



elmhurst
energy



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: Plot 34

Contact: Tobias Whiting
Abacus Energy (UK) Ltd
toby@abacusenergyuk.com

Report Issue Date: 08/02/2024

EXCELLENCE
IN ENERGY
ASSESSMENT

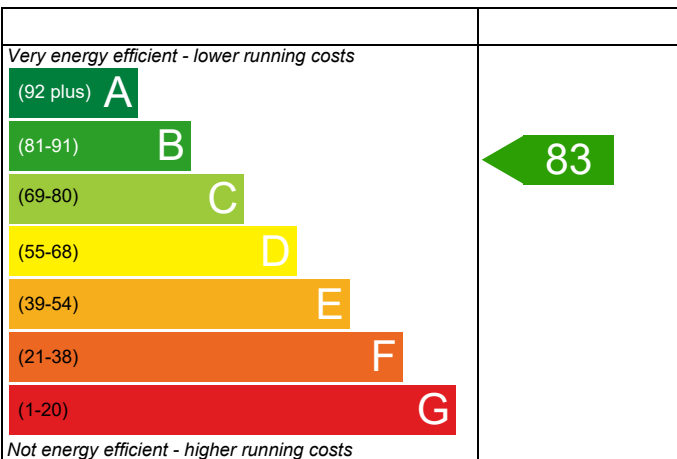
Plot 34

Dwelling type: Flat, Detached
 Date of assessment: 08/02/2024
 Produced by: Abacus Energy (UK) Ltd
 Total floor area: 61.36 m²
 DRRN: 8120-8272-0046

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

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

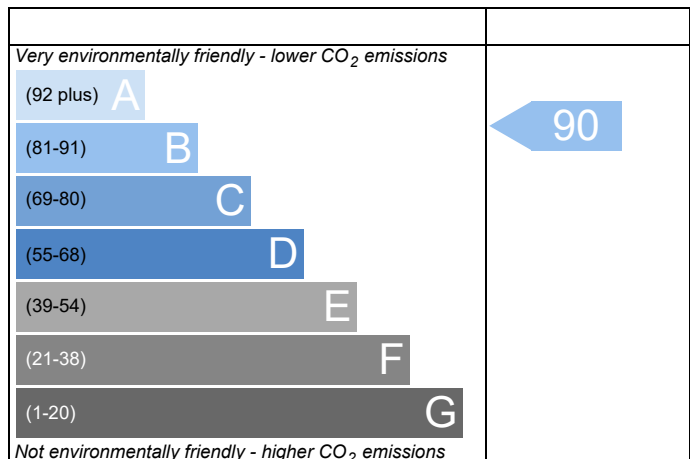
Energy Efficiency Rating



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 34	Issued on Date	08/02/2024
Assessment Reference	Rev B	Prop Type Ref	Block Ev1
Property	Plot 34		
SAP Rating	83 B	DER	15.24
Environmental	90 B	TER	17.89
CO ₂ Emissions (t/year)	0.73	% DER<TER	14.80
General Requirements Compliance	Pass	DFEE	37.36
		TREE	42.70
		% DFEE<TFEE	12.49
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 TFE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	17.89	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	15.24	kgCO ₂ /m ²	Pass
	-2.65 (-14.8%)	kgCO ₂ /m ²	

1b TFE and DFEE

Target Fabric Energy Efficiency (TFEE)	42.70	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	37.36	kWh/m ² /yr	
	-5.3 (-12.4%)	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
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

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)

Main heating system

Boiler system with radiators or underfloor - Mains gas
Data from database
Vaillant ecoTEC plus 835 VUW 306/5-5 (H-GB) R6
Combi boiler
Efficiency: 89.4% 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 South East

5.25 m², No overhang

Windows facing North 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

Door U-value

1.10 W/m²K

Photovoltaic array

418.00 kWh/Year

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.

RECOMMENDATIONS

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

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.



THERMAL BRIDGING

Calculation Type: New Build (As Designed)

Property Reference	SAP 0931 Plot 34	Issued on Date	08/02/2024
Assessment Reference	Rev B	Prop Type Ref	Block Ev1
Property	Plot 34		

SAP Rating	83 B	DER	15.24	TER	17.89
Environmental	90 B	% DER<TER	14.80		
CO ₂ Emissions (t/year)	0.73	DFEE	37.36	TFEE	42.70
General Requirements Compliance	Pass	% DFEE<TFEE	12.49		

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	E7 Party floor between dwellings (in blocks of flats)	Table K1 - Approved	0.070	63.06	4.41	
External wall	E16 Corner (normal)	Independently assessed	0.061	9.84	0.60	Knauf P23

Total: **5.87** W/mK:
 Y-Value: **0.076** W/m²K:

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	SAP 0931 Plot 34			Issued on Date	08/02/2024
Assessment Reference	Rev B	Prop Type Ref	Block Ev1		
Property	Plot 34				
SAP Rating	83 B	DER	15.24	TER	17.89
Environmental	90 B	% DER<TER	14.80		
CO₂ Emissions (t/year)	0.73	DFEE	37.36	TFEE	42.70
General Requirements Compliance	Pass	% DFEE<TFEE	12.49		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com			Assessor ID	E477-0001
Client	Foreman Homes, FORE				

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

DWELLING AS DESIGNED

Mid-floor flat, total floor area 61 m²

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

1a TER and DER

Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 17.89 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.24 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)42.7 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)37.4 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	(no floor)		
Roof	(no roof)		
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

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

Data from database

Vaillant ecoTEC plus 835 VUW 306/5-5 (H-GB) R6

Combi boiler

Efficiency: 89.4% 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 South East:

5.25 m², No overhang

Windows facing North 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

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 (m ²)	Storey height (m)	Volume (m ³)
Ground floor	61.3600 (1b)	2.4600 (2b)	150.9456 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.3600		150.9456 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 150.9456 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				2 * 10 =	20.0000 (7a)
Number of passive vents				1 * 10 =	10.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Air changes per hour					
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) =	0.1987 (8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate				0.4487	(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) =	0.3814 (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	0.4863	0.4768	0.4673	0.4196	0.4100	0.3624	0.3624	0.3528	0.3814	0.4100	0.4291	0.4482 (22b)
Effective ac	0.6183	0.6137	0.6092	0.5880	0.5841	0.5657	0.5657	0.5622	0.5727	0.5841	0.5921	0.6004 (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)
Brick and Block	44.8600		44.8600	0.2200	9.8692	42.2200	1893.9892 (29a)
7.3N Brick and Block	16.3500	9.5600	6.7900	0.2700	1.8333	113.5000	770.6650 (29a)
Wall to Corridor	16.3500	2.1200	14.2300	0.2300	3.2726	113.5000	1615.1050 (29a)
Total net area of external elements Aum, m ²			77.5600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.2536		(33)
Party Floor 1			61.3600			70.0000	4295.2000 (32d)
Party Ceilings 1			61.3600			70.0000	4295.2000 (32b)
Ground Floor Stud			122.1600			9.0000	1099.4400 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13969.5992 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							227.6662 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.8659 (36)
Total fabric heat loss						(33) + (36) =	34.1195 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	30.7967	30.5680	30.3438	29.2906	29.0936	28.1764	28.1764	28.0065	28.5297	29.0936	29.4922	29.9089 (38)
Average = Sum(39)m / 12 =	64.9162	64.6875	64.4633	63.4101	63.2131	62.2959	62.2959	62.1260	62.6492	63.2131	63.6117	64.0284 (39)
												63.4092 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0580	1.0542	1.0506	1.0334	1.0302	1.0153	1.0153	1.0125	1.0210	1.0302	1.0367	1.0435 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.0198 (42)
Average daily hot water use (litres/day)												82.1706 (43)
Daily hot water use	90.3877	87.1008	83.8140	80.5272	77.2404	73.9535	73.9535	77.2404	80.5272	83.8140	87.1008	90.3877 (44)
Energy conte	134.0423	117.2342	120.9752	105.4691	101.2001	87.3280	80.9223	92.8595	93.9685	109.5112	119.5401	129.8128 (45)
Energy content (annual)												Total = Sum(45)m = 1292.8634 (45)
Distribution loss (46)m = 0.15 x (45)m	20.1063	17.5851	18.1463	15.8204	15.1800	13.0992	12.1383	13.9289	14.0953	16.4267	17.9310	19.4719 (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	46.0606	40.0902	42.7107	39.7120	39.3608	36.4702	37.6859	39.3608	39.7120	42.7107	42.9538	46.0606	46.0606	(61)
Total heat required for water heating calculated for each month	180.1028	157.3245	163.6859	145.1812	140.5610	123.7983	118.6082	132.2203	133.6805	152.2219	162.4939	175.8733	175.8733	(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	180.1028	157.3245	163.6859	145.1812	140.5610	123.7983	118.6082	132.2203	133.6805	152.2219	162.4939	175.8733	175.8733	(64)
Heat gains from water heating, kWh/month	56.0842	49.0029	50.9019	44.9965	43.4893	38.1541	36.3281	40.7160	41.1725	47.0902	50.4855	54.6779	54.6779	(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	100.9907	100.9907	100.9907	100.9907	100.9907	100.9907	100.9907	100.9907	100.9907	100.9907	100.9907	100.9907	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.4910	14.6471	11.9118	9.0180	6.7411	5.6911	6.1494	7.9933	10.7286	13.6224	15.8993	16.9493	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	176.3634	178.1935	173.5817	163.7637	151.3703	139.7223	131.9406	130.1105	134.7223	144.5403	156.9337	168.5818	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.0991	33.0991	33.0991	33.0991	33.0991	33.0991	33.0991	33.0991	33.0991	33.0991	33.0991	33.0991	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-80.7926	-80.7926	-80.7926	-80.7926	-80.7926	-80.7926	-80.7926	-80.7926	-80.7926	-80.7926	-80.7926	-80.7926	(71)
Water heating gains (Table 5)	75.3820	72.9210	68.4166	62.4951	58.4533	52.9918	48.8281	54.7258	57.1841	63.2932	70.1188	73.4918	(72)
Total internal gains	324.5336	322.0589	310.2073	291.5741	272.8619	254.7024	243.2154	249.1268	258.9322	277.7531	299.2491	315.3201	(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						
Southeast		5.2500	36.7938	0.6300	0.7000	0.7700	59.0345	(77)					
Northwest		4.3100	11.2829	0.6300	0.7000	0.7700	14.8618	(81)					
Solar gains	73.8963	130.8093	192.0912	259.9883	311.2691	317.8422	302.7616	263.1548	215.3918	148.1075	89.4098	62.6582	(83)
Total gains	398.4299	452.8682	502.2985	551.5624	584.1311	572.5446	545.9771	512.2816	474.3240	425.8606	388.6588	377.9782	(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	59.7762	59.9876	60.1962	61.1960	61.3867	62.2906	62.2906	62.4609	61.9393	61.3867	61.0021	60.6050			
alpha	4.9851	4.9992	5.0131	5.0797	5.0924	5.1527	5.1527	5.1641	5.1293	5.0924	5.0668	5.0403			
util living area	0.9957	0.9911	0.9789	0.9393	0.8385	0.6596	0.4948	0.5454	0.7957	0.9585	0.9912	0.9967			(86)
MIT	19.8472	20.0054	20.2559	20.5800	20.8346	20.9644	20.9933	20.9892	20.9073	20.5797	20.1596	19.8244			(87)
Th 2	20.0353	20.0384	20.0414	20.0556	20.0582	20.0706	20.0706	20.0729	20.0659	20.0582	20.0529	20.0473			(88)
util rest of house	0.9944	0.9885	0.9724	0.9202	0.7912	0.5779	0.3940	0.4416	0.7239	0.9415	0.9881	0.9957			(89)
MIT 2	18.9866	19.1462	19.3956	19.7188	19.9467	20.0538	20.0688	20.0696	20.0145	19.7261	19.3119	18.9736			(90)
Living area fraction										fLA = Living area / (4) =		0.3347			(91)
MIT	19.2747	19.4338	19.6836	20.0071	20.2439	20.3587	20.3782	20.3775	20.3134	20.0118	19.5957	19.2584			(92)
Temperature adjustment												0.0000			(93)
adjusted MIT	19.2747	19.4338	19.6836	20.0071	20.2439	20.3587	20.3782	20.3775	20.3134	20.0118	19.5957	19.2584			(93)

8. Space heating requirement

Utilisation	0.9930	0.9864	0.9694	0.9190	0.8014	0.6043	0.4279	0.4765	0.7446	0.9405	0.9862	0.9946			(94)
Useful gains	395.6605	446.7001	486.9339	506.9051	468.1463	345.9756	233.6057	244.1063	353.1899	400.5037	383.2969	375.9221			(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	972.1002	940.1533	849.8583	704.3004	540.0864	358.7408	235.3689	247.1034	389.2619	594.9501	794.8728	964.1636			(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	428.8711	331.6005	270.0157	142.1246	53.5234	0.0000	0.0000	0.0000	0.0000	144.6681	296.3346	437.6517			(98)
Space heating												2104.7898			(98)
Space heating per m2												(98) / (4) =			(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													90.3000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													2330.8857	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	428.8711	331.6005	270.0157	142.1246	53.5234	0.0000	0.0000	0.0000	0.0000	144.6681	296.3346	437.6517	(98)	
Space heating efficiency (main heating system 1)	90.3000	90.3000	90.3000	90.3000	90.3000	0.0000	0.0000	0.0000	0.0000	90.3000	90.3000	90.3000	(210)	
Space heating fuel (main heating system)	474.9403	367.2210	299.0207	157.3916	59.2729	0.0000	0.0000	0.0000	0.0000	160.2084	328.1668	484.6641	(211)	
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Water heating requirement	180.1028	157.3245	163.6859	145.1812	140.5610	123.7983	118.6082	132.2203	133.6805	152.2219	162.4939	175.8733	(64)	
Efficiency of water heater (217)m	87.0575	86.7833	86.2028	84.8973	82.7525	80.2000	80.2000	80.2000	80.2000	84.8230	86.4446	87.1537	(216)	
Fuel for water heating, kWh/month	206.8779	181.2843	189.8847	171.0079	169.8571	154.3619	147.8905	164.8632	166.6840	179.4583	187.9747	201.7968	(219)	
Water heating fuel used													2121.9413	(219)
Annual totals kWh/year													2330.8857	(211)
Space heating fuel - main system													0.0000	(215)
Space heating fuel - secondary													30.0000	(230c)
Electricity for pumps and fans:													45.0000	(230e)
central heating pump													75.0000	(231)
main heating flue fan													291.2356	(232)
Total electricity for the above, kWh/year													75.0000	(231)
Electricity for lighting (calculated in Appendix L)													291.2356	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													4819.0626	(238)
Total delivered energy for all uses													4819.0626	(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	2330.8857	0.2160	503.4713	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2121.9413	0.2160	458.3393	(264)
Space and water heating			961.8106	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	291.2356	0.5190	151.1513	(268)
Energy saving/generation technologies				
PV Unit	-418.0000	0.5190	-216.9420	(269)
Total CO2, kg/year			934.9449	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			15.2400	(273)

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

DER			15.2400	ZC1
Total Floor Area		TFA	61.3600	
Assumed number of occupants		N	2.0198	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			17.0321	ZC2
CO2 emissions from cooking, equation (L16)			2.7294	ZC3
Total CO2 emissions			35.0015	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			35.0015	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	61.3600 (1b)	x 2.4600 (2b)	= 150.9456 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.3600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 150.9456 (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) =	0.1325 (8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate				0.3825	(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) =		0.3251 (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	0.4145	0.4064	0.3983	0.3576	0.3495	0.3089	0.3089	0.3007	0.3251	0.3495	0.3658	0.3820 (22b)
Effective ac	0.5859	0.5826	0.5793	0.5640	0.5611	0.5477	0.5477	0.5452	0.5529	0.5611	0.5669	0.5730 (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)					
Brick and Block	44.8600		44.8600	0.1800	8.0748		(29a)					
7.3N Brick and Block	16.3500	9.5600	6.7900	0.1800	1.2222		(29a)					
Wall to Corridor	16.3500	2.1200	14.2300	0.1800	2.5614		(29a)					
Total net area of external elements Aum(A, m ²)			77.5600				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	26.6526	(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.0703 (36)					
Total fabric heat loss							(33) + (36) = 33.7229 (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	29.1858	29.0196	28.8567	28.0916	27.9484	27.2820	27.2820	27.1586	27.5387	27.9484	28.2380	28.5408 (38)
Average = Sum(39)m / 12 =	62.9087	62.7426	62.5797	61.8145	61.6714	61.0050	61.0050	60.8816	61.2617	61.6714	61.9610	62.2637 (39)
	61.8138											61.8138 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0252	1.0225	1.0199	1.0074	1.0051	0.9942	0.9942	0.9922	0.9984	1.0051	1.0098	1.0147 (40)
Days in month												1.0074 (40)
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.0198 (42)
Average daily hot water use (litres/day)												82.1706 (43)
Daily hot water use	90.3877	87.1008	83.8140	80.5272	77.2404	73.9535	73.9535	77.2404	80.5272	83.8140	87.1008	90.3877 (44)
Energy conte	134.0423	117.2342	120.9752	105.4691	101.2001	87.3280	80.9223	92.8595	93.9685	109.5112	119.5401	129.8128 (45)
Energy content (annual)												Total = Sum(45)m = 1292.8634 (45)
Distribution loss (46)m = 0.15 x (45)m	20.1063	17.5851	18.1463	15.8204	15.1800	13.0992	12.1383	13.9289	14.0953	16.4267	17.9310	19.4719 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi loss	46.0606	40.0902	42.7107	39.7120	39.3608	36.4702	37.6859	39.3608	39.7120	42.7107	42.9538	46.0606 (61)
Total heat required for water heating calculated for each month	180.1028	157.3245	163.6859	145.1812	140.5610	123.7983	118.6082	132.2203	133.6805	152.2219	162.4939	175.8733 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	180.1028	157.3245	163.6859	145.1812	140.5610	123.7983	118.6082	132.2203	133.6805	152.2219	162.4939	175.8733 (64)
Heat gains from water heating, kWh/month	56.0842	49.0029	50.9019	44.9965	43.4893	38.1541	36.3281	40.7160	41.1725	47.0902	50.4855	54.6779 (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	100.9907	100.9907	100.9907	100.9907	100.9907	100.9907	100.9907	100.9907	100.9907	100.9907	100.9907	100.9907 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.4910	14.6471	11.9118	9.0180	6.7411	5.6911	6.1494	7.9933	10.7286	13.6224	15.8993	16.9493 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	176.3634	178.1935	173.5817	163.7637	151.3703	139.7223	131.9406	130.1105	134.7223	144.5403	156.9337	168.5818 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.0991	33.0991	33.0991	33.0991	33.0991	33.0991	33.0991	33.0991	33.0991	33.0991	33.0991	33.0991 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-80.7926	-80.7926	-80.7926	-80.7926	-80.7926	-80.7926	-80.7926	-80.7926	-80.7926	-80.7926	-80.7926	-80.7926 (71)
Water heating gains (Table 5)	75.3820	72.9210	68.4166	62.4951	58.4533	52.9918	48.8281	54.7258	57.1841	63.2932	70.1188	73.4918 (72)
Total internal gains	324.5336	322.0589	310.2073	291.5741	272.8619	254.7024	243.2154	249.1268	258.9322	277.7531	299.2491	315.3201 (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						
Southeast	5.2500	36.7938	0.6300	0.7000	0.7700	59.0345 (77)						
Northwest	4.3100	11.2829	0.6300	0.7000	0.7700	14.8618 (81)						
Solar gains	73.8963	130.8093	192.0912	259.9883	311.2691	317.8422	302.7616	263.1548	215.3918	148.1075	89.4098	62.6582 (83)
Total gains	398.4299	452.8682	502.2985	551.5624	584.1311	572.5446	545.9771	512.2816	474.3240	425.8606	388.6588	377.9782 (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)	0.9970	0.9934	0.9828	0.9448	0.8408	0.6549	0.4871	0.5384	0.7964	0.9637	0.9935	0.9978 (86)	
MIT	19.9768	20.1221	20.3513	20.6436	20.8704	20.9757	20.9961	20.9933	20.9292	20.6369	20.2537	19.9503 (87)	
Th 2	20.0624	20.0646	20.0668	20.0772	20.0791	20.0882	20.0882	20.0898	20.0847	20.0791	20.0752	20.0711 (88)	
util rest of house	0.9961	0.9913	0.9770	0.9261	0.7922	0.5728	0.3886	0.4362	0.7228	0.9476	0.9910	0.9971 (89)	
MIT 2	18.6981	18.9112	19.2441	19.6626	19.9547	20.0723	20.0867	20.0871	20.0298	19.6622	19.1118	18.6660 (90)	
Living area fraction	19.1262	19.3166	19.6148	19.9910	20.2612	20.3747	20.3911	20.3905	fLA = Living area / (4) =	20.3309	19.9885	19.4940	0.3347 (91)
MIT	19.1262	19.3166	19.6148	19.9910	20.2612	20.3747	20.3911	20.3905	20.3309	19.9885	19.4940	19.0959 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.1262	19.3166	19.6148	19.9910	20.2612	20.3747	20.3911	20.3905	20.3309	19.9885	19.4940	19.0959 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	396.3278	447.8753	488.9181	509.6567	468.8566	343.2392	230.2391	241.0683	353.0234	402.6907	384.3298	376.4545 (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	932.6948	904.5321	820.7170	685.5846	527.9835	352.2848	231.2770	242.9456	381.7144	579.0010	767.9460	927.4767 (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	399.0571	306.8734	246.8583	126.6681	43.9904	0.0000	0.0000	0.0000	0.0000	131.1749	276.2036	409.9605 (98)
Space heating												1940.7862 (98)
Space heating per m2										(98) / (4) =		31.6295 (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

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													2077.9296 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	399.0571	306.8734	246.8583	126.6681	43.9904	0.0000	0.0000	0.0000	0.0000	131.1749	276.2036	409.9605	(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)	427.2560	328.5582	264.3023	135.6189	47.0989	0.0000	0.0000	0.0000	0.0000	140.4442	295.7212	438.9299	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	180.1028	157.3245	163.6859	145.1812	140.5610	123.7983	118.6082	132.2203	133.6805	152.2219	162.4939	175.8733	(64)
Efficiency of water heater (217)m	86.9972	86.7039	86.0831	84.7099	82.4970	80.3000	80.3000	80.3000	80.3000	84.6791	86.3759	87.1107	(217)
Fuel for water heating, kWh/month	207.0214	181.4502	190.1488	171.3864	170.3831	154.1697	147.7063	164.6579	166.4764	179.7633	188.1242	201.8964	(219)
Water heating fuel used													2123.1839 (219)
Annual totals kWh/year													
Space heating fuel - main system													2077.9296 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													75.0000 (231)
Electricity for lighting (calculated in Appendix L)													291.2356 (232)
Total delivered energy for all uses													4567.3491 (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	2077.9296	0.2160	448.8328 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2123.1839	0.2160	458.6077 (264)
Space and water heating			907.4405 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	291.2356	0.5190	151.1513 (268)
Total CO2, kg/m2/year			1097.5168 (272)
Emissions per m2 for space and water heating			14.7888 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4634 (272b)
Emissions per m2 for pumps and fans			0.6344 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.7888 * 1.00) + 2.4634 + 0.6344, rounded to 2 d.p.			17.8900 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	61.3600 (1b)	2.4600 (2b)	150.9456 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.3600		150.9456 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 150.9456 (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) =	0.1325 (8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate				0.3825	0.3825 (18)
Number of sides sheltered				2	2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3251 (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	0.4145	0.4064	0.3983	0.3576	0.3495	0.3089	0.3089	0.3007	0.3251	0.3495	0.3658	0.3820 (22b)
Effective ac	0.5859	0.5826	0.5793	0.5640	0.5611	0.5477	0.5477	0.5452	0.5529	0.5611	0.5669	0.5730 (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)
Brick and Block	44.8600		44.8600	0.2200	9.8692	42.2200	1893.9892 (29a)
7.3N Brick and Block	16.3500	9.5600	6.7900	0.2700	1.8333	113.5000	770.6650 (29a)
Wall to Corridor	16.3500	2.1200	14.2300	0.2300	3.2726	113.5000	1615.1050 (29a)
Total net area of external elements Aum, m ²			77.5600				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 28.2536		(33)
Party Floor 1			61.3600			70.0000	4295.2000 (32d)
Party Ceilings 1			61.3600			30.0000	1840.8000 (32b)
Ground Floor Stud			122.1600			9.0000	1099.4400 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 11515.1992 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							187.6662 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.8659 (36)
Total fabric heat loss							(33) + (36) = 34.1195 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	29.1858	29.0196	28.8567	28.0916	27.9484	27.2820	27.2820	27.1586	27.5387	27.9484	28.2380	28.5408 (38)
Heat transfer coeff	63.3053	63.1391	62.9762	62.2111	62.0679	61.4015	61.4015	61.2781	61.6582	62.0679	62.3575	62.6603 (39)
Average = Sum(39)m / 12 =												62.2104 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0317	1.0290	1.0263	1.0139	1.0115	1.0007	1.0007	0.9987	1.0049	1.0115	1.0163	1.0212 (40)
HLP (average)												1.0139 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.0198 (42)
Average daily hot water use (litres/day)												82.1706 (43)
Daily hot water use	90.3877	87.1008	83.8140	80.5272	77.2404	73.9535	73.9535	77.2404	80.5272	83.8140	87.1008	90.3877 (44)
Energy conte	134.0423	117.2342	120.9752	105.4691	101.2001	87.3280	80.9223	92.8595	93.9685	109.5112	119.5401	129.8128 (45)
Energy content (annual)												Total = Sum(45)m = 1292.8634 (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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	140.8014	187.8705	155.8626	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction												484.5345 (104)
Intermittency factor (Table 10b)												FC = cooled area / (4) =
	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	1.0000 (105)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	35.2003	46.9676	38.9657	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling												121.1336 (107)
Space cooling per m2												1.9741 (108)
Energy for space heating												35.3897 (99)
Energy for space cooling												1.9741 (108)
Total												37.3638 (109)
Dwelling Fabric Energy Efficiency (DFEE)												37.4 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	61.3600 (1b)	2.4600 (2b)	150.9456 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.3600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	150.9456 (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) =	0.1325 (8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate				0.3825	0.3825 (18)
Number of sides sheltered				2	2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3251 (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	0.4145	0.4064	0.3983	0.3576	0.3495	0.3089	0.3089	0.3007	0.3251	0.3495	0.3658	0.3820 (22b)
	0.5859	0.5826	0.5793	0.5640	0.5611	0.5477	0.5477	0.5452	0.5529	0.5611	0.5669	0.5730 (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)					
Brick and Block	44.8600		44.8600	0.1800	8.0748		(29a)					
7.3N Brick and Block	16.3500	9.5600	6.7900	0.1800	1.2222		(29a)					
Wall to Corridor	16.3500	2.1200	14.2300	0.1800	2.5614		(29a)					
Total net area of external elements Aum(A, m ²)			77.5600				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	26.6526	(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.0703 (36)					
Total fabric heat loss							(33) + (36) =					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 29.1858	Feb 29.0196	Mar 28.8567	Apr 28.0916	May 27.9484	Jun 27.2820	Jul 27.2820	Aug 27.1586	Sep 27.5387	Oct 27.9484	Nov 28.2380	Dec 28.5408 (38)
Heat transfer coeff	62.9087	62.7426	62.5797	61.8145	61.6714	61.0050	61.0050	60.8816	61.2617	61.6714	61.9610	62.2637 (39)
Average = Sum(39)m / 12 =												61.8138 (39)
HLP	Jan 1.0252	Feb 1.0225	Mar 1.0199	Apr 1.0074	May 1.0051	Jun 0.9942	Jul 0.9942	Aug 0.9922	Sep 0.9984	Oct 1.0051	Nov 1.0098	Dec 1.0147 (40)
HLP (average)												1.0074 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.0198 (42)
Average daily hot water use (litres/day)												82.1706 (43)
Daily hot water use	90.3877	87.1008	83.8140	80.5272	77.2404	73.9535	73.9535	77.2404	80.5272	83.8140	87.1008	90.3877 (44)
Energy conte	134.0423	117.2342	120.9752	105.4691	101.2001	87.3280	80.9223	92.8595	93.9685	109.5112	119.5401	129.8128 (45)
Energy content (annual)												Total = Sum(45)m =
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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	28.4840	24.9123	25.7072	22.4122	21.5050	18.5572	17.1960	19.7326	19.9683	23.2711	25.4023	27.5852 (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	100.9907	100.9907	100.9907	100.9907	100.9907	100.9907	100.9907	100.9907	100.9907	100.9907	100.9907	100.9907 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.4910	14.6471	11.9118	9.0180	6.7411	5.6911	6.1494	7.9933	10.7286	13.6224	15.8993	16.9493 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	176.3634	178.1935	173.5817	163.7637	151.3703	139.7223	131.9406	130.1105	134.7223	144.5403	156.9337	168.5818 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.0991	33.0991	33.0991	33.0991	33.0991	33.0991	33.0991	33.0991	33.0991	33.0991	33.0991	33.0991 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-80.7926	-80.7926	-80.7926	-80.7926	-80.7926	-80.7926	-80.7926	-80.7926	-80.7926	-80.7926	-80.7926	-80.7926 (71)
Water heating gains (Table 5)	38.2849	37.0718	34.5527	31.1280	28.9046	25.7739	23.1129	26.5224	27.7338	31.2784	35.2809	37.0769 (72)
Total internal gains	284.4365	283.2097	273.3435	257.2070	240.3132	224.4845	214.5002	217.9234	226.4819	242.7383	261.4112	275.9052 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
Southeast	5.2500	36.7938	0.6300	0.7000	0.7700	59.0345 (77)						
Northwest	4.3100	11.2829	0.6300	0.7000	0.7700	14.8618 (81)						
Solar gains	73.8963	130.8093	192.0912	259.9883	311.2691	317.8422	302.7616	263.1548	215.3918	148.1075	89.4098	62.6582 (83)
Total gains	358.3328	414.0190	465.4347	517.1954	551.5824	542.3267	517.2618	481.0782	441.8736	390.8458	350.8209	338.5634 (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)												21.0000 (85)
tau	67.7348	67.9142	68.0910	68.9338	69.0938	69.8486	69.8486	69.9902	69.5559	69.0938	68.7709	68.4365
alpha	5.5157	5.5276	5.5394	5.5956	5.6063	5.6566	5.6566	5.6660	5.6371	5.6063	5.5847	5.5624
util living area	0.9983	0.9957	0.9878	0.9571	0.8647	0.6845	0.5127	0.5705	0.8299	0.9747	0.9961	0.9987 (86)
MIT	19.9149	20.0631	20.2982	20.6025	20.8481	20.9698	20.9950	20.9912	20.9118	20.5906	20.1961	19.8891 (87)
Th 2	20.0624	20.0646	20.0668	20.0772	20.0791	20.0882	20.0882	20.0898	20.0847	20.0791	20.0752	20.0711 (88)
util rest of house	0.9977	0.9943	0.9835	0.9416	0.8196	0.6013	0.4098	0.4636	0.7603	0.9627	0.9945	0.9983 (89)
MIT 2	19.0693	19.2187	19.4534	19.7567	19.9775	20.0744	20.0869	20.0873	20.0364	19.7516	19.3604	19.0508 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	19.3523	19.5014	19.7362	20.0399	20.2689	20.3741	20.3908	20.3899	20.3294	20.0325	19.6402	19.3314 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3523	19.5014	19.7362	20.0399	20.2689	20.3741	20.3908	20.3899	20.3294	20.0325	19.6402	19.3314 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9971	0.9932	0.9816	0.9409	0.8299	0.6285	0.4445	0.4997	0.7808	0.9619	0.9935	0.9978 (94)
Useful gains	357.2838	411.1900	456.8675	486.6189	457.7438	340.8558	229.9074	240.3786	345.0131	375.9729	348.5408	337.8315 (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	946.9225	916.1286	828.3174	688.6051	528.4567	352.2507	231.2601	242.9090	381.6251	581.7130	777.0000	942.1373 (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	438.6912	339.3187	276.3588	145.4301	52.6104	0.0000	0.0000	0.0000	0.0000	153.0707	308.4907	449.6035 (98)
Space heating per m2												2163.5740 (98)
												(98) / (4) = 35.2603 (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	573.4468	451.4368	462.6999	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9241	0.9643	0.9495	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	529.9325	435.3222	439.3391	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	709.5812	678.8250	637.8190	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	129.3470	181.1661	147.6690	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												458.1821 (104)
Cooled fraction												1.0000 (105)
Intermittency factor (Table 10b)												fC = cooled area / (4) =

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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	32.3368	45.2915	36.9173	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling per m2												114.5455 (107)
Energy for space heating												1.8668 (108)
Energy for space cooling												35.2603 (99)
Total												1.8668 (108)
Target Fabric Energy Efficiency (TFEE)												37.1271 (109)
												42.7 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	61.3600 (1b)	2.4600 (2b)	150.9456 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.3600		150.9456 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 150.9456 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				2 * 10 =	20.0000 (7a)
Number of passive vents				1 * 10 =	10.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Air changes per hour					
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) =	0.1987 (8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate				0.4487	(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) =	0.3814 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	4.7000	4.6000	4.3000	4.3000	4.0000	4.0000	3.9000	4.0000	4.5000	4.4000	4.7000 (22)
Wind factor	1.2750	1.1750	1.1500	1.0750	1.0750	1.0000	1.0000	0.9750	1.0000	1.1250	1.1000	1.1750 (22a)
Adj infilt rate	0.4863	0.4482	0.4387	0.4100	0.4100	0.3814	0.3814	0.3719	0.3814	0.4291	0.4196	0.4482 (22b)
Effective ac	0.6183	0.6004	0.5962	0.5841	0.5841	0.5727	0.5727	0.5692	0.5727	0.5921	0.5880	0.6004 (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)
Brick and Block	44.8600		44.8600	0.2200	9.8692	42.2200	1893.9892 (29a)
7.3N Brick and Block	16.3500	9.5600	6.7900	0.2700	1.8333	113.5000	770.6650 (29a)
Wall to Corridor	16.3500	2.1200	14.2300	0.2300	3.2726	113.5000	1615.1050 (29a)
Total net area of external elements Aum, m2			77.5600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	28.2536			(33)
Party Floor 1			61.3600			70.0000	4295.2000 (32d)
Party Ceilings 1			61.3600			70.0000	4295.2000 (32b)
Ground Floor Stud			122.1600			9.0000	1099.4400 (32c)
Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =				13969.5992 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							227.6662 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.8659 (36)
Total fabric heat loss			(33) + (36) =				34.1195 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	30.7967	29.9089	29.6983	29.0936	29.0936	28.5297	28.5297	28.3508	28.5297	29.4922	29.2906	29.9089 (38)
Heat transfer coeff	64.9162	64.0284	63.8178	63.2131	63.2131	62.6492	62.6492	62.4702	62.6492	63.6117	63.4101	64.0284 (39)
Average = Sum(39)m / 12 =	63.3880 (39)											
HLP	1.0580	1.0435	1.0401	1.0302	1.0302	1.0210	1.0210	1.0181	1.0210	1.0367	1.0334	1.0435 (40)
HLP (average)	1.0331 (40)											
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy	2.0198 (42)											
Average daily hot water use (litres/day)	82.1706 (43)											
Daily hot water use	90.3877	87.1008	83.8140	80.5272	77.2404	73.9535	73.9535	77.2404	80.5272	83.8140	87.1008	90.3877 (44)
Energy conte	134.0423	117.2342	120.9752	105.4691	101.2001	87.3280	80.9223	92.8595	93.9685	109.5112	119.5401	129.8128 (45)
Energy content (annual)	Total = Sum(45)m = 1292.8634 (45)											
Distribution loss (46)m = 0.15 x (45)m	20.1063	17.5851	18.1463	15.8204	15.1800	13.0992	12.1383	13.9289	14.0953	16.4267	17.9310	19.4719 (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	46.0606	40.0902	42.7107	39.7120	39.3608	36.4702	37.6859	39.3608	39.7120	42.7107	42.9538	46.0606		(61)
Total heat required for water heating calculated for each month	180.1028	157.3245	163.6859	145.1812	140.5610	123.7983	118.6082	132.2203	133.6805	152.2219	162.4939	175.8733		(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(63)
Output from w/h	180.1028	157.3245	163.6859	145.1812	140.5610	123.7983	118.6082	132.2203	133.6805	152.2219	162.4939	175.8733		(64)
RHI water heating demand														(64)
Heat gains from water heating, kWh/month	56.0842	49.0029	50.9019	44.9965	43.4893	38.1541	36.3281	40.7160	41.1725	47.0902	50.4855	54.6779		(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	121.1889	121.1889	121.1889	121.1889	121.1889	121.1889	121.1889	121.1889	121.1889	121.1889	121.1889	121.1889	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.2274	36.6178	29.7796	22.5451	16.8527	14.2278	15.3736	19.9832	26.8214	34.0559	39.7483	42.3733	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	263.2289	265.9604	259.0772	244.4235	225.9259	208.5407	196.9263	194.1948	201.0781	215.7318	234.2294	251.6146	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.1387	49.1387	49.1387	49.1387	49.1387	49.1387	49.1387	49.1387	49.1387	49.1387	49.1387	49.1387	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-80.7926	-80.7926	-80.7926	-80.7926	-80.7926	-80.7926	-80.7926	-80.7926	-80.7926	-80.7926	-80.7926	-80.7926	(71)
Water heating gains (Table 5)	75.3820	72.9210	68.4166	62.4951	58.4533	52.9918	48.8281	54.7258	57.1841	63.2932	70.1188	73.4918	(72)
Total internal gains	472.3733	468.0343	449.8084	421.9987	393.7669	368.2953	353.6631	361.4388	377.6186	405.6159	436.6315	460.0146	(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							
Southeast	5.2500	46.3896	0.6300	0.7000	0.7700	74.4306 (77)							
Northwest	4.3100	15.0428	0.6300	0.7000	0.7700	19.8143 (81)							
Solar gains	94.2449	142.9882	210.0015	291.3003	334.4992	370.1396	343.9563	304.4315	250.3348	171.5449	113.0708	76.2575	(83)
Total gains	566.6183	611.0225	659.8098	713.2990	728.2660	738.4349	697.6194	665.8703	627.9534	577.1609	549.7024	536.2721	(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)													21.0000 (85)
tau	59.7762	60.6050	60.8051	61.3867	61.3867	61.9393	61.9393	62.1167	61.9393	61.0021	61.1960	60.6050	
alpha	4.9851	5.0403	5.0537	5.0924	5.0924	5.1293	5.1293	5.1411	5.1293	5.0668	5.0797	5.0403	
util living area	0.9749	0.9630	0.9277	0.8401	0.6828	0.4696	0.3315	0.3461	0.5805	0.8409	0.9480	0.9788	(86)
MIT	20.2280	20.3420	20.5587	20.7953	20.9432	20.9931	20.9991	20.9989	20.9808	20.8318	20.5317	20.2136	(87)
Th 2	20.0353	20.0473	20.0501	20.0582	20.0582	20.0659	20.0659	20.0683	20.0659	20.0529	20.0556	20.0473	(88)
util rest of house	0.9679	0.9531	0.9088	0.8025	0.6205	0.3938	0.2482	0.2595	0.4977	0.7932	0.9318	0.9728	(89)
MIT 2	19.3617	19.4817	19.6898	19.9087	20.0253	20.0633	20.0657	20.0681	20.0577	19.9397	19.6732	19.3580	(90)
Living area fraction	19.6517	19.7697	19.9807	20.2055	20.3325	20.3745	20.3781	20.3797	20.3667	20.2383	19.9606	19.6444	(92)
Temperature adjustment	19.6517	19.7697	19.9807	20.2055	20.3325	20.3745	20.3781	20.3797	20.3667	20.2383	19.9606	0.0000	
adjusted MIT	19.6517	19.7697	19.9807	20.2055	20.3325	20.3745	20.3781	20.3797	20.3667	20.2383	19.9606	19.6444	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9645	0.9497	0.9072	0.8089	0.6394	0.4191	0.2762	0.2886	0.5251	0.8035	0.9298	0.9696	(94)
Useful gains	546.4867	580.2957	598.6008	576.9830	465.6596	309.4819	192.6519	192.1558	329.7406	463.7272	511.1400	519.9951	(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	925.1639	900.8581	809.2518	670.4071	488.7980	311.6501	192.8427	192.3871	336.2216	536.7774	733.0565	905.6462	(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	281.7358	215.4179	156.7244	67.2653	17.2150	0.0000	0.0000	0.0000	0.0000	54.3494	159.7799	286.9245	(98)
Space heating												1239.4121	(98)
RHI space heating demand												1239	(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 (m ²)	Storey height (m)	Volume (m ³)
Ground floor	61.3600 (1b)	2.4600 (2b)	150.9456 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.3600		150.9456 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 150.9456 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				2 * 10 =	20.0000 (7a)
Number of passive vents				1 * 10 =	10.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Air changes per hour					
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) =	0.1987 (8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate				0.4487	(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) =	0.3814 (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	0.4863	0.4768	0.4673	0.4196	0.4100	0.3624	0.3624	0.3528	0.3814	0.4100	0.4291	0.4482 (22b)
Effective ac	0.6183	0.6137	0.6092	0.5880	0.5841	0.5657	0.5657	0.5622	0.5727	0.5841	0.5921	0.6004 (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)
Brick and Block	44.8600		44.8600	0.2200	9.8692	42.2200	1893.9892 (29a)
7.3N Brick and Block	16.3500	9.5600	6.7900	0.2700	1.8333	113.5000	770.6650 (29a)
Wall to Corridor	16.3500	2.1200	14.2300	0.2300	3.2726	113.5000	1615.1050 (29a)
Total net area of external elements Aum(A, m ²)			77.5600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.2536		(33)
Party Floor 1			61.3600			70.0000	4295.2000 (32d)
Party Ceilings 1			61.3600			70.0000	4295.2000 (32b)
Ground Floor Stud			122.1600			9.0000	1099.4400 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13969.5992 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							227.6662 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.8659 (36)
Total fabric heat loss						(33) + (36) =	34.1195 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	30.7967	30.5680	30.3438	29.2906	29.0936	28.1764	28.1764	28.0065	28.5297	29.0936	29.4922	29.9089 (38)
Average = Sum(39)m / 12 =	64.9162	64.6875	64.4633	63.4101	63.2131	62.2959	62.2959	62.1260	62.6492	63.2131	63.6117	64.0284 (39)
												63.4092 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0580	1.0542	1.0506	1.0334	1.0302	1.0153	1.0153	1.0125	1.0210	1.0302	1.0367	1.0435 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.0198 (42)
Average daily hot water use (litres/day)												82.1706 (43)
Daily hot water use	90.3877	87.1008	83.8140	80.5272	77.2404	73.9535	73.9535	77.2404	80.5272	83.8140	87.1008	90.3877 (44)
Energy conte	134.0423	117.2342	120.9752	105.4691	101.2001	87.3280	80.9223	92.8595	93.9685	109.5112	119.5401	129.8128 (45)
Energy content (annual)												Total = Sum(45)m = 1292.8634 (45)
Distribution loss (46)m = 0.15 x (45)m	20.1063	17.5851	18.1463	15.8204	15.1800	13.0992	12.1383	13.9289	14.0953	16.4267	17.9310	19.4719 (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	46.0606	40.0902	42.7107	39.7120	39.3608	36.4702	37.6859	39.3608	39.7120	42.7107	42.9538	46.0606	46.0606	(61)
Total heat required for water heating calculated for each month	180.1028	157.3245	163.6859	145.1812	140.5610	123.7983	118.6082	132.2203	133.6805	152.2219	162.4939	175.8733	175.8733	(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	180.1028	157.3245	163.6859	145.1812	140.5610	123.7983	118.6082	132.2203	133.6805	152.2219	162.4939	175.8733	175.8733	(64)
Heat gains from water heating, kWh/month	56.0842	49.0029	50.9019	44.9965	43.4893	38.1541	36.3281	40.7160	41.1725	47.0902	50.4855	54.6779	54.6779	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	121.1889	121.1889	121.1889	121.1889	121.1889	121.1889	121.1889	121.1889	121.1889	121.1889	121.1889	121.1889	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.2274	36.6178	29.7796	22.5451	16.8527	14.2278	15.3736	19.9832	26.8214	34.0559	39.7483	42.3733	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	263.2289	265.9604	259.0772	244.4235	225.9259	208.5407	196.9263	194.1948	201.0781	215.7318	234.2294	251.6146	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.1387	49.1387	49.1387	49.1387	49.1387	49.1387	49.1387	49.1387	49.1387	49.1387	49.1387	49.1387	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-80.7926	-80.7926	-80.7926	-80.7926	-80.7926	-80.7926	-80.7926	-80.7926	-80.7926	-80.7926	-80.7926	-80.7926	(71)
Water heating gains (Table 5)	75.3820	72.9210	68.4166	62.4951	58.4533	52.9918	48.8281	54.7258	57.1841	63.2932	70.1188	73.4918	(72)
Total internal gains	472.3733	468.0343	449.8084	421.9987	393.7669	368.2953	353.6631	361.4388	377.6186	405.6159	436.6315	460.0146	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data g or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W							
Southeast	5.2500	36.7938	0.6300	0.7000	0.7700	59.0345 (77)							
Northwest	4.3100	11.2829	0.6300	0.7000	0.7700	14.8618 (81)							
Solar gains	73.8963	130.8093	192.0912	259.9883	311.2691	317.8422	302.7616	263.1548	215.3918	148.1075	89.4098	62.6582	(83)
Total gains	546.2697	598.8436	641.8995	681.9870	705.0360	686.1375	656.4247	624.5936	593.0104	553.7235	526.0413	522.6728	(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	59.7762	59.9876	60.1962	61.1960	61.3867	62.2906	62.2906	62.4609	61.9393	61.3867	61.0021	60.6050	
alpha	4.9851	4.9992	5.0131	5.0797	5.0924	5.1527	5.1527	5.1641	5.1293	5.0924	5.0668	5.0403	
util living area	0.9834	0.9723	0.9468	0.8806	0.7518	0.5657	0.4149	0.4531	0.6833	0.8985	0.9695	0.9863	(86)
MIT	20.0828	20.2292	20.4509	20.7190	20.9025	20.9821	20.9970	20.9953	20.9543	20.7304	20.3698	20.0578	(87)
Th 2	20.0353	20.0384	20.0414	20.0556	20.0582	20.0706	20.0706	20.0729	20.0659	20.0582	20.0529	20.0473	(88)
util rest of house	0.9790	0.9649	0.9327	0.8504	0.6972	0.4898	0.3286	0.3641	0.6071	0.8662	0.9602	0.9826	(89)
MIT 2	19.2191	19.3646	19.5808	19.8408	19.9961	20.0627	20.0698	20.0716	20.0426	19.8588	19.5158	19.2044	(90)
Living area fraction	fLA = Living area / (4) =												0.3347 (91)
MIT	19.5082	19.6541	19.8721	20.1348	20.2995	20.3704	20.3802	20.3808	20.3478	20.1506	19.8017	19.4901	(92)
Temperature adjustment													0.0000
adjusted MIT	19.5082	19.6541	19.8721	20.1348	20.2995	20.3704	20.3802	20.3808	20.3478	20.1506	19.8017	19.4901	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9759	0.9614	0.9298	0.8532	0.7119	0.5148	0.3576	0.3939	0.6311	0.8698	0.9572	0.9798	(94)
Useful gains	533.1211	575.7269	596.8657	581.8651	501.9479	353.2378	234.7220	246.0586	374.2770	481.6067	503.5081	512.1316	(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	987.2584	954.4031	862.0080	712.3999	543.6030	359.4750	235.4907	247.3117	391.4193	603.7202	807.9742	978.9983	(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	337.8782	254.4704	197.2658	93.9850	30.9913	0.0000	0.0000	0.0000	0.0000	90.8524	219.2156	347.3488	(98)
Space heating													1572.0076 (98)
Space heating per m2													(98) / (4) = 25.6194 (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 %)													90.3000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1740.8722 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	337.8782	254.4704	197.2658	93.9850	30.9913	0.0000	0.0000	0.0000	0.0000	90.8524	219.2156	347.3488	(98)
Space heating efficiency (main heating system 1)	90.3000	90.3000	90.3000	90.3000	90.3000	0.0000	0.0000	0.0000	0.0000	90.3000	90.3000	90.3000	(210)
Space heating fuel (main heating system)	374.1730	281.8055	218.4561	104.0809	34.3204	0.0000	0.0000	0.0000	0.0000	100.6118	242.7637	384.6609	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	180.1028	157.3245	163.6859	145.1812	140.5610	123.7983	118.6082	132.2203	133.6805	152.2219	162.4939	175.8733	(64)
Efficiency of water heater (217)m	86.5118	86.1548	85.4216	83.8871	81.8539	80.2000	80.2000	80.2000	80.2000	83.6991	85.7053	86.6327	(216)
Fuel for water heating, kWh/month	208.1829	182.6067	191.6212	173.0673	171.7217	154.3619	147.8905	164.8632	166.6840	181.8681	189.5961	203.0103	(219)
Water heating fuel used													2135.4740 (219)
Annual totals kWh/year													
Space heating fuel - main system													1740.8722 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													75.0000 (231)
Electricity for lighting (calculated in Appendix L)													291.2356 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses													4242.5818 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1740.8722	3.4800	60.5824	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	2135.4740	3.4800	74.3145	(247)
Pumps and fans for heating	75.0000	13.1900	9.8925	(249)
Energy for lighting	291.2356	13.1900	38.4140	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	0.0000	13.1900	0.0000	(252)
Total energy cost			303.2033	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.1973 (257)
SAP value		83.2976
SAP rating (Section 12)		83 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1740.8722	0.2160	376.0284	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2135.4740	0.2160	461.2624	(264)
Space and water heating			837.2908	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	291.2356	0.5190	151.1513	(268)
Energy saving/generation technologies				
PV Unit	-418.0000	0.5190	-216.9420	(269)
Total kg/year			810.4251	(272)
CO2 emissions per m2			13.2100	(273)
EI value			89.7897	
EI rating			90	(274)
EI band			B	

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9030 = 3.854$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9030 = 0.2392$, stars = 4
Water heating energy efficiency	$3.48 / 0.8339 = 4.173$, stars = 4
Water heating environmental impact	$0.216 / 0.8339 = 0.2590$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	61.3600 (1b)	2.4600 (2b)	150.9456 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.3600		150.9456 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 150.9456 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				2 * 10 =	20.0000 (7a)
Number of passive vents				1 * 10 =	10.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Air changes per hour					
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) =	0.1987 (8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate				0.4487	(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) =		0.3814 (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	0.4863	0.4482	0.4387	0.4100	0.4100	0.3814	0.3814	0.3719	0.3814	0.4291	0.4196	0.4482 (22b)
Effective ac	0.6183	0.6004	0.5962	0.5841	0.5841	0.5727	0.5727	0.5692	0.5727	0.5921	0.5880	0.6004 (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)
Brick and Block	44.8600		44.8600	0.2200	9.8692	42.2200	1893.9892 (29a)
7.3N Brick and Block	16.3500	9.5600	6.7900	0.2700	1.8333	113.5000	770.6650 (29a)
Wall to Corridor	16.3500	2.1200	14.2300	0.2300	3.2726	113.5000	1615.1050 (29a)
Total net area of external elements Aum, m2)			77.5600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.2536		(33)
Party Floor 1			61.3600			70.0000	4295.2000 (32d)
Party Ceilings 1			61.3600			70.0000	4295.2000 (32b)
Ground Floor Stud			122.1600			9.0000	1099.4400 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13969.5992 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							227.6662 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.8659 (36)
Total fabric heat loss						(33) + (36) =	34.1195 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	30.7967	29.9089	29.6983	29.0936	29.0936	28.5297	28.5297	28.3508	28.5297	29.4922	29.2906	29.9089 (38)
Average = Sum(39)m / 12 =	64.9162	64.0284	63.8178	63.2131	63.2131	62.6492	62.6492	62.4702	62.6492	63.6117	63.4101	64.0284 (39)
												63.3880 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0580	1.0435	1.0401	1.0302	1.0302	1.0210	1.0210	1.0181	1.0210	1.0367	1.0334	1.0435 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.0198 (42)
Average daily hot water use (litres/day)												82.1706 (43)
Daily hot water use	90.3877	87.1008	83.8140	80.5272	77.2404	73.9535	73.9535	77.2404	80.5272	83.8140	87.1008	90.3877 (44)
Energy conte	134.0423	117.2342	120.9752	105.4691	101.2001	87.3280	80.9223	92.8595	93.9685	109.5112	119.5401	129.8128 (45)
Energy content (annual)												Total = Sum(45)m = 1292.8634 (45)
Distribution loss (46)m = 0.15 x (45)m	20.1063	17.5851	18.1463	15.8204	15.1800	13.0992	12.1383	13.9289	14.0953	16.4267	17.9310	19.4719 (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	46.0606	40.0902	42.7107	39.7120	39.3608	36.4702	37.6859	39.3608	39.7120	42.7107	42.9538	46.0606	46.0606	(61)
Total heat required for water heating calculated for each month	180.1028	157.3245	163.6859	145.1812	140.5610	123.7983	118.6082	132.2203	133.6805	152.2219	162.4939	175.8733	175.8733	(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	180.1028	157.3245	163.6859	145.1812	140.5610	123.7983	118.6082	132.2203	133.6805	152.2219	162.4939	175.8733	175.8733	(64)
Heat gains from water heating, kWh/month	56.0842	49.0029	50.9019	44.9965	43.4893	38.1541	36.3281	40.7160	41.1725	47.0902	50.4855	54.6779	54.6779	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	121.1889	121.1889	121.1889	121.1889	121.1889	121.1889	121.1889	121.1889	121.1889	121.1889	121.1889	121.1889	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.2274	36.6178	29.7796	22.5451	16.8527	14.2278	15.3736	19.9832	26.8214	34.0559	39.7483	42.3733	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	263.2289	265.9604	259.0772	244.4235	225.9259	208.5407	196.9263	194.1948	201.0781	215.7318	234.2294	251.6146	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.1387	49.1387	49.1387	49.1387	49.1387	49.1387	49.1387	49.1387	49.1387	49.1387	49.1387	49.1387	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-80.7926	-80.7926	-80.7926	-80.7926	-80.7926	-80.7926	-80.7926	-80.7926	-80.7926	-80.7926	-80.7926	-80.7926	(71)
Water heating gains (Table 5)	75.3820	72.9210	68.4166	62.4951	58.4533	52.9918	48.8281	54.7258	57.1841	63.2932	70.1188	73.4918	(72)
Total internal gains	472.3733	468.0343	449.8084	421.9987	393.7669	368.2953	353.6631	361.4388	377.6186	405.6159	436.6315	460.0146	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data g or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W							
Southeast	5.2500	46.3896	0.6300	0.7000	0.7700	74.4306 (77)							
Northwest	4.3100	15.0428	0.6300	0.7000	0.7700	19.8143 (81)							
Solar gains	94.2449	142.9882	210.0015	291.3003	334.4992	370.1396	343.9563	304.4315	250.3348	171.5449	113.0708	76.2575	(83)
Total gains	566.6183	611.0225	659.8098	713.2990	728.2660	738.4349	697.6194	665.8703	627.9534	577.1609	549.7024	536.2721	(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	59.7762	60.6050	60.8051	61.3867	61.3867	61.9393	61.9393	62.1167	61.9393	61.0021	61.1960	60.6050	
alpha	4.9851	5.0403	5.0537	5.0924	5.0924	5.1293	5.1293	5.1411	5.1293	5.0668	5.0797	5.0403	
util living area	0.9749	0.9630	0.9277	0.8401	0.6828	0.4696	0.3315	0.3461	0.5805	0.8409	0.9480	0.9788	(86)
MIT	20.2280	20.3420	20.5587	20.7953	20.9432	20.9931	20.9991	20.9989	20.9808	20.8318	20.5317	20.2136	(87)
Th 2	20.0353	20.0473	20.0501	20.0582	20.0582	20.0659	20.0659	20.0683	20.0659	20.0529	20.0556	20.0473	(88)
util rest of house	0.9679	0.9531	0.9088	0.8025	0.6205	0.3938	0.2482	0.2595	0.4977	0.7932	0.9318	0.9728	(89)
MIT 2	19.3617	19.4817	19.6898	19.9087	20.0253	20.0633	20.0657	20.0681	20.0577	19.9397	19.6732	19.3580	(90)
Living area fraction	fLA = Living area / (4) =												0.3347 (91)
MIT	19.6517	19.7697	19.9807	20.2055	20.3325	20.3745	20.3781	20.3797	20.3667	20.2383	19.9606	19.6444	(92)
Temperature adjustment													0.0000
adjusted MIT	19.6517	19.7697	19.9807	20.2055	20.3325	20.3745	20.3781	20.3797	20.3667	20.2383	19.9606	19.6444	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9645	0.9497	0.9072	0.8089	0.6394	0.4191	0.2762	0.2886	0.5251	0.8035	0.9298	0.9696	(94)
Useful gains	546.4867	580.2957	598.6008	576.9830	465.6596	309.4819	192.6519	192.1558	329.7406	463.7272	511.1400	519.9951	(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	925.1639	900.8581	809.2518	670.4071	488.7980	311.6501	192.8427	192.3871	336.2216	536.7774	733.0565	905.6462	(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	281.7358	215.4179	156.7244	67.2653	17.2150	0.0000	0.0000	0.0000	0.0000	54.3494	159.7799	286.9245	(98)
Space heating													1239.4121 (98)
Space heating per m2													(98) / (4) = 20.1990 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.3000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1372.5494 (211)
Space heating requirement	281.7358	215.4179	156.7244	67.2653	17.2150	0.0000	0.0000	0.0000	0.0000	54.3494	159.7799	286.9245	(98)
Space heating efficiency (main heating system 1)	90.3000	90.3000	90.3000	90.3000	90.3000	0.0000	0.0000	0.0000	0.0000	90.3000	90.3000	90.3000	(210)
Space heating fuel (main heating system)	311.9998	238.5581	173.5596	74.4909	19.0642	0.0000	0.0000	0.0000	0.0000	60.1876	176.9434	317.7458	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	180.1028	157.3245	163.6859	145.1812	140.5610	123.7983	118.6082	132.2203	133.6805	152.2219	162.4939	175.8733	(64)
Efficiency of water heater (217)m	86.0729	85.7425	84.8417	83.1445	81.1908	80.2000	80.2000	80.2000	80.2000	82.6317	84.9085	86.1758	(216)
Fuel for water heating, kWh/month	209.2446	183.4849	192.9311	174.6131	173.1242	154.3619	147.8905	164.8632	166.6840	184.2174	191.3753	204.0867	(219)
Water heating fuel used													2146.8769 (219)
Annual totals kWh/year													
Space heating fuel - main system													1372.5494 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													75.0000 (231)
Electricity for lighting (calculated in Appendix L)													291.2356 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses													3885.6620 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1372.5494	7.6100	104.4510	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	2146.8769	7.6100	163.3773	(247)
Pumps and fans for heating	75.0000	31.0800	23.3100	(249)
Energy for lighting	291.2356	31.0800	90.5160	(250)
Additional standing charges			105.0000	(251)
Energy saving/generation technologies				
PV Unit	0.0000	31.0800	0.0000	(252)
Total energy cost			486.6544	(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	1372.5494	0.2160	296.4707	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2146.8769	0.2160	463.7254	(264)
Space and water heating			760.1961	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	291.2356	0.5190	151.1513	(268)
Energy saving/generation technologies				
PV Unit	-418.0000	0.5190	-216.9420	(269)
Total kg/year			733.3304	(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	1372.5494	1.2200	1674.5103	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2146.8769	1.2200	2619.1898	(264)
Space and water heating			4293.7001	(265)
Pumps and fans	75.0000	3.0700	230.2500	(267)
Energy for lighting	291.2356	3.0700	894.0934	(268)
Energy saving/generation technologies				
PV Unit	-418.0000	3.0700	-1283.2600	(269)
Primary energy kWh/year			4134.7835	(272)
Primary energy kWh/m2/year			67.3857	(273)

SAP 2012 EPC IMPROVEMENTS

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

(For testing purposes):

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

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

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

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

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

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

	Current	Potential	Saving
Electricity	£114	£114	£0
Mains gas	£373	£373	£0
Space heating	£233	£233	£0
Water heating	£163	£163	£0
Lighting	£91	£91	£0
Total cost of fuels	£487	£487	£0
Total cost of uses	£487	£487	£0
Delivered energy	63 kWh/m ²	63 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	0.7 tonnes	0.7 tonnes	0.0 tonnes
CO2 emissions per m ²	12 kg/m ²	12 kg/m ²	0 kg/m ²
Primary energy	67 kWh/m ²	67 kWh/m ²	0 kWh/m ²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

No improvements selected / applicable

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0931 Plot 34		Issued on Date	08/02/2024
Assessment Reference	Rev B	Prop Type Ref	Block Ev1	
Project	Plot 34			
Calculation Type	New Build (As Designed)			

SAP Rating	83 B	DER	15.24	TER	17.89
Environmental	90 B	% DER<TER	14.80		
CO ₂ Emissions (t/year)	0.73	DFEE	37.36	TFEE	42.70
General Requirements Compliance	Pass	% DFEE<TFEE	12.49		

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 34	Issued on Date	08/02/2024
Assessment Reference	Rev B	Prop Type Ref	Block Ev1
Project	Plot 34		
Calculation Type	New Build (As Designed)		

SAP Rating	83 B	DER	15.24	TER	17.89
Environmental	90 B	% DER<TER	14.80		
CO ₂ Emissions (t/year)	0.73	DFEE	37.36	TFEE	42.70
General Requirements Compliance	Pass	% DFEE<TFEE	12.49		

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 000004

Wall Type: Standard Wall

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	Brick, outer leaf						
	Main construction	102	0.7700	0.1325	82.81		
	Main construction	102	0.9407	0.1084	17.19		
Layer 2	Supafil 34						
	Main construction	100	0.0340	2.9412	100.00		
	Corrections - Air Gap: Level 0, Fasteners: None or plastic						
Layer 3	Hemelite standard solid *7.3N						
	Main construction	140	0.4700	0.2979	93.43	1450	1000
	Main construction	140	0.8803	0.1590	6.57	1450	1000
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 4	airspace/plaster dabs						
	Main construction	15	0.0882	0.1700	80.00		
	Main construction	15	0.0882	0.1700	20.00		
	Corrections - Cavity Unventilated, Emissivity: Normal						
Layer 5	Plasterboard, standard						
	Main construction	12.5	0.2100	0.0595	100.00	700	1000
Int surface				0.1300			

Total resistance:	Upper limit = 3.757 m ² K/W	Lower limit = 3.750 m ² K/W	Average = 3.754 m ² K/W
	Total correction = 0.0001 m ² K/W	U-value (unrounded) = 0.27 W/m ² K	

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

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0931 Plot 34	Issued on Date	08/02/2024
Assessment Reference	Rev B	Prop Type Ref	Block Ev1
Project	Plot 34		
Calculation Type	New Build (As Designed)		

SAP Rating	83 B	DER	15.24	TER	17.89
Environmental	90 B	% DER<TER	14.80		
CO ₂ Emissions (t/year)	0.73	DFEE	37.36	TFEE	42.70
General Requirements Compliance	Pass	% DFEE<TFEE	12.49		

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 Wall to Corridor

Wall Type: Standard Wall

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

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

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

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Property Reference	SAP 0931 Plot 34	Issued on Date	08/02/2024
Assessment Reference	Rev B	Prop Type Ref	Block Ev1
Property	Plot 34		

SAP Rating	83 B	DER	15.24	TER	17.89
Environmental	90 B	% DER<TER	14.80		
CO ₂ Emissions (t/year)	0.73	DFEE	37.36	TFEE	42.70
General Requirements Compliance	Pass	% DFEE<TFEE	12.49		

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

Client	Foreman Homes, FORE
--------	---------------------

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	South West
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	Flat, Detached
2.0 Number of Storeys	1
3.0 Date Built	2023
4.0 Sheltered Sides	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	61.36 m ²	2.46 m

7.0 Living Area	20.54	m ²
-----------------	-------	----------------

8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	227.67	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	44.86	44.86
	7.3N Brick and Block	Cavity Wall	Other	0.27	113.50	16.35	6.79
	Wall to Corridor	Cavity Wall	Other	0.29	113.50	16.35	14.23

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	122.16

10.1 Party Ceilings	Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
	Party Ceilings 1	Precast concrete plank floor (screed laid on rubber), carpeted	30.00	61.36

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

11.1 Party Floors

Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
Party Floor 1	Precast concrete plank floor (screed laid on rubber), carpeted	70.00	61.36

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 West							2.12	
Windows	Window	[2] 7.3N Brick and Block	North West	None	0.00					4.31	
East Elevation	Window	[2] 7.3N Brick and Block	South 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	E7 Party floor between dwellings (in blocks of flats)	63.06	0.070	No	
Independently assessed	E16 Corner (normal)	9.84	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				1
Number of flueless gas fires				0

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

21.0 Fixed Cooling System

22.0 Lighting

Internal

Total number of light fittings

Total number of L.E.L. fittings

Percentage of L.E.L. fittings %

External

External lights fitted

Light and motion sensor

23.0 Electricity Tariff

24.0 Main Heating 1

Description

Percentage of Heat %

Database Ref. No.

Fuel Type

Main Heating

SAP Code

In Winter

In Summer

Controls

PCDF Controls

Delayed Start Stat

Sap Code

Flue Type

Fan Assisted Flue

Is MHS Pumped

Heat Emitter

Flow Temperature

Combi boiler type

Combi keep hot type

25.0 Main Heating 2

Community Heating

28.0 Water Heating

Water Heating

Flue Gas Heat Recovery System

Waste Water Heat Recovery Instantaneous System 1

Waste Water Heat Recovery Instantaneous System 2

Waste Water Heat Recovery Storage System

Solar Panel

Water use <= 125 litres/person/day

SAP Code

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

Block Compliance Report - DER

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

Block Compliance Report - DFEE

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