



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: Plot 127

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

Report Issue Date: 28/03/2023

EXCELLENCE
IN ENERGY
ASSESSMENT

PREDICTED ENERGY ASSESSMENT

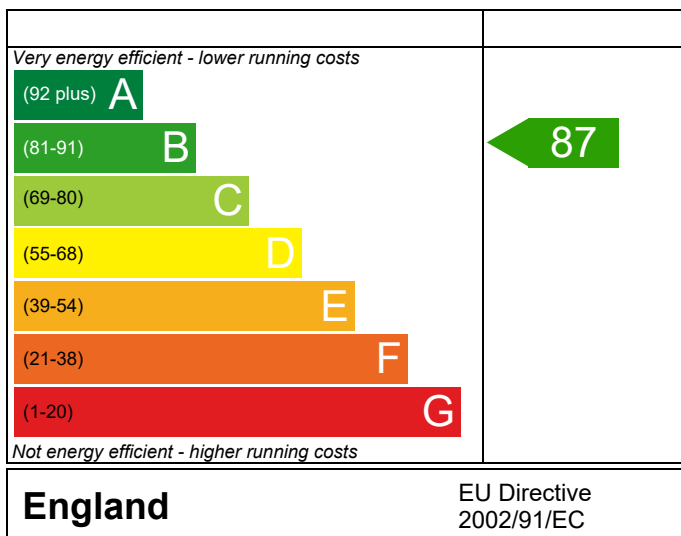
Plot 127

Dwelling type: House, End-Terrace
Date of assessment: 28/03/2023
Produced by: Abacus Energy (UK) Ltd
Total floor area: 69.92 m²
DRRN: 4129-8787-2076

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.

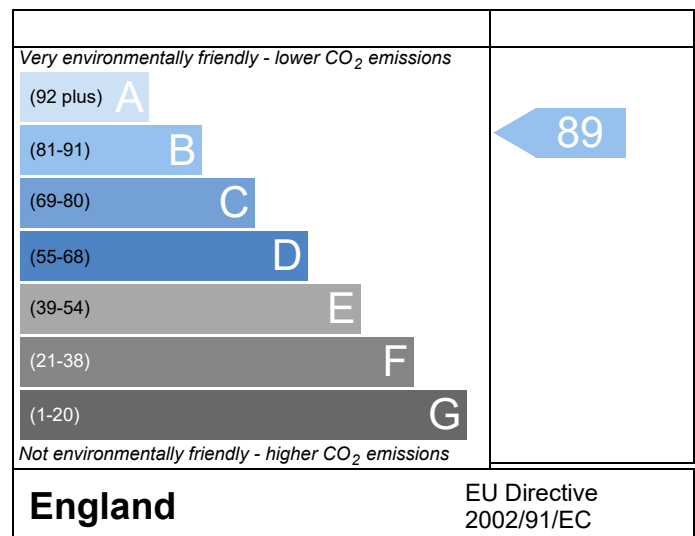
The energy performance has been assessed using the Government approved SAP2012 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.

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 127				Issued on Date	28/03/2023
Assessment Reference	Rev A	Prop Type Ref	Newton (HA)			
Property	Plot 127					
SAP Rating	87 B	DER	15.50	TER	19.97	
Environmental	89 B	% DER<TER	22.36			
CO ₂ Emissions (t/year)	0.80	DFEE	48.91	TFEE	56.35	
General Requirements Compliance	Pass	% DFEE<TFEE	13.20			
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)	19.97	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	15.50	kgCO ₂ /m ²	Pass
	-4.47 (-22.4%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	56.35	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	48.91	kWh/m ² /yr	
	-7.5 (-13.3%)	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

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

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Designed)

Main heating system

Boiler system with radiators or underfloor - Mains gas
Data from database
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)

Slight

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

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

5.00 (design value)

m³/(h.m²) @ 50 Pa

Maximum

10.0

m³/(h.m²) @ 50 Pa

Pass

10 Key features

Party wall U-value

0.00

W/m²K

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

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

RECOMMENDATIONS

	Typical cost	Typical savings per year	Energy efficiency	Environmental impact	Result
Low energy lights			0	0	Already installed
Solar water heating	£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	

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

THERMAL BRIDGING

Calculation Type: New Build (As Designed)

Property Reference	SAP 0879 Plot 127	Issued on Date	28/03/2023
Assessment Reference	Rev A	Prop Type Ref	Newton (HA)
Property	Plot 127		

SAP Rating	87 B	DER	15.50	TER	19.97
Environmental	89 B	% DER<TER	22.36		
CO ₂ Emissions (t/year)	0.80	DFEE	48.91	TFEE	56.35
General Requirements Compliance	Pass	% DFEE<TFEE	13.20		

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

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

	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.910	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	16.74	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	10.58	0.41	Knauf P23
External wall	E18 Party wall between dwellings	Table K1 - Approved	0.060	9.38	0.56	
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: **12.28** W/mK:
Y-Value: **0.078** W/m²K:

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	SAP 0879 Plot 127				Issued on Date	28/03/2023
Assessment Reference	Rev A	Prop Type Ref	Newton (HA)			
Property	Plot 127					
SAP Rating	87 B	DER	15.50	TER	19.97	
Environmental	89 B	% DER<TER	22.36			
CO ₂ Emissions (t/year)	0.80	DFEE	48.91	TFEE	56.35	
General Requirements Compliance	Pass	% DFEE<TFEE	13.20			
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

End-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) 19.97 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.50 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)56.4 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)48.9 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): Slight 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
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	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					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3887 (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	0.4956	0.4859	0.4762	0.4276	0.4179	0.3693	0.3693	0.3596	0.3887	0.4179	0.4373	0.4568 (22b)
Effective ac	0.6228	0.6181	0.6134	0.5914	0.5873	0.5682	0.5682	0.5647	0.5756	0.5873	0.5956	0.6043 (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	45.0000	1814.8500 (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) = 10933.6348 (34)
156.3735 (35)
12.2780 (36)
(33) + (36) = 52.4683 (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	36.2149	35.9376	35.6657	34.3889	34.1500	33.0379	33.0379	32.8319	33.4662	34.1500	34.6333	35.1385 (38)
Heat transfer coeff	88.6833	88.4059	88.1341	86.8572	86.6183	85.5062	85.5062	85.3003	85.9346	86.6183	87.1016	87.6069 (39)
Average = Sum(39)m / 12 =												86.8561 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2684	1.2644	1.2605	1.2422	1.2388	1.2229	1.2229	1.2200	1.2290	1.2388	1.2457	1.2530 (40)
HLP (average)												1.2422 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy
Average daily hot water use (litres/day)
2.2442 (42)
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)
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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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	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)
Total per year (kWh/year) = Sum(64)m =												1673.3288	(64)

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 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	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	34.2468	34.3543	34.4602	34.9668	35.0633	35.5193	35.5193	35.6051	35.3422	35.0633	34.8687	34.6676	
alpha	3.2831	3.2903	3.2973	3.3311	3.3376	3.3680	3.3680	3.3737	3.3561	3.3376	3.3246	3.3112	
util living area	0.9876	0.9804	0.9669	0.9360	0.8706	0.7490	0.6079	0.6506	0.8348	0.9466	0.9805	0.9896	(86)
MIT	19.0458	19.2482	19.5821	20.0348	20.4614	20.7870	20.9242	20.9028	20.6633	20.1228	19.5122	19.0161	(87)
Th 2	19.8657	19.8688	19.8719	19.8864	19.8891	19.9017	19.9017	19.9041	19.8968	19.8891	19.8836	19.8779	(88)
util rest of house	0.9849	0.9760	0.9590	0.9191	0.8327	0.6696	0.4836	0.5306	0.7732	0.9293	0.9753	0.9872	(89)
MIT 2	18.0955	18.2984	18.6306	19.0835	19.4879	19.7785	19.8732	19.8643	19.6805	19.1767	18.5728	18.0749	(90)
Living area fraction	18.3279	18.5307	18.8633	19.3161	19.7260	20.0252	20.1303	20.1183	19.9208	19.4081	18.8025	18.3051	(91)
MIT	18.3279	18.5307	18.8633	19.3161	19.7260	20.0252	20.1303	20.1183	19.9208	19.4081	18.8025	18.3051	(92)
Temperature adjustment	18.3279	18.5307	18.8633	19.3161	19.7260	20.0252	20.1303	20.1183	19.9208	19.4081	18.8025	18.3051	(93)
adjusted MIT	18.3279	18.5307	18.8633	19.3161	19.7260	20.0252	20.1303	20.1183	19.9208	19.4081	18.8025	18.3051	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9797	0.9690	0.9498	0.9084	0.8261	0.6796	0.5117	0.5564	0.7747	0.9196	0.9685	0.9827	(94)
Useful gains	422.0490	472.5077	504.4875	517.3153	490.3715	393.3516	282.5892	291.2057	383.2092	418.2716	406.6331	401.5745	(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	1244.0404	1205.0303	1089.6293	904.7160	695.1997	463.8845	301.8584	317.1722	500.2104	762.9394	1019.3087	1235.7040	(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	611.5616	492.2552	435.3455	278.9286	152.3922	0.0000	0.0000	0.0000	0.0000	256.4329	441.1264	620.5923	(98)
Space heating												3288.6346	(98)
Space heating per m2												(98) / (4) =	47.0342 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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												3625.8375 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	611.5616	492.2552	435.3455	278.9286	152.3922	0.0000	0.0000	0.0000	0.0000	256.4329	441.1264	620.5923 (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)	674.2686	542.7290	479.9840	307.5287	168.0178	0.0000	0.0000	0.0000	0.0000	282.7264	486.3576	684.2253 (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	89.9221	89.8677	89.7584	89.5184	89.0351	87.2000	87.2000	87.2000	87.2000	89.4219	89.7778	87.2000 (216)
Fuel for water heating, kWh/month	186.8501	164.2995	171.6214	152.6825	149.2849	134.5172	127.5998	142.2187	142.6652	158.5827	168.9962	181.7779 (219)
Water heating fuel used												1881.0959 (219)
Annual totals kWh/year												
Space heating fuel - main system												3625.8375 (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 (233)
Total delivered energy for all uses												5303.3454 (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	3625.8375	0.2160	783.1809 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1881.0959	0.2160	406.3167 (264)
Space and water heating			1189.4976 (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			1083.8354 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			15.5000 (273)

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

DER		15.5000 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		34.6776 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		34.6776 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 heating	+	secondary heating	+	other	=	total	m3 per hour				
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							2 * 10 =	20.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
								Air changes per hour				
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						20.0000 / (5) =	0.1135 (8)				
Pressure test							Yes					
Measured/design AP50							5.0000					
Infiltration rate							0.3635	(18)				
Number of sides sheltered							1	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.9250 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.3362 (21)				
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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	0.4287	0.4203	0.4119	0.3699	0.3615	0.3194	0.3194	0.3110	0.3362	0.3615	0.3783	0.3951 (22b)
Effective ac	0.5919	0.5883	0.5848	0.5684	0.5653	0.5510	0.5510	0.5484	0.5565	0.5653	0.5715	0.5780 (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)								12.1631 (36)					
Total fabric heat loss						(33) + (36) =		51.0122 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 34.4161	Feb 34.2087	Mar 34.0053	Apr 33.0500	May 32.8713	Jun 32.0392	Jul 32.0392	Aug 31.8852	Sep 32.3597	Oct 32.8713	Nov 33.2328	Dec 33.6108	(38)
Heat transfer coeff	85.4283	85.2209	85.0175	84.0622	83.8835	83.0514	83.0514	82.8974	83.3719	83.8835	84.2450	84.6230	(39)
Average = Sum(39)m / 12 =												84.0613	(39)
HLP	Jan 1.2218	Feb 1.2188	Mar 1.2159	Apr 1.2023	May 1.1997	Jun 1.1878	Jul 1.1878	Aug 1.1856	Sep 1.1924	Oct 1.1997	Nov 1.2049	Dec 1.2103	(40)
HLP (average)												1.2023	(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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 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	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	56.8378	56.9761	57.1124	57.7615	57.8845	58.4644	58.4644	58.5731	58.2397	57.8845	57.6361	57.3787
alpha	4.7892	4.7984	4.8075	4.8508	4.8590	4.8976	4.8976	4.9049	4.8826	4.8590	4.8424	4.8252
util living area	0.9976	0.9952	0.9894	0.9715	0.9182	0.7892	0.6245	0.6736	0.8820	0.9781	0.9952	0.9981 (86)
MIT	19.6888	19.8334	20.0703	20.3909	20.6939	20.9056	20.9768	20.9667	20.8220	20.4398	20.0081	19.6637 (87)
Th 2	19.9026	19.9050	19.9073	19.9182	19.9202	19.9298	19.9298	19.9315	19.9261	19.9202	19.9161	19.9118 (88)
util rest of house	0.9967	0.9935	0.9855	0.9598	0.8819	0.6994	0.4880	0.5394	0.8170	0.9668	0.9932	0.9975 (89)
MIT 2	18.1635	18.3760	18.7221	19.1901	19.6062	19.8628	19.9208	19.9171	19.7767	19.2662	18.6396	18.1332 (90)
Living area fraction												
MIT	18.5365	18.7324	19.0519	19.4837	19.8722	20.1178	20.1791	20.1738	20.0324	19.5532	18.9743	18.5075 (92)
Temperature adjustment												0.0000
adjusted MIT	18.5365	18.7324	19.0519	19.4837	19.8722	20.1178	20.1791	20.1738	20.0324	19.5532	18.9743	18.5075 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	436.6573	490.5095	527.8810	549.0272	527.2711	418.6680	290.7052	302.6602	413.0785	443.9049	423.2515	415.0413 (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	1216.2048	1178.8102	1067.1267	889.6929	685.5115	458.2631	297.2488	312.8347	494.5927	751.0247	1000.3501	1210.7429 (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	579.9833	462.5381	401.1988	245.2794	117.7309	0.0000	0.0000	0.0000	0.0000	228.4971	415.5111	592.0020 (98)
Space heating												3042.7407 (98)
Space heating per m2										(98) / (4) =		43.5175 (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												3257.7523 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	579.9833	462.5381	401.1988	245.2794	117.7309	0.0000	0.0000	0.0000	0.0000	228.4971	415.5111	592.0020 (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)	620.9671	495.2228	429.5490	262.6117	126.0502	0.0000	0.0000	0.0000	0.0000	244.6436	444.8727	633.8351 (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	87.6601	87.4746	87.0826	86.2079	84.4542	80.3000	80.3000	80.3000	80.3000	85.9154	87.1763	80.3000 (216)
Fuel for water heating, kWh/month	218.7795	191.5149	200.1557	179.3293	177.2276	164.1675	157.2850	175.3359	177.2723	188.6663	198.4846	87.7476 (217)
Water heating fuel used												213.4287 (219)
Annual totals kWh/year												2241.6471 (219)
Space heating fuel - main system												3257.7523 (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												5900.3452 (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	3257.7523	0.2160	703.6745 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2241.6471	0.2160	484.1958 (264)
Space and water heating			1187.8703 (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			1395.9611 (272)
Emissions per m2 for space and water heating			16.9890 (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) = (16.9890 * 1.00) + 2.4194 + 0.5567, rounded to 2 d.p.			19.9700 (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	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					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					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3362 (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	0.4287	0.4203	0.4119	0.3699	0.3615	0.3194	0.3194	0.3110	0.3362	0.3615	0.3783	0.3951 (22b)
Effective ac	0.5919	0.5883	0.5848	0.5684	0.5653	0.5510	0.5510	0.5484	0.5565	0.5653	0.5715	0.5780 (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	45.0000	1814.8500 (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)
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) = 10618.9948 (34)
151.8735 (35)
12.2780 (36)
(33) + (36) = 52.4683 (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	34.4161	34.2087	34.0053	33.0500	32.8713	32.0392	32.0392	31.8852	32.3597	32.8713	33.2328	33.6108 (38)
Heat transfer coeff	86.8845	86.6770	86.4736	85.5183	85.3396	84.5076	84.5076	84.3535	84.8281	85.3396	85.7012	86.0792 (39)
Average = Sum(39)m / 12 =												85.5175 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2426	1.2397	1.2368	1.2231	1.2205	1.2086	1.2086	1.2064	1.2132	1.2205	1.2257	1.2311 (40)
HLP (average)												1.2231 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy
Average daily hot water use (litres/day)
2.2442 (42)
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)
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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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 (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, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	33.9499	34.0312	34.1112	34.4923	34.5645	34.9048	34.9048	34.9686	34.7729	34.5645	34.4187	34.2675	
alpha	3.2633	3.2687	3.2741	3.2995	3.3043	3.3270	3.3270	3.3312	3.3182	3.3043	3.2946	3.2845	
util living area	0.9894	0.9827	0.9699	0.9406	0.8781	0.7611	0.6220	0.6675	0.8469	0.9524	0.9832	0.9912	(86)
MIT	18.9871	19.1936	19.5341	19.9922	20.4308	20.7683	20.9155	20.8907	20.6356	20.0762	19.4524	18.9512	(87)
Th 2	19.8860	19.8884	19.8907	19.9016	19.9036	19.9131	19.9131	19.9149	19.9094	19.9036	19.8995	19.8952	(88)
util rest of house	0.9871	0.9789	0.9628	0.9251	0.8425	0.6843	0.4988	0.5492	0.7890	0.9369	0.9788	0.9892	(89)
MIT 2	18.0554	18.2620	18.6007	19.0573	19.4747	19.7762	19.8803	19.8687	19.6705	19.1462	18.5287	18.0263	(90)
Living area fraction	18.2833	18.4898	18.8290	19.2859	19.7085	20.0188	20.1335	20.1186	19.9066	19.3736	18.7546	18.2525	(91)
MIT	18.2833	18.4898	18.8290	19.2859	19.7085	20.0188	20.1335	20.1186	19.9066	19.3736	18.7546	18.2525	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2833	18.4898	18.8290	19.2859	19.7085	20.0188	20.1335	20.1186	19.9066	19.3736	18.7546	18.2525	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9824	0.9723	0.9539	0.9142	0.8349	0.6928	0.5261	0.5738	0.7889	0.9273	0.9726	0.9852	(94)
Ext temp.	389.3280	441.2688	475.9342	493.0555	471.5016	382.2948	277.2210	284.6298	367.9981	393.6723	376.5343	369.3035	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	1214.9281	1177.9252	1066.1341	888.1861	683.4452	457.9337	298.6043	313.6793	492.5597	748.7372	998.8103	1209.6265	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating	614.2464	495.0331	439.1087	284.4940	157.6860	0.0000	0.0000	0.0000	0.0000	264.1683	448.0387	625.2003	(98)
Space heating per m2												3327.9755	(98)
												47.5969	(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	794.3713	625.3561	641.0867	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7347	0.8092	0.7821	0.0000	0.0000	0.0000	0.0000	(101)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	583.6441	506.0594	501.3636	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	104.4964	142.8382	120.4966	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												367.8311 (104)
Cooled fraction									FC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	26.1241	35.7095	30.1241	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												91.9578 (107)
Space cooling per m2												1.3152 (108)
Energy for space heating												47.5969 (99)
Energy for space cooling												1.3152 (108)
Total												48.9121 (109)
Dwelling Fabric Energy Efficiency (DFEE)												48.9 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (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										1 (19)							
Shelter factor										(20) = 1 - [0.075 x (19)] =					0.9250 (20)		
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =					0.3362 (21)		
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
Wind factor	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)				
Adj infilt rate	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)				
	0.4287	0.4203	0.4119	0.3699	0.3615	0.3194	0.3194	0.3110	0.3362	0.3615	0.3783	0.3951	(22b)				
Effective ac	0.5919	0.5883	0.5848	0.5684	0.5653	0.5510	0.5510	0.5484	0.5565	0.5653	0.5715	0.5780	(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)								12.1631 (36)					
Total fabric heat loss						(33) + (36) =		51.0122 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 34.4161	Feb 34.2087	Mar 34.0053	Apr 33.0500	May 32.8713	Jun 32.0392	Jul 32.0392	Aug 31.8852	Sep 32.3597	Oct 32.8713	Nov 33.2328	Dec 33.6108	(38)
Heat transfer coeff	85.4283	85.2209	85.0175	84.0622	83.8835	83.0514	83.0514	82.8974	83.3719	83.8835	84.2450	84.6230	(39)
Average = Sum(39)m / 12 =												84.0613	(39)
HLP	Jan 1.2218	Feb 1.2188	Mar 1.2159	Apr 1.2023	May 1.1997	Jun 1.1878	Jul 1.1878	Aug 1.1856	Sep 1.1924	Oct 1.1997	Nov 1.2049	Dec 1.2103	(40)
HLP (average)												1.2023	(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

cylinder contains dedicated solar storage												
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
	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			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)												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	56.8378	56.9761	57.1124	57.7615	57.8845	58.4644	58.4644	58.5731	58.2397	57.8845	57.6361	57.3787
alpha	4.7892	4.7984	4.8075	4.8508	4.8590	4.8976	4.8976	4.9049	4.8826	4.8590	4.8424	4.8252
util living area	0.9984	0.9967	0.9923	0.9778	0.9324	0.8145	0.6534	0.7067	0.9041	0.9843	0.9968	0.9988 (86)
MIT	19.6331	19.7799	20.0209	20.3483	20.6625	20.8905	20.9719	20.9589	20.7954	20.3950	19.9559	19.6086 (87)
Th 2	19.9026	19.9050	19.9073	19.9182	19.9202	19.9298	19.9298	19.9315	19.9261	19.9202	19.9161	19.9118 (88)
util rest of house	0.9979	0.9955	0.9893	0.9684	0.9005	0.7280	0.5139	0.5712	0.8463	0.9758	0.9955	0.9984 (89)
MIT 2	18.6597	18.8080	19.0495	19.3807	19.6793	19.8752	19.9221	19.9189	19.8049	19.4310	18.9928	18.6425 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.8977	19.0457	19.2871	19.6173	19.9198	20.1235	20.1789	20.1733	20.0471	19.6668	19.2283	18.8788 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.8977	19.0457	19.2871	19.6173	19.9198	20.1235	20.1789	20.1733	20.0471	19.6668	19.2283	18.8788 (93)

8. Space heating requirement												

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9972	0.9942	0.9871	0.9649	0.9005	0.7458	0.5486	0.6046	0.8543	0.9731	0.9943	0.9978 (94)
Ext temp.	395.1689	451.2159	492.4669	520.4121	508.5449	411.5656	289.1093	299.9063	398.5182	413.1454	384.9640	374.0485 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Month fracti	1247.0599	1205.5068	1087.1263	900.9236	689.5016	458.7377	297.2305	312.7933	495.8245	760.5510	1021.7529	1242.1652 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating	633.8068	506.8835	442.4265	273.9683	134.6318	0.0000	0.0000	0.0000	0.0000	258.4698	458.4880	645.8788 (98)
Space heating per m2	(98) / (4) =											47.9770 (99)

8c. Space cooling requirement												

Calculated for June, July and August. See Table 10b												
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	780.6835	614.5807	630.0200	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.8007	0.8787	0.8513	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	625.0590	540.0040	536.3374	0.0000	0.0000	0.0000	0.0000 (102)
Month fracti	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)
Space cooling kWh	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	0.0000	0.0000	0.0000	0.0000	0.0000	74.6777	117.5834	94.4761	0.0000	0.0000	0.0000	0.0000 (104)
												286.7372 (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 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	18.6694	29.3959	23.6190	0.0000	0.0000	0.0000 (107)
Space cooling											71.6843 (107)
Space cooling per m2											1.0252 (108)
Energy for space heating											47.9770 (99)
Energy for space cooling											1.0252 (108)
Total											49.0023 (109)
Target Fabric Energy Efficiency (TFEE)											56.4 (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	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					1 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3887 (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	0.4956	0.4568	0.4471	0.4179	0.4179	0.3887	0.3887	0.3790	0.3887	0.4373	0.4276	0.4568 (22b)
Effective ac	0.6228	0.6043	0.5999	0.5873	0.5873	0.5756	0.5756	0.5718	0.5756	0.5956	0.5914	0.6043 (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	45.0000	1814.8500 (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) = 10933.6348 (34)
156.3735 (35)
12.2780 (36)
(33) + (36) = 52.4683 (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	36.2149	35.1385	34.8831	34.1500	34.1500	33.4662	33.4662	33.2493	33.4662	34.6333	34.3889	35.1385 (38)
Heat transfer coeff	88.6833	87.6069	87.3515	86.6183	86.6183	85.9346	85.9346	85.7177	85.9346	87.1016	86.8572	87.6069 (39)
Average = Sum(39)m / 12 =												86.8304 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2684	1.2530	1.2493	1.2388	1.2388	1.2290	1.2290	1.2259	1.2290	1.2457	1.2422	1.2530 (40)
HLP (average)												1.2419 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy
Average daily hot water use (litres/day)
2.2442 (42)
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)
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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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	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 (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 (57)
Combi loss	25.2847	22.8154	25.2242	24.3701	25.1531	24.3078	25.0970	25.1334	24.3418	25.1948	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	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 (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	163.5041 (64)
RHI water heating demand	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	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	34.2468	34.6676	34.7690	35.0633	35.0633	35.3422	35.3422	35.4317	35.3422	34.8687	34.9668	34.6676
alpha	3.2831	3.3112	3.3179	3.3376	3.3376	3.3561	3.3561	3.3621	3.3561	3.3246	3.3311	3.3112
util living area	0.9598	0.9489	0.9218	0.8650	0.7585	0.5789	0.4291	0.4431	0.6689	0.8566	0.9350	0.9643 (86)
MIT	19.5336	19.6737	19.9770	20.3561	20.7017	20.9159	20.9774	20.9753	20.8596	20.4951	20.0003	19.5217 (87)
Th 2	19.8657	19.8779	19.8808	19.8891	19.8891	19.8968	19.8968	19.8993	19.8968	19.8836	19.8864	19.8779 (88)
util rest of house	0.9511	0.9381	0.9047	0.8342	0.7003	0.4847	0.3086	0.3198	0.5792	0.8156	0.9187	0.9565 (89)
MIT 2	18.5756	18.7210	19.0173	19.3819	19.6890	19.8573	19.8910	19.8928	19.8232	19.5125	19.0488	18.5738 (90)
Living area fraction	18.8099	18.9540	19.2520	19.6202	19.9366	20.1162	20.1567	20.1576	20.0766	19.7528	19.2815	18.8056 (92)
MIT	18.8099	18.9540	19.2520	19.6202	19.9366	20.1162	20.1567	20.1576	20.0766	19.7528	19.2815	18.8056 (93)
Temperature adjustment	18.8099	18.9540	19.2520	19.6202	19.9366	20.1162	20.1567	20.1576	20.0766	19.7528	19.2815	18.8056 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9408	0.9270	0.8930	0.8255	0.7030	0.5045	0.3380	0.3498	0.5951	0.8100	0.9077	0.9468 (94)
Useful gains	579.7316	612.3070	626.6106	612.9121	526.1502	380.2442	240.9489	239.9491	391.9069	501.3370	541.6912	552.3233 (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	1189.2356	1161.1389	1044.0236	867.9310	635.4867	405.2822	245.4883	244.9439	436.2586	692.7048	945.1335	1165.6603 (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	453.4710	368.8150	310.5553	183.6136	81.3463	0.0000	0.0000	0.0000	0.0000	142.3776	290.4784	456.3228 (98)
Space heating												2286.9801 (98)
RHI space heating demand												2287 (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					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3887 (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	0.4956	0.4859	0.4762	0.4276	0.4179	0.3693	0.3693	0.3596	0.3887	0.4179	0.4373	0.4568 (22b)
Effective ac	0.6228	0.6181	0.6134	0.5914	0.5873	0.5682	0.5682	0.5647	0.5756	0.5873	0.5956	0.6043 (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	45.0000	1814.8500 (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) = 10933.6348 (34)
156.3735 (35)
12.2780 (36)
(33) + (36) = 52.4683 (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	36.2149	35.9376	35.6657	34.3889	34.1500	33.0379	33.0379	32.8319	33.4662	34.1500	34.6333	35.1385 (38)
Heat transfer coeff	88.6833	88.4059	88.1341	86.8572	86.6183	85.5062	85.5062	85.3003	85.9346	86.6183	87.1016	87.6069 (39)
Average = Sum(39)m / 12 =												86.8561 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2684	1.2644	1.2605	1.2422	1.2388	1.2229	1.2229	1.2200	1.2290	1.2388	1.2457	1.2530 (40)
HLP (average)												1.2422 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy
Average daily hot water use (litres/day)
2.2442 (42)
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)
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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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 (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 (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											
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	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	34.2468	34.3543	34.4602	34.9668	35.0633	35.5193	35.5193	35.6051	35.3422	35.0633	34.8687	34.6676
alpha	3.2831	3.2903	3.2973	3.3311	3.3376	3.3680	3.3680	3.3737	3.3561	3.3376	3.3246	3.3112
util living area	0.9695	0.9574	0.9361	0.8912	0.8072	0.6662	0.5205	0.5565	0.7493	0.8976	0.9546	0.9732 (86)
MIT	19.3251	19.5142	19.8200	20.2268	20.5922	20.8537	20.9526	20.9398	20.7680	20.3179	19.7622	19.2934 (87)
Th 2	19.8657	19.8688	19.8719	19.8864	19.8891	19.9017	19.9017	19.9041	19.8968	19.8891	19.8836	19.8779 (88)
util rest of house	0.9632	0.9487	0.9223	0.8662	0.7598	0.5828	0.4055	0.4427	0.6762	0.8691	0.9438	0.9676 (89)
MIT 2	18.3701	18.5578	18.8588	19.2601	19.5965	19.8214	19.8850	19.8810	19.7565	19.3548	18.8153	18.3481 (90)
Living area fraction	18.6037	18.7917	19.0939	19.4965	19.8401	20.0738	20.1461	20.1400	20.0039	19.5903	19.0468	18.5793 (91)
MIT	18.6037	18.7917	19.0939	19.4965	19.8401	20.0738	20.1461	20.1400	20.0039	19.5903	19.0468	18.5793 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6037	18.7917	19.0939	19.4965	19.8401	20.0738	20.1461	20.1400	20.0039	19.5903	19.0468	18.5793 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9541	0.9381	0.9106	0.8558	0.7575	0.5970	0.4324	0.4687	0.6841	0.8599	0.9334	0.9592	(94)
Useful gains	567.2022	609.0425	624.3849	610.8162	550.7812	420.3875	291.5443	303.4505	428.0683	512.6675	533.8049	545.6488	(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	1268.4971	1228.1056	1109.9498	920.3834	705.0778	468.0457	303.2112	319.0201	507.3474	778.7274	1040.5889	1259.7261	(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	521.7634	416.0104	361.2603	222.8884	114.7967	0.0000	0.0000	0.0000	0.0000	197.9486	364.8845	531.2735	(98)
Space heating												2730.8257	(98)
Space heating per m2												(98) / (4) =	39.0564 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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												3010.8332	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	521.7634	416.0104	361.2603	222.8884	114.7967	0.0000	0.0000	0.0000	0.0000	197.9486	364.8845	531.2735	(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)	575.2628	458.6664	398.3024	245.7424	126.5675	0.0000	0.0000	0.0000	0.0000	218.2454	402.2982	585.7481	(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	89.8218	89.7563	89.6246	89.3370	88.7878	87.2000	87.2000	87.2000	87.2000	89.2056	89.6433	87.2000	(216)
Fuel for water heating, kWh/month	187.0587	164.5034	171.8775	152.9925	149.7007	134.5172	127.5998	142.2187	142.6652	158.9674	169.2497	181.9718	(219)
Water heating fuel used												1883.3227	(219)
Annual totals kWh/year													
Space heating fuel - main system												3010.8332	(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												4690.5679	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3010.8332	3.4800	104.7770 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1883.3227	3.4800	65.5396 (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			263.4634 (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] =	0.9629 (257)
SAP value	86.5678	
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	3010.8332	0.2160	650.3400 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1883.3227	0.2160	406.7977 (264)
Space and water heating			1057.1377 (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			951.4755 (272)
CO2 emissions per m2			13.6100 (273)
EI value			88.9055
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	$3.48 / 0.8874 = 3.922$, stars = 4
Water heating environmental impact	$0.216 / 0.8874 = 0.2434$, 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					1 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3887 (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	0.4956	0.4568	0.4471	0.4179	0.4179	0.3887	0.3887	0.3790	0.3887	0.4373	0.4276	0.4568 (22b)
Effective ac	0.6228	0.6043	0.5999	0.5873	0.5873	0.5756	0.5756	0.5718	0.5756	0.5956	0.5914	0.6043 (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	45.0000	1814.8500 (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) = 10933.6348 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							156.3735 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.2780 (36)
Total fabric heat loss							(33) + (36) = 52.4683 (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	36.2149	35.1385	34.8831	34.1500	34.1500	33.4662	33.4662	33.2493	33.4662	34.6333	34.3889	35.1385 (38)
Heat transfer coeff	88.6833	87.6069	87.3515	86.6183	86.6183	85.9346	85.9346	85.7177	85.9346	87.1016	86.8572	87.6069 (39)
Average = Sum(39)m / 12 =												86.8304 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2684	1.2530	1.2493	1.2388	1.2388	1.2290	1.2290	1.2259	1.2290	1.2457	1.2422	1.2530 (40)
HLP (average)												1.2419 (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)
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)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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													2521.4775 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	453.4710	368.8150	310.5553	183.6136	81.3463	0.0000	0.0000	0.0000	0.0000	142.3776	290.4784	456.3228	(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)	499.9680	406.6318	342.3983	202.4406	89.6873	0.0000	0.0000	0.0000	0.0000	156.9765	320.2629	503.1122	(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	89.7264	89.6710	89.5088	89.1727	88.4965	87.2000	87.2000	87.2000	87.2000	88.9191	89.4679	87.2000	(216)
Fuel for water heating, kWh/month	187.2577	164.6598	172.0999	153.2744	150.1935	134.5172	127.5998	142.2187	142.6652	159.4795	169.5815	182.1777	(219)
Water heating fuel used												1885.7251	(219)
Annual totals kWh/year													
Space heating fuel - main system												2521.4775	(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	(233)
Total delivered energy for all uses												4116.8480	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2521.4775	9.7400	245.5919 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1885.7251	9.7400	183.6696 (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			426.2659 (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	2521.4775	0.2160	544.6391 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1885.7251	0.2160	407.3166 (264)
Space and water heating			951.9558 (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			801.2617 (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	2521.4775	1.2200	3076.2025 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1885.7251	1.2200	2300.5846 (264)
Space and water heating			5376.7871 (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			4485.3986 (272)
Primary energy kWh/m2/year			64.1504 (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 (23.0%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£76 2.64 kg/m ²	B 88	B 91
Total Savings	£76 2.64 kg/m ²		

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	£533	£438	£95
Space heating	£377	£377	£0
Water heating	£184	£107	£76
Lighting	£120	£120	£0
Generated (PV)	-£255	-£255	£0
Total cost of fuels	£426	£349	£77
Total cost of uses	£426	£349	£76
Delivered energy	59 kWh/m ²	46 kWh/m ²	13 kWh/m ²
Carbon dioxide emissions	0.8 tonnes	0.6 tonnes	0.2 tonnes
CO2 emissions per m ²	11 kg/m ²	9 kg/m ²	3 kg/m ²
Primary energy	64 kWh/m ²	49 kWh/m ²	15 kWh/m ²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

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					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3887 (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	0.4956	0.4859	0.4762	0.4276	0.4179	0.3693	0.3693	0.3596	0.3887	0.4179	0.4373	0.4568 (22b)
Effective ac	0.6228	0.6181	0.6134	0.5914	0.5873	0.5682	0.5682	0.5647	0.5756	0.5873	0.5956	0.6043 (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	45.0000	1814.8500 (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) = 10933.6348 (34)
156.3735 (35)
12.2780 (36)
(33) + (36) = 52.4683 (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	36.2149	35.9376	35.6657	34.3889	34.1500	33.0379	33.0379	32.8319	33.4662	34.1500	34.6333	35.1385 (38)
Heat transfer coeff	88.6833	88.4059	88.1341	86.8572	86.6183	85.5062	85.5062	85.3003	85.9346	86.6183	87.1016	87.6069 (39)
Average = Sum(39)m / 12 =												86.8561 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2684	1.2644	1.2605	1.2422	1.2388	1.2229	1.2229	1.2200	1.2290	1.2388	1.2457	1.2530 (40)
HLP (average)												1.2422 (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)
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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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	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 (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 (57)
Combi loss	25.2847	22.8154	25.2242	24.3701	25.1531	24.3078	25.0970	25.1334	24.3418	25.1948	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
Aperture area of solar collector											163.5041 (62)
Zero-loss collector efficiency											3.0000 (H1)
Collector heat loss coefficient											0.7000 (H2)
Collector 2nd order heat loss coefficient											1.8000 (H3)
Collector effective heat loss coefficient											0.0050 (H3a)
Collector performance ratio											1.8063 (H3b)
Annual solar radiation per m2											2.5804 (H4)
Overshading factor											1079.5246 (H5)
Solar energy available											0.8000 (H6)
Adjustment factor for showers											1813.6014 (H7)
Solar-to-load ratio											1.0000 (H7a)
Utilisation factor											1.3173 (H8)
Collector performance factor											0.5319 (H9)
Dedicated solar storage volume											0.8793 (H10)
Effective solar volume											75.0000 (H11)
Daily hot water demand											75.0000 (H13)
Volume ratio Veff/V											87.4993 (H14)
Solar storage volume factor											0.8571 (H15)
Solar input											0.9692 (H16)
Solar input	-23.8388	-39.7801	-67.7501	-90.7985	-112.1739	-110.2848	-108.8273	-95.0830	-74.4691	-50.8536	-28.2763
											-822.0845 (H17)
											-19.9490 (63)
											-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)
											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	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	Specific data or Table 6b	g	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	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	34.2468	34.3543	34.4602	34.9668	35.0633	35.5193	35.5193	35.6051	35.3422	35.0633	34.8687	34.6676
alpha	3.2831	3.2903	3.2973	3.3311	3.3376	3.3680	3.3680	3.3737	3.3561	3.3376	3.3246	3.3112
util living area	0.9695	0.9574	0.9361	0.8912	0.8072	0.6662	0.5205	0.5565	0.7493	0.8976	0.9546	0.9732 (86)
MIT	19.3251	19.5142	19.8200	20.2268	20.5922	20.8537	20.9526	20.9398	20.7680	20.3179	19.7622	19.2934 (87)
Th 2	19.8657	19.8688	19.8719	19.8864	19.8891	19.9017	19.9017	19.9041	19.8968	19.8891	19.8836	19.8779 (88)
util rest of house	0.9632	0.9487	0.9223	0.8662	0.7598	0.5828	0.4055	0.4427	0.6762	0.8691	0.9438	0.9676 (89)
MIT 2	18.3701	18.5578	18.8588	19.2601	19.5965	19.8214	19.8850	19.8810	19.7565	19.3548	18.8153	18.3481 (90)
Living area fraction	fLA = Living area / (4) =											0.2446 (91)
MIT	18.6037	18.7917	19.0939	19.4965	19.8401	20.0738	20.1461	20.1400	20.0039	19.5903	19.0468	18.5793 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6037	18.7917	19.0939	19.4965	19.8401	20.0738	20.1461	20.1400	20.0039	19.5903	19.0468	18.5793 (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	0.9541	0.9381	0.9106	0.8558	0.7575	0.5970	0.4324	0.4687	0.6841	0.8599	0.9334	0.9592	(94)
Useful gains	567.2022	609.0425	624.3849	610.8162	550.7812	420.3875	291.5443	303.4505	428.0683	512.6675	533.8049	545.6488	(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	1268.4971	1228.1056	1109.9498	920.3834	705.0778	468.0457	303.2112	319.0201	507.3474	778.7274	1040.5889	1259.7261	(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	521.7634	416.0104	361.2603	222.8884	114.7967	0.0000	0.0000	0.0000	0.0000	197.9486	364.8845	531.2735	(98)
Space heating												2730.8257	(98)
Space heating per m2												39.0564	(99)
												(98) / (4) =	

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													3010.8332 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	521.7634	416.0104	361.2603	222.8884	114.7967	0.0000	0.0000	0.0000	0.0000	197.9486	364.8845	531.2735	(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)	575.2628	458.6664	398.3024	245.7424	126.5675	0.0000	0.0000	0.0000	0.0000	218.2454	402.2982	585.7481	(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	89.9186	89.9565	90.0035	90.0828	90.1463	87.2000	87.2000	87.2000	87.2000	89.5682	89.7890	89.9321	(216)
(217)m	89.9186	89.9565	90.0035	90.0828	90.1463	87.2000	87.2000	87.2000	87.2000	89.5682	89.7890	89.9321	(217)
Fuel for water heating, kWh/month	160.3458	119.9157	95.8791	50.9313	23.0094	8.0438	2.7978	33.1786	57.2649	101.5474	137.4832	159.6260	(219)
Water heating fuel used												950.0230	(219)
Annual totals kWh/year													
Space heating fuel - main system												3010.8332	(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												3807.2683	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3010.8332	3.4800	104.7770	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	950.0230	3.4800	33.0608	(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			237.5795	(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] =	0.8683 (257)
SAP value			87.8874
SAP rating (Section 12)			88 (258)
SAP band			B

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

Energy	Emission factor	Emissions
--------	-----------------	-----------

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

	kWh/year	kg CO2/kWh	kg CO2/year	
Space heating - main system 1	3010.8332	0.2160	650.3400	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	950.0230	0.2160	205.2050	(264)
Space and water heating			855.5450	(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			775.8328	(272)
CO2 emissions per m2			11.1000	(273)
EI value			90.9536	
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	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					1 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3887 (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	0.4956	0.4568	0.4471	0.4179	0.4179	0.3887	0.3887	0.3790	0.3887	0.4373	0.4276	0.4568 (22b)
Effective ac	0.6228	0.6043	0.5999	0.5873	0.5873	0.5756	0.5756	0.5718	0.5756	0.5956	0.5914	0.6043 (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	45.0000	1814.8500 (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) = 10933.6348 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							156.3735 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.2780 (36)
Total fabric heat loss							(33) + (36) = 52.4683 (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	36.2149	35.1385	34.8831	34.1500	34.1500	33.4662	33.4662	33.2493	33.4662	34.6333	34.3889	35.1385 (38)
Heat transfer coeff	88.6833	87.6069	87.3515	86.6183	86.6183	85.9346	85.9346	85.7177	85.9346	87.1016	86.8572	87.6069 (39)
Average = Sum(39)m / 12 =												86.8304 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2684	1.2530	1.2493	1.2388	1.2388	1.2290	1.2290	1.2259	1.2290	1.2457	1.2422	1.2530 (40)
HLP (average)												1.2419 (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)
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)

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)	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	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 (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 (57)
Combi loss	25.2847	22.8154	25.2242	24.3701	25.1531	24.3078	25.0970	25.1334	24.3418	25.1948	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
Aperture area of solar collector											163.5041 (62)
Zero-loss collector efficiency											3.0000 (H1)
Collector heat loss coefficient											0.7000 (H2)
Collector 2nd order heat loss coefficient											1.8000 (H3)
Collector effective heat loss coefficient											0.0050 (H3a)
Collector performance ratio											1.8063 (H3b)
Annual solar radiation per m2											2.5804 (H4)
Overshading factor											1234.4649 (H5)
Solar energy available											0.8000 (H6)
Adjustment factor for showers											2073.9010 (H7)
Solar-to-load ratio											1.0000 (H7a)
Utilisation factor											1.5064 (H8)
Collector performance factor											0.4851 (H9)
Dedicated solar storage volume											0.8793 (H10)
Effective solar volume											75.0000 (H11)
Daily hot water demand											75.0000 (H13)
Volume ratio Veff/V											87.4993 (H14)
Solar storage volume factor											0.8571 (H15)
Solar input											0.9692 (H16)
Solar input	-28.1364	-40.1655	-68.0737	-92.8908	-109.6315	-116.6686	-112.3613	-100.2410	-79.3349	-54.3204	-33.0799
	Solar input (sum of months) = Sum(63)m =										-857.3788 (H17)
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
	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	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	34.2468	34.6676	34.7690	35.0633	35.0633	35.3422	35.3422	35.4317	35.3422	34.8687	34.9668	34.6676
alpha	3.2831	3.3112	3.3179	3.3376	3.3376	3.3561	3.3561	3.3621	3.3561	3.3246	3.3311	3.3112
util living area	0.9598	0.9489	0.9218	0.8650	0.7585	0.5789	0.4291	0.4431	0.6689	0.8566	0.9350	0.9643 (86)
MIT	19.5336	19.6737	19.9770	20.3561	20.7017	20.9159	20.9774	20.9753	20.8596	20.4951	20.0003	19.5217 (87)
Th 2	19.8657	19.8779	19.8808	19.8891	19.8891	19.8968	19.8968	19.8993	19.8968	19.8836	19.8864	19.8779 (88)
util rest of house	0.9511	0.9381	0.9047	0.8342	0.7003	0.4847	0.3086	0.3198	0.5792	0.8156	0.9187	0.9565 (89)
MIT 2	18.5756	18.7210	19.0173	19.3819	19.6890	19.8573	19.8910	19.8928	19.8232	19.5125	19.0488	18.5738 (90)
Living area fraction	18.8099	18.9540	19.2520	19.6202	19.9366	20.1162	20.1567	20.1576	fLA = Living area / (4) =	19.7528	19.2815	0.2446 (91)
MIT	18.8099	18.9540	19.2520	19.6202	19.9366	20.1162	20.1567	20.1576	20.0766	19.7528	19.2815	18.8056 (92)
Temperature adjustment	18.8099	18.9540	19.2520	19.6202	19.9366	20.1162	20.1567	20.1576	20.0766	19.7528	19.2815	18.8056 (93)
adjusted MIT	18.8099	18.9540	19.2520	19.6202	19.9366	20.1162	20.1567	20.1576	20.0766	19.7528	19.2815	18.8056 (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	0.9408	0.9270	0.8930	0.8255	0.7030	0.5045	0.3380	0.3498	0.5951	0.8100	0.9077	0.9468	(94)
Useful gains	579.7316	612.3070	626.6106	612.9121	526.1502	380.2442	240.9489	239.9491	391.9069	501.3370	541.6912	552.3233	(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	1189.2356	1161.1389	1044.0236	867.9310	635.4867	405.2822	245.4883	244.9439	436.2586	692.7048	945.1335	1165.6603	(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	453.4710	368.8150	310.5553	183.6136	81.3463	0.0000	0.0000	0.0000	0.0000	142.3776	290.4784	456.3228	(98)
Space heating												2286.9801	(98)
Space heating per m2											(98) / (4) =	32.7085	(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													2521.4775	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	453.4710	368.8150	310.5553	183.6136	81.3463	0.0000	0.0000	0.0000	0.0000	142.3776	290.4784	456.3228	(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)	499.9680	406.6318	342.3983	202.4406	89.6873	0.0000	0.0000	0.0000	0.0000	156.9765	320.2629	503.1122	(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	89.8498	89.8958	89.9175	90.0044	89.8970	87.2000	87.2000	87.2000	87.2000	89.3353	89.6564	89.8486	(217)	
Fuel for water heating, kWh/month	155.6855	119.5813	95.6108	48.6510	25.9013	0.7230	0.0000	27.2634	51.6848	97.9314	132.3286	156.9634	(219)	
Water heating fuel used												912.3246	(219)	
Annual totals kWh/year														
Space heating fuel - main system												2521.4775	(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													3193.4475	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2521.4775	9.7400	245.5919	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	912.3246	9.7400	88.8604	(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			349.8817	(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	2521.4775	0.2160	544.6391	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	912.3246	0.2160	197.0621	(264)
Space and water heating			741.7012	(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)
Total kg/year			616.9572	(272)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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	2521.4775	1.2200	3076.2025	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	912.3246	1.2200	1113.0360	(264)
Space and water heating			4189.2385	(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			3451.3500	(272)
Primary energy kWh/m2/year			49.3614	(273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0879 Plot 127	Issued on Date	28/03/2023
Assessment Reference	Rev A	Prop Type Ref	Newton (HA)
Project	Plot 127		
Calculation Type	New Build (As Designed)		

SAP Rating	87 B	DER	15.50	TER	19.97
Environmental	89 B	% DER<TER	22.36		
CO ₂ Emissions (t/year)	0.80	DFEE	48.91	TTEE	56.35
General Requirements Compliance	Pass	% DFEE<TFEE	13.20		

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 127	Issued on Date	28/03/2023
Assessment Reference	Rev A	Prop Type Ref	Newton (HA)
Project	Plot 127		
Calculation Type	New Build (As Designed)		

SAP Rating	87 B	DER	15.50	TER	19.97
Environmental	89 B	% DER<TER	22.36		
CO ₂ Emissions (t/year)	0.80	DFEE	48.91	TFEE	56.35
General Requirements Compliance	Pass	% DFEE<TFEE	13.20		

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

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

Building Elements

Wall 000001

Wall Type: Standard Wall

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	Brick, outer leaf						
	Main construction	102	0.7700	0.1325	82.81		
	Main construction	102	0.9407	0.1084	17.19		
Layer 2	Supafil 34						
	Main construction	100	0.0340	2.9412	100.00		
	Corrections - Air Gap: Level 0, Fasteners: None or plastic						
Layer 3	Supabloc						
	Main construction	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 127	Issued on Date	28/03/2023
Assessment Reference	Rev A	Prop Type Ref	Newton (HA)
Project	Plot 127		
Calculation Type	New Build (As Designed)		

SAP Rating	87 B	DER	15.50	TER	19.97
Environmental	89 B	% DER<TER	22.36		
CO ₂ Emissions (t/year)	0.80	DFEE	48.91	TFEE	56.35
General Requirements Compliance	Pass	% DFEE<TFEE	13.20		

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

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

Building Elements

Wall 000004

Wall Type: Standard Wall

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	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 127	Issued on Date	28/03/2023
Assessment Reference	Rev A	Prop Type Ref	Newton (HA)
Project	Plot 127		
Calculation Type	New Build (As Designed)		

SAP Rating	87 B	DER	15.50	TER	19.97
Environmental	89 B	% DER<TER	22.36		
CO ₂ Emissions (t/year)	0.80	DFEE	48.91	TFEE	56.35
General Requirements Compliance	Pass	% DFEE<TFEE	13.20		

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

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

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 127			Issued on Date	28/03/2023
Assessment Reference	Rev A	Prop Type Ref	Newton (HA)		
Property	Plot 127				
SAP Rating	87 B	DER	15.50	TER	19.97
Environmental	89 B	% DER<TER	22.36		
CO ₂ Emissions (t/year)	0.80	DFEE	48.91	TFEE	56.35
General Requirements Compliance	Pass	% DFEE<TFEE	13.20		
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, End-Terrace
2.0 Number of Storeys	2
3.0 Date Built	2022
4.0 Sheltered Sides	1
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements		Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	Ground Floor:	16.74 m	34.96 m ²	2.39 m
	1st Storey:	16.74 m	34.96 m ²	2.65 m

7.0 Living Area	17.10	m ²
-----------------	-------	----------------

8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	156.37	kJ/m ² K

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

9.1 Party Walls						
Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)	
Party Wall 1	Filled Cavity with Edge Sealing	Plasterboard on dabs mounted on cement render on both sides, AAC blocks, cavity	0.00	45.00	40.33	

9.2 Internal Walls				
Description	Construction	Kappa (kJ/m ² K)	Area (m ²)	
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							
Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)	
External Roof 1	External Plane Roof	Other	0.10	9.10	34.96	34.96	

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

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 Do	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	16.74	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)	10.58	0.039	No	Knauf P23
Table K1 - Approved	E18 Party wall between dwellings	9.38	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 0.078 W/m²K

18.0 Pressure Testing

Yes

Designed AP₅₀ 5.00 m³/(h.m²) @ 50 Pa

Property Tested ?

As Built AP₅₀ m³/(h.m²) @ 50 Pa

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

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
---------------------------------------	----

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	15	
Total number of L.E.L. fittings	15	
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

0 Main Heating 1		Database	
Description		Gas Combi	
Percentage of Heat		100	%
Database Ref. No.		17513	
Fuel Type		Mains gas	
Main Heating		BGW	
SAP Code		104	
In Winter		90.7	
In Summer		87.2	
Controls		CBE Programmer, room thermostat and TRVs	
PCDF Controls		0	
Delayed Start Stat		No	
Sap Code		2106	
Flue Type		Balanced	
Fan Assisted Flue		Yes	
Is MHS Pumped		Pump in heated space	
Heat Emitter		Radiators	
Flow Temperature		Normal (> 45°C)	
Combi boiler type		Standard Combi	
Combi keep hot type		Gas/Oil, time clock	

25.0 Main Heating 2

None

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

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	