525.5917	373.5956	251.3481	262.9940	396.1826	504.5521	516.8527	517.7654	(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	1038.4245	1004.4590	907.6186	749.3641	573.3008	380.9881	252.2702	264.4202	414.6217	636.1423	849.0053	1027.7870	(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	369.5760	274.3409	212.2630	102.8122	35.4956	0.0000	0.0000	0.0000	0.0000	97.9031	239.1499	379.4561	(98)
Space heating												1710.9967	(98)
Space heating per m ²												27.8664	(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													1896.8921 (211)
Space heating requirement	369.5760	274.3409	212.2630	102.8122	35.4956	0.0000	0.0000	0.0000	0.0000	97.9031	239.1499	379.4561	(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)	409.7295	304.1473	235.3248	113.9825	39.3521	0.0000	0.0000	0.0000	0.0000	108.5400	265.1329	420.6830	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	135.4797	118.4470	122.1810	106.4804	102.1322	88.0993	81.6370	93.7147	94.8695	110.6027	120.7767	131.2048	(64)
Efficiency of water heater (217)m	85.9634	85.4649	84.5266	82.4894	79.3775	76.2000	76.2000	76.2000	76.2000	82.1899	84.9620	86.1340	(216)
Fuel for water heating, kWh/month	157.6016	138.5914	144.5474	129.0838	128.6665	115.6159	107.1351	122.9852	124.5007	134.5698	142.1539	152.3264	(219)
Water heating fuel used													1597.7777 (219)
Annual totals kWh/year													
Space heating fuel - main system													1896.8921 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													75.0000 (231)
Electricity for lighting (calculated in Appendix L)													291.3776 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses													3861.0474 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1896.8921	3.4800	66.0118 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1597.7777	3.4800	55.6027 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	291.3776	13.1900	38.4327 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	0.0000	13.1900	0.0000 (252)
Total energy cost			289.9397 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.1445 (257)
SAP value		84.0342
SAP rating (Section 12)		84 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1896.8921	0.2160	409.7287 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1597.7777	0.2160	345.1200 (264)
Space and water heating			754.8487 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	291.3776	0.5190	151.2250 (268)
Energy saving/generation technologies			
PV Unit	-420.0000	0.5190	-217.9800 (269)
Total kg/year			727.0186 (272)
CO2 emissions per m2			11.8400 (273)
EI value			90.8439
EI rating			91 (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	$3.48 / 0.8133 = 4.279$, stars = 4
Water heating environmental impact	$0.216 / 0.8133 = 0.2656$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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)	x 2.4600 (2b)	= 151.0440 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 151.0440 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					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) = 0.1986 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4486 (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) =	0.4150 (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	0.5291	0.4876	0.4772	0.4461	0.4461	0.4150	0.4150	0.4046	0.4150	0.4668	0.4565	0.4876 (22b)
Effective ac	0.6400	0.6189	0.6139	0.5995	0.5995	0.5861	0.5861	0.5818	0.5861	0.6090	0.6042	0.6189 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			9.5700	1.1450	10.9580		(27)
Brick and Block	38.5500	4.6800	33.8700	0.2200	7.4514	42.2200	1429.9914 (29a)
7.3N Brick and Block	25.8400	4.8900	20.9500	0.2700	5.6565	113.5000	2377.8250 (29a)
Wall to Corridor	18.1200	2.1200	16.0000	0.2300	3.6796	113.5000	1816.0000 (29a)
Total net area of external elements Aum, m2)			82.5100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.0775		(33)
Party Floor 1			61.4000			70.0000	4298.0000 (32d)
Party Ceilings 1			61.4000			70.0000	4298.0000 (32b)
Ground Floor Stud			95.5100			9.0000	859.5900 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	15079.4064 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							245.5929 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.8371 (36)
Total fabric heat loss						(33) + (36) =	35.9146 (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	31.8989	30.8474	30.5980	29.8818	29.8818	29.2139	29.2139	29.0020	29.2139	30.3539	30.1151	30.8474 (38)
Average = Sum(39)m / 12 =	67.8135	66.7620	66.5126	65.7964	65.7964	65.1285	65.1285	64.9166	65.1285	66.2685	66.0297	66.7620 (39)
												66.0036 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1045	1.0873	1.0833	1.0716	1.0716	1.0607	1.0607	1.0573	1.0607	1.0793	1.0754	1.0873 (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 EPC COSTS, EMISSIONS AND PRIMARY ENERGY 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	41.2475	36.6357	29.7941	22.5561	16.8609	14.2347	15.3811	19.9929	26.8345	34.0725	39.7677	42.3939	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	263.3783	266.1113	259.2242	244.5622	226.0540	208.6590	197.0381	194.3050	201.1922	215.8542	234.3623	251.7573	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.1465	49.1465	49.1465	49.1465	49.1465	49.1465	49.1465	49.1465	49.1465	49.1465	49.1465	49.1465	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	(71)
Water heating gains (Table 5)	60.3924	58.4623	54.4743	49.0613	45.5440	40.5996	36.4079	41.7904	43.7115	49.3122	55.6381	58.4868	(72)
Total internal gains	457.5833	453.7744	436.0577	408.7446	381.0241	356.0584	341.3921	348.6534	364.3033	391.8040	422.3332	445.2032	(73)

6. Solar gains

[Jan]	Area 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	0.7000	0.7700	7.7234 (75)						
Southeast	3.0000	46.3896	0.6300	0.7000	0.7700	42.5318 (77)						
Southwest	4.8900	46.3896	0.6300	0.7000	0.7700	69.3268 (79)						
Solar gains	119.5820	176.2628	246.1136	321.9507	354.8460	386.2399	361.4347	330.2406	286.4858	207.7681	142.3705	97.4474 (83)
Total gains	577.1653	630.0372	682.1713	730.6953	735.8701	742.2983	702.8269	678.8941	650.7890	599.5720	564.7036	542.6506 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, 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	61.7683	62.7411	62.9764	63.6619	63.6619	64.3148	64.3148	64.5247	64.3148	63.2084	63.4369	62.7411	
alpha	5.1179	5.1827	5.1984	5.2441	5.2441	5.2877	5.2877	5.3016	5.2877	5.2139	5.2291	5.1827	
util living area	0.9790	0.9670	0.9331	0.8506	0.7010	0.4854	0.3421	0.3529	0.5836	0.8460	0.9535	0.9829	(86)
MIT	20.2290	20.3531	20.5686	20.7977	20.9420	20.9931	20.9991	20.9990	20.9827	20.8390	20.5383	20.2131	(87)
Th 2	19.9972	20.0112	20.0145	20.0241	20.0241	20.0330	20.0330	20.0359	20.0330	20.0178	20.0210	20.0112	(88)
util rest of house	0.9726	0.9574	0.9140	0.8121	0.6356	0.4044	0.2531	0.2614	0.4969	0.7962	0.9376	0.9776	(89)
MIT 2	19.3268	19.4584	19.6656	19.8786	19.9914	20.0306	20.0329	20.0357	20.0261	19.9121	19.6469	19.3233	(90)
Living area fraction	19.7600	19.8880	20.0991	20.3199	20.4478	20.4927	20.4968	20.4982	20.4854	20.3571	20.0749	19.7505	(92)
Temperature adjustment	19.7600	19.8880	20.0991	20.3199	20.4478	20.4927	20.4968	20.4982	20.4854	20.3571	20.0749	0.0000	
adjusted MIT	19.7600	19.8880	20.0991	20.3199	20.4478	20.4927	20.4968	20.4982	20.4854	20.3571	20.0749	19.7505	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	560.3130	602.3145	624.7740	602.5682	489.3720	329.0730	207.9678	207.3476	350.3362	488.5351	530.0520	529.5418	(94)
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	973.8023	947.2175	851.3036	705.3291	516.3593	331.6816	208.2035	207.6174	357.2559	567.0691	770.8890	951.3929	(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	307.6360	231.7748	168.5380	73.9879	20.0786	0.0000	0.0000	0.0000	0.0000	58.4293	173.4026	313.8572	(98)
Space heating													1347.7045 (98)
Space heating per m2													(98) / (4) = 21.9496 (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													1494.1292 (211)
Space heating requirement	307.6360	231.7748	168.5380	73.9879	20.0786	0.0000	0.0000	0.0000	0.0000	58.4293	173.4026	313.8572	(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)	341.0599	256.9565	186.8493	82.0265	22.2601	0.0000	0.0000	0.0000	0.0000	64.7775	192.2424	347.9570	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	135.4797	118.4470	122.1810	106.4804	102.1322	88.0993	81.6370	93.7147	94.8695	110.6027	120.7767	131.2048	(64)
Efficiency of water heater (217)m	85.4027	84.9231	83.7344	81.3783	78.1940	76.2000	76.2000	76.2000	76.2000	80.5200	83.8734	85.5655	(216)
Fuel for water heating, kWh/month	158.6364	139.4757	145.9149	130.8462	130.6140	115.6159	107.1351	122.9852	124.5007	137.3605	143.9988	153.3384	(219)
Water heating fuel used													1610.4218 (219)
Annual totals kWh/year													
Space heating fuel - main system													1494.1292 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													75.0000 (231)
Electricity for lighting (calculated in Appendix L)													291.3776 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses													3470.9285 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1494.1292	7.6100	113.7032 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1610.4218	7.6100	122.5531 (247)
Pumps and fans for heating	75.0000	31.0800	23.3100 (249)
Energy for lighting	291.3776	31.0800	90.5602 (250)
Additional standing charges			105.0000 (251)
Energy saving/generation technologies			
PV Unit	0.0000	31.0800	0.0000 (252)
Total energy cost			455.1265 (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	1494.1292	0.2160	322.7319 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1610.4218	0.2160	347.8511 (264)
Space and water heating			670.5830 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	291.3776	0.5190	151.2250 (268)
Energy saving/generation technologies			
PV Unit	-420.0000	0.5190	-217.9800 (269)
Total kg/year			642.7530 (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	1494.1292	1.2200	1822.8376 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1610.4218	1.2200	1964.7145 (264)
Space and water heating			3787.5521 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	291.3776	3.0700	894.5292 (268)
Energy saving/generation technologies			
PV Unit	-420.0000	3.0700	-1289.4000 (269)
Primary energy kWh/year			3622.9313 (272)
Primary energy kWh/m2/year			59.0054 (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 84
 Current environmental impact rating: B 91

(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 84
 Potential environmental impact rating: B 91

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

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

	Current	Potential	Saving
Electricity	£114	£114	£0
Mains gas	£341	£341	£0
Space heating	£242	£242	£0
Water heating	£123	£123	£0
Lighting	£91	£91	£0
Total cost of fuels	£455	£455	£0
Total cost of uses	£456	£456	£0
Delivered energy	57 kWh/m ²	57 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	0.6 tonnes	0.6 tonnes	0.0 tonnes
CO2 emissions per m ²	10 kg/m ²	10 kg/m ²	0 kg/m ²
Primary energy	59 kWh/m ²	59 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 33		Issued on Date	08/02/2024
Assessment Reference	Rev B	Prop Type Ref	Block Ev1	
Project	Plot 33			
Calculation Type	New Build (As Designed)			

SAP Rating	84 B	DER	13.93	TER	18.04
Environmental	91 B	% DER<TER	22.80		
CO ₂ Emissions (t/year)	0.64	DFEE	38.67	TFEE	43.34
General Requirements Compliance	Pass	% DFEE<TFEE	10.78		

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 33	Issued on Date	08/02/2024
Assessment Reference	Rev B	Prop Type Ref	Block Ev1
Project	Plot 33		
Calculation Type	New Build (As Designed)		

SAP Rating	84 B	DER	13.93	TER	18.04
Environmental	91 B	% DER<TER	22.80		
CO ₂ Emissions (t/year)	0.64	DFEE	38.67	TFEE	43.34
General Requirements Compliance	Pass	% DFEE<TFEE	10.78		

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 *7.3N						
	Main construction	140	0.4700	0.2979	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 = 3.757 m ² K/W	Lower limit = 3.750 m ² K/W	Average = 3.754 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 33	Issued on Date	08/02/2024
Assessment Reference	Rev B	Prop Type Ref	Block Ev1
Project	Plot 33		
Calculation Type	New Build (As Designed)		

SAP Rating	84 B	DER	13.93	TER	18.04
Environmental	91 B	% DER<TER	22.80		
CO ₂ Emissions (t/year)	0.64	DFEE	38.67	TFEE	43.34
General Requirements Compliance	Pass	% DFEE<TFEE	10.78		

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

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Property Reference	SAP 0931 Plot 33		Issued on Date	08/02/2024	
Assessment Reference	Rev B	Prop Type Ref	Block Ev1		
Property	Plot 33				
SAP Rating	84 B	DER	13.93	TER	18.04
Environmental	91 B	% DER<TER	22.80		
CO ₂ Emissions (t/year)	0.64	DFEE	38.67	TFEE	43.34
General Requirements Compliance	Pass	% DFEE<TFEE	10.78		
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)

Orientation	North East					
Property Tenure	Unknown					
Transaction Type	New dwelling					
Terrain Type	Suburban					
1.0 Property Type	Flat, Detached					
2.0 Number of Storeys	1					
3.0 Date Built	2023					
4.0 Sheltered Sides	1					
5.0 Sunlight/Shade	Average or unknown					
6.0 Measurements						
		Heat Loss Perimeter	Internal Floor Area	Average Storey Height		
	Ground Floor:	33.54 m	61.40 m ²	2.46 m		
7.0 Living Area	29.48	m ²				
8.0 Thermal Mass Parameter	Precise calculation					
Thermal Mass	245.59	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	38.55	33.87
7.3N Brick and Block	Cavity Wall	Other	0.27	113.50	25.84	20.95
Wall to Corridor	Cavity Wall	Other	0.29	113.50	18.12	16.00
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	95.51	
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)

11.1 Party Floors

Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
Party Floor 1	Precast concrete plank floor (screed laid on rubber), carpeted	70.00	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	[3] Wall to Corridor	North East							2.12	
Windows	Window	[2] 7.3N Brick and Block	South West	None	0.00					4.89	
Side Elevation	Window	[1] Brick and Block	North East	None	0.00					1.68	
East Elevation	Window	[1] Brick and Block	South East	None	0.00					3.00	

14.0 Conservatory

15.0 Draught Proofing

 %

16.0 Draught Lobby

17.0 Thermal Bridging

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	8.37	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	E7 Party floor between dwellings (in blocks of flats)	67.08	0.070	No	
Independently assessed	E16 Corner (normal)	14.75	0.061	No	Knauf P23
Independently assessed	E17 Corner (inverted – internal area greater than external area)	4.92	-0.113	No	Knauf P24

Y-value	<input type="text" value="0.071"/>	W/m ² K
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18.0 Pressure Testing

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

19.0 Mechanical Ventilation

Summer Overheating

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

Mechanical Ventilation

Mechanical Ventilation System Present	<input type="text" value="No"/>
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20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				2
Number of passive vents				1

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Number of flueless gas fires 0

21.0 Fixed Cooling System No

22.0 Lighting

Internal

Total number of light fittings 9
 Total number of L.E.L. fittings 9
 Percentage of L.E.L. fittings 100.00 %

External

External lights fitted Yes
 Light and motion sensor Yes

23.0 Electricity Tariff Standard

24.0 Main Heating 1

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

25.0 Main Heating 2 None

Community Heating None

28.0 Water Heating

HWP From main heating 1
 Water Heating Main Heating 1
 Flue Gas Heat Recovery System No
 Waste Water Heat Recovery Instantaneous System 1 No
 Waste Water Heat Recovery Instantaneous System 2 No
 Waste Water Heat Recovery Storage System No
 Solar Panel No
 Water use <= 125 litres/person/day Yes

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

SAP Code	901	
29.0 Hot Water Cylinder	None	
32.0 Photovoltaic Unit	More Dwellings, One Block	
Apportioned	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 %			