



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: Plot 128

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Report Issue Date: 28/03/2023

EXCELLENCE
IN ENERGY
ASSESSMENT

PREDICTED ENERGY ASSESSMENT

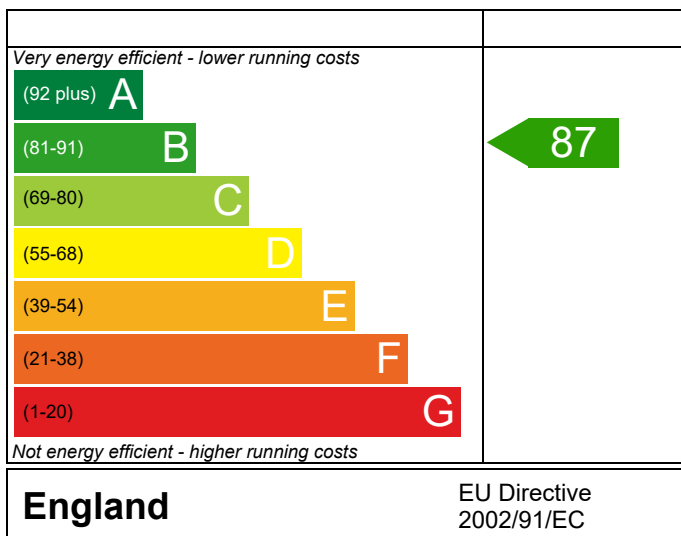
Plot 128

Dwelling type: House, Mid-Terrace
Date of assessment: 28/03/2023
Produced by: Abacus Energy (UK) Ltd
Total floor area: 69.92 m²
DRRN: 0228-8705-2076

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.

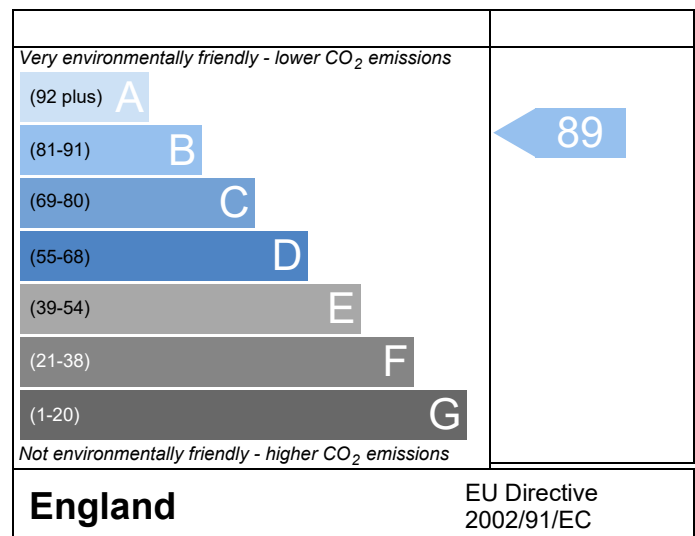
The energy performance has been assessed using the Government approved SAP2012 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.

Energy Efficiency Rating



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



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 0879 Plot 128				Issued on Date	28/03/2023
Assessment Reference	Rev A	Prop Type Ref		Newton (HA)		
Property	Plot 128					
SAP Rating	87 B	DER	15.68	TER	19.78	
Environmental	89 B	% DER<TER	20.73			
CO ₂ Emissions (t/year)	0.78	DFEE	49.77	TFEE	55.37	
General Requirements Compliance	Pass	% DFEE<TFEE	10.12			
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com				Assessor ID	E477-0001
Client	Foreman Homes, FORE					

SUMMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	19.78	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	15.68	kgCO ₂ /m ²	Pass
	-4.10 (-20.7%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	55.37	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	49.77	kWh/m ² /yr	
	-5.6 (-10.1%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.26 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	Pass
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	Pass
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

Limiting System Efficiencies

4 Heating efficiency

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BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Designed)

Main heating system

Boiler system with radiators or underfloor - Mains gas
Data from database
Worcester Greenstar 32CDi Compact ErP
Combi boiler
Efficiency: 89.8% 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)

Not significant

Pass

Based on:

Overshading

Average

Windows facing North

6.46 m², No overhang

Windows facing South

4.36 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

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Filled Cavity with Edge Sealing

0.00

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

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BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Designed)

10 Key features

Party wall U-value	0.00	W/m ² K
Party wall U-value	0.00	W/m ² K
Roof U-value	0.10	W/m ² K
Floor U-value	0.12	W/m ² K
Door U-value	1.10	W/m ² K
Photovoltaic array	0.70	kW

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RECOMMENDATIONS

	Typical cost	Typical savings per year	Energy efficiency	Environmental impact	Result
Low energy lights			0	0	Already installed
Solar water heating	£4,000 - £6,000	£76	B 88	B 91	Recommended
Photovoltaic			0	0	Already installed
Wind turbine			0	0	Not applicable
Totals	£4,000 - £6,000	£76	B 88	B 91	

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THERMAL BRIDGING

Calculation Type: New Build (As Designed)

Property Reference	SAP 0879 Plot 128	Issued on Date	28/03/2023
Assessment Reference	Rev A	Prop Type Ref	Newton (HA)
Property	Plot 128		

SAP Rating	87 B	DER	15.68	TER	19.78
Environmental	89 B	% DER<TER	20.73		
CO ₂ Emissions (t/year)	0.78	DFEE	49.77	TFEE	55.37
General Requirements Compliance	Pass	% DFEE<TFEE	10.12		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com	Assessor ID	E477-0001
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Client	Foreman Homes, FORE
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	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.910	2.73	2.48	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.071	1.02	0.07	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.067	1.89	0.13	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.064	3.62	0.23	Birtley Supatherm
External wall	E3 Sill	Independently assessed	0.021	6.65	0.14	Knauf P5
External wall	E4 Jamb	Independently assessed	0.016	20.10	0.32	Knauf P6
External wall	E5 Ground floor (normal)	Table K1 - Approved	0.160	25.32	4.05	
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	8.19	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	8.19	0.49	
External wall	E24 Eaves (insulation at ceiling level - inverted)	Independently assessed	0.120	8.61	1.03	Value Halved
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.044	8.61	0.38	Knauf P21
External wall	E16 Corner (normal)	Independently assessed	0.039	0.60	0.02	Knauf P23
External wall	E18 Party wall between dwellings	Table K1 - Approved	0.060	18.76	1.13	
Party wall	P1 Party wall - Ground floor	Table K1 - Default	0.160	8.61	1.38	
Party wall	P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	0.000	8.61	0.00	
Party wall	P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	0.069	8.61	0.59	Knauf P29

Total: **12.45** W/mK:
Y-Value: **0.079** W/m²K:

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	SAP 0879 Plot 128				Issued on Date	28/03/2023
Assessment Reference	Rev A	Prop Type Ref	Newton (HA)			
Property	Plot 128					
SAP Rating	87 B	DER	15.68	TER	19.78	
Environmental	89 B	% DER<TER	20.73			
CO ₂ Emissions (t/year)	0.78	DFEE	49.77	TFEE	55.37	
General Requirements Compliance	Pass	% DFEE<TFEE	10.12			
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-Terrace House, total floor area 70 m²

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

1a TER and DER

Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 19.78 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.68 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)55.4 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)49.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.26 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from database
Worcester Greenstar 32CDi Compact ErP
Combi boiler
Efficiency: 89.8% 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): Not significant OK
Based on:
Overshading: Average
Windows facing North: 6.46 m², No overhang
Windows facing South: 4.36 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Party wall U-value 0.00 W/m²K
Roof U-value 0.10 W/m²K
Floor U-value 0.12 W/m²K
Door U-value 1.10 W/m²K
Photovoltaic array 0.70 kW

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	34.9600 (1b)	x 2.3900 (2b)	= 83.5544 (1b) - (3b)
First floor	34.9600 (1c)	x 2.6500 (2c)	= 92.6440 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.9200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.1984 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1703 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4203 (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) =	0.3572 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4555	0.4465	0.4376	0.3929	0.3840	0.3394	0.3394	0.3304	0.3572	0.3840	0.4019	0.4197 (22b)
Effective ac	0.6037	0.5997	0.5957	0.5772	0.5737	0.5576	0.5576	0.5546	0.5638	0.5737	0.5808	0.5881 (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 & Fully Glazed Do (Uw = 1.20)			10.8200	1.1450	12.3893		(27)
Ground Floor			34.9600	0.1200	4.1952	90.0000	3146.4000 (28a)
Brick and Block	84.2300	12.9400	71.2900	0.2400	17.1096	42.2200	3009.8638 (29a)
Party Wall Step	2.5700		2.5700	0.2600	0.6682	113.5000	291.6950 (29a)
External Roof 1	34.9600		34.9600	0.1000	3.4960	9.1000	318.1360 (30)
Total net area of external elements Aum(A, m ²)			156.7200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.1903		(33)
Party Wall 1			40.3300	0.0000	0.0000	110.0000	4436.3000 (32)
Party Wall 2			40.3300	0.0000	0.0000	110.0000	4436.3000 (32)
GF Timber Stud			48.1300			9.0000	433.1700 (32c)
FF Timber Stud			73.4400			9.0000	660.9600 (32c)
Internal Floor 1			34.9600			18.0000	629.2800 (32d)
Internal Ceiling 1			34.9600			18.0000	629.2800 (32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17991.3848 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							257.3139 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.4516 (36)
Total fabric heat loss					(33) + (36) =		52.6419 (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	35.1037	34.8695	34.6399	33.5617	33.3600	32.4209	32.4209	32.2470	32.7827	33.3600	33.7681	34.1948 (38)
Heat transfer coeff	87.7456	87.5114	87.2819	86.2037	86.0019	85.0629	85.0629	84.8890	85.4246	86.0019	86.4100	86.8367 (39)
Average = Sum(39)m / 12 =												86.2027 (39)
HLP	1.2549	1.2516	1.2483	1.2329	1.2300	1.2166	1.2166	1.2141	1.2217	1.2300	1.2358	1.2419 (40)
HLP (average)												1.2329 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2442 (42)
Average daily hot water use (litres/day)												87.4993 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.2492	92.7493	89.2493	85.7493	82.2493	78.7494	78.7494	82.2493	85.7493	89.2493	92.7493	96.2492 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy conte	142.7348	124.8368	128.8204	112.3087	107.7629	92.9912	86.1700	98.8813	100.0623	116.6130	127.2922	138.2311 (45)
Energy content (annual)										Total =	Sum (45)m =	1376.7047 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.4102	18.7255	19.3231	16.8463	16.1644	13.9487	12.9255	14.8322	15.0093	17.4919	19.0938	20.7347 (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)
Combi loss	25.2847	22.8154	25.2242	24.3701	25.1531	24.3078	25.0970	25.1334	24.3418	25.1948	24.4289	25.2730 (61)
Total heat required for water heating calculated for each month												
	168.0195	147.6522	154.0446	136.6789	132.9160	117.2990	111.2670	124.0147	124.4041	141.8077	151.7210	163.5041 (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)
								Solar input (sum of months) =	Sum (63)m =			0.0000 (63)
Output from w/h	168.0195	147.6522	154.0446	136.6789	132.9160	117.2990	111.2670	124.0147	124.4041	141.8077	151.7210	163.5041 (64)
								Total per year (kWh/year) =	Sum (64)m =			1673.3288 (64)
Heat gains from water heating, kWh/month												
	53.7805	47.2121	49.1388	43.4352	42.1194	36.9965	34.9258	39.1614	39.3562	45.0725	48.4319	52.2801 (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	112.2091	112.2091	112.2091	112.2091	112.2091	112.2091	112.2091	112.2091	112.2091	112.2091	112.2091	112.2091 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	18.4564	16.3928	13.3315	10.0928	7.5445	6.3694	6.8823	8.9459	12.0072	15.2459	17.7942	18.9694 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	197.1103	199.1557	194.0014	183.0284	169.1771	156.1588	147.4618	145.4164	150.5707	161.5436	175.3949	188.4133 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	34.2209	34.2209	34.2209	34.2209	34.2209	34.2209	34.2209	34.2209	34.2209	34.2209	34.2209	34.2209 (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)												
	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672 (71)
Water heating gains (Table 5)												
	72.2856	70.2561	66.0468	60.3266	56.6121	51.3841	46.9432	52.6363	54.6613	60.5813	67.2665	70.2689 (72)
Total internal gains	347.5150	345.4673	333.0424	313.1106	292.9965	273.5750	260.9501	266.6613	276.9020	297.0336	320.1184	337.3142 (73)

6. Solar gains

[Jan]													
	Area				Solar flux		g		FF		Access		Gains
	m2				Table 6a		or Table 6b		or Table 6c		factor		W
					W/m2						Table 6d		
North	6.4600				10.6334		0.6300		0.7000		0.7700		20.9931
South	4.3600				46.7521		0.6300		0.7000		0.7700		62.2958 (74)
Solar gains	83.2889	142.1434	198.1329	256.3856	300.5708	305.2139	291.3539	256.7368	217.7243	157.7993	99.7395	71.3302 (83)	
Total gains	430.8039	487.6107	531.1753	569.4963	593.5673	578.7888	552.3040	523.3981	494.6263	454.8329	419.8579	408.6445 (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	56.9556	57.1081	57.2582	57.9744	58.1104	58.7519	58.7519	58.8723	58.5031	58.1104	57.8360	57.5518
alpha	4.7970	4.8072	4.8172	4.8650	4.8740	4.9168	4.9168	4.9248	4.9002	4.8740	4.8557	4.8368
util living area	0.9980	0.9960	0.9911	0.9754	0.9271	0.8046	0.6418	0.6917	0.8943	0.9815	0.9960	0.9985 (86)
MIT	19.6656	19.8094	20.0463	20.3692	20.6770	20.8979	20.9743	20.9631	20.8094	20.4201	19.9877	19.6426 (87)
Th 2	19.8763	19.8789	19.8815	19.8938	19.8961	19.9068	19.9068	19.9087	19.9026	19.8961	19.8914	19.8866 (88)
util rest of house												
	0.9973	0.9946	0.9876	0.9647	0.8925	0.7143	0.5001	0.5532	0.8314	0.9714	0.9943	0.9979 (89)
MIT 2	18.6686	18.8140	19.0514	19.3785	19.6694	19.8575	19.9002	19.8980	19.7932	19.4331	19.0020	18.6538 (90)
Living area fraction									fLA =	Living area / (4) =		0.2446 (91)
MIT	18.9124	19.0574	19.2948	19.6208	19.9158	20.1119	20.1629	20.1585	20.0417	19.6745	19.2431	18.8957 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9124	19.0574	19.2948	19.6208	19.9158	20.1119	20.1629	20.1585	20.0417	19.6745	19.2431	18.8957 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9964	0.9931	0.9852	0.9613	0.8933	0.7334	0.5354	0.5876	0.8411	0.9687	0.9929	0.9972 (94)
Useful gains	429.2728	484.2534	523.3038	547.4764	530.2058	424.4858	295.7029	307.5589	416.0083	440.5785	416.8956	407.5166 (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	1282.1767	1238.9376	1116.7502	924.1704	706.5769	468.8586	303.0668	319.0530	507.5666	780.4236	1049.2836	1276.1229 (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	634.5605	507.1478	441.5241	271.2197	131.2201	0.0000	0.0000	0.0000	0.0000	252.8447	455.3194	646.2431 (98)
Space heating												3340.0794 (98)
Space heating per m2										(98) / (4) =		47.7700 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

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 %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3682.5573 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	634.5605	507.1478	441.5241	271.2197	131.2201	0.0000	0.0000	0.0000	0.0000	252.8447	455.3194	646.2431	(98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)
Space heating fuel (main heating system)	699.6257	559.1486	486.7962	299.0294	144.6749	0.0000	0.0000	0.0000	0.0000	278.7704	502.0059	712.5062	(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	168.0195	147.6522	154.0446	136.6789	132.9160	117.2990	111.2670	124.0147	124.4041	141.8077	151.7210	163.5041	(64)
Efficiency of water heater (217)m	89.9442	89.8865	89.7681	89.4963	88.9043	87.2000	87.2000	87.2000	87.2000	89.4105	89.7992	89.9708	(216)
Fuel for water heating, kWh/month	186.8041	164.2652	171.6029	152.7201	149.5045	134.5172	127.5998	142.2187	142.6652	158.6030	168.9560	181.7301	(219)
Water heating fuel used												1881.1868	(219)
Annual totals kWh/year													
Space heating fuel - main system												3682.5573	(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)												325.9458	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.70 * 1080 * 1.00) =										-604.5338		-604.5338	(233)
Total delivered energy for all uses												5360.1560	(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	3682.5573	0.2160	795.4324	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1881.1868	0.2160	406.3363	(264)
Space and water heating			1201.7687	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	325.9458	0.5190	169.1659	(268)
Energy saving/generation technologies				
PV Unit	-604.5338	0.5190	-313.7530	(269)
Total CO2, kg/year			1096.1065	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			15.6800	(273)

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

DER			15.6800	ZC1
Total Floor Area		TFA	69.9200	
Assumed number of occupants		N	2.2442	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			16.7053	ZC2
CO2 emissions from cooking, equation (L16)			2.4723	ZC3
Total CO2 emissions			34.8576	ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000	ZC7
Net CO2 emissions			34.8576	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	34.9600 (1b)	x 2.3900 (2b)	= 83.5544 (1b) - (3b)
First floor	34.9600 (1c)	x 2.6500 (2c)	= 92.6440 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.9200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.1984 (5)

2. Ventilation rate

										main	secondary	other	total	m3 per hour											
										heating	heating														
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) =	0.1135 (8)								
Pressure test										Yes															
Measured/design AP50										5.0000															
Infiltration rate										0.3635 (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) =					0.3090 (21)										
													Jan		Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed													5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)	
Wind factor													1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)	
Adj infilt rate													0.3940	0.3862	0.3785	0.3399	0.3322	0.2935	0.2935	0.2858	0.3090	0.3322	0.3476	0.3631 (22b)	
Effective ac													0.5776	0.5746	0.5716	0.5578	0.5552	0.5431	0.5431	0.5408	0.5477	0.5552	0.5604	0.5659 (25)	

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opaque door			2.1200	1.0000	2.1200			(26)					
TER Opening Type (Uw = 1.40)			10.8200	1.3258	14.3447			(27)					
Ground Floor			34.9600	0.1300	4.5448			(28a)					
Brick and Block	84.2300	12.9400	71.2900	0.1800	12.8322			(29a)					
Party Wall Step	2.5700		2.5700	0.1800	0.4626			(29a)					
External Roof 1	34.9600		34.9600	0.1300	4.5448			(30)					
Total net area of external elements Aum(A, m2)			156.7200					(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	38.8491		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								11.8277 (36)					
Total fabric heat loss						(33) + (36) =		50.6768 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 33.5848	Feb 33.4096	Mar 33.2378	Apr 32.4312	May 32.2803	Jun 31.5777	Jul 31.5777	Aug 31.4476	Sep 31.8483	Oct 32.2803	Nov 32.5856	Dec 32.9048	(38)
Heat transfer coeff	84.2616	84.0864	83.9146	83.1080	82.9571	82.2545	82.2545	82.1244	82.5251	82.9571	83.2624	83.5816	(39)
Average = Sum(39)m / 12 =												83.1073	(39)
HLP	Jan 1.2051	Feb 1.2026	Mar 1.2002	Apr 1.1886	May 1.1865	Jun 1.1764	Jul 1.1764	Aug 1.1745	Sep 1.1803	Oct 1.1865	Nov 1.1908	Dec 1.1954	(40)
HLP (average)												1.1886	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2442 (42)
Average daily hot water use (litres/day)												87.4993 (43)
Daily hot water use	Jan 96.2492	Feb 92.7493	Mar 89.2493	Apr 85.7493	May 82.2493	Jun 78.7494	Jul 78.7494	Aug 82.2493	Sep 85.7493	Oct 89.2493	Nov 92.7493	Dec 96.2492 (44)
Energy conte	142.7348	124.8368	128.8204	112.3087	107.7629	92.9912	86.1700	98.8813	100.0623	116.6130	127.2922	138.2311 (45)
Energy content (annual)												Total = Sum(45)m = 1376.7047 (45)
Distribution loss (46)m = 0.15 x (45)m	21.4102	18.7255	19.3231	16.8463	16.1644	13.9487	12.9255	14.8322	15.0093	17.4919	19.0938	20.7347 (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)

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If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	49.0476	42.6901	45.4805	42.2873	41.9134	38.8353	40.1298	41.9134	42.2873	45.4805	45.7394	49.0476 (61)
Total heat required for water heating calculated for each month	191.7824	167.5269	174.3008	154.5961	149.6763	131.8265	126.2998	140.7947	142.3496	162.0934	173.0315	187.2786 (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	191.7824	167.5269	174.3008	154.5961	149.6763	131.8265	126.2998	140.7947	142.3496	162.0934	173.0315	187.2786 (64)
Heat gains from water heating, kWh/month	59.7212	52.1808	54.2029	47.9145	46.3095	40.6284	38.6840	43.3564	43.8425	50.1439	53.7595	58.2237 (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	112.2091	112.2091	112.2091	112.2091	112.2091	112.2091	112.2091	112.2091	112.2091	112.2091	112.2091	112.2091 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4564	16.3928	13.3315	10.0928	7.5445	6.3694	6.8823	8.9459	12.0072	15.2459	17.7942	18.9694 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.1103	199.1557	194.0014	183.0284	169.1771	156.1588	147.4618	145.4164	150.5707	161.5436	175.3949	188.4133 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2209	34.2209	34.2209	34.2209	34.2209	34.2209	34.2209	34.2209	34.2209	34.2209	34.2209	34.2209 (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)	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672 (71)
Water heating gains (Table 5)	80.2705	77.6499	72.8534	66.5479	62.2440	56.4283	51.9946	58.2747	60.8924	67.3978	74.6660	78.2577 (72)
Total internal gains	355.4998	352.8611	339.8490	319.3319	298.6283	278.6192	266.0014	272.2997	283.1331	303.8500	327.5179	345.3030 (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	
North	6.4600				10.6334		0.6300		0.7000		0.7700		20.9931 (74)	
South	4.3600				46.7521		0.6300		0.7000		0.7700		62.2958 (78)	
Solar gains	83.2889	142.1434	198.1329	256.3856	300.5708	305.2139	291.3539	256.7368	217.7243	157.7993	99.7395	71.3302	(83)	
Total gains	438.7888	495.0045	537.9819	575.7175	599.1991	583.8331	557.3553	529.0365	500.8574	461.6493	427.2574	416.6332	(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	57.6248	57.7449	57.8630	58.4247	58.5310	59.0309	59.0309	59.1244	58.8373	58.5310	58.3163	58.0936
alpha	4.8417	4.8497	4.8575	4.8950	4.9021	4.9354	4.9354	4.9416	4.9225	4.9021	4.8878	4.8729
util living area	0.9976	0.9952	0.9893	0.9710	0.9165	0.7858	0.6201	0.6694	0.8797	0.9778	0.9951	0.9981 (86)
MIT	19.7108	19.8542	20.0889	20.4044	20.7033	20.9095	20.9782	20.9684	20.8279	20.4511	20.0238	19.6834 (87)
Th 2	19.9159	19.9179	19.9199	19.9291	19.9308	19.9389	19.9389	19.9404	19.9358	19.9308	19.9273	19.9237 (88)
util rest of house	0.9967	0.9935	0.9854	0.9592	0.8799	0.6961	0.4850	0.5364	0.8145	0.9664	0.9932	0.9975 (89)
MIT 2	18.2049	18.4155	18.7580	19.2173	19.6268	19.8748	19.9305	19.9267	19.7917	19.2900	18.6703	18.1703 (90)
Living area fraction	18.5732	18.7674	19.0835	19.5076	19.8901	20.1279	20.1867	20.1815	20.0451	19.5739	19.0014	0.2446 (91)
MIT	18.5732	18.7674	19.0835	19.5076	19.8901	20.1279	20.1867	20.1815	20.0451	19.5739	19.0014	18.5403 (92)
Temperature adjustment												0.0000
adjusted MIT	18.5732	18.7674	19.0835	19.5076	19.8901	20.1279	20.1867	20.1815	20.0451	19.5739	19.0014	18.5403 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	436.6694	490.5073	527.8138	548.7156	526.2213	416.8194	288.8707	300.9223	411.9327	443.7290	423.2488	415.0524 (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	1202.6793	1166.0557	1055.9356	881.5759	679.4258	454.6942	295.0242	310.5503	490.6195	744.4511	990.9349	1198.5887 (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	569.9114	453.9685	392.9226	239.6595	113.9841	0.0000	0.0000	0.0000	0.0000	223.7372	408.7340	582.9510 (98)
Space heating												2985.8683 (98)
Space heating per m2										(98) / (4) =		42.7041 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												93.4000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												3196.8611 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	569.9114	453.9685	392.9226	239.6595	113.9841	0.0000	0.0000	0.0000	0.0000	223.7372	408.7340	582.9510 (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)	610.1835	486.0476	420.6880	256.5947	122.0387	0.0000	0.0000	0.0000	0.0000	239.5474	437.6167	624.1445 (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	191.7824	167.5269	174.3008	154.5961	149.6763	131.8265	126.2998	140.7947	142.3496	162.0934	173.0315	187.2786 (64)
Efficiency of water heater (217)m	87.6250	87.4356	87.0360	86.1510	84.3754	80.3000	80.3000	80.3000	80.3000	85.8629	87.1401	80.3000 (216)
Fuel for water heating, kWh/month	218.8672	191.6003	200.2628	179.4478	177.3933	164.1675	157.2850	175.3359	177.2723	188.7817	198.5670	213.5023 (219)
Water heating fuel used												2242.4831 (219)
Annual totals kWh/year												
Space heating fuel - main system												3196.8611 (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)												325.9458 (232)
Total delivered energy for all uses												5840.2900 (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	3196.8611	0.2160	690.5220 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2242.4831	0.2160	484.3763 (264)
Space and water heating			1174.8984 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	325.9458	0.5190	169.1659 (268)
Total CO2, kg/m2/year			1382.9892 (272)
Emissions per m2 for space and water heating			16.8035 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4194 (272b)
Emissions per m2 for pumps and fans			0.5567 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.8035 * 1.00) + 2.4194 + 0.5567, rounded to 2 d.p.			19.7800 (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	34.9600 (1b)	x 2.3900 (2b)	= 83.5544 (1b) - (3b)
First floor	34.9600 (1c)	x 2.6500 (2c)	= 92.6440 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.9200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.1984 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					20.0000 / (5) = 0.1135 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3635 (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) =	0.3090 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3940	0.3862	0.3785	0.3399	0.3322	0.2935	0.2935	0.2858	0.3090	0.3322	0.3476	0.3631 (22b)
Effective ac	0.5776	0.5746	0.5716	0.5578	0.5552	0.5431	0.5431	0.5408	0.5477	0.5552	0.5604	0.5659 (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 & Fully Glazed Do (Uw = 1.20)			10.8200	1.1450	12.3893		(27)
Ground Floor			34.9600	0.1200	4.1952	90.0000	3146.4000 (28a)
Brick and Block	84.2300	12.9400	71.2900	0.2400	17.1096	42.2200	3009.8638 (29a)
Party Wall Step	2.5700		2.5700	0.2600	0.6682	113.5000	291.6950 (29a)
External Roof 1	34.9600		34.9600	0.1000	3.4960	9.1000	318.1360 (30)
Total net area of external elements Aum(A, m ²)			156.7200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.1903		(33)
Party Wall 1			40.3300	0.0000	0.0000	110.0000	4436.3000 (32)
Party Wall 2			40.3300	0.0000	0.0000	110.0000	4436.3000 (32)
GF Timber Stud			48.1300			9.0000	433.1700 (32c)
FF Timber Stud			73.4400			9.0000	660.9600 (32c)
Internal Floor 1			34.9600			18.0000	629.2800 (32d)
Internal Ceiling 1			34.9600			9.0000	314.6400 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	17676.7448 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							252.8139 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.4516 (36)
Total fabric heat loss						(33) + (36) =	52.6419 (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	33.5848	33.4096	33.2378	32.4312	32.2803	31.5777	31.5777	31.4476	31.8483	32.2803	32.5856	32.9048 (38)
Heat transfer coeff	86.2267	86.0515	85.8798	85.0731	84.9222	84.2196	84.2196	84.0895	84.4902	84.9222	85.2275	85.5467 (39)
Average = Sum(39)m / 12 =												85.0724 (39)
HLP	1.2332	1.2307	1.2283	1.2167	1.2146	1.2045	1.2045	1.2027	1.2084	1.2146	1.2189	1.2235 (40)
HLP (average)												1.2167 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2442 (42)
Average daily hot water use (litres/day)												87.4993 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.2492	92.7493	89.2493	85.7493	82.2493	78.7494	78.7494	82.2493	85.7493	89.2493	92.7493	96.2492 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Energy conte	142.7348	124.8368	128.8204	112.3087	107.7629	92.9912	86.1700	98.8813	100.0623	116.6130	127.2922	138.2311 (45)
Energy content (annual)										Total =	Sum (45)m =	1376.7047 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	30.3312	26.5278	27.3743	23.8656	22.8996	19.7606	18.3111	21.0123	21.2632	24.7803	27.0496	29.3741 (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	112.2091	112.2091	112.2091	112.2091	112.2091	112.2091	112.2091	112.2091	112.2091	112.2091	112.2091	112.2091	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4564	16.3928	13.3315	10.0928	7.5445	6.3694	6.8823	8.9459	12.0072	15.2459	17.7942	18.9694	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.1103	199.1557	194.0014	183.0284	169.1771	156.1588	147.4618	145.4164	150.5707	161.5436	175.3949	188.4133	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2209	34.2209	34.2209	34.2209	34.2209	34.2209	34.2209	34.2209	34.2209	34.2209	34.2209	34.2209	(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)	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	(71)
Water heating gains (Table 5)	40.7677	39.4759	36.7935	33.1467	30.7791	27.4453	24.6117	28.2423	29.5323	33.3068	37.5689	39.4813	(72)
Total internal gains	312.9971	311.6871	300.7891	282.9307	264.1634	246.6362	235.6186	239.2673	248.7729	266.7590	287.4208	303.5266	(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
North					6.4600	10.6334	0.6300		0.7000		0.7700		20.9931
South					4.3600	46.7521	0.6300		0.7000		0.7700		62.2958 (74)
Solar gains	83.2889	142.1434	198.1329	256.3856	300.5708	305.2139	291.3539	256.7368	217.7243	157.7993	99.7395	71.3302	(83)
Total gains	396.2860	453.8305	498.9220	539.3163	564.7342	551.8501	526.9725	496.0041	466.4972	424.5583	387.1603	374.8569	(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	56.9453	57.0613	57.1754	57.7175	57.8201	58.3024	58.3024	58.3926	58.1157	57.8201	57.6129	57.3980	
alpha	4.7964	4.8041	4.8117	4.8478	4.8547	4.8868	4.8868	4.8928	4.8744	4.8547	4.8409	4.8265	
util living area	0.9985	0.9968	0.9926	0.9788	0.9349	0.8202	0.6605	0.7137	0.9077	0.9850	0.9970	0.9989	(86)
MIT	19.6303	19.7757	20.0154	20.3403	20.6555	20.8861	20.9703	20.9567	20.7898	20.3880	19.9498	19.6036	(87)
Th 2	19.8935	19.8955	19.8975	19.9066	19.9084	19.9164	19.9164	19.9179	19.9133	19.9084	19.9049	19.9013	(88)
util rest of house	0.9980	0.9957	0.9898	0.9696	0.9036	0.7335	0.5186	0.5762	0.8504	0.9767	0.9957	0.9985	(89)
MIT 2	18.6487	18.7952	19.0353	19.3627	19.6625	19.8598	19.9084	19.9047	19.7889	19.4138	18.9767	18.6282	(90)
Living area fraction									fLA = Living area / (4) =			0.2446	(91)
MIT	18.8887	19.0350	19.2750	19.6018	19.9054	20.1108	20.1681	20.1620	20.0337	19.6521	19.2147	18.8668	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8887	19.0350	19.2750	19.6018	19.9054	20.1108	20.1681	20.1620	20.0337	19.6521	19.2147	18.8668	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9973	0.9945	0.9876	0.9662	0.9035	0.7513	0.5539	0.6103	0.8582	0.9741	0.9946	0.9979	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	400.3499	413.5710	385.0565	374.0846	(95)
Heat loss rate W	1257.9373	1216.3367	1097.1111	910.4351	696.8192	464.1151	300.5062	316.3436	501.3358	768.7217	1032.5061	1254.6922	(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	641.8624	514.0867	449.6662	280.3224	138.8310	0.0000	0.0000	0.0000	0.0000	264.2321	466.1636	655.1721	(98)
Space heating												3410.3364	(98)
Space heating per m2										(98) / (4) =		48.7748	(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	791.6644	623.2251	639.0803	0.0000	0.0000	0.0000	0.0000	(100)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7940	0.8735	0.8454	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	628.6121	544.4021	540.2637	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	728.7780	698.0462	663.3214	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												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	72.1194	114.3112	91.5549	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												277.9856 (104)
Cooled fraction									FC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)												
Intermittency factor	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	18.0299	28.5778	22.8887	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												69.4964 (107)
Space cooling per m2												0.9939 (108)
Energy for space heating												48.7748 (99)
Energy for space cooling												0.9939 (108)
Total												49.7688 (109)
Dwelling Fabric Energy Efficiency (DFEE)												49.8 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	34.9600 (1b)	x 2.3900 (2b)	= 83.5544 (1b) - (3b)
First floor	34.9600 (1c)	x 2.6500 (2c)	= 92.6440 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.9200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.1984 (5)

2. Ventilation rate

										main	secondary	other	total	m3 per hour											
										heating	heating														
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) =	0.1135 (8)								
Pressure test										Yes															
Measured/design AP50										5.0000															
Infiltration rate										0.3635 (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) =					0.3090 (21)										
													Jan		Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed													5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)	
Wind factor													1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)	
Adj infilt rate													0.3940	0.3862	0.3785	0.3399	0.3322	0.2935	0.2935	0.2858	0.3090	0.3322	0.3476	0.3631 (22b)	
Effective ac													0.5776	0.5746	0.5716	0.5578	0.5552	0.5431	0.5431	0.5408	0.5477	0.5552	0.5604	0.5659 (25)	

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opaque door			2.1200	1.0000	2.1200			(26)					
TER Opening Type (Uw = 1.40)			10.8200	1.3258	14.3447			(27)					
Ground Floor			34.9600	0.1300	4.5448			(28a)					
Brick and Block	84.2300	12.9400	71.2900	0.1800	12.8322			(29a)					
Party Wall Step	2.5700		2.5700	0.1800	0.4626			(29a)					
External Roof 1	34.9600		34.9600	0.1300	4.5448			(30)					
Total net area of external elements Aum(A, m2)			156.7200					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	38.8491			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								11.8277 (36)					
Total fabric heat loss						(33) + (36) =		50.6768 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 33.5848	Feb 33.4096	Mar 33.2378	Apr 32.4312	May 32.2803	Jun 31.5777	Jul 31.5777	Aug 31.4476	Sep 31.8483	Oct 32.2803	Nov 32.5856	Dec 32.9048	(38)
Heat transfer coeff	84.2616	84.0864	83.9146	83.1080	82.9571	82.2545	82.2545	82.1244	82.5251	82.9571	83.2624	83.5816	(39)
Average = Sum(39)m / 12 =												83.1073	(39)
HLP	Jan 1.2051	Feb 1.2026	Mar 1.2002	Apr 1.1886	May 1.1865	Jun 1.1764	Jul 1.1764	Aug 1.1745	Sep 1.1803	Oct 1.1865	Nov 1.1908	Dec 1.1954	(40)
HLP (average)												1.1886	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2442 (42)
Average daily hot water use (litres/day)												87.4993 (43)
Daily hot water use	Jan 96.2492	Feb 92.7493	Mar 89.2493	Apr 85.7493	May 82.2493	Jun 78.7494	Jul 78.7494	Aug 82.2493	Sep 85.7493	Oct 89.2493	Nov 92.7493	Dec 96.2492 (44)
Energy conte	142.7348	124.8368	128.8204	112.3087	107.7629	92.9912	86.1700	98.8813	100.0623	116.6130	127.2922	138.2311 (45)
Energy content (annual)										Total = Sum(45)m =		1376.7047 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

If cylinder contains dedicated solar storage												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Heat gains from water heating, kWh/month	30.3312	26.5278	27.3743	23.8656	22.8996	19.7606	18.3111	21.0123	21.2632	24.7803	27.0496	(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	112.2091	112.2091	112.2091	112.2091	112.2091	112.2091	112.2091	112.2091	112.2091	112.2091	112.2091	112.2091 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4564	16.3928	13.3315	10.0928	7.5445	6.3694	6.8823	8.9459	12.0072	15.2459	17.7942	18.9694 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.1103	199.1557	194.0014	183.0284	169.1771	156.1588	147.4618	145.4164	150.5707	161.5436	175.3949	188.4133 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2209	34.2209	34.2209	34.2209	34.2209	34.2209	34.2209	34.2209	34.2209	34.2209	34.2209	34.2209 (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)	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672 (71)
Water heating gains (Table 5)	40.7677	39.4759	36.7935	33.1467	30.7791	27.4453	24.6117	28.2423	29.5323	33.3068	37.5689	39.4813 (72)
Total internal gains	312.9971	311.6871	300.7891	282.9307	264.1634	246.6362	235.6186	239.2673	248.7729	266.7590	287.4208	303.5266 (73)

6. Solar gains												

[Jan]												
			Area		Solar flux		g		FF		Access	Gains
			m2		Table 6a		Specific data		Specific data		factor	W
					W/m2		or Table 6b		or Table 6c		Table 6d	
North			6.4600		10.6334		0.6300		0.7000		0.7700	20.9931 (74)
South			4.3600		46.7521		0.6300		0.7000		0.7700	62.2958 (78)

Solar gains	83.2889	142.1434	198.1329	256.3856	300.5708	305.2139	291.3539	256.7368	217.7243	157.7993	99.7395	71.3302 (83)
Total gains	396.2860	453.8305	498.9220	539.3163	564.7342	551.8501	526.9725	496.0041	466.4972	424.5583	387.1603	374.8569 (84)

7. Mean internal temperature (heating season)												

Temperature during heating periods in the living area from Table 9, Th1 (C)												
Utilisation factor for gains for living area, nil,m (see Table 9a)												21.0000 (85)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	57.6248	57.7449	57.8630	58.4247	58.5310	59.0309	59.0309	59.1244	58.8373	58.5310	58.3163	58.0936
alpha	4.8417	4.8497	4.8575	4.8950	4.9021	4.9354	4.9354	4.9416	4.9225	4.9021	4.8878	4.8729
util living area	0.9984	0.9967	0.9922	0.9775	0.9310	0.8113	0.6491	0.7027	0.9022	0.9840	0.9968	0.9988 (86)
MIT	19.6549	19.8006	20.0393	20.3618	20.6721	20.8948	20.9734	20.9609	20.8016	20.4063	19.9715	19.6282 (87)
Th 2	19.9159	19.9179	19.9199	19.9291	19.9308	19.9389	19.9389	19.9404	19.9358	19.9308	19.9273	19.9237 (88)
util rest of house	0.9979	0.9955	0.9892	0.9679	0.8988	0.7249	0.5109	0.5681	0.8441	0.9755	0.9955	0.9984 (89)
MIT 2	18.6920	18.8389	19.0779	19.4028	19.6971	19.8866	19.9317	19.9284	19.8185	19.4506	19.0172	18.6715 (90)
Living area fraction									fLA = Living area / (4) =			0.2446 (91)
MIT	18.9275	19.0741	19.3130	19.6373	19.9355	20.1332	20.1865	20.1809	20.0589	19.6843	19.2506	18.9055 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9275	19.0741	19.3130	19.6373	19.9355	20.1332	20.1865	20.1809	20.0589	19.6843	19.2506	18.9055 (93)

8. Space heating requirement												

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9972	0.9942	0.9870	0.9645	0.8990	0.7428	0.5453	0.6014	0.8523	0.9729	0.9943	0.9979 (94)
Useful gains	395.1789	451.2203	492.4317	520.1946	507.6950	409.8989	287.3474	298.2757	397.5912	413.0409	384.9677	374.0567 (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	1232.5328	1191.8501	1075.2012	892.3590	683.1947	455.1287	295.0043	310.5065	491.7607	753.6107	1011.6891	1229.1070 (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	622.9913	497.7033	433.5805	267.9584	130.5718	0.0000	0.0000	0.0000	0.0000	253.3839	451.2394	636.1575 (98)
Space heating												3293.5860 (98)
Space heating per m2										(98) / (4) =		47.1051 (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	773.1922	608.6832	624.1453	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8060	0.8830	0.8560	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	623.1984	537.4679	534.2456	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	728.7780	698.0462	663.3214	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	76.0173	119.4703	96.0324	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												291.5199 (104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Cooled fraction											FC = cooled area / (4) =	1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	19.0043	29.8676	24.0081	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												72.8800 (107)
Space cooling per m2												1.0423 (108)
Energy for space heating												47.1051 (99)
Energy for space cooling												1.0423 (108)
Total												48.1474 (109)
Target Fabric Energy Efficiency (TFEE)												55.4 (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 (m ²)	Storey height (m)	Volume (m ³)
Ground floor	34.9600 (1b)	x 2.3900 (2b)	= 83.5544 (1b) - (3b)
First floor	34.9600 (1c)	x 2.6500 (2c)	= 92.6440 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.9200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.1984 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					30.0000 / (5) = 0.1703 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4203 (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)	=	0.3572 (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	0.4555	0.4197	0.4108	0.3840	0.3840	0.3572	0.3572	0.3483	0.3572	0.4019	0.3929	0.4197 (22b)
Effective ac	0.6037	0.5881	0.5844	0.5737	0.5737	0.5638	0.5638	0.5607	0.5638	0.5808	0.5772	0.5881 (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 & Fully Glazed Do (Uw = 1.20)			10.8200	1.1450	12.3893		(27)
Ground Floor			34.9600	0.1200	4.1952	90.0000	3146.4000 (28a)
Brick and Block	84.2300	12.9400	71.2900	0.2400	17.1096	42.2200	3009.8638 (29a)
Party Wall Step	2.5700		2.5700	0.2600	0.6682	113.5000	291.6950 (29a)
External Roof 1	34.9600		34.9600	0.1000	3.4960	9.1000	318.1360 (30)
Total net area of external elements Aum(A, m ²)			156.7200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.1903		(33)
Party Wall 1			40.3300	0.0000	0.0000	110.0000	4436.3000 (32)
Party Wall 2			40.3300	0.0000	0.0000	110.0000	4436.3000 (32)
GF Timber Stud			48.1300			9.0000	433.1700 (32c)
FF Timber Stud			73.4400			9.0000	660.9600 (32c)
Internal Floor 1			34.9600			18.0000	629.2800 (32d)
Internal Ceiling 1			34.9600			18.0000	629.2800 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 17991.3848 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 257.3139 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 12.4516 (36)
Total fabric heat loss (33) + (36) = 52.6419 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 35.1037	Feb 34.1948	Mar 33.9791	Apr 33.3600	May 33.3600	Jun 32.7827	Jul 32.7827	Aug 32.5995	Sep 32.7827	Oct 33.7681	Nov 33.5617	Dec 34.1948 (38)
Heat transfer coeff	87.7456	86.8367	86.6210	86.0019	86.0019	85.4246	85.4246	85.2414	85.4246	86.4100	86.2037	86.8367 (39)
Average = Sum(39)m / 12 =												86.1811 (39)
HLP	Jan 1.2549	Feb 1.2419	Mar 1.2389	Apr 1.2300	May 1.2300	Jun 1.2217	Jul 1.2217	Aug 1.2191	Sep 1.2217	Oct 1.2358	Nov 1.2329	Dec 1.2419 (40)
HLP (average)												1.2326 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2442 (42)
Average daily hot water use (litres/day)												87.4993 (43)
Daily hot water use	Jan 96.2492	Feb 92.7493	Mar 89.2493	Apr 85.7493	May 82.2493	Jun 78.7494	Jul 78.7494	Aug 82.2493	Sep 85.7493	Oct 89.2493	Nov 92.7493	Dec 96.2492 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Energy content (annual)	142.7348	124.8368	128.8204	112.3087	107.7629	92.9912	86.1700	98.8813	100.0623	116.6130	127.2922	138.2311 (45)
Distribution loss (46)m = 0.15 x (45)m	21.4102	18.7255	19.3231	16.8463	16.1644	13.9487	12.9255	14.8322	15.0093	17.4919	19.0938	1376.7047 (45)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	25.2847	22.8154	25.2242	24.3701	25.1531	24.3078	25.0970	25.1334	24.3418	25.1948	24.4289	25.2730 (61)
Total heat required for water heating calculated for each month	168.0195	147.6522	154.0446	136.6789	132.9160	117.2990	111.2670	124.0147	124.4041	141.8077	151.7210	163.5041 (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	168.0195	147.6522	154.0446	136.6789	132.9160	117.2990	111.2670	124.0147	124.4041	141.8077	151.7210	163.5041 (64)
RHI water heating demand	53.7805	47.2121	49.1388	43.4352	42.1194	36.9965	34.9258	39.1614	39.3562	45.0725	48.4319	52.2801 (65)
Heat gains from water heating, kWh/month												
	53.7805	47.2121	49.1388	43.4352	42.1194	36.9965	34.9258	39.1614	39.3562	45.0725	48.4319	52.2801 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	134.6509	134.6509	134.6509	134.6509	134.6509	134.6509	134.6509	134.6509	134.6509	134.6509	134.6509	134.6509 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	46.1410	40.9820	33.3288	25.2321	18.8613	15.9235	17.2059	22.3648	30.0180	38.1148	44.4856	47.4234 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	294.1944	297.2473	289.5543	273.1768	252.5031	233.0728	220.0922	217.0394	224.7324	241.1099	261.7835	281.2138 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7093	50.7093	50.7093	50.7093	50.7093	50.7093	50.7093	50.7093	50.7093	50.7093	50.7093	50.7093 (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)	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672 (71)
Water heating gains (Table 5)	72.2856	70.2561	66.0468	60.3266	56.6121	51.3841	46.9432	52.6363	54.6613	60.5813	67.2665	70.2689 (72)
Total internal gains	511.2140	507.0782	487.5228	457.3284	426.5694	398.9732	382.8342	390.6334	408.0046	438.3989	472.1285	497.4990 (73)

6. Solar gains

[Jan]												
	Area	Solar flux	g	Specific data	FF	Access	Gains					
	m2	Table 6a	W/m2	or Table 6b	Specific data	factor	W					
					Table 6c	Table 6d						
North	6.4600	13.8645	0.6300		0.7000	0.7700	27.3722 (74)					
South	4.3600	58.2505	0.6300		0.7000	0.7700	77.6172 (78)					
Solar gains	104.9894	153.4490	214.1419	285.1358	321.8158	354.6632	330.0706	295.2987	250.5017	180.5107	124.6271	85.8362 (83)
Total gains	616.2034	660.5273	701.6647	742.4641	748.3852	753.6364	712.9048	685.9321	658.5063	618.9096	596.7556	583.3352 (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	56.9556	57.5518	57.6951	58.1104	58.1104	58.5031	58.5031	58.6289	58.5031	57.8360	57.9744	57.5518
alpha	4.7970	4.8368	4.8463	4.8740	4.8740	4.9002	4.9002	4.9086	4.9002	4.8557	4.8650	4.8368
util living area	0.9879	0.9826	0.9664	0.9222	0.8148	0.6079	0.4387	0.4543	0.7129	0.9146	0.9748	0.9900 (86)
MIT	20.0205	20.1222	20.3427	20.6172	20.8542	20.9738	20.9957	20.9951	20.9441	20.7040	20.3474	20.0074 (87)
Th 2	19.8763	19.8866	19.8890	19.8961	19.8961	19.9026	19.9026	19.9047	19.9026	19.8914	19.8938	19.8866 (88)
util rest of house	0.9837	0.9766	0.9545	0.8938	0.7494	0.5009	0.3112	0.3228	0.6089	0.8756	0.9644	0.9864 (89)
MIT 2	19.0205	19.1286	19.3452	19.6089	19.8099	19.8934	19.9020	19.9040	19.8795	19.6881	19.3565	19.0162 (90)
Living area fraction									fLA = Living area / (4) =			0.2446 (91)
MIT	19.2651	19.3716	19.5892	19.8555	20.0653	20.1576	20.1695	20.1708	20.1399	19.9365	19.5988	19.2586 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2651	19.3716	19.5892	19.8555	20.0653	20.1576	20.1695	20.1708	20.1399	19.9365	19.5988	19.2586 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9807	0.9731	0.9505	0.8926	0.7606	0.5269	0.3426	0.3553	0.6332	0.8775	0.9609	0.9838 (94)
Useful gains	604.3359	642.7560	666.8979	662.7290	569.2102	397.0925	244.2623	243.7099	416.9725	543.0774	573.4189	573.8801 (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	1216.5977	1187.1961	1064.5020	881.9942	642.0273	406.4198	245.1237	244.7118	439.0731	703.0774	965.3814	1194.7504 (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	455.5228	365.8638	295.8175	157.8710	54.1760	0.0000	0.0000	0.0000	0.0000	119.0400	282.2130	461.9275 (98)
Space heating												2192.4314 (98)
RHI space heating demand												2192 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	34.9600 (1b)	x 2.3900 (2b)	= 83.5544 (1b) - (3b)
First floor	34.9600 (1c)	x 2.6500 (2c)	= 92.6440 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.9200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.1984 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					30.0000 / (5) = 0.1703 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4203 (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) =	0.3572 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4555	0.4465	0.4376	0.3929	0.3840	0.3394	0.3394	0.3304	0.3572	0.3840	0.4019	0.4197 (22b)
Effective ac	0.6037	0.5997	0.5957	0.5772	0.5737	0.5576	0.5576	0.5546	0.5638	0.5737	0.5808	0.5881 (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 & Fully Glazed Do (Uw = 1.20)			10.8200	1.1450	12.3893		(27)
Ground Floor			34.9600	0.1200	4.1952	90.0000	3146.4000 (28a)
Brick and Block	84.2300	12.9400	71.2900	0.2400	17.1096	42.2200	3009.8638 (29a)
Party Wall Step	2.5700		2.5700	0.2600	0.6682	113.5000	291.6950 (29a)
External Roof 1	34.9600		34.9600	0.1000	3.4960	9.1000	318.1360 (30)
Total net area of external elements Aum(A, m ²)			156.7200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.1903		(33)
Party Wall 1			40.3300	0.0000	0.0000	110.0000	4436.3000 (32)
Party Wall 2			40.3300	0.0000	0.0000	110.0000	4436.3000 (32)
GF Timber Stud			48.1300			9.0000	433.1700 (32c)
FF Timber Stud			73.4400			9.0000	660.9600 (32c)
Internal Floor 1			34.9600			18.0000	629.2800 (32d)
Internal Ceiling 1			34.9600			18.0000	629.2800 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 17991.3848 (34)
257.3139 (35)
12.4516 (36)
(33) + (36) = 52.6419 (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	35.1037	34.8695	34.6399	33.5617	33.3600	32.4209	32.4209	32.2470	32.7827	33.3600	33.7681	34.1948 (38)
Heat transfer coeff	87.7456	87.5114	87.2819	86.2037	86.0019	85.0629	85.0629	84.8890	85.4246	86.0019	86.4100	86.8367 (39)
Average = Sum(39)m / 12 =												86.2027 (39)
HLP	1.2549	1.2516	1.2483	1.2329	1.2300	1.2166	1.2166	1.2141	1.2217	1.2300	1.2358	1.2419 (40)
HLP (average)												1.2329 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2442 (42)
Average daily hot water use (litres/day)												87.4993 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.2492	92.7493	89.2493	85.7493	82.2493	78.7494	78.7494	82.2493	85.7493	89.2493	92.7493	96.2492 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Energy conte	142.7348	124.8368	128.8204	112.3087	107.7629	92.9912	86.1700	98.8813	100.0623	116.6130	127.2922	138.2311 (45)
Energy content (annual)										Total = Sum (45)m =		1376.7047 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.4102	18.7255	19.3231	16.8463	16.1644	13.9487	12.9255	14.8322	15.0093	17.4919	19.0938	20.7347 (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)
Combi loss	25.2847	22.8154	25.2242	24.3701	25.1531	24.3078	25.0970	25.1334	24.3418	25.1948	24.4289	25.2730 (61)
Total heat required for water heating calculated for each month												
	168.0195	147.6522	154.0446	136.6789	132.9160	117.2990	111.2670	124.0147	124.4041	141.8077	151.7210	163.5041 (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)
								Solar input (sum of months) = Sum (63)m =				0.0000 (63)
Output from w/h												
	168.0195	147.6522	154.0446	136.6789	132.9160	117.2990	111.2670	124.0147	124.4041	141.8077	151.7210	163.5041 (64)
Heat gains from water heating, kWh/month								Total per year (kWh/year) = Sum (64)m =				1673.3288 (64)
	53.7805	47.2121	49.1388	43.4352	42.1194	36.9965	34.9258	39.1614	39.3562	45.0725	48.4319	52.2801 (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	134.6509	134.6509	134.6509	134.6509	134.6509	134.6509	134.6509	134.6509	134.6509	134.6509	134.6509	134.6509 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	46.1410	40.9820	33.3288	25.2321	18.8613	15.9235	17.2059	22.3648	30.0180	38.1148	44.4856	47.4234 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	294.1944	297.2473	289.5543	273.1768	252.5031	233.0728	220.0922	217.0394	224.7324	241.1099	261.7835	281.2138 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	50.7093	50.7093	50.7093	50.7093	50.7093	50.7093	50.7093	50.7093	50.7093	50.7093	50.7093	50.7093 (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)												
	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672 (71)
Water heating gains (Table 5)												
	72.2856	70.2561	66.0468	60.3266	56.6121	51.3841	46.9432	52.6363	54.6613	60.5813	67.2665	70.2689 (72)
Total internal gains												
	511.2140	507.0782	487.5228	457.3284	426.5694	398.9732	382.8342	390.6334	408.0046	438.3989	472.1285	497.4990 (73)

6. Solar gains

[Jan]												Gains	
				Area	Solar flux			g	FF			Access	Gains
				m2	Table 6a			Specific data	Specific data			factor	W
					W/m2			or Table 6b	or Table 6c			Table 6d	
North				6.4600	10.6334			0.6300	0.7000			0.7700	20.9931
South				4.3600	46.7521			0.6300	0.7000			0.7700	62.2958 (74)
Solar gains	83.2889	142.1434	198.1329	256.3856	300.5708	305.2139	291.3539	256.7368	217.7243	157.7993	99.7395	71.3302 (83)	
Total gains	594.5029	649.2216	685.6557	713.7140	727.1403	704.1871	674.1881	647.3702	625.7289	596.1982	571.8680	568.8292 (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	56.9556	57.1081	57.2582	57.9744	58.1104	58.7519	58.7519	58.8723	58.5031	58.1104	57.8360	57.5518
alpha	4.7970	4.8072	4.8172	4.8650	4.8740	4.9168	4.9168	4.9248	4.9002	4.8740	4.8557	4.8368
util living area												
	0.9921	0.9868	0.9754	0.9441	0.8667	0.7098	0.5410	0.5823	0.8048	0.9491	0.9855	0.9936 (86)
MIT	19.8716	20.0093	20.2300	20.5223	20.7805	20.9422	20.9877	20.9824	20.8887	20.5747	20.1757	19.8456 (87)
Th 2	19.8763	19.8789	19.8815	19.8938	19.8961	19.9068	19.9068	19.9087	19.9026	19.8961	19.8914	19.8866 (88)
util rest of house												
	0.9895	0.9825	0.9668	0.9233	0.8166	0.6132	0.4139	0.4546	0.7218	0.9259	0.9799	0.9914 (89)
MIT 2	18.8730	19.0111	19.2298	19.5203	19.7523	19.8813	19.9039	19.9041	19.8456	19.5758	19.1868	18.8555 (90)
Living area fraction												
MIT	19.1172	19.2553	19.4744	19.7653	20.0037	20.1408	20.1689	20.1679	20.1007	19.8201	19.4286	19.0977 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1172	19.2553	19.4744	19.7653	20.0037	20.1408	20.1689	20.1679	20.1007	19.8201	19.4286	19.0977 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9871	0.9793	0.9628	0.9204	0.8222	0.6354	0.4454	0.4862	0.7386	0.9240	0.9768	0.9894 (94)
Useful gains	586.8609	635.7976	660.1527	656.9064	597.8452	447.4501	300.2510	314.7473	462.1764	550.8612	558.6050	562.7891 (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												
	1300.1481	1256.2490	1132.4332	936.6303	714.1377	471.3132	303.5822	319.8491	512.6056	792.9457	1065.3182	1293.6650 (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												
	530.6857	416.9433	351.3766	201.4012	86.5216	0.0000	0.0000	0.0000	0.0000	180.1108	364.8335	543.7716 (98)
Space heating												2675.6444 (98)
Space heating per m2												(98) / (4) = 38.2672 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

8c. Space cooling requirement

Not applicable

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 %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2949.9938 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	530.6857	416.9433	351.3766	201.4012	86.5216	0.0000	0.0000	0.0000	0.0000	180.1108	364.8335	543.7716	(98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)
Space heating fuel (main heating system)	585.1000	459.6949	387.4053	222.0520	95.3932	0.0000	0.0000	0.0000	0.0000	198.5786	402.2420	599.5277	(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													
Water heating requirement	168.0195	147.6522	154.0446	136.6789	132.9160	117.2990	111.2670	124.0147	124.4041	141.8077	151.7210	163.5041	(64)
Efficiency of water heater (217)m	89.8329	89.7578	89.6038	89.2517	88.5473	87.2000	87.2000	87.2000	87.2000	89.1242	89.6432	89.8662	(216)
Fuel for water heating, kWh/month	187.0356	164.5006	171.9174	153.1386	150.1074	134.5172	127.5998	142.2187	142.6652	159.1125	169.2499	181.9418	(219)
Water heating fuel used													1884.0046 (219)
Annual totals kWh/year													
Space heating fuel - main system													2949.9938 (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)													325.9458 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.70 * 1080 * 1.00) =										-604.5338			-604.5338 (233)
Total delivered energy for all uses													4630.4105 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2949.9938	3.4800	102.6598 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1884.0046	3.4800	65.5634 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	325.9458	13.1900	42.9922 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-604.5338	13.1900	-79.7380 (252)
Total energy cost			261.3699 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.9552 (257)
SAP value		86.6745
SAP rating (Section 12)		87 (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	2949.9938	0.2160	637.1987 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1884.0046	0.2160	406.9450 (264)
Space and water heating			1044.1437 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	325.9458	0.5190	169.1659 (268)
Energy saving/generation technologies			
PV Unit	-604.5338	0.5190	-313.7530 (269)
Total kg/year			938.4815 (272)
CO2 emissions per m2			13.4200 (273)
EI value			89.0570
EI rating			89 (274)
EI band			B

Calculation of stars for heating and DHW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9070 = 3.837$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9070 = 0.2381$, stars = 4
Water heating energy efficiency	$3.48 / 0.8870 = 3.923$, stars = 4
Water heating environmental impact	$0.216 / 0.8870 = 0.2435$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	34.9600 (1b)	x 2.3900 (2b)	= 83.5544 (1b) - (3b)
First floor	34.9600 (1c)	x 2.6500 (2c)	= 92.6440 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.9200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.1984 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) = 0.1703 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4203 (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) =				0.3572 (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	0.4555	0.4197	0.4108	0.3840	0.3840	0.3572	0.3572	0.3483	0.3572	0.4019	0.3929	0.4197 (22b)
Effective ac	0.6037	0.5881	0.5844	0.5737	0.5737	0.5638	0.5638	0.5607	0.5638	0.5808	0.5772	0.5881 (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 & Fully Glazed Do (Uw = 1.20)			10.8200	1.1450	12.3893		(27)
Ground Floor			34.9600	0.1200	4.1952	90.0000	3146.4000 (28a)
Brick and Block	84.2300	12.9400	71.2900	0.2400	17.1096	42.2200	3009.8638 (29a)
Party Wall Step	2.5700		2.5700	0.2600	0.6682	113.5000	291.6950 (29a)
External Roof 1	34.9600		34.9600	0.1000	3.4960	9.1000	318.1360 (30)
Total net area of external elements Aum(A, m ²)			156.7200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.1903		(33)
Party Wall 1			40.3300	0.0000	0.0000	110.0000	4436.3000 (32)
Party Wall 2			40.3300	0.0000	0.0000	110.0000	4436.3000 (32)
GF Timber Stud			48.1300			9.0000	433.1700 (32c)
FF Timber Stud			73.4400			9.0000	660.9600 (32c)
Internal Floor 1			34.9600			18.0000	629.2800 (32d)
Internal Ceiling 1			34.9600			18.0000	629.2800 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 17991.3848 (34)
257.3139 (35)
12.4516 (36)
(33) + (36) = 52.6419 (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	35.1037	34.1948	33.9791	33.3600	33.3600	32.7827	32.7827	32.5995	32.7827	33.7681	33.5617	34.1948 (38)
Heat transfer coeff	87.7456	86.8367	86.6210	86.0019	86.0019	85.4246	85.4246	85.2414	85.4246	86.4100	86.2037	86.8367 (39)
Average = Sum(39)m / 12 =												86.1811 (39)
HLP	1.2549	1.2419	1.2389	1.2300	1.2300	1.2217	1.2217	1.2191	1.2217	1.2358	1.2329	1.2419 (40)
HLP (average)												1.2326 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2442 (42)
Average daily hot water use (litres/day)												87.4993 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.2492	92.7493	89.2493	85.7493	82.2493	78.7494	78.7494	82.2493	85.7493	89.2493	92.7493	96.2492 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Energy conte	142.7348	124.8368	128.8204	112.3087	107.7629	92.9912	86.1700	98.8813	100.0623	116.6130	127.2922	138.2311 (45)
Energy content (annual)										Total =	Sum (45)m =	1376.7047 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.4102	18.7255	19.3231	16.8463	16.1644	13.9487	12.9255	14.8322	15.0093	17.4919	19.0938	20.7347 (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)
Combi loss	25.2847	22.8154	25.2242	24.3701	25.1531	24.3078	25.0970	25.1334	24.3418	25.1948	24.4289	25.2730 (61)
Total heat required for water heating calculated for each month												
	168.0195	147.6522	154.0446	136.6789	132.9160	117.2990	111.2670	124.0147	124.4041	141.8077	151.7210	163.5041 (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)
								Solar input (sum of months) =	Sum (63)m =			0.0000 (63)
Output from w/h												
	168.0195	147.6522	154.0446	136.6789	132.9160	117.2990	111.2670	124.0147	124.4041	141.8077	151.7210	163.5041 (64)
Heat gains from water heating, kWh/month								Total per year (kWh/year) =	Sum (64)m =			1673.3288 (64)
	53.7805	47.2121	49.1388	43.4352	42.1194	36.9965	34.9258	39.1614	39.3562	45.0725	48.4319	52.2801 (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	134.6509	134.6509	134.6509	134.6509	134.6509	134.6509	134.6509	134.6509	134.6509	134.6509	134.6509	134.6509 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	46.1410	40.9820	33.3288	25.2321	18.8613	15.9235	17.2059	22.3648	30.0180	38.1148	44.4856	47.4234 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	294.1944	297.2473	289.5543	273.1768	252.5031	233.0728	220.0922	217.0394	224.7324	241.1099	261.7835	281.2138 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	50.7093	50.7093	50.7093	50.7093	50.7093	50.7093	50.7093	50.7093	50.7093	50.7093	50.7093	50.7093 (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)												
	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672 (71)
Water heating gains (Table 5)												
	72.2856	70.2561	66.0468	60.3266	56.6121	51.3841	46.9432	52.6363	54.6613	60.5813	67.2665	70.2689 (72)
Total internal gains												
	511.2140	507.0782	487.5228	457.3284	426.5694	398.9732	382.8342	390.6334	408.0046	438.3989	472.1285	497.4990 (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
North												6.4600	13.8645	0.6300	0.7000	0.7700	27.3722 (74)
South												4.3600	58.2505	0.6300	0.7000	0.7700	77.6172 (78)
Solar gains	104.9894	153.4490	214.1419	285.1358	321.8158	354.6632	330.0706	295.2987	250.5017	180.5107	124.6271	85.8362 (83)					
Total gains	616.2034	660.5273	701.6647	742.4641	748.3852	753.6364	712.9048	685.9321	658.5063	618.9096	596.7556	583.3352 (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	56.9556	57.5518	57.6951	58.1104	58.1104	58.5031	58.5031	58.6289	58.5031	57.8360	57.9744	57.5518
alpha	4.7970	4.8368	4.8463	4.8740	4.8740	4.9002	4.9002	4.9086	4.9002	4.8557	4.8650	4.8368
util living area												
	0.9879	0.9826	0.9664	0.9222	0.8148	0.6079	0.4387	0.4543	0.7129	0.9146	0.9748	0.9900 (86)
MIT	20.0205	20.1222	20.3427	20.6172	20.8542	20.9738	20.9957	20.9951	20.9441	20.7040	20.3474	20.0074 (87)
Th 2	19.8763	19.8866	19.8890	19.8961	19.8961	19.9026	19.9026	19.9047	19.9026	19.8914	19.8938	19.8866 (88)
util rest of house												
	0.9837	0.9766	0.9545	0.8938	0.7494	0.5009	0.3112	0.3228	0.6089	0.8756	0.9644	0.9864 (89)
MIT 2	19.0205	19.1286	19.3452	19.6089	19.8099	19.8934	19.9020	19.9040	19.8795	19.6881	19.3565	19.0162 (90)
Living area fraction												
MIT	19.2651	19.3716	19.5892	19.8555	20.0653	20.1576	20.1695	20.1708	20.1399	19.9365	19.5988	19.2586 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2651	19.3716	19.5892	19.8555	20.0653	20.1576	20.1695	20.1708	20.1399	19.9365	19.5988	19.2586 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9807	0.9731	0.9505	0.8926	0.7606	0.5269	0.3426	0.3553	0.6332	0.8775	0.9609	0.9838 (94)
Useful gains	604.3359	642.7560	666.8979	662.7290	569.2102	397.0925	244.2623	243.7099	416.9725	543.0774	573.4189	573.8801 (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												
	1216.5977	1187.1961	1064.5020	881.9942	642.0273	406.4198	245.1237	244.7118	439.0731	703.0774	965.3814	1194.7504 (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												
	455.5228	365.8638	295.8175	157.8710	54.1760	0.0000	0.0000	0.0000	0.0000	119.0400	282.2130	461.9275 (98)
Space heating												2192.4314 (98)
Space heating per m2												31.3563 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

8c. Space cooling requirement

Not applicable

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 %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2417.2342 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	455.5228	365.8638	295.8175	157.8710	54.1760	0.0000	0.0000	0.0000	0.0000	119.0400	282.2130	461.9275	(98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)
Space heating fuel (main heating system)	502.2302	403.3779	326.1494	174.0584	59.7309	0.0000	0.0000	0.0000	0.0000	131.2458	311.1500	509.2916	(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													
Water heating requirement	168.0195	147.6522	154.0446	136.6789	132.9160	117.2990	111.2670	124.0147	124.4041	141.8077	151.7210	163.5041	(64)
Efficiency of water heater (217)m	89.7295	89.6652	89.4703	89.0416	88.1854	87.2000	87.2000	87.2000	87.2000	88.7631	89.4448	89.7582	(216)
Fuel for water heating, kWh/month	187.2511	164.6706	172.1740	153.5000	150.7234	134.5172	127.5998	142.2187	142.6652	159.7597	169.6254	182.1606	(219)
Water heating fuel used													1886.8657 (219)
Annual totals kWh/year													
Space heating fuel - main system													2417.2342 (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)													325.9458 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.70 * 1234 * 1.00) =										-691.3003			-691.3003 (233)
Total delivered energy for all uses													4013.7453 (238)

10a. Fuel costs - using BEDF prices (513)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2417.2342	9.7400	235.4386 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1886.8657	9.7400	183.7807 (247)
Pumps and fans for heating	75.0000	36.8500	27.6375 (249)
Energy for lighting	325.9458	36.8500	120.1110 (250)
Additional standing charges			104.0000 (251)
Energy saving/generation technologies			
PV Unit	-691.3003	36.8500	-254.7442 (252)
Total energy cost			416.2237 (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	2417.2342	0.2160	522.1226 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1886.8657	0.2160	407.5630 (264)
Space and water heating			929.6856 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	325.9458	0.5190	169.1659 (268)
Energy saving/generation technologies			
PV Unit	-691.3003	0.5190	-358.7849 (269)
Total kg/year			778.9916 (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	2417.2342	1.2200	2949.0257 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1886.8657	1.2200	2301.9761 (264)
Space and water heating			5251.0018 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	325.9458	3.0700	1000.6535 (268)
Energy saving/generation technologies			
PV Unit	-691.3003	3.0700	-2122.2920 (269)
Primary energy kWh/year			4359.6134 (272)
Primary energy kWh/m2/year			62.3514 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 87
Current environmental impact rating: B 89

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

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.3	-£ 76	-184 kg (23.7%)

		Typical annual savings	Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£76	2.64 kg/m²	B 88	B 91
Total Savings	£76	2.64 kg/m²		
Potential energy efficiency rating:			B 88	
Potential environmental impact rating:				B 91

Fuel prices for cost data on this page from database revision number 513 TEST (28 Feb 2023)
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	£148	£166	-£18
Mains gas	£523	£428	£95
Space heating	£367	£367	£0
Water heating	£184	£107	£76
Lighting	£120	£120	£0
Generated (PV)	-£255	-£255	£0
Total cost of fuels	£416	£339	£77
Total cost of uses	£416	£339	£76
Delivered energy	57 kWh/m²	44 kWh/m²	13 kWh/m²
Carbon dioxide emissions	0.8 tonnes	0.6 tonnes	0.2 tonnes
CO2 emissions per m²	11 kg/m²	9 kg/m²	3 kg/m²
Primary energy	62 kWh/m²	48 kWh/m²	15 kWh/m²

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	34.9600 (1b)	x 2.3900 (2b)	= 83.5544 (1b) - (3b)
First floor	34.9600 (1c)	x 2.6500 (2c)	= 92.6440 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.9200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.1984 (5)

2. Ventilation rate

										main	secondary	other	total	m3 per hour			
										heating	heating						
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																3 * 10 =	30.0000 (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) =				30.0000	/ (5) =	0.1703 (8)	
Pressure test										Yes							
Measured/design AP50										5.0000							
Infiltration rate										0.4203 (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) =				0.3572 (21)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)				
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)				
Adj infilt rate	0.4555	0.4465	0.4376	0.3929	0.3840	0.3394	0.3394	0.3304	0.3572	0.3840	0.4019	0.4197	(22b)				
Effective ac	0.6037	0.5997	0.5957	0.5772	0.5737	0.5576	0.5576	0.5546	0.5638	0.5737	0.5808	0.5881	(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 & Fully Glazed Do (Uw = 1.20)			10.8200	1.1450	12.3893			(27)
Ground Floor			34.9600	0.1200	4.1952	90.0000	3146.4000	(28a)
Brick and Block	84.2300	12.9400	71.2900	0.2400	17.1096	42.2200	3009.8638	(29a)
Party Wall Step	2.5700		2.5700	0.2600	0.6682	113.5000	291.6950	(29a)
External Roof 1	34.9600		34.9600	0.1000	3.4960	9.1000	318.1360	(30)
Total net area of external elements Aum(A, m2)			156.7200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.1903			(33)
Party Wall 1			40.3300	0.0000	0.0000	110.0000	4436.3000	(32)
Party Wall 2			40.3300	0.0000	0.0000	110.0000	4436.3000	(32)
GF Timber Stud			48.1300			9.0000	433.1700	(32c)
FF Timber Stud			73.4400			9.0000	660.9600	(32c)
Internal Floor 1			34.9600			18.0000	629.2800	(32d)
Internal Ceiling 1			34.9600			18.0000	629.2800	(32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	17991.3848	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							257.3139	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.4516	(36)
Total fabric heat loss						(33) + (36) =	52.6419	(37)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2442 (42)
Average daily hot water use (litres/day)												87.4993 (43)
Daily hot water use	Jan 96.2492	Feb 92.7493	Mar 89.2493	Apr 85.7493	May 82.2493	Jun 78.7494	Jul 78.7494	Aug 82.2493	Sep 85.7493	Oct 89.2493	Nov 92.7493	Dec 96.2492 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Energy content (annual)	142.7348	124.8368	128.8204	112.3087	107.7629	92.9912	86.1700	98.8813	100.0623	116.6130	127.2922	138.2311 (45)
Distribution loss (46)m = 0.15 x (45)m	21.4102	18.7255	19.3231	16.8463	16.1644	13.9487	12.9255	14.8322	15.0093	17.4919	19.0938	1376.7047 (45)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	25.2847	22.8154	25.2242	24.3701	25.1531	24.3078	25.0970	25.1334	24.3418	25.1948	24.4289	25.2730 (61)
Total heat required for water heating calculated for each month	168.0195	147.6522	154.0446	136.6789	132.9160	117.2990	111.2670	124.0147	124.4041	141.8077	151.7210	163.5041 (62)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.7000 (H2)
Collector heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0050 (H3a)
Collector effective heat loss coefficient												1.8063 (H3b)
Collector performance ratio												2.5804 (H4)
Annual solar radiation per m2												1079.5246 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												1813.6014 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.3173 (H8)
Utilisation factor												0.5319 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												87.4993 (H14)
Volume ratio Veff/V												0.8571 (H15)
Solar storage volume factor												0.9692 (H16)
Solar input												-822.0845 (H17)
Solar input	-23.8388	-39.7801	-67.7501	-90.7985	-112.1739	-110.2848	-108.8273	-95.0830	-74.4691	-50.8536	-28.2763	-19.9490 (63)
Solar input (sum of months) = Sum (63)m =												-822.0845 (63)
Output from w/h	144.1807	107.8720	86.2945	45.8804	20.7421	7.0142	2.4397	28.9317	49.9350	90.9541	123.4448	143.5550 (64)
Total per year (kWh/year) = Sum (64)m =												851.2443 (64)
Heat gains from water heating, kWh/month	53.7805	47.2121	49.1388	43.4352	42.1194	36.9965	34.9258	39.1614	39.3562	45.0725	48.4319	52.2801 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	134.6509	134.6509	134.6509	134.6509	134.6509	134.6509	134.6509	134.6509	134.6509	134.6509	134.6509	134.6509 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	46.1410	40.9820	33.3288	25.2321	18.8613	15.9235	17.2059	22.3648	30.0180	38.1148	44.4856	47.4234 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	294.1944	297.2473	289.5543	273.1768	252.5031	233.0728	220.0922	217.0394	224.7324	241.1099	261.7835	281.2138 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7093	50.7093	50.7093	50.7093	50.7093	50.7093	50.7093	50.7093	50.7093	50.7093	50.7093	50.7093 (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)	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672 (71)
Water heating gains (Table 5)	72.2856	70.2561	66.0468	60.3266	56.6121	51.3841	46.9432	52.6363	54.6613	60.5813	67.2665	70.2689 (72)
Total internal gains	511.2140	507.0782	487.5228	457.3284	426.5694	398.9732	382.8342	390.6334	408.0046	438.3989	472.1285	497.4990 (73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
	m2	Table 6a	Specific data	Specific data	factor	W
		W/m2	or Table 6b	or Table 6c	Table 6d	
North	6.4600	10.6334	0.6300	0.7000	0.7700	20.9931 (74)
South	4.3600	46.7521	0.6300	0.7000	0.7700	62.2958 (78)

Solar gains	83.2889	142.1434	198.1329	256.3856	300.5708	305.2139	291.3539	256.7368	217.7243	157.7993	99.7395	71.3302 (83)
Total gains	594.5029	649.2216	685.6557	713.7140	727.1403	704.1871	674.1881	647.3702	625.7289	596.1982	571.8680	568.8292 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	56.9556	57.1081	57.2582	57.9744	58.1104	58.7519	58.7519	58.8723	58.5031	58.1104	57.8360	57.5518
alpha	4.7970	4.8072	4.8172	4.8650	4.8740	4.9168	4.9168	4.9248	4.9002	4.8740	4.8557	4.8368
util living area	0.9921	0.9868	0.9754	0.9441	0.8667	0.7098	0.5410	0.5823	0.8048	0.9491	0.9855	0.9936 (86)
MIT	19.8716	20.0093	20.2300	20.5223	20.7805	20.9422	20.9877	20.9824	20.8887	20.5747	20.1757	19.8456 (87)
Th 2	19.8763	19.8789	19.8815	19.8938	19.8961	19.9068	19.9068	19.9087	19.9026	19.8961	19.8914	19.8866 (88)
util rest of house	0.9895	0.9825	0.9668	0.9233	0.8166	0.6132	0.4139	0.4546	0.7218	0.9259	0.9799	0.9914 (89)
MIT 2	18.8730	19.0111	19.2298	19.5203	19.7523	19.8813	19.9039	19.9041	19.8456	19.5758	19.1868	18.8555 (90)
Living area fraction									fLA = Living area / (4) =			0.2446 (91)
MIT	19.1172	19.2553	19.4744	19.7653	20.0037	20.1408	20.1689	20.1679	20.1007	19.8201	19.4286	19.0977 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1172	19.2553	19.4744	19.7653	20.0037	20.1408	20.1689	20.1679	20.1007	19.8201	19.4286	19.0977 (93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9871	0.9793	0.9628	0.9204	0.8222	0.6354	0.4454	0.4862	0.7386	0.9240	0.9768	0.9894	(94)
Useful gains	586.8609	635.7976	660.1527	656.9064	597.8452	447.4501	300.2510	314.7473	462.1764	550.8612	558.6050	562.7891	(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	1300.1481	1256.2490	1132.4332	936.6303	714.1377	471.3132	303.5822	319.8491	512.6056	792.9457	1065.3182	1293.6650	(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	530.6857	416.9433	351.3766	201.4012	86.5216	0.0000	0.0000	0.0000	0.0000	180.1108	364.8335	543.7716	(98)
Space heating												2675.6444	(98)
Space heating per m2											(98) / (4) =	38.2672	(99)

8c. Space cooling requirement

Not applicable

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 %)													90.7000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													2949.9938	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	530.6857	416.9433	351.3766	201.4012	86.5216	0.0000	0.0000	0.0000	0.0000	180.1108	364.8335	543.7716	(98)	
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)	
Space heating fuel (main heating system)	585.1000	459.6949	387.4053	222.0520	95.3932	0.0000	0.0000	0.0000	0.0000	198.5786	402.2420	599.5277	(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														
Water heating requirement	144.1807	107.8720	86.2945	45.8804	20.7421	7.0142	2.4397	28.9317	49.9350	90.9541	123.4448	143.5550	(64)	
Efficiency of water heater	89.9288	89.9578	89.9879	90.0295	90.0014	87.2000	87.2000	87.2000	87.2000	89.4947	89.7889	89.9460	(217)	
Fuel for water heating, kWh/month	160.3275	119.9140	95.8957	50.9615	23.0464	8.0438	2.7978	33.1786	57.2649	101.6308	137.4834	159.6014	(219)	
Water heating fuel used												950.1458	(219)	
Annual totals kWh/year														
Space heating fuel - main system												2949.9938	(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)
pump for solar water heating													50.0000	(230g)
Total electricity for the above, kWh/year													125.0000	(231)
Electricity for lighting (calculated in Appendix L)													325.9458	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.70 * 1080 * 1.00) =										-604.5338		-604.5338	(233)	
Total delivered energy for all uses												3746.5516	(238)	

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2949.9938	3.4800	102.6598 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	950.1458	3.4800	33.0651 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Pump for solar water heating	50.0000	13.1900	6.5950 (249)
Energy for lighting	325.9458	13.1900	42.9922 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-604.5338	13.1900	-79.7380 (252)
Total energy cost			235.4666 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)		0.8606 (257)
SAP value	[(255) x (256)] / [(4) + 45.0] =	87.9951
SAP rating (Section 12)		88 (258)
SAP band		B

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2949.9938	0.2160	637.1987 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	950.1458	0.2160	205.2315 (264)
Space and water heating			842.4302 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	325.9458	0.5190	169.1659 (268)
Energy saving/generation technologies			
PV Unit	-604.5338	0.5190	-313.7530 (269)
Total kg/year			762.7180 (272)
CO2 emissions per m2			10.9100 (273)
EI value			91.1065
EI rating			91 (274)
EI band			B

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	34.9600 (1b)	x 2.3900 (2b)	= 83.5544 (1b) - (3b)
First floor	34.9600 (1c)	x 2.6500 (2c)	= 92.6440 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.9200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.1984 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1703 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4203 (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) =	0.3572 (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	0.4555	0.4197	0.4108	0.3840	0.3840	0.3572	0.3572	0.3483	0.3572	0.4019	0.3929	0.4197 (22b)
Effective ac	0.6037	0.5881	0.5844	0.5737	0.5737	0.5638	0.5638	0.5607	0.5638	0.5808	0.5772	0.5881 (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 & Fully Glazed Do (Uw = 1.20)			10.8200	1.1450	12.3893		(27)
Ground Floor			34.9600	0.1200	4.1952	90.0000	3146.4000 (28a)
Brick and Block	84.2300	12.9400	71.2900	0.2400	17.1096	42.2200	3009.8638 (29a)
Party Wall Step	2.5700		2.5700	0.2600	0.6682	113.5000	291.6950 (29a)
External Roof 1	34.9600		34.9600	0.1000	3.4960	9.1000	318.1360 (30)
Total net area of external elements Aum(A, m ²)			156.7200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.1903		(33)
Party Wall 1			40.3300	0.0000	0.0000	110.0000	4436.3000 (32)
Party Wall 2			40.3300	0.0000	0.0000	110.0000	4436.3000 (32)
GF Timber Stud			48.1300			9.0000	433.1700 (32c)
FF Timber Stud			73.4400			9.0000	660.9600 (32c)
Internal Floor 1			34.9600			18.0000	629.2800 (32d)
Internal Ceiling 1			34.9600			18.0000	629.2800 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 17991.3848 (34)
257.3139 (35)
12.4516 (36)
(33) + (36) = 52.6419 (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	35.1037	34.1948	33.9791	33.3600	33.3600	32.7827	32.7827	32.5995	32.7827	33.7681	33.5617	34.1948 (38)
Heat transfer coeff	87.7456	86.8367	86.6210	86.0019	86.0019	85.4246	85.4246	85.2414	85.4246	86.4100	86.2037	86.8367 (39)
Average = Sum(39)m / 12 =												86.1811 (39)
HLP	1.2549	1.2419	1.2389	1.2300	1.2300	1.2217	1.2217	1.2191	1.2217	1.2358	1.2329	1.2419 (40)
HLP (average)												1.2326 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2442 (42)
Average daily hot water use (litres/day)												87.4993 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.2492	92.7493	89.2493	85.7493	82.2493	78.7494	78.7494	82.2493	85.7493	89.2493	92.7493	96.2492 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Energy content (annual)	142.7348	124.8368	128.8204	112.3087	107.7629	92.9912	86.1700	98.8813	100.0623	116.6130	127.2922	138.2311 (45)
Distribution loss (46)m = 0.15 x (45)m	21.4102	18.7255	19.3231	16.8463	16.1644	13.9487	12.9255	14.8322	15.0093	17.4919	19.0938	20.7347 (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)
Combi loss	25.2847	22.8154	25.2242	24.3701	25.1531	24.3078	25.0970	25.1334	24.3418	25.1948	24.4289	25.2730 (61)
Total heat required for water heating calculated for each month	168.0195	147.6522	154.0446	136.6789	132.9160	117.2990	111.2670	124.0147	124.4041	141.8077	151.7210	163.5041 (62)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.7000 (H2)
Collector heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0050 (H3a)
Collector effective heat loss coefficient												1.8063 (H3b)
Collector performance ratio												2.5804 (H4)
Annual solar radiation per m2												1234.4649 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												2073.9010 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.5064 (H8)
Utilisation factor												0.4851 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												87.4993 (H14)
Volume ratio Veff/V												0.8571 (H15)
Solar storage volume factor												0.9692 (H16)
Solar input												-857.3788 (H17)
Solar input	-28.1364	-40.1655	-68.0737	-92.8908	-109.6315	-116.6686	-112.3613	-100.2410	-79.3349	-54.3204	-33.0799	-22.4747 (63)
Solar input (sum of months) = Sum (63)m =												-857.3788 (63)
Output from w/h	139.8831	107.4867	85.9708	43.7880	23.2845	0.6304	0.0000	23.7737	45.0692	87.4873	118.6411	141.0294 (64)
Total per year (kWh/year) = Sum (64)m =												817.0443 (64)
Heat gains from water heating, kWh/month	53.7805	47.2121	49.1388	43.4352	42.1194	36.9965	34.9258	39.1614	39.3562	45.0725	48.4319	52.2801 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	134.6509	134.6509	134.6509	134.6509	134.6509	134.6509	134.6509	134.6509	134.6509	134.6509	134.6509	134.6509 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	46.1410	40.9820	33.3288	25.2321	18.8613	15.9235	17.2059	22.3648	30.0180	38.1148	44.4856	47.4234 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	294.1944	297.2473	289.5543	273.1768	252.5031	233.0728	220.0922	217.0394	224.7324	241.1099	261.7835	281.2138 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7093	50.7093	50.7093	50.7093	50.7093	50.7093	50.7093	50.7093	50.7093	50.7093	50.7093	50.7093 (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)	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672	-89.7672 (71)
Water heating gains (Table 5)	72.2856	70.2561	66.0468	60.3266	56.6121	51.3841	46.9432	52.6363	54.6613	60.5813	67.2665	70.2689 (72)
Total internal gains	511.2140	507.0782	487.5228	457.3284	426.5694	398.9732	382.8342	390.6334	408.0046	438.3989	472.1285	497.4990 (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
North	6.4600	13.8645	0.6300	0.7000	0.7700	27.3722 (74)
South	4.3600	58.2505	0.6300	0.7000	0.7700	77.6172 (78)

Solar gains	104.9894	153.4490	214.1419	285.1358	321.8158	354.6632	330.0706	295.2987	250.5017	180.5107	124.6271	85.8362 (83)
Total gains	616.2034	660.5273	701.6647	742.4641	748.3852	753.6364	712.9048	685.9321	658.5063	618.9096	596.7556	583.3352 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	56.9556	57.5518	57.6951	58.1104	58.1104	58.5031	58.5031	58.6289	58.5031	57.8360	57.9744	57.5518
alpha	4.7970	4.8368	4.8463	4.8740	4.8740	4.9002	4.9002	4.9086	4.9002	4.8557	4.8650	4.8368
util living area	0.9879	0.9826	0.9664	0.9222	0.8148	0.6079	0.4387	0.4543	0.7129	0.9146	0.9748	0.9900 (86)
MIT	20.0205	20.1222	20.3427	20.6172	20.8542	20.9738	20.9957	20.9951	20.9441	20.7040	20.3474	20.0074 (87)
Th 2	19.8763	19.8866	19.8890	19.8961	19.8961	19.9026	19.9026	19.9047	19.9026	19.8914	19.8938	19.8866 (88)
util rest of house	0.9837	0.9766	0.9545	0.8938	0.7494	0.5009	0.3112	0.3228	0.6089	0.8756	0.9644	0.9864 (89)
MIT 2	19.0205	19.1286	19.3452	19.6089	19.8099	19.8934	19.9020	19.9040	19.8795	19.6881	19.3565	19.0162 (90)
Living area fraction									fLA = Living area / (4) =			0.2446 (91)
MIT	19.2651	19.3716	19.5892	19.8555	20.0653	20.1576	20.1695	20.1708	20.1399	19.9365	19.5988	19.2586 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2651	19.3716	19.5892	19.8555	20.0653	20.1576	20.1695	20.1708	20.1399	19.9365	19.5988	19.2586 (93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9807	0.9731	0.9505	0.8926	0.7606	0.5269	0.3426	0.3553	0.6332	0.8775	0.9609	0.9838	(94)
Useful gains	604.3359	642.7560	666.8979	662.7290	569.2102	397.0925	244.2623	243.7099	416.9725	543.0774	573.4189	573.8801	(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	1216.5977	1187.1961	1064.5020	881.9942	642.0273	406.4198	245.1237	244.7118	439.0731	703.0774	965.3814	1194.7504	(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	455.5228	365.8638	295.8175	157.8710	54.1760	0.0000	0.0000	0.0000	0.0000	119.0400	282.2130	461.9275	(98)
Space heating												2192.4314	(98)
Space heating per m2												(98) / (4) =	31.3563 (99)

8c. Space cooling requirement

Not applicable

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 %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2417.2342 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	455.5228	365.8638	295.8175	157.8710	54.1760	0.0000	0.0000	0.0000	0.0000	119.0400	282.2130	461.9275	(98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)
Space heating fuel (main heating system)	502.2302	403.3779	326.1494	174.0584	59.7309	0.0000	0.0000	0.0000	0.0000	131.2458	311.1500	509.2916	(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													
Water heating requirement	139.8831	107.4867	85.9708	43.7880	23.2845	0.6304	0.0000	23.7737	45.0692	87.4873	118.6411	141.0294	(64)
Efficiency of water heater	89.8527	89.8808	89.8876	89.9163	89.6187	87.2000	87.2000	87.2000	87.2000	89.1836	89.6352	89.8564	(216)
(217)m	155.6805	119.5880	95.6426	48.6986	25.9818	0.7230	0.0000	27.2634	51.6848	98.0980	132.3600	156.9497	(219)
Fuel for water heating, kWh/month												912.6704	(219)
Water heating fuel used													
Annual totals kWh/year													
Space heating fuel - main system												2417.2342	(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)
pump for solar water heating												50.0000	(230g)
Total electricity for the above, kWh/year												125.0000	(231)
Electricity for lighting (calculated in Appendix L)												325.9458	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.70 * 1234 * 1.00) =									-691.3003			-691.3003	(233)
Total delivered energy for all uses												3089.5500	(238)

10a. Fuel costs - using BEDF prices (513)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2417.2342	9.7400	235.4386	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	912.6704	9.7400	88.8941	(247)
Pumps and fans for heating	75.0000	36.8500	27.6375	(249)
Pump for solar water heating	50.0000	36.8500	18.4250	(249)
Energy for lighting	325.9458	36.8500	120.1110	(250)
Additional standing charges			104.0000	(251)
Energy saving/generation technologies				
PV Unit	-691.3003	36.8500	-254.7442	(252)
Total energy cost			339.7621	(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	2417.2342	0.2160	522.1226	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	912.6704	0.2160	197.1368	(264)
Space and water heating			719.2594	(265)
Pumps and fans	125.0000	0.5190	64.8750	(267)
Energy for lighting	325.9458	0.5190	169.1659	(268)
Energy saving/generation technologies				
PV Unit	-691.3003	0.5190	-358.7849	(269)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Total kg/year

594.5154 (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	2417.2342	1.2200	2949.0257 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	912.6704	1.2200	1113.4578 (264)
Space and water heating			4062.4836 (265)
Pumps and fans	125.0000	3.0700	383.7500 (267)
Energy for lighting	325.9458	3.0700	1000.6535 (268)
Energy saving/generation technologies			
PV Unit	-691.3003	3.0700	-2122.2920 (269)
Primary energy kWh/year			3324.5951 (272)
Primary energy kWh/m2/year			47.5486 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0879 Plot 128	Issued on Date	28/03/2023
Assessment Reference	Rev A	Prop Type Ref	Newton (HA)
Project	Plot 128		
Calculation Type	New Build (As Designed)		

SAP Rating	87 B	DER	15.68	TER	19.78
Environmental	89 B	% DER<TER	20.73		
CO ₂ Emissions (t/year)	0.78	DFEE	49.77	TTEE	55.37
General Requirements Compliance	Pass	% DFEE<TTEE	10.12		

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

Building Elements

Roof 000002 - Mineral Wool between and above

Roof Type: Pitched Roof, insulated flat ceiling

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	Earthwool Loft Roll 40						
	Main construction	150	0.0400	3.7500	100.00		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 2	Earthwool Loft Roll 40						
	Main construction	200	0.0400	5.0000	100.00		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 3	Earthwool Loft Roll 40						
	Main construction	100	0.0400	2.5000	87.50		
	Main construction	100	0.1300	0.7692	12.50		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 4	Plasterboard, standard						
	Main construction	12.5	0.2100	0.0595	100.00	700	1000
Int surface				0.1000			

Total resistance:	Upper limit = 11.200 m ² K/W	Lower limit = 10.901 m ² K/W	Average = 11.050 m ² K/W
	Total correction = 0.0065 m ² K/W	U-value (unrounded) = 0.1 W/m ² K	

Unheated space: None

Total thickness: 463 mm

U-value: 0.10 W/m² K

Kappa: 9.10 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0879 Plot 128	Issued on Date	28/03/2023
Assessment Reference	Rev A	Prop Type Ref	Newton (HA)
Project	Plot 128		
Calculation Type	New Build (As Designed)		

SAP Rating	87 B	DER	15.68	TER	19.78
Environmental	89 B	% DER<TER	20.73		
CO ₂ Emissions (t/year)	0.78	DFEE	49.77	TFEE	55.37
General Requirements Compliance	Pass	% DFEE<TFEE	10.12		

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

Wall 000001

Wall Type: Standard Wall

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	Brick, outer leaf						
	Main construction	102	0.7700	0.1325	82.81		
	Main construction	102	0.9407	0.1084	17.19		
Layer 2	Supafil 34						
	Main construction	100	0.0340	2.9412	100.00		
	Corrections - Air Gap: Level 0, Fasteners: None or plastic						
Layer 3	Supabloc						
	Main construction	100	0.1100	0.9091	94.04	460	1000
	Main construction	100	0.8803	0.1136	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 = 4.321 m ² K/W	Lower limit = 4.110 m ² K/W	Average = 4.215 m ² K/W
	Total correction = 0.0002 m ² K/W	U-value (unrounded) = 0.24 W/m ² K	

Unheated space: None

Total thickness: 330 mm

U-value: 0.24 W/m² K

Kappa: 42.22 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0879 Plot 128	Issued on Date	28/03/2023
Assessment Reference	Rev A	Prop Type Ref	Newton (HA)
Project	Plot 128		
Calculation Type	New Build (As Designed)		

SAP Rating	87 B	DER	15.68	TER	19.78
Environmental	89 B	% DER<TER	20.73		
CO ₂ Emissions (t/year)	0.78	DFEE	49.77	TFEE	55.37
General Requirements Compliance	Pass	% DFEE<TFEE	10.12		

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

Wall 000004

Wall Type: Standard Wall

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	Supabloc *7						
	Main construction	100	0.1900	0.5263	94.04		
	Main construction	100	0.8803	0.1136	5.96		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 2	Supafil Party Wall						
	Main construction	100	0.0400	2.5000	100.00		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 3	Supabloc *7						
	Main construction	100	0.1900	0.5263	94.04	1450	1000
	Main construction	100	0.8803	0.1136	5.96	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 = 3.898 m ² K/W	Lower limit = 3.765 m ² K/W	Average = 3.831 m ² K/W
	Total correction = 0.0045 m ² K/W	U-value (unrounded) = 0.26 W/m ² K	

Unheated space: None

Total thickness: 328 mm

U-value: 0.26 W/m² K

Kappa: 113.50 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0879 Plot 128	Issued on Date	28/03/2023
Assessment Reference	Rev A	Prop Type Ref	Newton (HA)
Project	Plot 128		
Calculation Type	New Build (As Designed)		

SAP Rating	87 B	DER	15.68	TER	19.78
Environmental	89 B	% DER<TER	20.73		
CO ₂ Emissions (t/year)	0.78	DFEE	49.77	TFEE	55.37
General Requirements Compliance	Pass	% DFEE<TFEE	10.12		

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

Floor 000003

Floor Type: Suspended Floor

Area = 43.90 m², Perimeter = 18.83 m, Wall thickness = 275.00 mm, Soil: Unknown

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

Floor height above ground: h = 0.200 m

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

Ventilation openings per perimeter length: e = 0.0015 %

Mean wind speed: v = 5.000 m/s

Resistance on solum: R_g = 0.000 m²K/W

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

Total resistance:	Upper limit = 9.271 m ² K/W	Lower limit = 6.052 m ² K/W	Average = 7.661 m ² K/W
	Total correction = 0.0046 m ² K/W	U-value (unrounded) = 0.12 W/m ² K	

Unheated space: None

Total thickness: 385 mm

U-value: 0.12 W/m² K

Kappa: 90.00 kJ/m² K

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Property Reference	SAP 0879 Plot 128	Issued on Date	28/03/2023
Assessment Reference	Rev A	Prop Type Ref	Newton (HA)
Property	Plot 128		

SAP Rating	87 B	DER	15.68	TER	19.78
Environmental	89 B	% DER<TER	20.73		
CO ₂ Emissions (t/year)	0.78	DFEE	49.77	TFEE	55.37
General Requirements Compliance	Pass	% DFEE<TFEE	10.12		

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
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	House, Mid-Terrace
2.0 Number of Storeys	2
3.0 Date Built	2022
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:	16.74 m	34.96 m ²	2.39 m
	1st Storey:	8.19 m	34.96 m ²	2.65 m

7.0 Living Area	17.10	m ²
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8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	257.31	kJ/m ² K

9.0 External Walls			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type	Construction				
Brick and Block	Cavity Wall	Other	0.24	42.22	84.23	71.29
Party Wall Step	Cavity Wall	Other	0.26	113.50	2.57	2.57

9.1 Party Walls			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)
Description	Type	Construction			
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	40.33
Party Wall 2	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	40.33

9.2 Internal Walls		Kappa (kJ/m ² K)	Area (m ²)
Description	Construction		
GF Timber Stud	Plasterboard on timber frame	9.00	48.13
FF Timber Stud	Plasterboard on timber frame	9.00	73.44

10.0 External Roofs

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area (m²)	Nett Area (m²)
External Roof 1	External Plane Roof	Other	0.10	9.10	34.96	34.96

10.2 Internal Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Ceiling 1	Plasterboard ceiling, carpeted chipboard floor	9.00	34.96

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)
Ground Floor	Ground Floor - Solid	Other	0.12	90.00	34.96

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	34.96

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Front Door	Manufacturer	Solid Door							1.10
Windows & Fully Glazed Door	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 (m²)	Curtain Closed
Front Door	Solid Door	[1] Brick and Block	South							2.12	
Front Elevation	Window	[1] Brick and Block	South	None	0.00					4.36	
Rear Elevation	Window	[1] Brick and Block	North	None	0.00					6.46	

14.0 Conservatory

None

15.0 Draught Proofing

100 %

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	2.73	0.910	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.02	0.071	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.89	0.067	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	3.62	0.064	No	Birtley Supatherm
Independently assessed	E3 Sill	6.65	0.021	No	Knauf P5
Independently assessed	E4 Jamb	20.10	0.016	No	Knauf P6
Table K1 - Approved	E5 Ground floor (normal)	25.32	0.160	No	
Independently assessed	E6 Intermediate floor within a dwelling	8.19	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	8.19	0.060	No	
Independently assessed	E24 Eaves (insulation at ceiling level - inverted)	8.61	0.120	No	Value Halved
Independently assessed	E12 Gable (insulation at ceiling level)	8.61	0.044	No	Knauf P21
Independently assessed	E16 Corner (normal)	0.60	0.039	No	Knauf P23
Table K1 - Approved	E18 Party wall between dwellings	18.76	0.060	No	
Table K1 - Default	P1 Party wall - Ground floor	8.61	0.160	No	
Table K1 - Default	P2 Party wall - Intermediate floor within a dwelling	8.61	0.000	No	
Independently assessed	P4 Party wall - Roof (insulation at ceiling level)	8.61	0.069	No	Knauf P29

Y-value 0.079 W/m²K

18.0 Pressure Testing

Yes

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Designed AP ₅₀	5.00	m ³ /(h.m ²) @ 50 Pa
Property Tested ?		
As Built AP ₅₀		m ³ /(h.m ²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Windows half open
Cross ventilation possible	Yes
Night Ventilation	Yes
Air change rate	4.00

Mechanical Ventilation

Mechanical Ventilation System Present	No
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20.0 Fans, Open Fireplaces, Flues

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

21.0 Fixed Cooling System

No

22.0 Lighting

Internal

Total number of light fittings	11	
Total number of L.E.L. fittings	11	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	Yes
Light and motion sensor	Yes

23.0 Electricity Tariff

Standard

24.0 Main Heating 1

Description	Database	
Percentage of Heat	Gas Combi	%
Database Ref. No.	100	
Fuel Type	17513	
Main Heating	Mains gas	
SAP Code	BGW	
In Winter	104	
In Summer	90.7	
Controls	87.2	
PCDF Controls	CBE Programmer, room thermostat and TRVs	
Delayed Start Stat	0	
Sap Code	No	
Flue Type	2106	
Fan Assisted Flue	Balanced	
Is MHS Pumped	Yes	
Heat Emitter	Pump in heated space	
Flow Temperature	Radiators	
Combi boiler type	Normal (> 45°C)	
	Standard Combi	

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Combi keep hot type	Gas/Oil, time clock			
25.0 Main Heating 2	None			
Community Heating	None			
28.0 Water Heating	HWP From main heating 1			
Water Heating	Main Heating 1			
Flue Gas Heat Recovery System	No			
Waste Water Heat Recovery Instantaneous System 1	No			
Waste Water Heat Recovery Instantaneous System 2	No			
Waste Water Heat Recovery Storage System	No			
Solar Panel	No			
Water use <= 125 litres/person/day	Yes			
SAP Code	901			
29.0 Hot Water Cylinder	None			
32.0 Photovoltaic Unit	One Dwelling			
PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
0.70	South	30°	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar water heating	£4,000 - £6,000	£76	B 88	