



elmhurst
energy



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: Plot 26

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

EXCELLENCE
IN ENERGY
ASSESSMENT

PREDICTED ENERGY ASSESSMENT

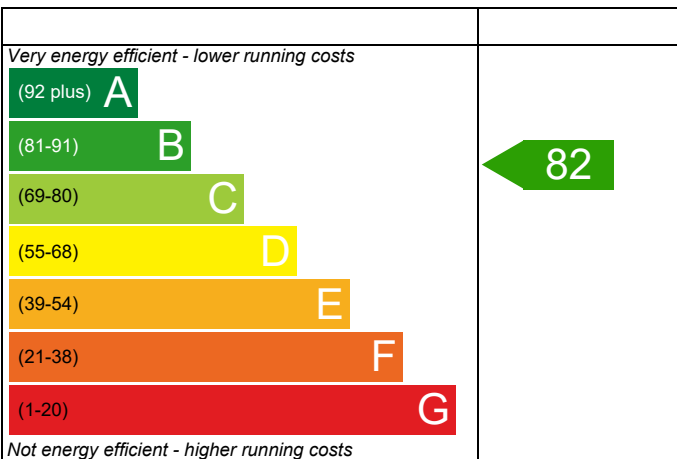
Plot 26

Dwelling type: Flat, Detached
 Date of assessment: 08/02/2024
 Produced by: Abacus Energy (UK) Ltd
 Total floor area: 60.63 m²
 DRRN: 7072-5248-4063

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.

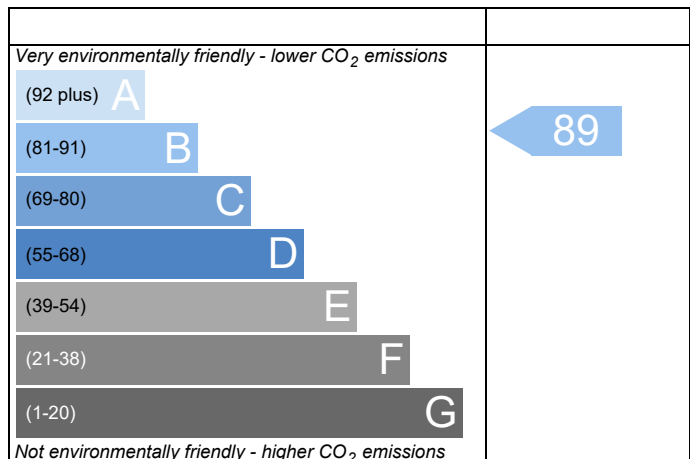
Energy Efficiency Rating



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 26	Issued on Date	08/02/2024
Assessment Reference	Rev B	Prop Type Ref	Block Ev
Property	Plot 26		

SAP Rating	82 B	DER	17.22	TER	20.63
Environmental	89 B	% DER<TER	16.52		
CO ₂ Emissions (t/year)	0.80	DFEE	48.79	TFEE	56.59
General Requirements Compliance	Pass	% DFEE<TFEE	13.79		

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

SUMMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	20.63	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	17.22	kgCO ₂ /m ²	Pass
	-3.41 (-16.5%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	56.59	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	48.79	kWh/m ² /yr	
	-7.8 (-13.8%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.23 (max. 0.30)	0.27 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	Pass
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

Limiting System Efficiencies

4 Heating efficiency

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BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Designed)

Main heating system

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

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Programmer, room thermostat and TRVs

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100 %

Minimum

75 %

Pass

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Southern England)

Slight

Pass

Based on:

Overshading

Average

Windows facing North East

5.25 m², No overhang

Windows facing South West

4.31 m², No overhang

Air change rate

4.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

5.00 (design value) m³/(h.m²) @ 50 Pa

Maximum

10.0 m³/(h.m²) @ 50 Pa

Pass

10 Key features

Party wall U-value

0.00 W/m²K

Floor U-value

0.12 W/m²K

Door U-value

1.10 W/m²K

Photovoltaic array

418.00 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 82	B 89	

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THERMAL BRIDGING

Calculation Type: New Build (As Designed)

Property Reference	SAP 0931 Plot 26		Issued on Date	08/02/2024	
Assessment Reference	Rev B	Prop Type Ref	Block Ev		
Property	Plot 26				
SAP Rating	82 B	DER	17.22	TER	20.63
Environmental	89 B	% DER<TER	16.52		
CO ₂ Emissions (t/year)	0.80	DFEE	48.79	TFEE	56.59
General Requirements Compliance	Pass	% DFEE<TFEE	13.79		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com			Assessor ID	E477-0001
Client	Foreman Homes, FORE				

	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.043	9.06	0.39	Catnic Thermally Broken
External wall	E3 Sill	Independently assessed	0.021	8.05	0.17	Knauf P5
External wall	E4 Jamb	Independently assessed	0.016	18.30	0.29	Knauf P6
External wall	E5 Ground floor (normal)	Table K1 - Approved	0.160	31.53	5.04	
External wall	E7 Party floor between dwellings (in blocks of flats)	Table K1 - Approved	0.070	31.53	2.21	Knauf P15
External wall	E16 Corner (normal)	Independently assessed	0.061	9.42	0.57	Knauf P23

Total: **8.68** W/mK:
 Y-Value: **0.062** W/m²K:

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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Assessment Reference	Rev B	Prop Type Ref	Block Ev		
Property	Plot 26				
SAP Rating	82 B	DER	17.22	TER	20.63
Environmental	89 B	% DER<TER	16.52		
CO₂ Emissions (t/year)	0.80	DFEE	48.79	TFEE	56.59
General Requirements Compliance	Pass	% DFEE<TFEE	13.79		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com			Assessor ID	E477-0001
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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

DWELLING AS DESIGNED

Ground-floor flat, total floor area 61 m²

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

1a TER and DER

Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 20.63 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 17.22 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)56.6 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)48.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.23 (max. 0.30)	0.27 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof (no roof)			
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas

Data from database

Vaillant ecoFIT sustain 830 VUW 306/6-3 (H-GB)

Combi boiler

Efficiency: 89.3% SEDBUK2009

Minimum: 88.0%

OK

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls:

No cylinder

Boiler interlock

Yes

OK

7 Low energy lights

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

Minimum 75% OK

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Southern England): Slight OK

Based on:

Overshading:

Average

Windows facing North East: 5.25 m², No overhang

Windows facing South West: 4.31 m², No overhang

Air change rate: 4.00 ach

Blinds/curtains:

None

10 Key features

Party wall U-value 0.00 W/m²K

Floor U-value 0.12 W/m²K

Door U-value 1.10 W/m²K

Photovoltaic array 418.00 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	60.6300 (1b)	2.5300 (2b)	153.3939 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.6300		153.3939 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 153.3939 (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				3 * 10 =	30.0000 (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) =				50.0000 / (5) =	0.3260 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.5760 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.4896 (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	0.6242	0.6120	0.5997	0.5385	0.5263	0.4651	0.4651	0.4528	0.4896	0.5263	0.5508	0.5752 (22b)
Effective ac	0.6948	0.6872	0.6798	0.6450	0.6385	0.6082	0.6082	0.6025	0.6198	0.6385	0.6517	0.6654 (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)			9.5600	1.1450	10.9466		(27)
Ground Floor			60.6300	0.1200	7.2756	90.0000	5456.7000 (28a)
Brick and Block	46.1100		46.1100	0.2200	10.1442	42.2200	1946.7642 (29a)
10.4N Brick and Block	16.8300	9.5600	7.2700	0.2700	1.9629	113.5000	825.1450 (29a)
Wall to Corridor	16.8300	2.1200	14.7100	0.2300	3.3830	113.5000	1669.5850 (29a)
Total net area of external elements Aum(A, m2)			140.4000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 36.0442		(33)
Party Ceilings 1			60.6300			70.0000	4244.1000 (32b)
Ground Floor Stud			126.1400			9.0000	1135.2600 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 15277.5542 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							251.9801 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.6780 (36)
Total fabric heat loss							(33) + (36) = 44.7222 (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	35.1712	34.7883	34.4130	32.6500	32.3202	30.7847	30.7847	30.5003	31.3761	32.3202	32.9874	33.6850 (38)
Average = Sum(39)m / 12 =	79.8934	79.5105	79.1351	77.3722	77.0423	75.5068	75.5068	75.2225	76.0983	77.0423	77.7096	78.4072 (39)
												77.3706 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.3177	1.3114	1.3052	1.2761	1.2707	1.2454	1.2454	1.2407	1.2551	1.2707	1.2817	1.2932 (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												1.9994 (42)
Average daily hot water use (litres/day)												81.6855 (43)
Daily hot water use	89.8541	86.5866	83.3192	80.0518	76.7844	73.5170	73.5170	76.7844	80.0518	83.3192	86.5866	89.8541 (44)
Energy conte	133.2510	116.5422	120.2611	104.8465	100.6027	86.8125	80.4445	92.3113	93.4138	108.8648	118.8344	129.0465 (45)
Energy content (annual)												Total = Sum(45)m = 1285.2312 (45)
Distribution loss (46)m = 0.15 x (45)m	19.9876	17.4813	18.0392	15.7270	15.0904	13.0219	12.0667	13.8467	14.0121	16.3297	17.8252	19.3570 (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	1.3769	1.1605	1.1523	0.9652	0.8883	0.7340	0.6801	0.8151	0.8600	1.0431	1.1833	1.3335	1.3335	(61)
Total heat required for water heating calculated for each month	134.6279	117.7026	121.4134	105.8117	101.4911	87.5465	81.1247	93.1264	94.2737	109.9079	120.0177	130.3799	130.3799	(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	134.6279	117.7026	121.4134	105.8117	101.4911	87.5465	81.1247	93.1264	94.2737	109.9079	120.0177	130.3799	130.3799	(64)
Heat gains from water heating, kWh/month	44.6502	39.0404	40.2749	35.1028	33.6725	29.0486	26.9178	30.8973	31.2751	36.4583	39.8083	43.2413	43.2413	(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	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.2805	14.4602	11.7598	8.9029	6.6550	5.6185	6.0709	7.8912	10.5916	13.4485	15.6964	16.7329	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	174.5330	176.3441	171.7801	162.0641	149.7993	138.2721	130.5713	128.7602	133.3241	143.0402	155.3049	166.8321	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	(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)	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	(71)
Water heating gains (Table 5)	60.0137	58.0958	54.1329	48.7538	45.2587	40.3453	36.1799	41.5286	43.4376	49.0031	55.2892	58.1200	(72)
Total internal gains	306.8180	304.8909	293.6637	275.7117	257.7039	240.2268	228.8130	234.1709	243.3442	261.4826	282.2814	297.6759	(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	5.2500	11.2829	0.6300	0.7000	0.7700	18.1031 (75)							
Southwest	4.3100	36.7938	0.6300	0.7000	0.7700	48.4645 (79)							
Solar gains	66.5677	119.4025	179.3436	248.9869	303.3217	311.8767	296.2094	254.0299	203.2023	136.2716	80.8278	56.2595	(83)
Total gains	373.3856	424.2934	473.0073	524.6985	561.0256	552.1035	525.0224	488.2008	446.5464	397.7542	363.1092	353.9354	(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	53.1178	53.3737	53.6268	54.8487	55.0835	56.2037	56.2037	56.4162	55.7669	55.0835	54.6106	54.1247	
alpha	4.5412	4.5582	4.5751	4.6566	4.6722	4.7469	4.7469	4.7611	4.7178	4.6722	4.6407	4.6083	
util living area	0.9978	0.9956	0.9897	0.9692	0.9078	0.7668	0.6043	0.6623	0.8847	0.9805	0.9958	0.9983	(86)
MIT	19.5633	19.7172	19.9829	20.3563	20.6878	20.9094	20.9773	20.9656	20.8036	20.3805	19.9196	19.5537	(87)
Th 2	19.8270	19.8319	19.8368	19.8596	19.8639	19.8839	19.8839	19.8876	19.8762	19.8639	19.8552	19.8462	(88)
util rest of house	0.9970	0.9941	0.9858	0.9563	0.8673	0.6719	0.4651	0.5241	0.8185	0.9701	0.9940	0.9977	(89)
MIT 2	18.5298	18.6870	18.9547	19.3386	19.6493	19.8415	19.8782	19.8778	19.7643	19.3700	18.9076	18.5353	(90)
Living area fraction	fLA = Living area / (4) =											0.3388 (91)	
MIT	18.8799	19.0360	19.3030	19.6834	20.0012	20.2033	20.2505	20.2463	20.1164	19.7123	19.2504	18.8803	(92)
Temperature adjustment													0.0000
adjusted MIT	18.8799	19.0360	19.3030	19.6834	20.0012	20.2033	20.2505	20.2463	20.1164	19.7123	19.2504	18.8803	(93)

8. Space heating requirement

Utilisation	0.9961	0.9926	0.9834	0.9538	0.8730	0.7017	0.5130	0.5716	0.8352	0.9683	0.9927	0.9970	(94)
Useful gains	371.9359	421.1657	465.1647	500.4797	489.7890	387.4096	269.3384	279.0609	372.9764	385.1258	360.4473	352.8646	(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	1164.8404	1123.9626	1013.1675	834.3328	639.5412	423.0860	275.6410	289.3288	457.8368	702.0337	944.2036	1151.0397	(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	589.9209	472.2795	407.7141	240.3742	111.4156	0.0000	0.0000	0.0000	0.0000	235.7794	420.3045	593.8423	(98)
Space heating													3071.6305 (98)
Space heating per m2													(98) / (4) = 50.6619 (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													3405.3554 (211)
Space heating requirement	589.9209	472.2795	407.7141	240.3742	111.4156	0.0000	0.0000	0.0000	0.0000	235.7794	420.3045	593.8423	(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)	654.0143	523.5914	452.0112	266.4903	123.5206	0.0000	0.0000	0.0000	0.0000	261.3963	465.9695	658.3617	(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	134.6279	117.7026	121.4134	105.8117	101.4911	87.5465	81.1247	93.1264	94.2737	109.9079	120.0177	130.3799	(64)
Efficiency of water heater (217)m	87.2224	87.0107	86.5512	85.4040	82.9363	76.2000	76.2000	76.2000	76.2000	85.2218	86.6633	76.2000	(216)
Fuel for water heating, kWh/month	154.3502	135.2737	140.2793	123.8955	122.3723	114.8904	106.4628	122.2132	123.7188	128.9668	138.4874	149.3263	(219)
Water heating fuel used													1560.2365 (219)
Annual totals kWh/year													
Space heating fuel - main system													3405.3554 (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)													287.5178 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses													5328.1097 (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	3405.3554	0.2160	735.5568 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1560.2365	0.2160	337.0111 (264)
Space and water heating			1072.5678 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	287.5178	0.5190	149.2218 (268)
Energy saving/generation technologies			
PV Unit	-418.0000	0.5190	-216.9420 (269)
Total CO2, kg/year			1043.7726 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			17.2200 (273)

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

DER			17.2200 ZC1
Total Floor Area		TFA	60.6300
Assumed number of occupants		N	1.9994
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			17.0583 ZC2
CO2 emissions from cooking, equation (L16)			2.7542 ZC3
Total CO2 emissions			37.0325 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			37.0325 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	60.6300 (1b)	2.5300 (2b)	153.3939 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.6300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	153.3939 (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)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) =	0.1304 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3804 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3233 (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	0.4122	0.4042	0.3961	0.3557	0.3476	0.3072	0.3072	0.2991	0.3233	0.3476	0.3637	0.3799 (22b)
	0.5850	0.5817	0.5784	0.5632	0.5604	0.5472	0.5472	0.5447	0.5523	0.5604	0.5662	0.5722 (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)			9.5600	1.3258	12.6742		(27)					
Ground Floor			60.6300	0.1300	7.8819		(28a)					
Brick and Block	46.1100		46.1100	0.1800	8.2998		(29a)					
10.4N Brick and Block	16.8300	9.5600	7.2700	0.1800	1.3086		(29a)					
Wall to Corridor	16.8300	2.1200	14.7100	0.1800	2.6478		(29a)					
Total net area of external elements Aum(A, m2)			140.4000				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	34.9323	(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.8702 (36)					
Total fabric heat loss						(33) + (36) =	44.8025 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	29.6112	29.4442	29.2805	28.5115	28.3677	27.6979	27.6979	27.5739	27.9559	28.3677	28.6587	28.9630 (38)
Heat transfer coeff	74.4138	74.2467	74.0830	73.3141	73.1702	72.5005	72.5005	72.3764	72.7584	73.1702	73.4612	73.7655 (39)
Average = Sum(39)m / 12 =												73.3134 (39)
HLP	1.2273	1.2246	1.2219	1.2092	1.2068	1.1958	1.1958	1.1937	1.2000	1.2068	1.2116	1.2167 (40)
HLP (average)												1.2092 (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												1.9994 (42)
Average daily hot water use (litres/day)												81.6855 (43)
Daily hot water use	89.8541	86.5866	83.3192	80.0518	76.7844	73.5170	73.5170	76.7844	80.0518	83.3192	86.5866	89.8541 (44)
Energy conte	133.2510	116.5422	120.2611	104.8465	100.6027	86.8125	80.4445	92.3113	93.4138	108.8648	118.8344	129.0465 (45)
Energy content (annual)												Total = Sum(45)m = 1285.2312 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	19.9876	17.4813	18.0392	15.7270	15.0904	13.0219	12.0667	13.8467	14.0121	16.3297	17.8252	19.3570 (46)
Total storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Total heat required for water heating calculated for each month	45.7886	39.8536	42.4586	39.4776	39.1285	36.2549	37.4634	39.1285	39.4776	42.4586	42.7003	45.7886 (61)
Solar input	179.0396	156.3957	162.7196	144.3241	139.7312	123.0674	117.9080	131.4398	132.8914	151.3233	161.5347	174.8351 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	Solar input (sum of months) = Sum (63)m = 0.0000 (63)											
	179.0396	156.3957	162.7196	144.3241	139.7312	123.0674	117.9080	131.4398	132.8914	151.3233	161.5347	174.8351 (64)
	Total per year (kWh/year) = Sum (64)m = 1775.2100 (64)											
	55.7531	48.7137	50.6014	44.7309	43.2325	37.9289	36.1137	40.4756	40.9295	46.8122	50.1875	54.3551 (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	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.2805	14.4602	11.7598	8.9029	6.6550	5.6185	6.0709	7.8912	10.5916	13.4485	15.6964	16.7329 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	174.5330	176.3441	171.7801	162.0641	149.7993	138.2721	130.5713	128.7602	133.3241	143.0402	155.3049	166.8321 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970 (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)	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756 (71)
Water heating gains (Table 5)	74.9370	72.4906	68.0127	62.1262	58.1082	52.6790	48.5399	54.4027	56.8465	62.9196	69.7049	73.0579 (72)
Total internal gains	321.7413	319.2856	307.5435	289.0841	270.5534	252.5605	241.1729	247.0450	256.7531	275.3991	296.6970	312.6138 (73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	Specific data	Specific data	factor	W						
		W/m2	or Table 6b	or Table 6c	Table 6d							
Northeast	5.2500	11.2829	0.6300	0.7000	0.7700	18.1031 (75)						
Southwest	4.3100	36.7938	0.6300	0.7000	0.7700	48.4645 (79)						
Solar gains	66.5677	119.4025	179.3436	248.9869	303.3217	311.8767	296.2094	254.0299	203.2023	136.2716	80.8278	56.2595 (83)
Total gains	388.3089	438.6881	486.8871	538.0709	573.8751	564.4372	537.3824	501.0749	459.9553	411.6707	377.5248	368.8733 (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	56.5811	56.7084	56.8338	57.4299	57.5428	58.0743	58.0743	58.1739	57.8684	57.5428	57.3148	57.0784
alpha	4.7721	4.7806	4.7889	4.8287	4.8362	4.8716	4.8716	4.8783	4.8579	4.8362	4.8210	4.8052
util living area	0.9973	0.9947	0.9875	0.9628	0.8909	0.7397	0.5737	0.6311	0.8634	0.9758	0.9948	0.9979 (86)
MIT	19.6933	19.8401	20.0927	20.4344	20.7406	20.9286	20.9835	20.9743	20.8390	20.4492	20.0111	19.6668 (87)
Th 2	19.8982	19.9004	19.9025	19.9126	19.9145	19.9234	19.9234	19.9250	19.9200	19.9145	19.9107	19.9067 (88)
util rest of house	0.9964	0.9929	0.9829	0.9481	0.8472	0.6458	0.4434	0.4997	0.7933	0.9635	0.9926	0.9972 (89)
MIT 2	18.1670	18.3825	18.7507	19.2455	19.6567	19.8751	19.9173	19.9143	19.7883	19.2748	18.6401	18.1342 (90)
Living area fraction	fLA = Living area / (4) = 0.3388 (91)											
MIT	18.6841	18.8763	19.2054	19.6483	20.0239	20.2320	20.2785	20.2734	20.1442	19.6727	19.1046	18.6534 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.6841	18.8763	19.2054	19.6483	20.0239	20.2320	20.2785	20.2734	20.1442	19.6727	19.1046	18.6534 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9949	0.9905	0.9790	0.9436	0.8523	0.6748	0.4879	0.5445	0.8102	0.9599	0.9904	0.9960 (94)
Ext temp.	386.3442	434.5289	476.6580	507.7444	489.1360	380.8996	262.1960	272.8316	372.6374	395.1452	373.8852	367.3995 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Month fracti	1070.3748	1037.6921	941.2521	788.0008	609.0590	408.3214	266.6945	280.3451	439.7690	663.8479	881.8699	1066.1609 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating per m2	508.9187	405.3257	345.6580	201.7846	89.2227	0.0000	0.0000	0.0000	0.0000	199.9148	365.7490	519.8785 (98)
	(98) / (4) = 2636.4520 (98)											
	43.4843 (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													2822.7538 (211)
Space heating requirement	508.9187	405.3257	345.6580	201.7846	89.2227	0.0000	0.0000	0.0000	0.0000	199.9148	365.7490	519.8785	(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)	544.8808	433.9675	370.0835	216.0435	95.5275	0.0000	0.0000	0.0000	0.0000	214.0416	391.5942	556.6151	(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	179.0396	156.3957	162.7196	144.3241	139.7312	123.0674	117.9080	131.4398	132.8914	151.3233	161.5347	174.8351	(64)
Efficiency of water heater (217)m	87.5347	87.3414	86.9015	85.8949	83.9553	80.3000	80.3000	80.3000	80.3000	85.7531	87.0459	87.6263	(217)
Fuel for water heating, kWh/month	204.5356	179.0627	187.2461	168.0240	166.4351	153.2596	146.8344	163.6859	165.4936	176.4639	185.5741	199.5236	(219)
Water heating fuel used													2096.1386 (219)
Annual totals kWh/year													
Space heating fuel - main system													2822.7538 (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)													287.5178 (232)
Total delivered energy for all uses													5281.4102 (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	2822.7538	0.2160	609.7148	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2096.1386	0.2160	452.7659	(264)
Space and water heating			1062.4808	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	287.5178	0.5190	149.2218	(268)
Total CO2, kg/m2/year			1250.6275	(272)
Emissions per m2 for space and water heating			17.5240	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.4612	(272b)
Emissions per m2 for pumps and fans			0.6420	(272c)
Target Carbon Dioxide Emission Rate (TER) = (17.5240 * 1.00) + 2.4612 + 0.6420, rounded to 2 d.p.			20.6300	(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	60.6300 (1b)	2.5300 (2b)	153.3939 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.6300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	153.3939 (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) =	0.1304 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3804 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3233 (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	0.4122	0.4042	0.3961	0.3557	0.3476	0.3072	0.3072	0.2991	0.3233	0.3476	0.3637	0.3799 (22b)
Effective ac	0.5850	0.5817	0.5784	0.5632	0.5604	0.5472	0.5472	0.5447	0.5523	0.5604	0.5662	0.5722 (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)			9.5600	1.1450	10.9466		(27)
Ground Floor			60.6300	0.1200	7.2756	90.0000	5456.7000 (28a)
Brick and Block	46.1100		46.1100	0.2200	10.1442	42.2200	1946.7642 (29a)
10.4N Brick and Block	16.8300	9.5600	7.2700	0.2700	1.9629	113.5000	825.1450 (29a)
Wall to Corridor	16.8300	2.1200	14.7100	0.2300	3.3830	113.5000	1669.5850 (29a)
Total net area of external elements Aum(A, m ²)			140.4000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.0442		(33)
Party Ceilings 1			60.6300			30.0000	1818.9000 (32b)
Ground Floor Stud			126.1400			9.0000	1135.2600 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	12852.3542 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							211.9801 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.6780 (36)
Total fabric heat loss						(33) + (36) =	44.7222 (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	29.6112	29.4442	29.2805	28.5115	28.3677	27.6979	27.6979	27.5739	27.9559	28.3677	28.6587	28.9630 (38)
Average = Sum(39)m / 12 =	74.3334	74.1664	74.0027	73.2337	73.0898	72.4201	72.4201	72.2961	72.6781	73.0898	73.3809	73.6851 (39)
												73.2330 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2260	1.2233	1.2206	1.2079	1.2055	1.1945	1.1945	1.1924	1.1987	1.2055	1.2103	1.2153 (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												1.9994 (42)
Average daily hot water use (litres/day)												81.6855 (43)
Daily hot water use	89.8541	86.5866	83.3192	80.0518	76.7844	73.5170	73.5170	76.7844	80.0518	83.3192	86.5866	89.8541 (44)
Energy conte	133.2510	116.5422	120.2611	104.8465	100.6027	86.8125	80.4445	92.3113	93.4138	108.8648	118.8344	129.0465 (45)
Energy content (annual)												Total = Sum(45)m = 1285.2312 (45)
Distribution loss (46)m = 0.15 x (45)m												
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)

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Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
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	28.3158	24.7652	25.5555	22.2799	21.3781	18.4477	17.0945	19.6161	19.8504	23.1338	25.2523	27.4224	27.4224	(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	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.2805	14.4602	11.7598	8.9029	6.6550	5.6185	6.0709	7.8912	10.5916	13.4485	15.6964	16.7329	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	174.5330	176.3441	171.7801	162.0641	149.7993	138.2721	130.5713	128.7602	133.3241	143.0402	155.3049	166.8321	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	(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)	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	(71)
Water heating gains (Table 5)	38.0589	36.8530	34.3488	30.9443	28.7340	25.6217	22.9764	26.3658	27.5700	31.0938	35.0727	36.8580	(72)
Total internal gains	281.8632	280.6481	270.8795	254.9021	238.1792	222.5032	212.6095	216.0080	224.4766	240.5733	259.0648	273.4139	(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	5.2500	11.2829	0.6300	0.7000	0.7700	18.1031 (75)							
Southwest	4.3100	36.7938	0.6300	0.7000	0.7700	48.4645 (79)							
Solar gains	66.5677	119.4025	179.3436	248.9869	303.3217	311.8767	296.2094	254.0299	203.2023	136.2716	80.8278	56.2595	(83)
Total gains	348.4309	400.0505	450.2232	503.8890	541.5009	534.3799	508.8189	470.0380	427.6789	376.8449	339.8926	329.6734	(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)	48.0282	48.1364	48.2428	48.7494	48.8454	49.2971	49.2971	49.3817	49.1221	48.8454	48.6516	48.4507	(85)
alpha	4.2019	4.2091	4.2162	4.2500	4.2564	4.2865	4.2865	4.2921	4.2748	4.2564	4.2434	4.2300	
util living area	0.9965	0.9933	0.9849	0.9587	0.8892	0.7491	0.5919	0.6517	0.8688	0.9739	0.9937	0.9973	(86)
MIT	19.4501	19.6182	19.9074	20.2988	20.6549	20.8898	20.9695	20.9542	20.7736	20.3157	19.8136	19.4207	(87)
Th 2	19.8992	19.9014	19.9036	19.9137	19.9156	19.9244	19.9244	19.9261	19.9210	19.9156	19.9118	19.9078	(88)
util rest of house	0.9955	0.9913	0.9801	0.9445	0.8491	0.6612	0.4629	0.5236	0.8060	0.9623	0.9914	0.9965	(89)
MIT 2	18.4906	18.6596	18.9481	19.3384	19.6707	19.8682	19.9153	19.9107	19.7844	19.3617	18.8629	18.4678	(90)
Living area fraction	fLA = Living area / (4) =												
MIT	18.8156	18.9843	19.2731	19.6638	20.0042	20.2143	20.2724	20.2642	20.1195	19.6849	19.1850	18.7906	(92)
Temperature adjustment	0.0000												
adjusted MIT	18.8156	18.9843	19.2731	19.6638	20.0042	20.2143	20.2724	20.2642	20.1195	19.6849	19.1850	18.7906	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains	0.9941	0.9891	0.9765	0.9405	0.8529	0.6871	0.5067	0.5668	0.8195	0.9591	0.9894	0.9953	(94)	
Ext temp.	346.3832	395.6765	439.6654	473.8846	461.8478	367.1580	257.8262	266.3948	350.4801	361.4386	336.2872	328.1304	(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	1078.9954	1044.5846	945.2422	788.2695	606.9489	406.5853	265.9582	279.3694	437.4888	664.0110	886.8057	1075.1097	(97)	
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	(97a)	
Space heating kWh	545.0635	436.0662	376.1492	226.3572	107.9553	0.0000	0.0000	0.0000	0.0000	225.1139	396.3733	555.7526	(98)	
Space heating												2868.8312	(98)	
Space heating per m ²												(98) / (4) =	47.3170	(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	680.7487	535.9086	549.4500	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8217	0.8883	0.8589	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	559.3852	476.0618	471.9075	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	699.5590	668.2386	624.1749	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													

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Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	100.9251	142.9796	113.2869	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction												357.1916 (104)
Intermittency factor (Table 10b)												1.0000 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	25.2313	35.7449	28.3217	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling per m2												89.2979 (107)
Energy for space heating												1.4728 (108)
Energy for space cooling												47.3170 (99)
Total												1.4728 (108)
Dwelling Fabric Energy Efficiency (DFEE)												48.7899 (109)
												48.8 (109)

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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 (m ²)	Storey height (m)	Volume (m ³)
Ground floor	60.6300 (1b)	2.5300 (2b)	153.3939 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.6300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	153.3939 (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)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) =	0.1304 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3804 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3233 (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	0.4122	0.4042	0.3961	0.3557	0.3476	0.3072	0.3072	0.2991	0.3233	0.3476	0.3637	0.3799 (22b)
	0.5850	0.5817	0.5784	0.5632	0.5604	0.5472	0.5472	0.5447	0.5523	0.5604	0.5662	0.5722 (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)			9.5600	1.3258	12.6742		(27)					
Ground Floor			60.6300	0.1300	7.8819		(28a)					
Brick and Block	46.1100		46.1100	0.1800	8.2998		(29a)					
10.4N Brick and Block	16.8300	9.5600	7.2700	0.1800	1.3086		(29a)					
Wall to Corridor	16.8300	2.1200	14.7100	0.1800	2.6478		(29a)					
Total net area of external elements Aum(A, m ²)			140.4000				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	34.9323	(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)							9.8702 (36)					
Total fabric heat loss						(33) + (36) =	44.8025 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	29.6112	29.4442	29.2805	28.5115	28.3677	27.6979	27.6979	27.5739	27.9559	28.3677	28.6587	28.9630 (38)
Heat transfer coeff	74.4138	74.2467	74.0830	73.3141	73.1702	72.5005	72.5005	72.3764	72.7584	73.1702	73.4612	73.7655 (39)
Average = Sum(39)m / 12 =												73.3134 (39)
HLP	1.2273	1.2246	1.2219	1.2092	1.2068	1.1958	1.1958	1.1937	1.2000	1.2068	1.2116	1.2167 (40)
HLP (average)												1.2092 (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												1.9994 (42)
Average daily hot water use (litres/day)												81.6855 (43)
Daily hot water use	89.8541	86.5866	83.3192	80.0518	76.7844	73.5170	73.5170	76.7844	80.0518	83.3192	86.5866	89.8541 (44)
Energy conte	133.2510	116.5422	120.2611	104.8465	100.6027	86.8125	80.4445	92.3113	93.4138	108.8648	118.8344	129.0465 (45)
Energy content (annual)										Total = Sum(45)m =		1285.2312 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

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Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Heat gains from water heating, kWh/month	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)
	28.3158	24.7652	25.5555	22.2799	21.3781	18.4477	17.0945	19.6161	19.8504	23.1338	25.2523	27.4224 (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	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	16.2805	14.4602	11.7598	8.9029	6.6550	5.6185	6.0709	7.8912	10.5916	13.4485	15.6964	16.7329 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	174.5330	176.3441	171.7801	162.0641	149.7993	138.2721	130.5713	128.7602	133.3241	143.0402	155.3049	166.8321 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970 (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)												
	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756 (71)
Water heating gains (Table 5)												
	38.0589	36.8530	34.3488	30.9443	28.7340	25.6217	22.9764	26.3658	27.5700	31.0938	35.0727	36.8580 (72)
Total internal gains												
	281.8632	280.6481	270.8795	254.9021	238.1792	222.5032	212.6095	216.0080	224.4766	240.5733	259.0648	273.4139 (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	5.2500	11.2829	0.6300	0.7000	0.7700	18.1031 (75)						
Southwest	4.3100	36.7938	0.6300	0.7000	0.7700	48.4645 (79)						
Solar gains	66.5677	119.4025	179.3436	248.9869	303.3217	311.8767	296.2094	254.0299	203.2023	136.2716	80.8278	56.2595 (83)
Total gains	348.4309	400.0505	450.2232	503.8890	541.5009	534.3799	508.8189	470.0380	427.6789	376.8449	339.8926	329.6734 (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)	56.5811	56.7084	56.8338	57.4299	57.5428	58.0743	58.0743	58.1739	57.8684	57.5428	57.3148	57.0784
tau	4.7721	4.7806	4.7889	4.8287	4.8362	4.8716	4.8716	4.8783	4.8579	4.8362	4.8210	4.8052
util living area	0.9983	0.9964	0.9909	0.9708	0.9081	0.7663	0.6012	0.6641	0.8884	0.9828	0.9967	0.9987 (86)
MIT	19.6331	19.7824	20.0397	20.3902	20.7106	20.9163	20.9799	20.9680	20.8126	20.4012	19.9548	19.6073 (87)
Th 2	19.8982	19.9004	19.9025	19.9126	19.9145	19.9234	19.9234	19.9250	19.9200	19.9145	19.9107	19.9067 (88)
util rest of house	0.9978	0.9952	0.9875	0.9588	0.8688	0.6740	0.4669	0.5298	0.8251	0.9737	0.9953	0.9983 (89)
MIT 2	18.6562	18.8068	19.0642	19.4157	19.7143	19.8838	19.9182	19.9157	19.8117	19.4322	18.9873	18.6372 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	18.9872	19.1373	19.3947	19.7458	20.0519	20.2336	20.2779	20.2722	20.1508	19.7605	19.3151	18.9659 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9872	19.1373	19.3947	19.7458	20.0519	20.2336	20.2779	20.2722	20.1508	19.7605	19.3151	18.9659 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9971	0.9940	0.9854	0.9565	0.8746	0.7030	0.5131	0.5759	0.8411	0.9720	0.9942	0.9978 (94)
Useful gains	347.4152	397.6527	443.6510	481.9575	473.6175	375.6880	261.0725	270.7176	359.7073	366.2943	337.9268	328.9357 (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	1092.9283	1057.0719	955.2753	795.1523	611.1078	408.4357	266.6480	280.2546	440.2432	670.2732	897.3347	1089.2113 (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	554.6618	443.1297	380.6484	225.5003	102.2928	0.0000	0.0000	0.0000	0.0000	226.1603	402.7736	565.6450 (98)
Space heating												2900.8119 (98)
Space heating per m ²												(98) / (4) = 47.8445 (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	681.5043	536.5034	550.0609	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8404	0.9066	0.8778	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	572.7025	486.4149	482.8237	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	699.5590	668.2386	624.1749	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	91.3366	135.2768	105.1652	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												331.7787 (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	22.8342	33.8192	26.2913	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling												82.9447 (107)
Space cooling per m2												1.3680 (108)
Energy for space heating												47.8445 (99)
Energy for space cooling												1.3680 (108)
Total												49.2125 (109)
Target Fabric Energy Efficiency (TFEE)												56.6 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	60.6300 (1b)	2.5300 (2b)	153.3939 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.6300		153.3939 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 153.3939 (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				3 * 10 =	30.0000 (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) =				50.0000 / (5) =	0.3260 (8)
Pressure test				Yes	
Measured/design AP50					5.0000
Infiltration rate					0.5760 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.4896 (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												
Effective ac	0.6242	0.5752	0.5630	0.5263	0.5263	0.4896	0.4896	0.4773	0.4896	0.5508	0.5385	0.5752 (22b)
Effective ac	0.6948	0.6654	0.6585	0.6385	0.6385	0.6198	0.6198	0.6139	0.6198	0.6517	0.6450	0.6654 (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)			9.5600	1.1450	10.9466		(27)
Ground Floor			60.6300	0.1200	7.2756	90.0000	5456.7000 (28a)
Brick and Block	46.1100		46.1100	0.2200	10.1442	42.2200	1946.7642 (29a)
10.4N Brick and Block	16.8300	9.5600	7.2700	0.2700	1.9629	113.5000	825.1450 (29a)
Wall to Corridor	16.8300	2.1200	14.7100	0.2300	3.3830	113.5000	1669.5850 (29a)
Total net area of external elements Aum(A, m2)			140.4000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 36.0442		(33)
Party Ceilings 1			60.6300			70.0000	4244.1000 (32b)
Ground Floor Stud			126.1400			9.0000	1135.2600 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 15277.5542 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							251.9801 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.6780 (36)
Total fabric heat loss							(33) + (36) = 44.7222 (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	35.1712	33.6850	33.3325	32.3202	32.3202	31.3761	31.3761	31.0766	31.3761	32.9874	32.6500	33.6850 (38)
Average = Sum(39)m / 12 =	79.8934	78.4072	78.0546	77.0423	77.0423	76.0983	76.0983	75.7988	76.0983	77.7096	77.3722	78.4072 (39)
												77.3352 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.3177	1.2932	1.2874	1.2707	1.2707	1.2551	1.2551	1.2502	1.2551	1.2817	1.2761	1.2932 (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												1.9994 (42)
Average daily hot water use (litres/day)												81.6855 (43)
Daily hot water use	89.8541	86.5866	83.3192	80.0518	76.7844	73.5170	73.5170	76.7844	80.0518	83.3192	86.5866	89.8541 (44)
Energy conte	133.2510	116.5422	120.2611	104.8465	100.6027	86.8125	80.4445	92.3113	93.4138	108.8648	118.8344	129.0465 (45)
Energy content (annual)												Total = Sum(45)m = 1285.2312 (45)
Distribution loss (46)m = 0.15 x (45)m	19.9876	17.4813	18.0392	15.7270	15.0904	13.0219	12.0667	13.8467	14.0121	16.3297	17.8252	19.3570 (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	1.3769	1.1605	1.1523	0.9652	0.8883	0.7340	0.6801	0.8151	0.8600	1.0431	1.1833	1.3335	1.3335	(61)
Total heat required for water heating calculated for each month	134.6279	117.7026	121.4134	105.8117	101.4911	87.5465	81.1247	93.1264	94.2737	109.9079	120.0177	130.3799	130.3799	(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	134.6279	117.7026	121.4134	105.8117	101.4911	87.5465	81.1247	93.1264	94.2737	109.9079	120.0177	130.3799	130.3799	(64)
RHI water heating demand	44.6502	39.0404	40.2749	35.1028	33.6725	29.0486	26.9178	30.8973	31.2751	36.4583	39.8083	43.2413	43.2413	(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	119.9634	119.9634	119.9634	119.9634	119.9634	119.9634	119.9634	119.9634	119.9634	119.9634	119.9634	119.9634	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	40.7011	36.1504	29.3995	22.2573	16.6376	14.0461	15.1774	19.7281	26.4790	33.6212	39.2409	41.8323	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	260.4970	263.2001	256.3883	241.8867	223.5810	206.3763	194.8825	192.1794	198.9912	213.4928	231.7984	249.0032	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	48.9957	48.9957	48.9957	48.9957	48.9957	48.9957	48.9957	48.9957	48.9957	48.9957	48.9957	48.9957	(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)	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	(71)
Water heating gains (Table 5)	60.0137	58.0958	54.1329	48.7538	45.2587	40.3453	36.1799	41.5286	43.4376	49.0031	55.2892	58.1200	(72)
Total internal gains	453.1953	449.4298	431.9042	404.8814	377.4609	352.7513	338.2233	345.4196	360.8913	388.1006	418.3121	440.9391	(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	5.2500	15.0428	0.6300	0.7000	0.7700	24.1358 (75)							
Southwest	4.3100	46.3896	0.6300	0.7000	0.7700	61.1040 (79)							
Solar gains	85.2398	131.1691	197.1949	280.4729	327.3642	364.5331	337.8484	295.3364	237.5295	158.6845	102.6588	68.7253	(83)
Total gains	538.4351	580.5989	629.0991	685.3543	704.8251	717.2845	676.0716	640.7560	598.4208	546.7851	520.9709	509.6644	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area, nil,m (see Table 9a)	53.1178	54.1247	54.3692	55.0835	55.0835	55.7669	55.7669	55.9873	55.7669	54.6106	54.8487	54.1247	21.0000 (85)
tau	4.5412	4.6083	4.6246	4.6722	4.6722	4.7178	4.7178	4.7325	4.7178	4.6407	4.6566	4.6083	
alpha	0.9873	0.9815	0.9627	0.9087	0.7868	0.5723	0.4125	0.4327	0.6989	0.9131	0.9741	0.9893	(86)
util living area	19.9322	20.0550	20.3035	20.6151	20.8605	20.9764	20.9960	20.9952	20.9420	20.6757	20.2965	19.9330	(87)
MIT	19.8270	19.8462	19.8507	19.8639	19.8639	19.8762	19.8762	19.8801	19.8762	19.8552	19.8596	19.8462	(88)
util rest of house	0.9829	0.9752	0.9497	0.8771	0.7177	0.4673	0.2894	0.3044	0.5936	0.8735	0.9635	0.9856	(89)
MIT 2	18.8957	19.0315	19.2767	19.5782	19.7829	19.8680	19.8755	19.8793	19.8523	19.6321	19.2806	18.9121	(90)
Living area fraction	19.2468	19.3782	19.6245	19.9295	20.1479	20.2435	20.2551	20.2573	20.2214	19.9857	19.6248	19.2580	(92)
Temperature adjustment	19.2468	19.3782	19.6245	19.9295	20.1479	20.2435	20.2551	20.2573	20.2214	19.9857	19.6248	19.2580	(93)
adjusted MIT	19.2468	19.3782	19.6245	19.9295	20.1479	20.2435	20.2551	20.2573	20.2214	19.9857	19.6248	19.2580	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	527.7335	564.3316	595.4769	602.5509	519.1339	360.6586	224.0445	223.1490	375.9423	480.5146	500.5390	501.0450	(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	1106.2688	1072.4715	961.9866	795.8055	581.5116	368.5812	224.8798	224.1629	397.3432	636.1050	868.4866	1078.7231	(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	430.4303	341.4700	272.6832	139.1433	46.4090	0.0000	0.0000	0.0000	0.0000	115.7592	264.9223	429.7925	(98)
Space heating RHI space heating demand												2041	(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	60.6300 (1b)	2.5300 (2b)	153.3939 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	60.6300		153.3939 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)... (3n)	153.3939 (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				3 * 10 =	30.0000 (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) =				50.0000 / (5) =	0.3260 (8)
Pressure test				Yes	
Measured/design AP50					5.0000
Infiltration rate					0.5760 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.4896 (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	0.6242	0.6120	0.5997	0.5385	0.5263	0.4651	0.4651	0.4528	0.4896	0.5263	0.5508	0.5752 (22b)
Effective ac	0.6948	0.6872	0.6798	0.6450	0.6385	0.6082	0.6082	0.6025	0.6198	0.6385	0.6517	0.6654 (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)			9.5600	1.1450	10.9466		(27)
Ground Floor			60.6300	0.1200	7.2756	90.0000	5456.7000 (28a)
Brick and Block	46.1100		46.1100	0.2200	10.1442	42.2200	1946.7642 (29a)
10.4N Brick and Block	16.8300	9.5600	7.2700	0.2700	1.9629	113.5000	825.1450 (29a)
Wall to Corridor	16.8300	2.1200	14.7100	0.2300	3.3830	113.5000	1669.5850 (29a)
Total net area of external elements Aum(A, m2)			140.4000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	36.0442	(33)
Party Ceilings 1			60.6300			70.0000	4244.1000 (32b)
Ground Floor Stud			126.1400			9.0000	1135.2600 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 15277.5542 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							251.9801 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.6780 (36)
Total fabric heat loss							(33) + (36) = 44.7222 (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	35.1712	34.7883	34.4130	32.6500	32.3202	30.7847	30.7847	30.5003	31.3761	32.3202	32.9874	33.6850 (38)
Average = Sum(39)m / 12 =	79.8934	79.5105	79.1351	77.3722	77.0423	75.5068	75.5068	75.2225	76.0983	77.0423	77.7096	78.4072 (39)
HLP	1.3177	1.3114	1.3052	1.2761	1.2707	1.2454	1.2454	1.2407	1.2551	1.2707	1.2817	1.2932 (40)
HLP (average)												1.2761 (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												1.9994 (42)
Average daily hot water use (litres/day)												81.6855 (43)
Daily hot water use	89.8541	86.5866	83.3192	80.0518	76.7844	73.5170	73.5170	76.7844	80.0518	83.3192	86.5866	89.8541 (44)
Energy conte	133.2510	116.5422	120.2611	104.8465	100.6027	86.8125	80.4445	92.3113	93.4138	108.8648	118.8344	129.0465 (45)
Energy content (annual)												Total = Sum(45)m = 1285.2312 (45)
Distribution loss (46)m = 0.15 x (45)m	19.9876	17.4813	18.0392	15.7270	15.0904	13.0219	12.0667	13.8467	14.0121	16.3297	17.8252	19.3570 (46)
Water storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	1.3769	1.1605	1.1523	0.9652	0.8883	0.7340	0.6801	0.8151	0.8600	1.0431	1.1833	1.3335	1.3335	(61)
Total heat required for water heating calculated for each month	134.6279	117.7026	121.4134	105.8117	101.4911	87.5465	81.1247	93.1264	94.2737	109.9079	120.0177	130.3799	130.3799	(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	134.6279	117.7026	121.4134	105.8117	101.4911	87.5465	81.1247	93.1264	94.2737	109.9079	120.0177	130.3799	130.3799	(64)
Heat gains from water heating, kWh/month	44.6502	39.0404	40.2749	35.1028	33.6725	29.0486	26.9178	30.8973	31.2751	36.4583	39.8083	43.2413	43.2413	(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	119.9634	119.9634	119.9634	119.9634	119.9634	119.9634	119.9634	119.9634	119.9634	119.9634	119.9634	119.9634	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	40.7011	36.1504	29.3995	22.2573	16.6376	14.0461	15.1774	19.7281	26.4790	33.6212	39.2409	41.8323	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	260.4970	263.2001	256.3883	241.8867	223.5810	206.3763	194.8825	192.1794	198.9912	213.4928	231.7984	249.0032	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	48.9957	48.9957	48.9957	48.9957	48.9957	48.9957	48.9957	48.9957	48.9957	48.9957	48.9957	48.9957	(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)	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	(71)
Water heating gains (Table 5)	60.0137	58.0958	54.1329	48.7538	45.2587	40.3453	36.1799	41.5286	43.4376	49.0031	55.2892	58.1200	(72)
Total internal gains	453.1953	449.4298	431.9042	404.8814	377.4609	352.7513	338.2233	345.4196	360.8913	388.1006	418.3121	440.9391	(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	5.2500	11.2829	0.6300	0.7000	0.7700	18.1031 (75)							
Southwest	4.3100	36.7938	0.6300	0.7000	0.7700	48.4645 (79)							
Solar gains	66.5677	119.4025	179.3436	248.9869	303.3217	311.8767	296.2094	254.0299	203.2023	136.2716	80.8278	56.2595	(83)
Total gains	519.7630	568.8323	611.2478	653.8682	680.7826	664.6280	634.4327	599.4495	564.0936	524.3722	499.1399	497.1985	(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	53.1178	53.3737	53.6268	54.8487	55.0835	56.2037	56.2037	56.4162	55.7669	55.0835	54.6106	54.1247	
alpha	4.5412	4.5582	4.5751	4.6566	4.6722	4.7469	4.7469	4.7611	4.7178	4.6722	4.6407	4.6083	
util living area	0.9915	0.9861	0.9730	0.9347	0.8441	0.6750	0.5118	0.5586	0.7943	0.9476	0.9848	0.9930	(86)
MIT	19.7766	19.9243	20.1724	20.5109	20.7863	20.9477	20.9886	20.9831	20.8836	20.5415	20.1150	19.7643	(87)
Th 2	19.8270	19.8319	19.8368	19.8596	19.8639	19.8839	19.8839	19.8876	19.8762	19.8639	19.8552	19.8462	(88)
util rest of house	0.9887	0.9815	0.9637	0.9114	0.7896	0.5778	0.3881	0.4328	0.7094	0.9239	0.9790	0.9907	(89)
MIT 2	18.7414	18.8912	19.1385	19.4803	19.7261	19.8613	19.8812	19.8832	19.8167	19.5185	19.0996	18.7445	(90)
Living area fraction	fLA = Living area / (4) =												0.3388 (91)
MIT	19.0921	19.2412	19.4888	19.8294	20.0853	20.2293	20.2564	20.2558	20.1781	19.8651	19.4436	19.0900	(92)
Temperature adjustment													0.0000
adjusted MIT	19.0921	19.2412	19.4888	19.8294	20.0853	20.2293	20.2564	20.2558	20.1781	19.8651	19.4436	19.0900	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9864	0.9785	0.9602	0.9107	0.8015	0.6096	0.4304	0.4759	0.7347	0.9240	0.9763	0.9887	(94)
Useful gains	512.7040	556.6020	586.9277	595.4646	545.6137	405.1735	273.0524	285.2484	414.4284	484.4995	487.2921	491.5651	(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	1181.7933	1140.2763	1027.8669	845.6326	646.0231	425.0514	276.0816	290.0436	462.5364	713.8050	959.2173	1167.4826	(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	497.8024	392.2291	328.0588	180.1209	74.7046	0.0000	0.0000	0.0000	0.0000	170.6033	339.7861	502.8827	(98)
Space heating													2486.1879 (98)
Space heating per m2													(98) / (4) = 41.0059 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2756.3059 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	497.8024	392.2291	328.0588	180.1209	74.7046	0.0000	0.0000	0.0000	0.0000	170.6033	339.7861	502.8827	(98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)
Space heating fuel (main heating system)	551.8874	434.8438	363.7015	199.6906	82.8211	0.0000	0.0000	0.0000	0.0000	189.1389	376.7030	557.5196	(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	134.6279	117.7026	121.4134	105.8117	101.4911	87.5465	81.1247	93.1264	94.2737	109.9079	120.0177	130.3799	(64)
Efficiency of water heater (217)m	86.8050	86.5304	85.9351	84.4577	81.5677	76.2000	76.2000	76.2000	76.2000	84.1428	86.0723	76.2000	(216)
Fuel for water heating, kWh/month	155.0923	136.0246	141.2849	125.2836	124.4255	114.8904	106.4628	122.2132	123.7188	130.6206	139.4382	150.0131	(219)
Water heating fuel used													1569.4680 (219)
Annual totals kWh/year													2756.3059 (211)
Space heating fuel - main system													0.0000 (215)
Space heating fuel - secondary													
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)													287.5178 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses													4688.2917 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2756.3059	3.4800	95.9194	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1569.4680	3.4800	54.6175	(247)
Pumps and fans for heating	75.0000	13.1900	9.8925	(249)
Energy for lighting	287.5178	13.1900	37.9236	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	0.0000	13.1900	0.0000	(252)
Total energy cost			318.3530	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.2658 (257)
SAP value		82.3418
SAP rating (Section 12)		82 (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	2756.3059	0.2160	595.3621	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1569.4680	0.2160	339.0051	(264)
Space and water heating			934.3672	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	287.5178	0.5190	149.2218	(268)
Energy saving/generation technologies				
PV Unit	-418.0000	0.5190	-216.9420	(269)
Total kg/year			905.5719	(272)
CO2 emissions per m2			14.9400	(273)
EI value			88.5121	
EI rating			89	(274)
EI band			B	

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9020 = 3.858$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9020 = 0.2395$, stars = 4
Water heating energy efficiency	$3.48 / 0.8227 = 4.230$, stars = 4
Water heating environmental impact	$0.216 / 0.8227 = 0.2626$, 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	60.6300 (1b)	2.5300 (2b)	153.3939 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.6300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	153.3939 (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				3 * 10 =	30.0000 (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) =				50.0000 / (5) =	0.3260 (8)
Pressure test				Yes	
Measured/design AP50					5.0000
Infiltration rate					0.5760 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.4896 (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												
Effective ac	0.6242	0.5752	0.5630	0.5263	0.5263	0.4896	0.4896	0.4773	0.4896	0.5508	0.5385	0.5752 (22b)
Effective ac	0.6948	0.6654	0.6585	0.6385	0.6385	0.6198	0.6198	0.6139	0.6198	0.6517	0.6450	0.6654 (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)			9.5600	1.1450	10.9466		(27)
Ground Floor			60.6300	0.1200	7.2756	90.0000	5456.7000 (28a)
Brick and Block	46.1100		46.1100	0.2200	10.1442	42.2200	1946.7642 (29a)
10.4N Brick and Block	16.8300	9.5600	7.2700	0.2700	1.9629	113.5000	825.1450 (29a)
Wall to Corridor	16.8300	2.1200	14.7100	0.2300	3.3830	113.5000	1669.5850 (29a)
Total net area of external elements Aum(A, m2)			140.4000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	36.0442	(33)
Party Ceilings 1			60.6300			70.0000	4244.1000 (32b)
Ground Floor Stud			126.1400			9.0000	1135.2600 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 15277.5542 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							251.9801 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.6780 (36)
Total fabric heat loss							(33) + (36) = 44.7222 (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	35.1712	33.6850	33.3325	32.3202	32.3202	31.3761	31.3761	31.0766	31.3761	32.9874	32.6500	33.6850 (38)
Average = Sum(39)m / 12 =	79.8934	78.4072	78.0546	77.0423	77.0423	76.0983	76.0983	75.7988	76.0983	77.7096	77.3722	78.4072 (39)
												77.3352 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.3177	1.2932	1.2874	1.2707	1.2707	1.2551	1.2551	1.2502	1.2551	1.2817	1.2761	1.2932 (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												1.9994 (42)
Average daily hot water use (litres/day)												81.6855 (43)
Daily hot water use	89.8541	86.5866	83.3192	80.0518	76.7844	73.5170	73.5170	76.7844	80.0518	83.3192	86.5866	89.8541 (44)
Energy conte	133.2510	116.5422	120.2611	104.8465	100.6027	86.8125	80.4445	92.3113	93.4138	108.8648	118.8344	129.0465 (45)
Energy content (annual)												Total = Sum(45)m = 1285.2312 (45)
Distribution loss (46)m = 0.15 x (45)m	19.9876	17.4813	18.0392	15.7270	15.0904	13.0219	12.0667	13.8467	14.0121	16.3297	17.8252	19.3570 (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	1.3769	1.1605	1.1523	0.9652	0.8883	0.7340	0.6801	0.8151	0.8600	1.0431	1.1833	1.3335	1.3335	(61)
Total heat required for water heating calculated for each month	134.6279	117.7026	121.4134	105.8117	101.4911	87.5465	81.1247	93.1264	94.2737	109.9079	120.0177	130.3799	130.3799	(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	134.6279	117.7026	121.4134	105.8117	101.4911	87.5465	81.1247	93.1264	94.2737	109.9079	120.0177	130.3799	130.3799	(64)
Heat gains from water heating, kWh/month	44.6502	39.0404	40.2749	35.1028	33.6725	29.0486	26.9178	30.8973	31.2751	36.4583	39.8083	43.2413	43.2413	(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	119.9634	119.9634	119.9634	119.9634	119.9634	119.9634	119.9634	119.9634	119.9634	119.9634	119.9634	119.9634	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	40.7011	36.1504	29.3995	22.2573	16.6376	14.0461	15.1774	19.7281	26.4790	33.6212	39.2409	41.8323	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	260.4970	263.2001	256.3883	241.8867	223.5810	206.3763	194.8825	192.1794	198.9912	213.4928	231.7984	249.0032	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	48.9957	48.9957	48.9957	48.9957	48.9957	48.9957	48.9957	48.9957	48.9957	48.9957	48.9957	48.9957	(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)	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	(71)
Water heating gains (Table 5)	60.0137	58.0958	54.1329	48.7538	45.2587	40.3453	36.1799	41.5286	43.4376	49.0031	55.2892	58.1200	(72)
Total internal gains	453.1953	449.4298	431.9042	404.8814	377.4609	352.7513	338.2233	345.4196	360.8913	388.1006	418.3121	440.9391	(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	5.2500	15.0428	0.6300	0.7000	0.7700	24.1358 (75)							
Southwest	4.3100	46.3896	0.6300	0.7000	0.7700	61.1040 (79)							
Solar gains	85.2398	131.1691	197.1949	280.4729	327.3642	364.5331	337.8484	295.3364	237.5295	158.6845	102.6588	68.7253	(83)
Total gains	538.4351	580.5989	629.0991	685.3543	704.8251	717.2845	676.0716	640.7560	598.4208	546.7851	520.9709	509.6644	(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	53.1178	54.1247	54.3692	55.0835	55.0835	55.7669	55.7669	55.9873	55.7669	54.6106	54.8487	54.1247	
alpha	4.5412	4.6083	4.6246	4.6722	4.6722	4.7178	4.7178	4.7325	4.7178	4.6407	4.6566	4.6083	
util living area	0.9873	0.9815	0.9627	0.9087	0.7868	0.5723	0.4125	0.4327	0.6989	0.9131	0.9741	0.9893	(86)
MIT	19.9322	20.0550	20.3035	20.6151	20.8605	20.9764	20.9960	20.9952	20.9420	20.6757	20.2965	19.9330	(87)
Th 2	19.8270	19.8462	19.8507	19.8639	19.8639	19.8762	19.8762	19.8801	19.8762	19.8552	19.8596	19.8462	(88)
util rest of house	0.9829	0.9752	0.9497	0.8771	0.7177	0.4673	0.2894	0.3044	0.5936	0.8735	0.9635	0.9856	(89)
MIT 2	18.8957	19.0315	19.2767	19.5782	19.7829	19.8680	19.8755	19.8793	19.8523	19.6321	19.2806	18.9121	(90)
Living area fraction	fLA = Living area / (4) =												0.3388 (91)
MIT	19.2468	19.3782	19.6245	19.9295	20.1479	20.2435	20.2551	20.2573	20.2214	19.9857	19.6248	19.2580	(92)
Temperature adjustment													0.0000
adjusted MIT	19.2468	19.3782	19.6245	19.9295	20.1479	20.2435	20.2551	20.2573	20.2214	19.9857	19.6248	19.2580	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9801	0.9720	0.9466	0.8792	0.7365	0.5028	0.3314	0.3483	0.6282	0.8788	0.9608	0.9831	(94)
Useful gains	527.7335	564.3316	595.4769	602.5509	519.1339	360.6586	224.0445	223.1490	375.9423	480.5146	500.5390	501.0450	(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	1106.2688	1072.4715	961.9866	795.8055	581.5116	368.5812	224.8798	224.1629	397.3432	636.1050	868.4866	1078.7231	(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	430.4303	341.4700	272.6832	139.1433	46.4090	0.0000	0.0000	0.0000	0.0000	115.7592	264.9223	429.7925	(98)
Space heating													2040.6098 (98)
Space heating per m ²													(98) / (4) = 33.6568 (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

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		2262.3169	(211)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	430.4303	341.4700	272.6832	139.1433	46.4090	0.0000	0.0000	0.0000	0.0000	115.7592	264.9223	429.7925	(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)	477.1954	378.5699	302.3095	154.2609	51.4512	0.0000	0.0000	0.0000	0.0000	128.3362	293.7054	476.4884	(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	134.6279	117.7026	121.4134	105.8117	101.4911	87.5465	81.1247	93.1264	94.2737	109.9079	120.0177	130.3799	(64)	
Efficiency of water heater (217)m	86.4172	86.1430	85.3679	83.5678	80.1012	76.2000	76.2000	76.2000	76.2000	82.7917	85.3130	76.2000	(216)	
Fuel for water heating, kWh/month	155.7883	136.6363	142.2236	126.6179	126.7036	114.8904	106.4628	122.2132	123.7188	132.7523	140.6792	150.7265	(219)	
Water heating fuel used												1579.4129	(219)	
Annual totals kWh/year														
Space heating fuel - main system												2262.3169	(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)													287.5178	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
Total delivered energy for all uses													4204.2476	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2262.3169	7.6100	172.1623 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1579.4129	7.6100	120.1933 (247)
Pumps and fans for heating	75.0000	31.0800	23.3100 (249)
Energy for lighting	287.5178	31.0800	89.3605 (250)
Additional standing charges			105.0000 (251)
Energy saving/generation technologies			
PV Unit	0.0000	31.0800	0.0000 (252)
Total energy cost			510.0262 (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	2262.3169	0.2160	488.6604 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1579.4129	0.2160	341.1532 (264)
Space and water heating			829.8136 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	287.5178	0.5190	149.2218 (268)
Energy saving/generation technologies			
PV Unit	-418.0000	0.5190	-216.9420 (269)
Total kg/year			801.0184 (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	2262.3169	1.2200	2760.0266 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1579.4129	1.2200	1926.8837 (264)
Space and water heating			4686.9103 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	287.5178	3.0700	882.6798 (268)
Energy saving/generation technologies			
PV Unit	-418.0000	3.0700	-1283.2600 (269)
Primary energy kWh/year			4516.5801 (272)
Primary energy kWh/m2/year			74.4941 (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 82
 Current environmental impact rating: B 89

(For testing purposes):

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

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

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

Potential energy efficiency rating: B 82
 Potential environmental impact rating: B 89

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

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

	Current	Potential	Saving
Electricity	£113	£113	£0
Mains gas	£397	£397	£0
Space heating	£300	£300	£0
Water heating	£120	£120	£0
Lighting	£89	£89	£0
Total cost of fuels	£510	£510	£0
Total cost of uses	£509	£509	£0
Delivered energy	69 kWh/m ²	69 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	0.8 tonnes	0.8 tonnes	0.0 tonnes
CO2 emissions per m ²	13 kg/m ²	13 kg/m ²	0 kg/m ²
Primary energy	74 kWh/m ²	74 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 26		Issued on Date	08/02/2024
Assessment Reference	Rev B	Prop Type Ref	Block Ev	
Project	Plot 26			
Calculation Type	New Build (As Designed)			

SAP Rating	82 B	DER	17.22	TER	20.63
Environmental	89 B	% DER<TER	16.52		
CO ₂ Emissions (t/year)	0.80	DFEE	48.79	TFEE	56.59
General Requirements Compliance	Pass	% DFEE<TFEE	13.79		

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 26	Issued on Date	08/02/2024
Assessment Reference	Rev B	Prop Type Ref	Block Ev
Project	Plot 26		
Calculation Type	New Build (As Designed)		

SAP Rating	82 B	DER	17.22	TER	20.63
Environmental	89 B	% DER<TER	16.52		
CO ₂ Emissions (t/year)	0.80	DFEE	48.79	TFEE	56.59
General Requirements Compliance	Pass	% DFEE<TFEE	13.79		

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

Wall 000004

Wall Type: Standard Wall

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	Brick, outer leaf						
	Main construction	102	0.7700	0.1325	82.81		
	Main construction	102	0.9407	0.1084	17.19		
Layer 2	Supafil 34						
	Main construction	100	0.0340	2.9412	100.00		
	Corrections - Air Gap: Level 0, Fasteners: None or plastic						
Layer 3	Hemelite standard solid 10.4N						
	Main construction	140	0.4900	0.2857	93.43	1450	1000
	Main construction	140	0.8803	0.1590	6.57	1450	1000
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 4	airspace/plaster dabs						
	Main construction	15	0.0882	0.1700	80.00		
	Main construction	15	0.0882	0.1700	20.00		
	Corrections - Cavity Unventilated, Emissivity: Normal						
Layer 5	Plasterboard, standard						
	Main construction	12.5	0.2100	0.0595	100.00	700	1000
Int surface				0.1300			

Total resistance:	Upper limit = 3.746 m ² K/W	Lower limit = 3.740 m ² K/W	Average = 3.743 m ² K/W
	Total correction = 0.0001 m ² K/W	U-value (unrounded) = 0.27 W/m ² K	

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

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0931 Plot 26	Issued on Date	08/02/2024
Assessment Reference	Rev B	Prop Type Ref	Block Ev
Project	Plot 26		
Calculation Type	New Build (As Designed)		

SAP Rating	82 B	DER	17.22	TER	20.63
Environmental	89 B	% DER<TER	16.52		
CO ₂ Emissions (t/year)	0.80	DFEE	48.79	TFEE	56.59
General Requirements Compliance	Pass	% DFEE<TFEE	13.79		

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

Wall Wall to Corridor

Wall Type: Standard Wall

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

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

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

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0931 Plot 26	Issued on Date	08/02/2024
Assessment Reference	Rev B	Prop Type Ref	Block Ev
Project	Plot 26		
Calculation Type	New Build (As Designed)		

SAP Rating	82 B	DER	17.22	TER	20.63
Environmental	89 B	% DER<TER	16.52		
CO ₂ Emissions (t/year)	0.80	DFEE	48.79	TFEE	56.59
General Requirements Compliance	Pass	% DFEE<TFEE	13.79		

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

Floor 000003

Floor Type: Suspended Floor

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

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

Floor height above ground:h = 0.200 m

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

Ventilation openings per perimeter length:e = 0.0015 %

Mean wind speed:v = 5.000 m/s

Resistance on solum:R_g = 0.000 m²K/W

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.1700			
Layer 1	EPS 200 Lower portion						
	Main construction	55	0.0340	1.6176	80.65		
	Main construction	55	2.0000	0.0275	19.35		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 2	EPS Upper portion						
	Main construction	100	0.0340	2.9412	87.10		
	Main construction	100	2.0000	0.0500	12.90		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 3	Grey EPS 100 Topsheet						
	Main construction	155	0.0300	5.1667	100.00	15	1450
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 4	Screed						
	Main construction	75	1.1500	0.0652	100.00	1200	1000
Int surface				0.1700			

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

Unheated space: None

Total thickness: 385 mm

U-value: 0.12 W/m² K

Kappa: 90.00 kJ/m² K

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Property Reference	SAP 0931 Plot 26	Issued on Date	08/02/2024
Assessment Reference	Rev B	Prop Type Ref	Block Ev
Property	Plot 26		

SAP Rating	82 B	DER	17.22	TER	20.63
Environmental	89 B	% DER<TER	16.52		
CO ₂ Emissions (t/year)	0.80	DFEE	48.79	TFEE	56.59
General Requirements Compliance	Pass	% DFEE<TFEE	13.79		

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

Orientation	South 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	2
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements		Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	Ground Floor:	31.53 m	60.63 m ²	2.53 m

7.0 Living Area	20.54	m ²
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8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	251.98	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	46.11	46.11
	10.4N Brick and Block	Cavity Wall	Other	0.27	113.50	16.83	7.27
	Wall to Corridor	Cavity Wall	Other	0.29	113.50	16.83	14.71

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	126.14

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	60.63

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)
Ground Floor	Ground Floor - Solid	Other	0.12	90.00	60.63

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	South East							2.12	
Windows	Window	[2] 10.4N Brick and Block	South West	None	0.00					4.31	
North Elevation	Window	[2] 10.4N Brick and Block	North East	None	0.00					5.25	

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)	9.06	0.043	No	Catnic Thermally Broken
Independently assessed	E3 Sill	8.05	0.021	No	Knauf P5
Independently assessed	E4 Jamb	18.30	0.016	No	Knauf P6
Table K1 - Approved	E5 Ground floor (normal)	31.53	0.160	No	
Table K1 - Approved	E7 Party floor between dwellings (in blocks of flats)	31.53	0.070	No	Knauf P15
Independently assessed	E16 Corner (normal)	9.42	0.061	No	Knauf P23

Y-value W/m²K

18.0 Pressure Testing

Designed AP₅₀ m³/(h.m²) @ 50 Pa

Property Tested ?

As Built AP₅₀ m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather

Cross ventilation possible

Night Ventilation

Air change rate

Mechanical Ventilation

Mechanical Ventilation System Present

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				2
Number of passive vents				3
Number of flueless gas fires				0

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

21.0 Fixed Cooling System	<input type="text" value="No"/>	
22.0 Lighting		
Internal		
Total number of light fittings	<input type="text" value="17"/>	
Total number of L.E.L. fittings	<input type="text" value="17"/>	
Percentage of L.E.L. fittings	<input type="text" value="100.00"/>	%
External		
External lights fitted	<input type="text" value="Yes"/>	
Light and motion sensor	<input type="text" value="Yes"/>	
23.0 Electricity Tariff	<input type="text" value="Standard"/>	
24.0 Main Heating 1	<input type="text" value="Database"/>	
Description	<input type="text" value="Gas Combi"/>	
Percentage of Heat	<input type="text" value="100"/>	%
Database Ref. No.	<input type="text" value="17959"/>	
Fuel Type	<input type="text" value="Mains gas"/>	
Main Heating	<input type="text" value="BGW"/>	
SAP Code	<input type="text" value="104"/>	
In Winter	<input type="text" value="90.2"/>	
In Summer	<input type="text" value="76.2"/>	
Controls	<input type="text" value="CBE Programmer, room thermostat and TRVs"/>	
PCDF Controls	<input type="text" value="0"/>	
Delayed Start Stat	<input type="text" value="No"/>	
Sap Code	<input type="text" value="2106"/>	
Flue Type	<input type="text" value="Balanced"/>	
Fan Assisted Flue	<input type="text" value="Yes"/>	
Is MHS Pumped	<input type="text" value="Pump in heated space"/>	
Heat Emitter	<input type="text" value="Radiators"/>	
Flow Temperature	<input type="text" value="Normal (> 45°C)"/>	
Combi boiler type	<input type="text" value="Standard Combi"/>	
Combi keep hot type	<input type="text" value="None"/>	
25.0 Main Heating 2	<input type="text" value="None"/>	
Community Heating	<input type="text" value="None"/>	
28.0 Water Heating	<input type="text" value="HWP From main heating 1"/>	
Water Heating	<input type="text" value="Main Heating 1"/>	
Flue Gas Heat Recovery System	<input type="text" value="No"/>	
Waste Water Heat Recovery Instantaneous System 1	<input type="text" value="No"/>	
Waste Water Heat Recovery Instantaneous System 2	<input type="text" value="No"/>	
Waste Water Heat Recovery Storage System	<input type="text" value="No"/>	
Solar Panel	<input type="text" value="No"/>	
Water use <= 125 litres/person/day	<input type="text" value="Yes"/>	
SAP Code	<input type="text" value="901"/>	

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

29.0 Hot Water Cylinder	None
32.0 Photovoltaic Unit	More Dwellings, One Block
Apportioned	418.00

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 Block Ev	Issued on Date	08/02/2024
Block Name	Block EV		
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 Block Ev		Block Name: Block EV			
Property-Assessment Reference	Multiplier	Floor Area (m ²)	DER (kgCO ₂ /m ²)	TER (kgCO ₂ /m ²)	% DER/TER
SAP 0931 Plot 27-Rev B	1	60.9	14.29	19.11	25.23 %
SAP 0931 Plot 28-Rev B	1	60.63	13.08	18.14	27.90 %
SAP 0931 Plot 29-Rev B	1	60.9	14.99	20.24	25.93 %
SAP 0931 Plot 30-Rev B	1	60.63	14.65	19.99	26.73 %
SAP 0931 Plot 25-Rev B	1	60.9	18.29	21.22	13.83 %
SAP 0931 Plot 26-Rev B	1	60.63	17.22	20.63	16.52 %
Totals:	6	364.59	92.52	119.34	
Average DER = 15.42 kgCO ₂ /m ²		% DER/TER		PASS	
Average TER = 19.89 kgCO ₂ /m ²		22.47 %			

Block Compliance Report - DFEE

Block Reference: SAP 0931 Block Ev		Block Name: Block EV			
Property-Assessment Reference	Multiplier	Floor Area (m ²)	DFEE (kWh/m ² /yr)	TFEE (kWh/m ² /yr)	% DFEE/TFEE
SAP 0931 Plot 27-Rev B	1	60.9	42.94	48.50	11.46 %
SAP 0931 Plot 28-Rev B	1	60.63	38.24	43.76	12.61 %
SAP 0931 Plot 29-Rev B	1	60.9	45.83	54.30	15.60 %
SAP 0931 Plot 30-Rev B	1	60.63	43.78	52.78	17.06 %
SAP 0931 Plot 25-Rev B	1	60.9	52.47	59.51	11.84 %
SAP 0931 Plot 26-Rev B	1	60.63	48.79	56.59	13.79 %
Totals:	6	364.59	272.04	315.44	
Average DFEE = 45.34 kWh/m ² /yr		% DFEE/TFEE		PASS	
Average TFEE = 52.58 kWh/m ² /yr		13.77 %			