



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 14 Shaw Road
West End, Southampton, SO30 3JZ

Contact: Tobias Whiting
Abacus Energy (UK) Ltd
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Report Issue Date: 05/07/2022

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Plot 16			Issued on Date	05/07/2022
Assessment Reference	As Built	Prop Type Ref	B (P)		
Property	14 Shaw Road, West End, Southampton, SO30 3JZ				
SAP Rating	87 B	DER	14.61	TER	18.11
Environmental	89 B	% DER<TER	19.34		
CO ₂ Emissions (t/year)	0.88	DFEE	44.68	TFEE	51.59
General Requirements Compliance	Pass	% DFEE<TFEE	13.39		
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 Built)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	18.11	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.61	kgCO ₂ /m ²	Pass
	-3.50 (-19.3%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	51.59	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	44.68	kWh/m ² /yr	
	-6.9 (-13.4%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (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	1.19 (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	4.14 (measured in this dwelling)	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 Built)

Main heating system

Boiler system with radiators or underfloor - Mains gas
Data from database
Worcester Greenstar 36CDi 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 East

4.47 m², No overhang

Windows facing West

8.18 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

4.14 (measured in this dwelling)

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

0.77

kW

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THERMAL BRIDGING

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SAP Rating	87 B	DER	14.61
Environmental	89 B	TER	18.11
CO ₂ Emissions (t/year)	0.88	% DER<TER	19.34
General Requirements Compliance	Pass	DFEE	44.68
		TFEE	51.59
		% DFEE<TFEE	13.39
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	0.093	0.49	0.05	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.071	1.01	0.07	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.067	6.00	0.40	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.070	1.51	0.11	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.064	1.77	0.11	Birtley Supatherm
External wall	E3 Sill	Independently assessed	0.021	8.26	0.17	Knauf P5
External wall	E4 Jamb	Independently assessed	0.039	24.30	0.95	Knauf P6
External wall	E5 Ground floor (normal)	Table K1 - Approved	0.160	18.45	2.95	
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	18.45	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	9.69	0.58	
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.044	8.78	0.39	Knauf P21
External wall	E16 Corner (normal)	Independently assessed	0.039	10.10	0.39	Knauf P23
External wall	E25 Staggered party wall between dwellings	Table K1 - Default	0.120	10.10	1.21	
Party wall	P1 Party wall - Ground floor	Table K1 - Default	0.160	8.77	1.40	
Party wall	P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	0.000	8.77	0.00	
Party wall	P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	0.180	8.77	1.58	Knauf P29

Total: **10.37** W/mK:
Y-Value: **0.058** W/m²K:

FULL SAP CALCULATION PRINTOUT

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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

DWELLING AS BUILT

Semi-Detached House, total floor area 84 m²

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

1a TER and DER

Fuel for main heating:Mains gas

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 18.11 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 14.61 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)51.6 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)44.7 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (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	1.19 (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: 4.14 (measured in this dwelling)
Maximum 10.0 OK

4 Heating efficiency

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

Data from database

Worcester Greenstar 36CDi 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 East: 4.47 m², No overhang

Windows facing West: 8.18 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 0.77 kW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (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	42.1000 (1b)	x 2.3900 (2b)	= 100.6190 (1b) - (3b)
First floor	42.1000 (1c)	x 2.6700 (2c)	= 112.4070 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.0260 (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					4 * 10 = 40.0000 (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) =					40.0000 / (5) = 0.1878 (8)
Pressure test					Yes
Measured/design AP50					4.1400
Infiltration rate					0.3948 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3356 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4278	0.4194	0.4111	0.3691	0.3607	0.3188	0.3188	0.3104	0.3356	0.3607	0.3775	0.3943 (22b)
	0.5915	0.5880	0.5845	0.5681	0.5651	0.5508	0.5508	0.5482	0.5563	0.5651	0.5713	0.5777 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			12.6500	1.1450	14.4847		(27)
Ground Floor			42.1000	0.1200	5.0520	84.0000	3536.4000 (28a)
Brick and Block	93.3600	14.7700	78.5900	0.2400	18.8616	42.2200	3318.0698 (29a)
Pitched Roof	42.1000		42.1000	0.1000	4.2100	9.1000	383.1100 (30)
Total net area of external elements Aum(A, m ²)			177.5600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.9403		(33)
Party Wall 1			44.3300	0.0000	0.0000	110.0000	4876.3000 (32)
GF Stud			80.0000			9.0000	720.0000 (32c)
First Floor			96.9900			9.0000	872.9100 (32c)
Internal Floor 1			42.1000			18.0000	757.8000 (32d)
Internal Ceiling 1			42.1000			18.0000	757.8000 (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) = 15222.3898 (34)
180.7885 (35)
10.3668 (36)
(33) + (36) = 55.3072 (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	41.5830	41.3332	41.0883	39.9381	39.7229	38.7211	38.7211	38.5356	39.1070	39.7229	40.1583	40.6134 (38)
Heat transfer coeff	96.8902	96.6404	96.3955	95.2453	95.0301	94.0283	94.0283	93.8428	94.4142	95.0301	95.4654	95.9206 (39)
Average = Sum(39)m / 12 =												95.2443 (39)
HLP	1.1507	1.1477	1.1448	1.1312	1.1286	1.1167	1.1167	1.1145	1.1213	1.1286	1.1338	1.1392 (40)
HLP (average)												1.1312 (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												2.5377 (42)
Average daily hot water use (litres/day)												94.4713 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	103.9184	100.1396	96.3607	92.5819	88.8030	85.0242	85.0242	88.8030	92.5819	96.3607	100.1396	103.9184 (44)
Energy conte	154.1080	134.7839	139.0849	121.2576	116.3495	100.4008	93.0361	106.7603	108.0353	125.9048	137.4349	149.2454 (45)
Energy content (annual)										Total = Sum(45)m =		1486.4016 (45)

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	23.1162	20.2176	20.8627	18.1886	17.4524	15.0601	13.9554	16.0140	16.2053	18.8857	20.6152	22.3868 (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	27.5592	24.8899	27.5308	26.6130	27.4786	26.5673	27.4374	27.4641	26.5922	27.5092	26.6558	27.5511 (61)
Total heat required for water heating calculated for each month	181.6672	159.6737	166.6157	147.8706	143.8281	126.9681	120.4735	134.2244	134.6276	153.4140	164.0907	176.7965 (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	181.6672	159.6737	166.6157	147.8706	143.8281	126.9681	120.4735	134.2244	134.6276	153.4140	164.0907	176.7965 (64)
Heat gains from water heating, kWh/month	58.1307	51.0381	53.1284	46.9714	45.5559	40.0251	37.7939	42.3638	42.5698	48.7406	52.3611	56.5119 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1810.2502 (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	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.4793	19.0777	15.5150	11.7459	8.7802	7.4126	8.0096	10.4111	13.9738	17.7430	20.7087	22.0762 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	227.9943	230.3601	224.3982	211.7060	195.6844	180.6263	170.5666	168.2008	174.1627	186.8549	202.8765	217.9346 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887 (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)	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096 (71)
Water heating gains (Table 5)	78.1327	75.9496	71.4092	65.2381	61.2310	55.5904	50.7982	56.9406	59.1247	65.5116	72.7237	75.9568 (72)
Total internal gains	391.6723	389.4535	375.3885	352.7561	329.7617	307.6954	293.4405	299.6186	311.3273	334.1755	360.3749	380.0337 (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
East					4.4700	19.6403	0.6300	0.7000			0.7700	26.8304 (76)
West					8.1800	19.6403	0.6300	0.7000			0.7700	49.0990 (80)

Solar gains	75.9293	148.5339	244.6142	356.7552	437.2169	447.5693	426.1042	366.0172	284.4964	176.2480	94.6750	62.4406 (83)
Total gains	467.6017	537.9874	620.0027	709.5113	766.9786	755.2647	719.5447	665.6359	595.8237	510.4235	455.0499	442.4743 (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	43.6416	43.7544	43.8656	44.3953	44.4958	44.9699	44.9699	45.0588	44.7861	44.4958	44.2929	44.0827
alpha	3.9094	3.9170	3.9244	3.9597	3.9664	3.9980	3.9980	4.0039	3.9857	3.9664	3.9529	3.9388
util living area	0.9944	0.9897	0.9767	0.9381	0.8510	0.7006	0.5464	0.6031	0.8334	0.9635	0.9904	0.9955 (86)
MIT	19.3538	19.5379	19.8675	20.3017	20.6683	20.8954	20.9705	20.9564	20.7774	20.2874	19.7440	19.3238 (87)
Th 2	19.9596	19.9620	19.9644	19.9755	19.9775	19.9872	19.9872	19.9890	19.9835	19.9775	19.9733	19.9689 (88)
util rest of house	0.9930	0.9871	0.9705	0.9208	0.8086	0.6189	0.4330	0.4891	0.7705	0.9500	0.9875	0.9944 (89)
MIT 2	18.4564	18.6412	18.9691	19.3996	19.7387	19.9309	19.9772	19.9728	19.8449	19.3946	18.8559	18.4336 (90)
Living area fraction	18.6175	18.8021	19.1303	19.5615	19.9055	20.1040	20.1554	20.1493	20.0122	19.5548	19.0153	18.5933 (92)
Temperature adjustment	18.6175	18.8021	19.1303	19.5615	19.9055	20.1040	20.1554	20.1493	20.0122	19.5548	19.0153	18.5933 (93)
adjusted MIT	18.6175	18.8021	19.1303	19.5615	19.9055	20.1040	20.1554	20.1493	20.0122	19.5548	19.0153	18.5933 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9905	0.9832	0.9640	0.9123	0.8052	0.6292	0.4528	0.5083	0.7725	0.9428	0.9838	0.9923 (94)
Ext temp.	463.1644	528.9385	597.6637	647.3117	617.5693	475.1891	325.7740	338.3753	460.3010	481.2192	447.6702	439.0613 (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	1387.2217	1343.5041	1217.5021	1015.4548	779.7718	517.5344	334.3126	351.8459	558.1965	850.9737	1137.4988	1380.6145 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating per m2	687.4986	547.3881	461.1597	265.0630	120.6786	0.0000	0.0000	0.0000	0.0000	275.0974	496.6766	700.5156 (98)
												3554.0777 (98)
												(98) / (4) = 42.2099 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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													3918.4980	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	687.4986	547.3881	461.1597	265.0630	120.6786	0.0000	0.0000	0.0000	0.0000	275.0974	496.6766	700.5156	(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)	757.9919	603.5150	508.4451	292.2415	133.0525	0.0000	0.0000	0.0000	0.0000	303.3047	547.6037	772.3436	(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	181.6672	159.6737	166.6157	147.8706	143.8281	126.9681	120.4735	134.2244	134.6276	153.4140	164.0907	176.7965	(64)	
Efficiency of water heater (217)m	90.1001	90.0522	89.9396	89.6771	89.1557	87.9000	87.9000	87.9000	87.9000	89.6773	89.9881	90.1215	(216)	
Fuel for water heating, kWh/month	201.6282	177.3124	185.2528	164.8924	161.3224	144.4461	137.0575	152.7012	153.1599	171.0734	182.3471	196.1758	(219)	
Water heating fuel used												2027.3692	(219)	
Annual totals kWh/year														
Space heating fuel - main system													3918.4980	(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)													379.3306	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.77 * 908 * 1.00) =										-559.2382			-559.2382	(233)
Total delivered energy for all uses													5840.9596	(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	3918.4980	0.2160	846.3956	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2027.3692	0.2160	437.9117	(264)
Space and water heating			1284.3073	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	379.3306	0.5190	196.8726	(268)
Energy saving/generation technologies				
PV Unit	-559.2382	0.5190	-290.2446	(269)
Total CO2, kg/year			1229.8603	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			14.6100	(273)

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

DER			14.6100	ZC1
Total Floor Area		TFA	84.2000	
Assumed number of occupants		N	2.5377	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			16.0457	ZC2
CO2 emissions from cooking, equation (L16)			2.1366	ZC3
Total CO2 emissions			32.7923	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			32.7923	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (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	42.1000 (1b)	x 2.3900 (2b)	= 100.6190 (1b) - (3b)
First floor	42.1000 (1c)	x 2.6700 (2c)	= 112.4070 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.0260 (5)

2. Ventilation rate

										main	secondary	other	total	m3 per hour			
										heating	heating						
Number of chimneys										0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues										0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans																3 * 10 =	30.0000 (7a)
Number of passive vents																0 * 10 =	0.0000 (7b)
Number of flueless gas fires																0 * 40 =	0.0000 (7c)
										Air changes per hour							
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000	/ (5) =	0.1408 (8)
Pressure test										Yes							
Measured/design AP50										5.0000							
Infiltration rate										0.3908 (18)							
Number of sides sheltered										2 (19)							
Shelter factor										(20) = 1 - [0.075 x (19)] =					0.8500 (20)		
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =					0.3322 (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)					
	0.4236	0.4153	0.4069	0.3654	0.3571	0.3156	0.3156	0.3073	0.3322	0.3571	0.3737	0.3903 (22b)					
Effective ac	0.5897	0.5862	0.5828	0.5668	0.5638	0.5498	0.5498	0.5472	0.5552	0.5638	0.5698	0.5762 (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)			12.6500	1.3258	16.7708		(27)					
Ground Floor			42.1000	0.1300	5.4730		(28a)					
Brick and Block	93.3600	14.7700	78.5900	0.1800	14.1462		(29a)					
Pitched Roof	42.1000		42.1000	0.1300	5.4730		(30)					
Total net area of external elements Aum(A, m2)			177.5600				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		43.9830		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.4962 (36)					
Total fabric heat loss						(33) + (36) =	53.4792 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 41.4552	Feb 41.2103	Mar 40.9703	Apr 39.8429	May 39.6320	Jun 38.6501	Jul 38.6501	Aug 38.4683	Sep 39.0283	Oct 39.6320	Nov 40.0587	Dec 40.5048 (38)
Heat transfer coeff	94.9344	94.6895	94.4495	93.3222	93.1113	92.1294	92.1294	91.9475	92.5076	93.1113	93.5379	93.9840 (39)
Average = Sum(39)m / 12 =												93.3212 (39)
HLP	Jan 1.1275	Feb 1.1246	Mar 1.1217	Apr 1.1083	May 1.1058	Jun 1.0942	Jul 1.0942	Aug 1.0920	Sep 1.0987	Oct 1.1058	Nov 1.1109	Dec 1.1162 (40)
HLP (average)												1.1083 (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												2.5377 (42)
Average daily hot water use (litres/day)												94.4713 (43)
Daily hot water use	Jan 103.9184	Feb 100.1396	Mar 96.3607	Apr 92.5819	May 88.8030	Jun 85.0242	Jul 85.0242	Aug 88.8030	Sep 92.5819	Oct 96.3607	Nov 100.1396	Dec 103.9184 (44)
Energy conte	154.1080	134.7839	139.0849	121.2576	116.3495	100.4008	93.0361	106.7603	108.0353	125.9048	137.4349	149.2454 (45)
Energy content (annual)										Total = Sum(45)m =		1486.4016 (45)
Distribution loss (46)m = 0.15 x (45)m	23.1162	20.2176	20.8627	18.1886	17.4524	15.0601	13.9554	16.0140	16.2053	18.8857	20.6152	22.3868 (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												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Total heat required for water heating calculated for each month	50.9589	46.0274	49.1044	45.6568	45.2531	41.9297	43.3274	45.2531	45.6568	49.1044	49.3151	50.9589 (61)
Solar input	205.0670	180.8113	188.1893	166.9144	161.6026	142.3305	136.3635	152.0133	153.6922	175.0092	186.7500	200.2043 (62)
	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	205.0670	180.8113	188.1893	166.9144	161.6026	142.3305	136.3635	152.0133	153.6922	175.0092	186.7500	200.2043 (64)
Heat gains from water heating, kWh/month	63.9807	56.3225	58.5218	51.7324	49.9995	43.8657	41.7664	46.8111	47.3360	54.1394	58.0259	62.3638 (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	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.4793	19.0777	15.5150	11.7459	8.7802	7.4126	8.0096	10.4111	13.9738	17.7430	20.7087	22.0762	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	227.9943	230.3601	224.3982	211.7060	195.6844	180.6263	170.5666	168.2008	174.1627	186.8549	202.8765	217.9346	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	(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)	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	(71)
Water heating gains (Table 5)	85.9955	83.8132	78.6584	71.8505	67.2036	60.9246	56.1376	62.9181	65.7444	72.7681	80.5915	83.8223	(72)
Total internal gains	399.5351	397.3171	382.6377	359.3685	335.7343	313.0296	298.7799	305.5961	317.9470	341.4320	368.2427	387.8992	(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
East						4.4700	19.6403	0.6300	0.7000			0.7700	26.8304
West						8.1800	19.6403	0.6300	0.7000			0.7700	49.0990 (76)
Solar gains	75.9293	148.5339	244.6142	356.7552	437.2169	447.5693	426.1042	366.0172	284.4964	176.2480	94.6750	62.4406	(83)
Total gains	475.4645	545.8511	627.2519	716.1237	772.9512	760.5989	724.8841	671.6133	602.4434	517.6800	462.9177	450.3398	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.5922	61.7515	61.9084	62.6563	62.7982	63.4675	63.4675	63.5930	63.2080	62.7982	62.5118	62.2151	
alpha	5.1061	5.1168	5.1272	5.1771	5.1865	5.2312	5.2312	5.2395	5.2139	5.1865	5.1675	5.1477	
util living area	0.9985	0.9966	0.9900	0.9632	0.8820	0.7174	0.5471	0.6079	0.8623	0.9815	0.9969	0.9989	(86)
MIT	19.7561	19.9013	20.1608	20.5061	20.7929	20.9504	20.9901	20.9834	20.8662	20.4825	20.0578	19.7328	(87)
Th 2	19.9784	19.9808	19.9831	19.9940	19.9961	20.0056	20.0056	20.0074	20.0019	19.9961	19.9919	19.9876	(88)
util rest of house	0.9980	0.9955	0.9864	0.9490	0.8381	0.6282	0.4297	0.4876	0.7951	0.9721	0.9956	0.9985	(89)
MIT 2	18.3152	18.5289	18.9079	19.4085	19.7908	19.9722	20.0019	20.0004	19.8915	19.3840	18.7661	18.2878	(90)
Living area fraction									fLA = Living area / (4) =			0.1795	(91)
MIT	18.5738	18.7752	19.1328	19.6055	19.9706	20.1478	20.1792	20.1768	20.0664	19.5811	18.9979	18.5471	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5738	18.7752	19.1328	19.6055	19.9706	20.1478	20.1792	20.1768	20.0664	19.5811	18.9979	18.5471	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	473.9933	542.2699	616.0263	674.6396	646.8045	488.2364	326.8124	341.8876	482.0845	500.3952	459.9981	449.2786	(94)
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	1355.0754	1313.8376	1193.1579	999.0586	770.0866	511.1140	329.7528	347.2679	551.9393	836.2422	1112.9084	1348.3965	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	655.5251	518.4935	429.3859	233.5817	91.7219	0.0000	0.0000	0.0000	0.0000	249.8702	470.0955	668.9438	(98)
Space heating												3317.6176	(98)
Space heating per m2												39.4016	(99)

8c. Space cooling requirement

Not applicable

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3552.0531 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	655.5251	518.4935	429.3859	233.5817	91.7219	0.0000	0.0000	0.0000	0.0000	249.8702	470.0955	668.9438	(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)	701.8470	555.1322	459.7279	250.0875	98.2033	0.0000	0.0000	0.0000	0.0000	267.5270	503.3142	716.2139	(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	205.0670	180.8113	188.1893	166.9144	161.6026	142.3305	136.3635	152.0133	153.6922	175.0092	186.7500	200.2043	(64)
Efficiency of water heater (217)m	87.7694	87.5527	87.0631	85.8972	83.6853	80.3000	80.3000	80.3000	80.3000	85.9472	87.2789	87.8546	(216)
Fuel for water heating, kWh/month	233.6428	206.5171	216.1528	194.3187	193.1075	177.2485	169.8175	189.3068	191.3975	203.6240	213.9693	227.8813	(219)
Water heating fuel used												2416.9838	(219)
Annual totals kWh/year													
Space heating fuel - main system												3552.0531	(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)												379.3306	(232)
Total delivered energy for all uses												6423.3674	(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	3552.0531	0.2160	767.2435 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2416.9838	0.2160	522.0685 (264)
Space and water heating			1289.3120 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	379.3306	0.5190	196.8726 (268)
Total CO2, kg/m2/year			1525.1095 (272)
Emissions per m2 for space and water heating			15.3125 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3382 (272b)
Emissions per m2 for pumps and fans			0.4623 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.3125 * 1.00) + 2.3382 + 0.4623, rounded to 2 d.p.			18.1100 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (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	42.1000 (1b)	x 2.3900 (2b)	= 100.6190 (1b) - (3b)
First floor	42.1000 (1c)	x 2.6700 (2c)	= 112.4070 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.0260 (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) = 0.1408 (8)
Pressure test					Yes
Measured/design AP50					4.1400
Infiltration rate					0.3478 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.2957 (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	0.3770	0.3696	0.3622	0.3252	0.3178	0.2809	0.2809	0.2735	0.2957	0.3178	0.3326	0.3474 (22b)
Effective ac	0.5710	0.5683	0.5656	0.5529	0.5505	0.5394	0.5394	0.5374	0.5437	0.5505	0.5553	0.5603 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			12.6500	1.1450	14.4847		(27)
Ground Floor			42.1000	0.1200	5.0520	84.0000	3536.4000 (28a)
Brick and Block	93.3600	14.7700	78.5900	0.2400	18.8616	42.2200	3318.0698 (29a)
Pitched Roof	42.1000		42.1000	0.1000	4.2100	9.1000	383.1100 (30)
Total net area of external elements Aum(A, m ²)			177.5600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.9403		(33)
Party Wall 1			44.3300	0.0000	0.0000	110.0000	4876.3000 (32)
GF Stud			80.0000			9.0000	720.0000 (32c)
First Floor			96.9900			9.0000	872.9100 (32c)
Internal Floor 1			42.1000			18.0000	757.8000 (32d)
Internal Ceiling 1			42.1000			9.0000	378.9000 (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) = 14843.4898 (34)
176.2885 (35)
10.3668 (36)
(33) + (36) = 55.3072 (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	40.1439	39.9500	39.7599	38.8669	38.6999	37.9222	37.9222	37.7781	38.2217	38.6999	39.0378	39.3912 (38)
Heat transfer coeff	95.4511	95.2571	95.0670	94.1741	94.0070	93.2293	93.2293	93.0853	93.5289	94.0070	94.3450	94.6983 (39)
Average = Sum(39)m / 12 =												94.1733 (39)
HLP	1.1336	1.1313	1.1291	1.1185	1.1165	1.1072	1.1072	1.1055	1.1108	1.1165	1.1205	1.1247 (40)
HLP (average)												1.1184 (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												2.5377 (42)
Average daily hot water use (litres/day)												94.4713 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	103.9184	100.1396	96.3607	92.5819	88.8030	85.0242	85.0242	88.8030	92.5819	96.3607	100.1396	103.9184 (44)
Energy conte	154.1080	134.7839	139.0849	121.2576	116.3495	100.4008	93.0361	106.7603	108.0353	125.9048	137.4349	149.2454 (45)
Energy content (annual)										Total = Sum(45)m =		1486.4016 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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	32.7480	28.6416	29.5555	25.7672	24.7243	21.3352	19.7702	22.6866	22.9575	26.7548	29.2049	31.7147 (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	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.4793	19.0777	15.5150	11.7459	8.7802	7.4126	8.0096	10.4111	13.9738	17.7430	20.7087	22.0762	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	227.9943	230.3601	224.3982	211.7060	195.6844	180.6263	170.5666	168.2008	174.1627	186.8549	202.8765	217.9346	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	(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)	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	(71)
Water heating gains (Table 5)	44.0161	42.6214	39.7252	35.7878	33.2316	29.6322	26.5728	30.4927	31.8854	35.9607	40.5624	42.6272	(72)
Total internal gains	354.5557	353.1253	340.7045	320.3058	298.7622	278.7372	266.2151	270.1707	281.0880	301.6246	325.2136	343.7041	(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
East					4.4700	19.6403		0.6300		0.7000	0.7700	26.8304 (76)
West					8.1800	19.6403		0.6300		0.7000	0.7700	49.0990 (80)

Solar gains	75.9293	148.5339	244.6142	356.7552	437.2169	447.5693	426.1042	366.0172	284.4964	176.2480	94.6750	62.4406 (83)
Total gains	430.4850	501.6592	585.3187	677.0610	735.9791	726.3065	692.3193	636.1879	565.5844	477.8726	419.8886	406.1447 (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	43.1969	43.2849	43.3714	43.7826	43.8605	44.2263	44.2263	44.2948	44.0847	43.8605	43.7033	43.5403	
alpha	3.8798	3.8857	3.8914	3.9188	3.9240	3.9484	3.9484	3.9530	3.9390	3.9240	3.9136	3.9027	
util living area	0.9954	0.9912	0.9792	0.9428	0.8592	0.7130	0.5595	0.6195	0.8465	0.9683	0.9921	0.9964	(86)
MIT	19.2983	19.4860	19.8228	20.2656	20.6454	20.8843	20.9664	20.9499	20.7554	20.2450	19.6894	19.2643	(87)
Th 2	19.9735	19.9753	19.9772	19.9858	19.9874	19.9949	19.9949	19.9963	19.9920	19.9874	19.9841	19.9807	(88)
util rest of house	0.9943	0.9890	0.9737	0.9269	0.8189	0.6329	0.4456	0.5056	0.7870	0.9566	0.9897	0.9955	(89)
MIT 2	18.4141	18.6023	18.9375	19.3756	19.7289	19.9313	19.9832	19.9771	19.8365	19.3638	18.8124	18.3857	(90)
Living area fraction									fLA = Living area / (4) =			0.1795	(91)
MIT	18.5728	18.7609	19.0963	19.5353	19.8933	20.1024	20.1596	20.1517	20.0014	19.5219	18.9698	18.5434	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5728	18.7609	19.0963	19.5353	19.8933	20.1024	20.1596	20.1517	20.0014	19.5219	18.9698	18.5434	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9921	0.9854	0.9675	0.9182	0.8146	0.6423	0.4653	0.5246	0.7877	0.9495	0.9864	0.9937	(94)
Ext temp.	427.1012	494.3539	566.2852	621.7054	599.5475	466.4905	322.1317	333.7190	445.5026	453.7482	414.1964	403.5782	(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	1362.3510	1320.3459	1197.4966	1001.5705	770.2303	512.9805	331.8626	349.2262	551.9520	838.7248	1119.8576	1358.2933	(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	695.8259	555.0666	469.6213	273.5029	126.9880	0.0000	0.0000	0.0000	0.0000	286.4227	508.0760	710.3080	(98)
Space heating per m2												3625.8113	(98)
												(98) / (4) =	43.0619 (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	876.3558	689.8971	707.4484	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8266	0.8892	0.8599	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	724.3992	613.4245	608.3089	0.0000	0.0000	0.0000	0.0000	(102)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	944.4071	902.7367	838.8978	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	158.4057	215.2483	171.5582	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												545.2121 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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	39.6014	53.8121	42.8895	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												136.3030 (107)
Space cooling per m2												1.6188 (108)
Energy for space heating												43.0619 (99)
Energy for space cooling												1.6188 (108)
Total												44.6807 (109)
Dwelling Fabric Energy Efficiency (DFEE)												44.7 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (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	42.1000 (1b)	x 2.3900 (2b)	= 100.6190 (1b) - (3b)
First floor	42.1000 (1c)	x 2.6700 (2c)	= 112.4070 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.2000		(3a) + (3b) + (3c) + (3d) + (3e)...(3n) = 213.0260 (5)
Dwelling volume			

2. Ventilation rate

										main	secondary	other	total	m3 per hour			
										heating	heating						
Number of chimneys										0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues										0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans																3 * 10 =	30.0000 (7a)
Number of passive vents																0 * 10 =	0.0000 (7b)
Number of flueless gas fires																0 * 40 =	0.0000 (7c)
														Air changes per hour			
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000	/ (5) =	0.1408 (8)	
Pressure test															Yes		
Measured/design AP50															5.0000		
Infiltration rate															0.3908 (18)		
Number of sides sheltered															2 (19)		
Shelter factor														(20) = 1 - [0.075 x (19)] =	0.8500 (20)		
Infiltration rate adjusted to include shelter factor														(21) = (18) x (20) =	0.3322 (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)					
	0.4236	0.4153	0.4069	0.3654	0.3571	0.3156	0.3156	0.3073	0.3322	0.3571	0.3737	0.3903 (22b)					
Effective ac	0.5897	0.5862	0.5828	0.5668	0.5638	0.5498	0.5498	0.5472	0.5552	0.5638	0.5698	0.5762 (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)			12.6500	1.3258	16.7708		(27)					
Ground Floor			42.1000	0.1300	5.4730		(28a)					
Brick and Block	93.3600	14.7700	78.5900	0.1800	14.1462		(29a)					
Pitched Roof	42.1000		42.1000	0.1300	5.4730		(30)					
Total net area of external elements Aum(A, m2)			177.5600				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	43.9830		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.4962 (36)					
Total fabric heat loss						(33) + (36) =	53.4792 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 41.4552	Feb 41.2103	Mar 40.9703	Apr 39.8429	May 39.6320	Jun 38.6501	Jul 38.6501	Aug 38.4683	Sep 39.0283	Oct 39.6320	Nov 40.0587	Dec 40.5048 (38)
Heat transfer coeff	94.9344	94.6895	94.4495	93.3222	93.1113	92.1294	92.1294	91.9475	92.5076	93.1113	93.5379	93.9840 (39)
Average = Sum(39)m / 12 =												93.3212 (39)
HLP	Jan 1.1275	Feb 1.1246	Mar 1.1217	Apr 1.1083	May 1.1058	Jun 1.0942	Jul 1.0942	Aug 1.0920	Sep 1.0987	Oct 1.1058	Nov 1.1109	Dec 1.1162 (40)
HLP (average)												1.1083 (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												2.5377 (42)
Average daily hot water use (litres/day)												94.4713 (43)
Daily hot water use	Jan 103.9184	Feb 100.1396	Mar 96.3607	Apr 92.5819	May 88.8030	Jun 85.0242	Jul 85.0242	Aug 88.8030	Sep 92.5819	Oct 96.3607	Nov 100.1396	Dec 103.9184 (44)
Energy conte	154.1080	134.7839	139.0849	121.2576	116.3495	100.4008	93.0361	106.7603	108.0353	125.9048	137.4349	149.2454 (45)
Energy content (annual)										Total = Sum(45)m =		1486.4016 (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	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												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (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)
	32.7480	28.6416	29.5555	25.7672	24.7243	21.3352	19.7702	22.6866	22.9575	26.7548	29.2049	31.7147 (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	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.4793	19.0777	15.5150	11.7459	8.7802	7.4126	8.0096	10.4111	13.9738	17.7430	20.7087	22.0762	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	227.9943	230.3601	224.3982	211.7060	195.6844	180.6263	170.5666	168.2008	174.1627	186.8549	202.8765	217.9346	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	(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)	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	(71)
Water heating gains (Table 5)	44.0161	42.6214	39.7252	35.7878	33.2316	29.6322	26.5728	30.4927	31.8854	35.9607	40.5624	42.6272	(72)
Total internal gains	354.5557	353.1253	340.7045	320.3058	298.7622	278.7372	266.2151	270.1707	281.0880	301.6246	325.2136	343.7041	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W	
East				4.4700	19.6403		0.6300		0.7000	0.7700	26.8304	(76)
West				8.1800	19.6403		0.6300		0.7000	0.7700	49.0990	(80)

Solar gains	75.9293	148.5339	244.6142	356.7552	437.2169	447.5693	426.1042	366.0172	284.4964	176.2480	94.6750	62.4406 (83)
Total gains	430.4850	501.6592	585.3187	677.0610	735.9791	726.3065	692.3193	636.1879	565.5844	477.8726	419.8886	406.1447 (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	61.5922	61.7515	61.9084	62.6563	62.7982	63.4675	63.4675	63.5930	63.2080	62.7982	62.5118	62.2151	
alpha	5.1061	5.1168	5.1272	5.1771	5.1865	5.2312	5.2312	5.2395	5.2139	5.1865	5.1675	5.1477	
util living area	0.9991	0.9977	0.9926	0.9704	0.8982	0.7412	0.5702	0.6364	0.8852	0.9868	0.9980	0.9993	(86)
MIT	19.7061	19.8525	20.1159	20.4693	20.7696	20.9422	20.9881	20.9796	20.8450	20.4414	20.0102	19.6835	(87)
Th 2	19.9784	19.9808	19.9831	19.9940	19.9961	20.0056	20.0056	20.0074	20.0019	19.9961	19.9919	19.9876	(88)
util rest of house	0.9987	0.9969	0.9899	0.9586	0.8579	0.6526	0.4492	0.5130	0.8239	0.9798	0.9972	0.9991	(89)
MIT 2	18.7930	18.9410	19.2049	19.5599	19.8375	19.9785	20.0025	20.0014	19.9119	19.5388	19.1076	18.7778	(90)
Living area fraction												0.1795	(91)
MIT	18.9568	19.1046	19.3684	19.7231	20.0048	20.1515	20.1794	20.1769	20.0793	19.7008	19.2696	18.9403	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9568	19.1046	19.3684	19.7231	20.0048	20.1515	20.1794	20.1769	20.0793	19.7008	19.2696	18.9403	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9983	0.9960	0.9876	0.9546	0.8583	0.6667	0.4711	0.5352	0.8296	0.9770	0.9963	0.9987	(94)
Ext temp.	429.7404	499.6310	578.0743	646.3175	631.7212	484.2349	326.1616	340.5102	469.2013	466.8738	418.3540	405.6257	(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	1391.4367	1345.0288	1215.4169	1010.0331	773.2668	511.4521	329.7640	347.2770	553.1333	847.3857	1138.3192	1385.3528	(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	715.5020	568.1073	474.1829	261.8752	105.3099	0.0000	0.0000	0.0000	0.0000	283.1009	518.3750	728.9170	(98)
Space heating per m2												3655.3702	(98)
												43.4129	(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	866.0160	681.7573	698.8013	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8736	0.9318	0.9057	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	756.5206	635.2491	632.9383	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	944.4071	902.7367	838.8978	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	135.2783	199.0107	153.2338	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												487.5229	(104)
Cooled fraction												1.0000	(105)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	33.8196	49.7527	38.3085	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											121.8807 (107)
Space cooling per m2											1.4475 (108)
Energy for space heating											43.4129 (99)
Energy for space cooling											1.4475 (108)
Total											44.8605 (109)
Target Fabric Energy Efficiency (TFEE)											51.6 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (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	42.1000 (1b)	x 2.3900 (2b)	= 100.6190 (1b) - (3b)
First floor	42.1000 (1c)	x 2.6700 (2c)	= 112.4070 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.0260 (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											4 * 10 =	40.0000 (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) =										40.0000 / (5) =	0.1878 (8)
Pressure test											Yes	
Measured/design AP50												4.1400
Infiltration rate												0.3948 (18)
Number of sides sheltered												2 (19)
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.3356 (21)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)
Adj infilt rate	0.3943	0.3691	0.3691	0.3356	0.3439	0.3272	0.3272	0.3188	0.3188	0.3439	0.3356	0.3439 (22b)
Effective ac	0.5777	0.5681	0.5681	0.5563	0.5591	0.5535	0.5535	0.5508	0.5508	0.5591	0.5563	0.5591 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
Front Door			2.1200	1.1000	2.3320			(26)					
Windows (Uw = 1.20)			12.6500	1.1450	14.4847			(27)					
Ground Floor			42.1000	0.1200	5.0520	84.0000	3536.4000	(28a)					
Brick and Block	93.3600	14.7700	78.5900	0.2400	18.8616	42.2200	3318.0698	(29a)					
Pitched Roof	42.1000		42.1000	0.1000	4.2100	9.1000	383.1100	(30)					
Total net area of external elements Aum(A, m2)			177.5600					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.9403			(33)					
Party Wall 1			44.3300	0.0000	0.0000	110.0000	4876.3000	(32)					
GF Stud			80.0000			9.0000	720.0000	(32c)					
First Floor			96.9900			9.0000	872.9100	(32c)					
Internal Floor 1			42.1000			18.0000	757.8000	(32d)					
Internal Ceiling 1			42.1000			18.0000	757.8000	(32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	15222.3898	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							180.7885	(35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.3668	(36)					
Total fabric heat loss						(33) + (36) =	55.3072	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 40.6134	Feb 39.9381	Mar 39.9381	Apr 39.1070	May 39.3074	Jun 38.9116	Jul 38.9116	Aug 38.7211	Sep 38.7211	Oct 39.3074	Nov 39.1070	Dec 39.3074	(38)
Heat transfer coeff	95.9206	95.2453	95.2453	94.4142	94.6145	94.2188	94.2188	94.0283	94.0283	94.6145	94.4142	94.6145	(39)
Average = Sum(39)m / 12 =												94.6314	(39)
HLP	Jan 1.1392	Feb 1.1312	Mar 1.1312	Apr 1.1213	May 1.1237	Jun 1.1190	Jul 1.1190	Aug 1.1167	Sep 1.1167	Oct 1.1237	Nov 1.1213	Dec 1.1237	(40)
HLP (average)												1.1239	(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												2.5377 (42)
Average daily hot water use (litres/day)												94.4713 (43)
Daily hot water use	Jan 103.9184	Feb 100.1396	Mar 96.3607	Apr 92.5819	May 88.8030	Jun 85.0242	Jul 85.0242	Aug 88.8030	Sep 92.5819	Oct 96.3607	Nov 100.1396	Dec 103.9184 (44)
Energy conte	154.1080	134.7839	139.0849	121.2576	116.3495	100.4008	93.0361	106.7603	108.0353	125.9048	137.4349	149.2454 (45)
Energy content (annual)										Total = Sum(45)m =		1486.4016 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	23.1162	20.2176	20.8627	18.1886	17.4524	15.0601	13.9554	16.0140	16.2053	18.8857	20.6152	22.3868 (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	27.5592	24.8899	27.5308	26.6130	27.4786	26.5673	27.4374	27.4641	26.5922	27.5092	26.6558	27.5511 (61)
Total heat required for water heating calculated for each month	181.6672	159.6737	166.6157	147.8706	143.8281	126.9681	120.4735	134.2244	134.6276	153.4140	164.0907	176.7965 (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	181.6672	159.6737	166.6157	147.8706	143.8281	126.9681	120.4735	134.2244	134.6276	153.4140	164.0907	176.7965 (64)
RHI water heating demand												
Heat gains from water heating, kWh/month	58.1307	51.0381	53.1284	46.9714	45.5559	40.0251	37.7939	42.3638	42.5698	48.7406	52.3611	56.5119 (65)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Total per year (kWh/year) = Sum(64)m =												1810.2502 (64)
												1810 (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	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	53.6982	47.6942	38.7876	29.3647	21.9504	18.5315	20.0239	26.0279	34.9345	44.3574	51.7717	55.1906	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	340.2899	343.8211	334.9227	315.9791	292.0663	269.5916	254.5771	251.0459	259.9443	278.8879	302.8007	325.2754	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	(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)	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	(71)
Water heating gains (Table 5)	78.1327	75.9496	71.4092	65.2381	61.2310	55.5904	50.7982	56.9406	59.1247	65.5116	72.7237	75.9568	(72)
Total internal gains	578.6398	573.9838	551.6384	517.1008	481.7667	450.2324	431.9181	440.5334	460.5225	495.2759	533.8151	562.9418	(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			
East	4.4700				25.1733		0.6300	0.7000	0.7700	34.3889 (76)			
West	8.1800				25.1733		0.6300	0.7000	0.7700	62.9310 (80)			

Solar gains	97.3199	161.9476	270.6598	394.2042	452.7952	512.0824	468.7161	421.3909	328.8642	207.1732	120.9493	75.7526	(83)
Total gains	675.9597	735.9314	822.2982	911.3050	934.5619	962.3148	900.6342	861.9243	789.3867	702.4490	654.7643	638.6944	(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	44.0827	44.3953	44.3953	44.7861	44.6912	44.8790	44.8790	44.9699	44.9699	44.6912	44.7861	44.6912	
alpha	3.9388	3.9597	3.9597	3.9857	3.9794	3.9919	3.9919	3.9980	3.9980	3.9794	3.9857	3.9794	
util living area	0.9745	0.9636	0.9297	0.8449	0.7017	0.4832	0.3420	0.3457	0.6163	0.8644	0.9540	0.9781	(86)
MIT	19.8284	19.9680	20.2659	20.6274	20.8683	20.9777	20.9958	20.9958	20.9424	20.6626	20.2150	19.8177	(87)
Th 2	19.9689	19.9755	19.9755	19.9835	19.9815	19.9854	19.9854	19.9872	19.9872	19.9815	19.9835	19.9815	(88)
util rest of house	0.9683	0.9548	0.9127	0.8088	0.6366	0.3937	0.2385	0.2380	0.5232	0.8223	0.9408	0.9726	(89)
MIT 2	18.9329	19.0742	19.3613	19.7016	19.9009	19.9767	19.9846	19.9865	19.9608	19.7401	19.3240	18.9327	(90)
Living area fraction									fLA = Living area / (4) =			0.1795	(91)
MIT	19.0936	19.2346	19.5237	19.8677	20.0745	20.1563	20.1660	20.1676	20.1369	19.9056	19.4839	19.0915	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0936	19.2346	19.5237	19.8677	20.0745	20.1563	20.1660	20.1676	20.1369	19.9056	19.4839	19.0915	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9615	0.9469	0.9038	0.8042	0.6430	0.4093	0.2571	0.2574	0.5378	0.8187	0.9327	0.9664	(94)
Useful gains	649.9090	696.8594	743.1598	732.8305	600.9047	393.8305	231.5745	221.8828	424.5145	575.0752	610.6944	617.2446	(95)
Ext temp.	5.6000	6.0000	7.6000	10.1000	13.1000	15.9000	17.7000	17.8000	15.4000	12.1000	8.6000	5.7000	(96)
Heat loss rate W	1294.3116	1260.5324	1135.6734	922.2118	659.8863	401.0260	232.3474	222.6205	445.4060	738.5248	1027.5918	1267.0309	(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	479.4355	378.7882	292.0301	136.3545	43.8823	0.0000	0.0000	0.0000	0.0000	121.6065	300.1661	483.4410	(98)
Space heating												2235.7043	(98)
RHI space heating demand												2236	(98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (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	42.1000 (1b)	x 2.3900 (2b)	= 100.6190 (1b) - (3b)
First floor	42.1000 (1c)	x 2.6700 (2c)	= 112.4070 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.0260 (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					4 * 10 = 40.0000 (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) =					40.0000 / (5) = 0.1878 (8)
Pressure test					Yes
Measured/design AP50					4.1400
Infiltration rate					0.3948 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3356 (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	0.4278	0.4194	0.4111	0.3691	0.3607	0.3188	0.3188	0.3104	0.3356	0.3607	0.3775	0.3943 (22b)
Effective ac	0.5915	0.5880	0.5845	0.5681	0.5651	0.5508	0.5508	0.5482	0.5563	0.5651	0.5713	0.5777 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			12.6500	1.1450	14.4847		(27)
Ground Floor			42.1000	0.1200	5.0520	84.0000	3536.4000 (28a)
Brick and Block	93.3600	14.7700	78.5900	0.2400	18.8616	42.2200	3318.0698 (29a)
Pitched Roof	42.1000		42.1000	0.1000	4.2100	9.1000	383.1100 (30)
Total net area of external elements Aum(A, m ²)			177.5600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.9403		(33)
Party Wall 1			44.3300	0.0000	0.0000	110.0000	4876.3000 (32)
GF Stud			80.0000			9.0000	720.0000 (32c)
First Floor			96.9900			9.0000	872.9100 (32c)
Internal Floor 1			42.1000			18.0000	757.8000 (32d)
Internal Ceiling 1			42.1000			18.0000	757.8000 (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) = 15222.3898 (34)
180.7885 (35)
10.3668 (36)
(33) + (36) = 55.3072 (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	41.5830	41.3332	41.0883	39.9381	39.7229	38.7211	38.7211	38.5356	39.1070	39.7229	40.1583	40.6134 (38)
Heat transfer coeff	96.8902	96.6404	96.3955	95.2453	95.0301	94.0283	94.0283	93.8428	94.4142	95.0301	95.4654	95.9206 (39)
Average = Sum(39)m / 12 =												95.2443 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1507	1.1477	1.1448	1.1312	1.1286	1.1167	1.1167	1.1145	1.1213	1.1286	1.1338	1.1392 (40)
HLP (average)												1.1312 (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												2.5377 (42)
Average daily hot water use (litres/day)												94.4713 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	103.9184	100.1396	96.3607	92.5819	88.8030	85.0242	85.0242	88.8030	92.5819	96.3607	100.1396	103.9184 (44)
Energy conte	154.1080	134.7839	139.0849	121.2576	116.3495	100.4008	93.0361	106.7603	108.0353	125.9048	137.4349	149.2454 (45)
Energy content (annual)										Total = Sum(45)m =		1486.4016 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	23.1162	20.2176	20.8627	18.1886	17.4524	15.0601	13.9554	16.0140	16.2053	18.8857	20.6152	22.3868 (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	27.5592	24.8899	27.5308	26.6130	27.4786	26.5673	27.4374	27.4641	26.5922	27.5092	26.6558	27.5511 (61)
Total heat required for water heating calculated for each month	181.6672	159.6737	166.6157	147.8706	143.8281	126.9681	120.4735	134.2244	134.6276	153.4140	164.0907	176.7965 (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	181.6672	159.6737	166.6157	147.8706	143.8281	126.9681	120.4735	134.2244	134.6276	153.4140	164.0907	176.7965 (64)
Heat gains from water heating, kWh/month	58.1307	51.0381	53.1284	46.9714	45.5559	40.0251	37.7939	42.3638	42.5698	48.7406	52.3611	56.5119 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1810.2502 (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	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	53.6982	47.6942	38.7876	29.3647	21.9504	18.5315	20.0239	26.0279	34.9345	44.3574	51.7717	55.1906	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	340.2899	343.8211	334.9227	315.9791	292.0663	269.5916	254.5771	251.0459	259.9443	278.8879	302.8007	325.2754	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	(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)	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	(71)
Water heating gains (Table 5)	78.1327	75.9496	71.4092	65.2381	61.2310	55.5904	50.7982	56.9406	59.1247	65.5116	72.7237	75.9568	(72)
Total internal gains	578.6398	573.9838	551.6384	517.1008	481.7667	450.2324	431.9181	440.5334	460.5225	495.2759	533.8151	562.9418	(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	
East					4.4700	19.6403	0.6300	0.7000	0.7700		26.8304 (76)	
West					8.1800	19.6403	0.6300	0.7000	0.7700		49.0990 (80)	

Solar gains	75.9293	148.5339	244.6142	356.7552	437.2169	447.5693	426.1042	366.0172	284.4964	176.2480	94.6750	62.4406 (83)
Total gains	654.5691	722.5178	796.2526	873.8561	918.9836	897.8017	858.0224	806.5506	745.0189	671.5238	628.4900	625.3824 (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	43.6416	43.7544	43.8656	44.3953	44.4958	44.9699	44.9699	45.0588	44.7861	44.4958	44.2929	44.0827	
alpha	3.9094	3.9170	3.9244	3.9597	3.9664	3.9980	3.9980	4.0039	3.9857	3.9664	3.9529	3.9388	
util living area	0.9825	0.9728	0.9495	0.8918	0.7828	0.6186	0.4683	0.5139	0.7426	0.9189	0.9719	0.9852 (86)	
MIT	19.6081	19.7813	20.0827	20.4648	20.7640	20.9333	20.9829	20.9753	20.8588	20.4672	19.9735	19.5751 (87)	
Th 2	19.9596	19.9620	19.9644	19.9755	19.9775	19.9872	19.9872	19.9890	19.9835	19.9775	19.9733	19.9689 (88)	
util rest of house	0.9784	0.9665	0.9376	0.8658	0.7323	0.5378	0.3667	0.4101	0.6690	0.8937	0.9642	0.9817 (89)	
MIT 2	18.7078	18.8802	19.1761	19.5477	19.8145	19.9530	19.9817	19.9803	19.9014	19.5599	19.0804	18.6825 (90)	
Living area fraction	18.8694	19.0419	19.3388	19.7122	19.9849	20.1289	20.1613	20.1589	20.0732	19.7227	19.2407	18.8427 (92)	
Temperature adjustment	18.8694	19.0419	19.3388	19.7122	19.9849	20.1289	20.1613	20.1589	20.0732	19.7227	19.2407	18.8427 (93)	
adjusted MIT	18.8694	19.0419	19.3388	19.7122	19.9849	20.1289	20.1613	20.1589	20.0732	19.7227	19.2407	18.8427 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	636.7605	693.1935	739.4756	749.8812	673.3596	493.5275	330.0776	345.3879	503.7564	595.0560	601.5895	610.7865 (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	1411.6288	1366.6765	1237.6037	1029.8158	787.3123	519.8754	334.8670	352.7428	563.9590	866.9345	1159.0174	1404.5376 (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	576.5020	452.5806	370.6074	201.5529	84.7808	0.0000	0.0000	0.0000	0.0000	202.2777	401.3481	590.5509 (98)	
Space heating												2880.2002 (98)	
Space heating per m ²												34.2067 (99)	

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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													3175.5240 (211)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	576.5020	452.5806	370.6074	201.5529	84.7808	0.0000	0.0000	0.0000	0.0000	202.2777	401.3481	590.5509 (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)	635.6141	498.9864	408.6079	222.2193	93.4739	0.0000	0.0000	0.0000	0.0000	223.0184	442.5006	651.1035 (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	181.6672	159.6737	166.6157	147.8706	143.8281	126.9681	120.4735	134.2244	134.6276	153.4140	164.0907	176.7965 (64)	
Efficiency of water heater (217)m	90.0130	89.9527	89.8127	89.4936	88.9180	87.9000	87.9000	87.9000	87.9000	89.4707	89.8692	90.0392 (217)	
Fuel for water heating, kWh/month	201.8234	177.5085	185.5146	165.2304	161.7537	144.4461	137.0575	152.7012	153.1599	171.4683	182.5883	196.3551 (219)	
Water heating fuel used												2029.6071 (219)	
Annual totals kWh/year													
Space heating fuel - main system												3175.5240 (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)												379.3306 (232)	
Energy saving/generation technologies (Appendices M, N and Q)													
PV Unit 0 (0.80 * 0.77 * 908 * 1.00) =										-559.2382		-559.2382 (233)	
Total delivered energy for all uses												5100.2234 (238)	

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3175.5240	3.4800	110.5082 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2029.6071	3.4800	70.6303 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	379.3306	13.1900	50.0337 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-559.2382	13.1900	-73.7635 (252)
Total energy cost			287.3012 (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] =	0.9340 (257)
SAP value		86.9714
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	3175.5240	0.2160	685.9132 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2029.6071	0.2160	438.3951 (264)
Space and water heating			1124.3083 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	379.3306	0.5190	196.8726 (268)
Energy saving/generation technologies			
PV Unit	-559.2382	0.5190	-290.2446 (269)
Total kg/year			1069.8613 (272)
CO2 emissions per m2			12.7100 (273)
EI value			88.9039
EI rating			89 (274)
EI band			B

Calculation of stars for heating and DHW

Main heating energy efficiency $3.48 \times (1 + 0.29 \times 0.00) / 0.9070 = 3.837$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9070 = 0.2381$, stars = 4
Water heating energy efficiency	$3.48 / 0.8910 = 3.906$, stars = 4
Water heating environmental impact	$0.216 / 0.8910 = 0.2424$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

SAP 2012 WORKSHEET FOR New Build (As Built) (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	42.1000 (1b)	x 2.3900 (2b)	= 100.6190 (1b) - (3b)
First floor	42.1000 (1c)	x 2.6700 (2c)	= 112.4070 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.0260 (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					4 * 10 = 40.0000 (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) =					40.0000 / (5) = 0.1878 (8)
Pressure test					Yes
Measured/design AP50					4.1400
Infiltration rate					0.3948 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3356 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)
Adj infilt rate	0.3943	0.3691	0.3691	0.3356	0.3439	0.3272	0.3272	0.3188	0.3188	0.3439	0.3356	0.3439 (22b)
Effective ac	0.5777	0.5681	0.5681	0.5563	0.5591	0.5535	0.5535	0.5508	0.5508	0.5591	0.5563	0.5591 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			12.6500	1.1450	14.4847		(27)
Ground Floor			42.1000	0.1200	5.0520	84.0000	3536.4000 (28a)
Brick and Block	93.3600	14.7700	78.5900	0.2400	18.8616	42.2200	3318.0698 (29a)
Pitched Roof	42.1000		42.1000	0.1000	4.2100	9.1000	383.1100 (30)
Total net area of external elements Aum(A, m ²)			177.5600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.9403		(33)
Party Wall 1			44.3300	0.0000	0.0000	110.0000	4876.3000 (32)
GF Stud			80.0000			9.0000	720.0000 (32c)
First Floor			96.9900			9.0000	872.9100 (32c)
Internal Floor 1			42.1000			18.0000	757.8000 (32d)
Internal Ceiling 1			42.1000			18.0000	757.8000 (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) = 15222.3898 (34)
180.7885 (35)
10.3668 (36)
(33) + (36) = 55.3072 (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	40.6134	39.9381	39.9381	39.1070	39.3074	38.9116	38.9116	38.7211	38.7211	39.3074	39.1070	39.3074 (38)
Heat transfer coeff	95.9206	95.2453	95.2453	94.4142	94.6145	94.2188	94.2188	94.0283	94.0283	94.6145	94.4142	94.6145 (39)
Average = Sum(39)m / 12 =												94.6314 (39)
HLP	1.1392	1.1312	1.1312	1.1213	1.1237	1.1190	1.1190	1.1167	1.1167	1.1237	1.1213	1.1237 (40)
HLP (average)												1.1239 (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												2.5377 (42)
Average daily hot water use (litres/day)												94.4713 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	103.9184	100.1396	96.3607	92.5819	88.8030	85.0242	85.0242	88.8030	92.5819	96.3607	100.1396	103.9184 (44)
Energy conte	154.1080	134.7839	139.0849	121.2576	116.3495	100.4008	93.0361	106.7603	108.0353	125.9048	137.4349	149.2454 (45)
Energy content (annual)										Total = Sum(45)m =		1486.4016 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Distribution loss (46)m = 0.15 x (45)m	23.1162	20.2176	20.8627	18.1886	17.4524	15.0601	13.9554	16.0140	16.2053	18.8857	20.6152	22.3868 (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	27.5592	24.8899	27.5308	26.6130	27.4786	26.5673	27.4374	27.4641	26.5922	27.5092	26.6558	27.5511 (61)
Total heat required for water heating calculated for each month	181.6672	159.6737	166.6157	147.8706	143.8281	126.9681	120.4735	134.2244	134.6276	153.4140	164.0907	176.7965 (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	181.6672	159.6737	166.6157	147.8706	143.8281	126.9681	120.4735	134.2244	134.6276	153.4140	164.0907	176.7965 (64)
Heat gains from water heating, kWh/month	58.1307	51.0381	53.1284	46.9714	45.5559	40.0251	37.7939	42.3638	42.5698	48.7406	52.3611	56.5119 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1810.2502 (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)
(66)m	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	53.6982	47.6942	38.7876	29.3647	21.9504	18.5315	20.0239	26.0279	34.9345	44.3574	51.7717	55.1906	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	340.2899	343.8211	334.9227	315.9791	292.0663	269.5916	254.5771	251.0459	259.9443	278.8879	302.8007	325.2754	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	(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)	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	(71)
Water heating gains (Table 5)	78.1327	75.9496	71.4092	65.2381	61.2310	55.5904	50.7982	56.9406	59.1247	65.5116	72.7237	75.9568	(72)
Total internal gains	578.6398	573.9838	551.6384	517.1008	481.7667	450.2324	431.9181	440.5334	460.5225	495.2759	533.8151	562.9418	(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
East					4.4700	25.1733	0.6300	0.7000				0.7700	34.3889
West					8.1800	25.1733	0.6300	0.7000				0.7700	62.9310 (76)

Solar gains	97.3199	161.9476	270.6598	394.2042	452.7952	512.0824	468.7161	421.3909	328.8642	207.1732	120.9493		75.7526 (83)
Total gains	675.9597	735.9314	822.2982	911.3050	934.5619	962.3148	900.6342	861.9243	789.3867	702.4490	654.7643		638.6944 (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	44.0827	44.3953	44.3953	44.7861	44.6912	44.8790	44.8790	44.9699	44.9699	44.6912	44.7861	44.6912	
alpha	3.9388	3.9597	3.9597	3.9857	3.9794	3.9919	3.9919	3.9980	3.9980	3.9794	3.9857	3.9794	
util living area	0.9745	0.9636	0.9297	0.8449	0.7017	0.4832	0.3420	0.3457	0.6163	0.8644	0.9540	0.9781	(86)
MIT	19.8284	19.9680	20.2659	20.6274	20.8683	20.9777	20.9958	20.9958	20.9424	20.6626	20.2150	19.8177	(87)
Th 2	19.9689	19.9755	19.9755	19.9835	19.9815	19.9854	19.9854	19.9872	19.9872	19.9815	19.9835	19.9815	(88)
util rest of house	0.9683	0.9548	0.9127	0.8088	0.6366	0.3937	0.2385	0.2380	0.5232	0.8223	0.9408	0.9726	(89)
MIT 2	18.9329	19.0742	19.3613	19.7016	19.9009	19.9767	19.9846	19.9865	19.9608	19.7401	19.3240	18.9327	(90)
Living area fraction	19.0936	19.2346	19.5237	19.8677	20.0745	20.1563	20.1660	20.1676	20.1369	19.9056	19.4839	19.0915	(91)
MIT	19.0936	19.2346	19.5237	19.8677	20.0745	20.1563	20.1660	20.1676	20.1369	19.9056	19.4839	19.0915	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0936	19.2346	19.5237	19.8677	20.0745	20.1563	20.1660	20.1676	20.1369	19.9056	19.4839	19.0915	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9615	0.9469	0.9038	0.8042	0.6430	0.4093	0.2571	0.2574	0.5378	0.8187	0.9327	0.9664	(94)
Useful gains	649.9090	696.8594	743.1598	732.8305	600.9047	393.8305	231.5745	221.8828	424.5145	575.0752	610.6944	617.2446	(95)
Ext temp.	5.6000	6.0000	7.6000	10.1000	13.1000	15.9000	17.7000	17.8000	15.4000	12.1000	8.6000	5.7000	(96)
Heat loss rate W	1294.3116	1260.5324	1135.6734	922.2118	659.8863	401.0260	232.3474	222.6205	445.4060	738.5248	1027.5918	1267.0309	(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	479.4355	378.7882	292.0301	136.3545	43.8823	0.0000	0.0000	0.0000	0.0000	121.6065	300.1661	483.4410	(98)
Space heating												2235.7043	(98)
Space heating per m2												26.5523	(99)
										(98) / (4) =			

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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													2464.9441 (211)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	479.4355	378.7882	292.0301	136.3545	43.8823	0.0000	0.0000	0.0000	0.0000	121.6065	300.1661	483.4410 (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)	528.5948	417.6276	321.9737	150.3357	48.3818	0.0000	0.0000	0.0000	0.0000	134.0755	330.9439	533.0110 (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	181.6672	159.6737	166.6157	147.8706	143.8281	126.9681	120.4735	134.2244	134.6276	153.4140	164.0907	176.7965 (64)	
Efficiency of water heater (217)m	89.9130	89.8513	89.6624	89.2214	88.5390	87.9000	87.9000	87.9000	87.9000	89.1165	89.6902	89.9329 (217)	
Fuel for water heating, kWh/month	202.0479	177.7089	185.8255	165.7345	162.4461	144.4461	137.0575	152.7012	153.1599	172.1500	182.9528	196.5872 (219)	
Water heating fuel used												2032.8177 (219)	
Annual totals kWh/year													
Space heating fuel - main system												2464.9441 (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)												379.3306 (232)	
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.77 * 1030 * 1.00) =										-634.5166		-634.5166 (233)	
Total delivered energy for all uses												4317.5759 (238)	

10a. Fuel costs - using BEDF prices (497)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2464.9441	3.6300	89.4775 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2032.8177	3.6300	73.7913 (247)
Pumps and fans for heating	75.0000	19.4400	14.5800 (249)
Energy for lighting	379.3306	19.4400	73.7419 (250)
Additional standing charges			95.0000 (251)
Energy saving/generation technologies			
PV Unit	-634.5166	19.4400	-123.3500 (252)
Total energy cost			223.2406 (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	2464.9441	0.2160	532.4279 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2032.8177	0.2160	439.0886 (264)
Space and water heating			971.5166 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	379.3306	0.5190	196.8726 (268)
Energy saving/generation technologies			
PV Unit	-634.5166	0.5190	-329.3141 (269)
Total kg/year			878.0000 (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	2464.9441	1.2200	3007.2318 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2032.8177	1.2200	2480.0376 (264)
Space and water heating			5487.2695 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	379.3306	3.0700	1164.5449 (268)
Energy saving/generation technologies			
PV Unit	-634.5166	3.0700	-1947.9659 (269)
Primary energy kWh/year			4934.0985 (272)
Primary energy kWh/m2/year			58.5997 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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	+ 1.2	-£ 27	-190 kg (21.6%)

		Typical annual savings	Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£27	2.26 kg/m²	B 88	B 91
Total Savings	£27	2.26 kg/m²		

Potential energy efficiency rating: B 88
Potential environmental impact rating: B 91

Fuel prices for cost data on this page from database revision number 497 TEST (31 May 2022)
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	£88	£98	-£10
Mains gas	£258	£222	£36
Space heating	£199	£199	£0
Water heating	£74	£47	£27
Lighting	£74	£74	£0
Generated (PV)	-£123	-£123	£0
Total cost of fuels	£223	£197	£26
Total cost of uses	£224	£197	£27
Delivered energy	51 kWh/m²	40 kWh/m²	11 kWh/m²
Carbon dioxide emissions	0.9 tonnes	0.7 tonnes	0.2 tonnes
CO2 emissions per m²	10 kg/m²	8 kg/m²	2 kg/m²
Primary energy	59 kWh/m²	46 kWh/m²	13 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (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	42.1000 (1b)	x 2.3900 (2b)	= 100.6190 (1b) - (3b)
First floor	42.1000 (1c)	x 2.6700 (2c)	= 112.4070 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.0260 (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					4 * 10 = 40.0000 (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) =					40.0000 / (5) = 0.1878 (8)
Pressure test					Yes
Measured/design AP50					4.1400
Infiltration rate					0.3948 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3356 (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	0.4278	0.4194	0.4111	0.3691	0.3607	0.3188	0.3188	0.3104	0.3356	0.3607	0.3775	0.3943 (22b)
Effective ac	0.5915	0.5880	0.5845	0.5681	0.5651	0.5508	0.5508	0.5482	0.5563	0.5651	0.5713	0.5777 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			12.6500	1.1450	14.4847		(27)
Ground Floor			42.1000	0.1200	5.0520	84.0000	3536.4000 (28a)
Brick and Block	93.3600	14.7700	78.5900	0.2400	18.8616	42.2200	3318.0698 (29a)
Pitched Roof	42.1000		42.1000	0.1000	4.2100	9.1000	383.1100 (30)
Total net area of external elements Aum(A, m ²)			177.5600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.9403		(33)
Party Wall 1			44.3300	0.0000	0.0000	110.0000	4876.3000 (32)
GF Stud			80.0000			9.0000	720.0000 (32c)
First Floor			96.9900			9.0000	872.9100 (32c)
Internal Floor 1			42.1000			18.0000	757.8000 (32d)
Internal Ceiling 1			42.1000			18.0000	757.8000 (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) = 15222.3898 (34)
180.7885 (35)
10.3668 (36)
(33) + (36) = 55.3072 (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	41.5830	41.3332	41.0883	39.9381	39.7229	38.7211	38.7211	38.5356	39.1070	39.7229	40.1583	40.6134 (38)
Heat transfer coeff	96.8902	96.6404	96.3955	95.2453	95.0301	94.0283	94.0283	93.8428	94.4142	95.0301	95.4654	95.9206 (39)
Average = Sum(39)m / 12 =												95.2443 (39)
HLP	1.1507	1.1477	1.1448	1.1312	1.1286	1.1167	1.1167	1.1145	1.1213	1.1286	1.1338	1.1392 (40)
HLP (average)												1.1312 (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												2.5377 (42)
Average daily hot water use (litres/day)												94.4713 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	103.9184	100.1396	96.3607	92.5819	88.8030	85.0242	85.0242	88.8030	92.5819	96.3607	100.1396	103.9184 (44)
Energy conte	154.1080	134.7839	139.0849	121.2576	116.3495	100.4008	93.0361	106.7603	108.0353	125.9048	137.4349	149.2454 (45)
Energy content (annual)										Total = Sum(45)m =		1486.4016 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	23.1162	20.2176	20.8627	18.1886	17.4524	15.0601	13.9554	16.0140	16.2053	18.8857	20.6152	22.3868 (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	27.5592	24.8899	27.5308	26.6130	27.4786	26.5673	27.4374	27.4641	26.5922	27.5092	26.6558	27.5511 (61)
Total heat required for water heating calculated for each month	181.6672	159.6737	166.6157	147.8706	143.8281	126.9681	120.4735	134.2244	134.6276	153.4140	164.0907	176.7965 (62)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.7000 (H2)
Collector heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0050 (H3a)
Collector effective heat loss coefficient												1.8063 (H3b)
Collector performance ratio												2.5804 (H4)
Annual solar radiation per m2												1079.5246 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												1813.6014 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.2201 (H8)
Utilisation factor												0.5594 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												94.4713 (H14)
Volume ratio Veff/V												0.7939 (H15)
Solar storage volume factor												0.9538 (H16)
Solar input	-24.6735	-41.1729	-70.1222	-93.9775	-116.1013	-114.1461	-112.6376	-98.4121	-77.0764	-52.6341	-29.2663	-850.8674 (H17)
Solar input (sum of months) = Sum (63)m =												-850.8674 (63)
Output from w/h	156.9938	118.5008	96.4935	53.8931	27.7268	12.8220	7.8359	35.8123	57.5512	100.7799	134.8245	156.1490 (64)
Total per year (kWh/year) = Sum (64)m =												959.3828 (64)
Heat gains from water heating, kWh/month	58.1307	51.0381	53.1284	46.9714	45.5559	40.0251	37.7939	42.3638	42.5698	48.7406	52.3611	56.5119 (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)
(66)m	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	53.6982	47.6942	38.7876	29.3647	21.9504	18.5315	20.0239	26.0279	34.9345	44.3574	51.7717	55.1906	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	340.2899	343.8211	334.9227	315.9791	292.0663	269.5916	254.5771	251.0459	259.9443	278.8879	302.8007	325.2754	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	(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)	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	(71)
Water heating gains (Table 5)	78.1327	75.9496	71.4092	65.2381	61.2310	55.5904	50.7982	56.9406	59.1247	65.5116	72.7237	75.9568	(72)
Total internal gains	578.6398	573.9838	551.6384	517.1008	481.7667	450.2324	431.9181	440.5334	460.5225	495.2759	533.8151	562.9418	(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
East					4.4700	19.6403	0.6300	0.7000			0.7700			26.8304 (76)
West					8.1800	19.6403	0.6300	0.7000			0.7700			49.0990 (80)

Solar gains	75.9293	148.5339	244.6142	356.7552	437.2169	447.5693	426.1042	366.0172	284.4964	176.2480	94.6750			62.4406 (83)
Total gains	654.5691	722.5178	796.2526	873.8561	918.9836	897.8017	858.0224	806.5506	745.0189	671.5238	628.4900			625.3824 (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	43.6416	43.7544	43.8656	44.3953	44.4958	44.9699	44.9699	45.0588	44.7861	44.4958	44.2929	44.0827
alpha	3.9094	3.9170	3.9244	3.9597	3.9664	3.9980	3.9980	4.0039	3.9857	3.9664	3.9529	3.9388
util living area	0.9825	0.9728	0.9495	0.8918	0.7828	0.6186	0.4683	0.5139	0.7426	0.9189	0.9719	0.9852 (86)
MIT	19.6081	19.7813	20.0827	20.4648	20.7640	20.9333	20.9829	20.9753	20.8588	20.4672	19.9735	19.5751 (87)
Th 2	19.9596	19.9620	19.9644	19.9755	19.9775	19.9872	19.9872	19.9890	19.9835	19.9775	19.9733	19.9689 (88)
util rest of house	0.9784	0.9665	0.9376	0.8658	0.7323	0.5378	0.3667	0.4101	0.6690	0.8937	0.9642	0.9817 (89)
MIT 2	18.7078	18.8802	19.1761	19.5477	19.8145	19.9530	19.9817	19.9803	19.9014	19.5599	19.0804	18.6825 (90)
Living area fraction									fLA = Living area / (4) =			0.1795 (91)
MIT	18.8694	19.0419	19.3388	19.7122	19.9849	20.1289	20.1613	20.1589	20.0732	19.7227	19.2407	18.8427 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8694	19.0419	19.3388	19.7122	19.9849	20.1289	20.1613	20.1589	20.0732	19.7227	19.2407	18.8427 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9728	0.9594	0.9287	0.8581	0.7327	0.5497	0.3847	0.4282	0.6762	0.8861	0.9572	0.9767 (94)
Useful gains	636.7605	693.1935	739.4756	749.8812	673.3596	493.5275	330.0776	345.3879	503.7564	595.0560	601.5895	610.7865 (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												
	1411.6288	1366.6765	1237.6037	1029.8158	787.3123	519.8754	334.8670	352.7428	563.9590	866.9345	1159.0174	1404.5376 (97)
Month fracti	1.0000		1.0000	1.0000		0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh												
	576.5020	452.5806	370.6074	201.5529	84.7808	0.0000	0.0000	0.0000	0.0000	202.2777	401.3481	590.5509 (98)
Space heating												2880.2002 (98)
Space heating per m2												34.2067 (99)
										(98) / (4) =		

Not applicable

Energy saving/generation technologies (Appendices M ,N and Q)		
PV Unit 0 (0.80 * 0.77 * 908 * 1.00) =	-559.2382	-559.2382 (233)
Total delivered energy for all uses		4189.2724 (238)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3175.5240	3.4800	110.5082 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1068.6561	3.4800	37.1892 (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	379.3306	13.1900	50.0337 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-559.2382	13.1900	-73.7635 (252)
Total energy cost			260.4551 (253)

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

Energy	Emission factor	Emissions
kWh/year	kg CO2/kWh	kg CO2/year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Space heating - main system 1	3175.5240	0.2160	685.9132 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1068.6561	0.2160	230.8297 (264)
Space and water heating			916.7429 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	379.3306	0.5190	196.8726 (268)
Energy saving/generation technologies			
PV Unit			
Total kg/year	-559.2382	0.5190	-290.2446 (269)
CO2 emissions per m2			888.2458 (272)
EI value			10.5500 (273)
EI rating			90.7875
EI band			91 (274)
			B

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

SAP 2012 WORKSHEET FOR New Build (As Built) (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	42.1000 (1b)	x 2.3900 (2b)	= 100.6190 (1b) - (3b)
First floor	42.1000 (1c)	x 2.6700 (2c)	= 112.4070 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.0260 (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					4 * 10 = 40.0000 (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) =					40.0000 / (5) = 0.1878 (8)
Pressure test					Yes
Measured/design AP50					4.1400
Infiltration rate					0.3948 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3356 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)
Adj infilt rate	0.3943	0.3691	0.3691	0.3356	0.3439	0.3272	0.3272	0.3188	0.3188	0.3439	0.3356	0.3439 (22b)
Effective ac	0.5777	0.5681	0.5681	0.5563	0.5591	0.5535	0.5535	0.5508	0.5508	0.5591	0.5563	0.5591 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			12.6500	1.1450	14.4847		(27)
Ground Floor			42.1000	0.1200	5.0520	84.0000	3536.4000 (28a)
Brick and Block	93.3600	14.7700	78.5900	0.2400	18.8616	42.2200	3318.0698 (29a)
Pitched Roof	42.1000		42.1000	0.1000	4.2100	9.1000	383.1100 (30)
Total net area of external elements Aum(A, m ²)			177.5600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.9403		(33)
Party Wall 1			44.3300	0.0000	0.0000	110.0000	4876.3000 (32)
GF Stud			80.0000			9.0000	720.0000 (32c)
First Floor			96.9900			9.0000	872.9100 (32c)
Internal Floor 1			42.1000			18.0000	757.8000 (32d)
Internal Ceiling 1			42.1000			18.0000	757.8000 (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) = 15222.3898 (34)
180.7885 (35)
10.3668 (36)
(33) + (36) = 55.3072 (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	40.6134	39.9381	39.9381	39.1070	39.3074	38.9116	38.9116	38.7211	38.7211	39.3074	39.1070	39.3074 (38)
Heat transfer coeff	95.9206	95.2453	95.2453	94.4142	94.6145	94.2188	94.2188	94.0283	94.0283	94.6145	94.4142	94.6145 (39)
Average = Sum(39)m / 12 =												94.6314 (39)
HLP	1.1392	1.1312	1.1312	1.1213	1.1237	1.1190	1.1190	1.1167	1.1167	1.1237	1.1213	1.1237 (40)
HLP (average)												1.1239 (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												2.5377 (42)
Average daily hot water use (litres/day)												94.4713 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	103.9184	100.1396	96.3607	92.5819	88.8030	85.0242	85.0242	88.8030	92.5819	96.3607	100.1396	103.9184 (44)
Energy conte	154.1080	134.7839	139.0849	121.2576	116.3495	100.4008	93.0361	106.7603	108.0353	125.9048	137.4349	149.2454 (45)
Energy content (annual)										Total = Sum(45)m =		1486.4016 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Distribution loss (46)m = 0.15 x (45)m	23.1162	20.2176	20.8627	18.1886	17.4524	15.0601	13.9554	16.0140	16.2053	18.8857	20.6152	22.3868 (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	27.5592	24.8899	27.5308	26.6130	27.4786	26.5673	27.4374	27.4641	26.5922	27.5092	26.6558	27.5511 (61)
Total heat required for water heating calculated for each month	181.6672	159.6737	166.6157	147.8706	143.8281	126.9681	120.4735	134.2244	134.6276	153.4140	164.0907	176.7965 (62)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.7000 (H2)
Collector heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0050 (H3a)
Collector effective heat loss coefficient												1.8063 (H3b)
Collector performance ratio												2.5804 (H4)
Annual solar radiation per m2												1206.0102 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												2026.0972 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.3631 (H8)
Utilisation factor												0.5198 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												94.4713 (H14)
Volume ratio Veff/V												0.7939 (H15)
Solar storage volume factor												0.9538 (H16)
Solar input	-28.8250	-40.9924	-71.1324	-95.6850	-111.1925	-120.9452	-114.6745	-104.5720	-81.8483	-56.5706	-34.0934	-883.3553 (H17)
Solar input (sum of months) = Sum (63)m =												-883.3553 (63)
Output from w/h	152.8422	118.6813	95.4833	52.1856	32.6356	6.0230	5.7991	29.6524	52.7793	96.8434	129.9973	153.9724 (64)
Total per year (kWh/year) = Sum (64)m =												926.8950 (64)
Heat gains from water heating, kWh/month	58.1307	51.0381	53.1284	46.9714	45.5559	40.0251	37.7939	42.3638	42.5698	48.7406	52.3611	56.5119 (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)
(66)m	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	53.6982	47.6942	38.7876	29.3647	21.9504	18.5315	20.0239	26.0279	34.9345	44.3574	51.7717	55.1906	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	340.2899	343.8211	334.9227	315.9791	292.0663	269.5916	254.5771	251.0459	259.9443	278.8879	302.8007	325.2754	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	(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)	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	(71)
Water heating gains (Table 5)	78.1327	75.9496	71.4092	65.2381	61.2310	55.5904	50.7982	56.9406	59.1247	65.5116	72.7237	75.9568	(72)
Total internal gains	578.6398	573.9838	551.6384	517.1008	481.7667	450.2324	431.9181	440.5334	460.5225	495.2759	533.8151	562.9418	(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	
East				4.4700	25.1733	0.6300		0.7000		0.7700	34.3889 (76)	
West				8.1800	25.1733	0.6300		0.7000		0.7700	62.9310 (80)	
Solar gains	97.3199	161.9476	270.6598	394.2042	452.7952	512.0824	468.7161	421.3909	328.8642	207.1732	120.9493	75.7526 (83)
Total gains	675.9597	735.9314	822.2982	911.3050	934.5619	962.3148	900.6342	861.9243	789.3867	702.4490	654.7643	638.6944 (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	44.0827	44.3953	44.3953	44.7861	44.6912	44.8790	44.8790	44.9699	44.9699	44.6912	44.7861	44.6912
alpha	3.9388	3.9597	3.9597	3.9857	3.9794	3.9919	3.9919	3.9980	3.9980	3.9794	3.9857	3.9794
util living area	0.9745	0.9636	0.9297	0.8449	0.7017	0.4832	0.3420	0.3457	0.6163	0.8644	0.9540	0.9781 (86)
MIT	19.8284	19.9680	20.2659	20.6274	20.8683	20.9777	20.9958	20.9958	20.9424	20.6626	20.2150	19.8177 (87)
Th 2	19.9689	19.9755	19.9755	19.9835	19.9815	19.9854	19.9854	19.9872	19.9872	19.9815	19.9835	19.9815 (88)
util rest of house	0.9683	0.9548	0.9127	0.8088	0.6366	0.3937	0.2385	0.2380	0.5232	0.8223	0.9408	0.9726 (89)
MIT 2	18.9329	19.0742	19.3613	19.7016	19.9009	19.9767	19.9846	19.9865	19.9608	19.7401	19.3240	18.9327 (90)
Living area fraction									fLA = Living area / (4) =			0.1795 (91)
MIT	19.0936	19.2346	19.5237	19.8677	20.0745	20.1563	20.1660	20.1676	20.1369	19.9056	19.4839	19.0915 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0936	19.2346	19.5237	19.8677	20.0745	20.1563	20.1660	20.1676	20.1369	19.9056	19.4839	19.0915 (93)

8. Space heating requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9615	0.9469	0.9038	0.8042	0.6430	0.4093	0.2571	0.2574	0.5378	0.8187	0.9327	0.9664	(94)
Useful gains	649.9090	696.8594	743.1598	732.8305	600.9047	393.8305	231.5745	221.8828	424.5145	575.0752	610.6944	617.2446	(95)
Ext temp.	5.6000	6.0000	7.6000	10.1000	13.1000	15.9000	17.7000	17.8000	15.4000	12.1000	8.6000	5.7000	(96)
Heat loss rate W													
Month fracti	1294.3116	1260.5324	1135.6734	922.2118	659.8863	401.0260	232.3474	222.6205	445.4060	738.5248	1027.5918	1267.0309	(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	479.4355	378.7882	292.0301	136.3545	43.8823	0.0000	0.0000	0.0000	0.0000	121.6065	300.1661	483.4410	(98)
Space heating per m2												2235.7043	(98)
											(98) / (4) =	26.5523	(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													2464.9441	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	479.4355	378.7882	292.0301	136.3545	43.8823	0.0000	0.0000	0.0000	0.0000	121.6065	300.1661	483.4410	(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)	528.5948	417.6276	321.9737	150.3357	48.3818	0.0000	0.0000	0.0000	0.0000	134.0755	330.9439	533.0110	(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	152.8422	118.6813	95.4833	52.1856	32.6356	6.0230	5.7991	29.6524	52.7793	96.8434	129.9973	153.9724	(64)	
Efficiency of water heater (217)m	90.0069	90.0159	89.9936	89.9073	89.4842	87.9000	87.9000	87.9000	87.9000	89.4370	89.8352	87.9000	(216)	
Fuel for water heating, kWh/month	169.8116	131.8448	106.1001	58.0438	36.4708	6.8521	6.5973	33.7343	60.0447	108.2811	144.7064	171.0664	(219)	
Water heating fuel used												1033.5534	(219)	
Annual totals kWh/year														
Space heating fuel - main system												2464.9441	(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)													379.3306	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.77 * 1030 * 1.00) =										-634.5166		-634.5166	(233)	
Total delivered energy for all uses												3368.3115	(238)	

10a. Fuel costs - using BEDF prices (497)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2464.9441	3.6300	89.4775	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1033.5534	3.6300	37.5180	(247)
Pumps and fans for heating	75.0000	19.4400	14.5800	(249)
Pump for solar water heating	50.0000	19.4400	9.7200	(249)
Energy for lighting	379.3306	19.4400	73.7419	(250)
Additional standing charges			95.0000	(251)
Energy saving/generation technologies				
PV Unit	-634.5166	19.4400	-123.3500	(252)
Total energy cost			196.6873	(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	2464.9441	0.2160	532.4279	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1033.5534	0.2160	223.2475	(264)
Space and water heating			755.6755	(265)
Pumps and fans	125.0000	0.5190	64.8750	(267)
Energy for lighting	379.3306	0.5190	196.8726	(268)
Energy saving/generation technologies				
PV Unit	-634.5166	0.5190	-329.3141	(269)
Total kg/year			688.1089	(272)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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	2464.9441	1.2200	3007.2318 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1033.5534	1.2200	1260.9351 (264)
Space and water heating			4268.1670 (265)
Pumps and fans	125.0000	3.0700	383.7500 (267)
Energy for lighting	379.3306	3.0700	1164.5449 (268)
Energy saving/generation technologies			
PV Unit	-634.5166	3.0700	-1947.9659 (269)
Primary energy kWh/year			3868.4960 (272)
Primary energy kWh/m2/year			45.9441 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Plot 16	Issued on Date	05/07/2022
Assessment Reference	As Built	Prop Type Ref	B (P)
Project	14 Shaw Road, West End, Southampton, SO30 3JZ		
Calculation Type	New Build (As Built)		

SAP Rating	87 B	DER	14.61	TER	18.11
Environmental	89 B	% DER<TER	19.34		
CO ₂ Emissions (t/year)	0.88	DFEE	44.68	TREE	51.59
General Requirements Compliance	Pass	% DFEE<TFEE	13.39		

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 0647 Plot 16	Issued on Date	05/07/2022
Assessment Reference	As Built	Prop Type Ref	B (P)
Project	14 Shaw Road, West End, Southampton, SO30 3JZ		
Calculation Type	New Build (As Built)		

SAP Rating	87 B	DER	14.61	TER	18.11
Environmental	89 B	% DER<TER	19.34		
CO ₂ Emissions (t/year)	0.88	DFEE	44.68	TFEE	51.59
General Requirements Compliance	Pass	% DFEE<TFEE	13.39		

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

Wall 000001

Wall Type: Standard Wall

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	Brick, outer leaf						
	Main construction	102	0.7700	0.1325	82.81		
	Main construction	102	0.9407	0.1084	17.19		
Layer 2	Supafil 34						
	Main construction	100	0.0340	2.9412	100.00		
	Corrections - Air Gap: Level 0, Fasteners: None or plastic						
Layer 3	Supabloc						
	Main construction	100	0.1100	0.9091	94.04	460	1000
	Main construction	100	0.8803	0.1136	5.96	460	1000
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 4	airspace/plaster dabs						
	Main construction	15	0.0882	0.1700	80.00		
	Main construction	15	0.0882	0.1700	20.00		
	Corrections - Cavity Unventilated, Emissivity: Normal						
Layer 5	Plasterboard, standard						
	Main construction	12.5	0.2100	0.0595	100.00	700	1000
Int surface				0.1300			

Total resistance:	Upper limit = 4.321 m ² K/W	Lower limit = 4.110 m ² K/W	Average = 4.215 m ² K/W
	Total correction = 0.0002 m ² K/W	U-value (unrounded) = 0.24 W/m ² K	

Unheated space: None		
Total thickness: 330 mm	U-value: 0.24 W/m² K	Kappa: 42.22 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Plot 16	Issued on Date	05/07/2022
Assessment Reference	As Built	Prop Type Ref	B (P)
Project	14 Shaw Road, West End, Southampton, SO30 3JZ		
Calculation Type	New Build (As Built)		

SAP Rating	87 B	DER	14.61	TER	18.11
Environmental	89 B	% DER<TER	19.34		
CO ₂ Emissions (t/year)	0.88	DFEE	44.68	TFEE	51.59
General Requirements Compliance	Pass	% DFEE<TFEE	13.39		

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

Floor 000003 - Worst Case Slab

Floor Type: Slab On Ground Floor

Area = 42.10 m², Perimeter = 18.45 m, Wall thickness = 275.00 mm, Soil: Unknown

Horizontal edge insulation: none

Vertical edge insulation: none

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	Concrete, medium density						
	Main construction	100	1.3500	0.0741	100.00		
Layer 2	Polythene, 1000 gauge						
	Main construction	0.5	0.0000	0.0000	100.00		
Layer 3	Celotex XR4000						
	Main construction	150	0.0220	6.8182	100.00	30	1400
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 4	Polythene, 500 gauge						
	Main construction	0.5	0.0000	0.0000	100.00		
Layer 5	Screed						
	Main construction	70	1.1500	0.0609	100.00	1200	1000
Int surface				0.1700			

Total resistance: Upper limit = 6.953 m² K/W Lower limit = 6.953 m² K/W Average = 6.953 m² K/W

Total correction = 0.0096 m² K/W

U-value (unrounded) = 0.12 W/m² K

Unheated space: None

Total thickness: 321 mm

U-value: 0.12 W/m² K

Kappa: 84.00 kJ/m² K

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Plot 16			Issued on Date	05/07/2022
Assessment Reference	As Built	Prop Type Ref	B (P)		
Property	14 Shaw Road, West End, Southampton, SO30 3JZ				
SAP Rating	87 B	DER	14.61	TER	18.11
Environmental	89 B	% DER<TER	19.34		
CO ₂ Emissions (t/year)	0.88	DFEE	44.68	TFEE	51.59
General Requirements Compliance	Pass	% DFEE<TFEE	13.39		
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 Built)

Orientation	East
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	House, Semi-Detached
2.0 Number of Storeys	2
3.0 Date Built	2020
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements		Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	Ground Floor:	18.45 m	42.10 m ²	2.39 m
	1st Storey:	18.45 m	42.10 m ²	2.67 m

7.0 Living Area	15.11	m ²
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8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	180.79	kJ/m ² K

9.0 External Walls			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type	Construction				
Brick and Block	Cavity Wall	Other	0.24	42.22	93.36	78.59

9.1 Party Walls			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)
Description	Type	Construction			
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	44.33

9.2 Internal Walls			Kappa (kJ/m ² K)	Area (m ²)
Description	Construction			
GF Stud	Plasterboard on timber frame		9.00	80.00
First Floor	Plasterboard on timber frame		9.00	96.99

10.0 External Roofs			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type	Construction				
Pitched Roof	External Plane Roof	Other	0.10	9.10	42.10	42.10

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

10.2 Internal Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Ceiling 1	Plasterboard ceiling, carpeted chipboard floor	9.00	42.10

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	84.00	42.10

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	42.10

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	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	East							2.12	
Front Elevation	Window	[1] Brick and Block	East	None	0.00					4.47	
Rear Elevation	Window	[1] Brick and Block	West	None	0.00					8.18	

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)	0.49	0.093	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.01	0.071	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	6.00	0.067	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.51	0.070	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.77	0.064	No	Birtley Supatherm
Independently assessed	E3 Sill	8.26	0.021	No	Knauf P5
Independently assessed	E4 Jamb	24.30	0.039	No	Knauf P6
Table K1 - Approved	E5 Ground floor (normal)	18.45	0.160	No	
Independently assessed	E6 Intermediate floor within a dwelling	18.45	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	9.69	0.060	No	
Independently assessed	E12 Gable (insulation at ceiling level)	8.78	0.044	No	Knauf P21
Independently assessed	E16 Corner (normal)	10.10	0.039	No	Knauf P23
Table K1 - Default	E25 Staggered party wall between dwellings	10.10	0.120	No	
Table K1 - Default	P1 Party wall - Ground floor	8.77	0.160	No	
Table K1 - Default	P2 Party wall - Intermediate floor within a dwelling	8.77	0.000	No	
Independently assessed	P4 Party wall - Roof (insulation at ceiling level)	8.77	0.180	No	Knauf P29

Y-value	0.058	W/m²K
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18.0 Pressure Testing

Designed AP ₅₀	5.00	m³/(h.m²) @ 50 Pa
Property Tested ?	Yes	
As Built AP ₅₀	4.14	m³/(h.m²) @ 50 Pa

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

19.0 Mechanical Ventilation

Summer Overheating

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

Mechanical Ventilation

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

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				4
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	19	
Total number of L.E.L. fittings	19	
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.		17515	
Fuel Type		Mains gas	
Main Heating		BGW	
SAP Code		104	
In Winter		90.7	
In Summer		87.9	
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 Built)

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
0.77	West	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	£27	B 88	