



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 15 Oram Way
West End, Southampton, SO30 3JW

Contact: Tobias Whiting
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Report Issue Date: 06/06/2022

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Plot 14			Issued on Date	06/06/2022
Assessment Reference	As Built	Prop Type Ref	E		
Property	15 Oram Way, West End, Southampton, SO30 3JW				
SAP Rating	88 B	DER	13.46	TER	17.19
Environmental	89 B	% DER<TER	21.71		
CO ₂ Emissions (t/year)	1.09	DFEE	45.24	TFEE	55.75
General Requirements Compliance	Pass	% DFEE<TFEE	18.84		
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)	17.19	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	13.46	kgCO ₂ /m ²	Pass
	-3.73 (-21.7%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	55.75	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	45.24	kWh/m ² /yr	
	-10.5 (-18.9%)	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	4.03 (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 North

0.96 m², No overhang

Windows facing East

8.89 m², Overhang twice as wide as window, ratio 0.69

Windows facing South

2.88 m², No overhang

Windows facing West

8.63 m², No overhang

Air change rate

4.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

4.03 (measured in this dwelling)

m³/(h.m²) @ 50 Pa

Maximum

10.0

m³/(h.m²) @ 50 Pa

Pass

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BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

10 Key features

Party wall U-value	0.00	W/m ² K
Roof U-value	0.10	W/m ² K
Floor U-value	0.12	W/m ² K
Door U-value	1.10	W/m ² K
Thermal bridging ψ -value	0.024	W/m ² K
Photovoltaic array	0.97	kW

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THERMAL BRIDGING

Calculation Type: New Build (As Built)

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CO ₂ Emissions (t/year)	1.09	DFEE	45.24	TFEE	55.75
General Requirements Compliance	Pass	% DFEE<TFEE	18.84		

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Client	Foreman Homes, FORE
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	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.093	1.89	0.18	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.070	0.92	0.06	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	7.08	0.45	Birtley Supatherm
External wall	E3 Sill	Independently assessed	0.021	15.88	0.33	Knauf P5
External wall	E4 Jamb	Independently assessed	0.016	37.80	0.60	Knauf P6
External wall	E5 Ground floor (normal)	Independently assessed	0.052	30.80	1.60	CD0022
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	30.80	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	13.94	0.84	
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.054	16.86	0.91	CD0031
External wall	E16 Corner (normal)	Independently assessed	0.050	25.25	1.26	CD0035
External wall	E17 Corner (inverted – internal area greater than external area)	Independently assessed	-0.065	5.05	-0.33	CD0036

Total: **6.49** W/mK:
Y-Value: **0.024** W/m²K:

FULL SAP CALCULATION PRINTOUT

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

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

DWELLING AS BUILT

Detached House, total floor area 113 m²

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

1a TER and DER

Fuel for main heating:Mains gas

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 17.19 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 13.46 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)55.7 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)45.2 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: 4.03 (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 North: 0.96 m², No overhang

Windows facing East: 8.89 m², Overhang twice as wide as window, ratio 0.69

Windows facing South: 2.88 m², No overhang

Windows facing West: 8.63 m², No overhang

Air change rate: 4.00 ach

Blinds/curtains: None

10 Key features

Party wall U-value	0.00 W/m ² K
Roof U-value	0.10 W/m ² K
Floor U-value	0.12 W/m ² K
Door U-value	1.10 W/m ² K
Thermal bridging y-value	0.024 W/m ² K
Photovoltaic array	0.97 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	56.6000 (1b)	x 2.3900 (2b)	= 135.2740 (1b) - (3b)
First floor	56.6000 (1c)	x 2.6700 (2c)	= 151.1220 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	113.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 286.3960 (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) = 0.1397 (8)
Pressure test					Yes
Measured/design AP50					4.0300
Infiltration rate					0.3412 (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) =	0.2900 (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	0.3697	0.3625	0.3552	0.3190	0.3117	0.2755	0.2755	0.2682	0.2900	0.3117	0.3262	0.3407 (22b)
Effective ac	0.5684	0.5657	0.5631	0.5509	0.5486	0.5379	0.5379	0.5360	0.5420	0.5486	0.5532	0.5581 (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)			21.3600	1.1450	24.4580		(27)
Ground Floor			56.6000	0.1200	6.7920	84.0000	4754.4000 (28a)
Brick and Block	155.8500	23.4800	132.3700	0.2400	31.7688	42.2200	5588.6614 (29a)
Pitched Roof	56.6000		56.6000	0.1000	5.6600	9.1000	515.0600 (30)
Total net area of external elements Aum(A, m ²)			269.0500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	71.0108		(33)
GF Block			73.3100			75.0000	5498.2500 (32c)
GF Stud			30.9100			9.0000	278.1900 (32c)
FF Stud			123.0200			9.0000	1107.1800 (32c)
Internal Floor 1			56.6000			18.0000	1018.8000 (32d)
Internal Ceiling 1			56.6000			18.0000	1018.8000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 19779.3414 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 174.7292 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.4937 (36)
Total fabric heat loss (33) + (36) = 77.5045 (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	53.7155	53.4646	53.2187	52.0638	51.8477	50.8418	50.8418	50.6555	51.2293	51.8477	52.2849	52.7419 (38)
Heat transfer coeff	131.2200	130.9691	130.7232	129.5683	129.3522	128.3463	128.3463	128.1600	128.7338	129.3522	129.7894	130.2464 (39)
Average = Sum(39)m / 12 =												129.5673 (39)
HLP	1.1592	1.1570	1.1548	1.1446	1.1427	1.1338	1.1338	1.1322	1.1372	1.1427	1.1465	1.1506 (40)
HLP (average)												1.1446 (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												2.8327 (42)
Average daily hot water use (litres/day)												101.4773 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	111.6251	107.5660	103.5069	99.4478	95.3887	91.3296	91.3296	95.3887	99.4478	103.5069	107.5660	111.6251 (44)
Energy conte	165.5368	144.7795	149.3995	130.2501	124.9781	107.8466	99.9357	114.6777	116.0473	135.2419	147.6271	160.3135 (45)
Energy content (annual)										Total = Sum(45)m =		1596.6337 (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	24.8305	21.7169	22.4099	19.5375	18.7467	16.1770	14.9904	17.2017	17.4071	20.2863	22.1441	24.0470 (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	27.5654	24.8962	27.5520	26.6424	27.5056	26.5896	27.4581	27.4889	26.6184	27.5284	26.6623	27.5572 (61)
Total heat required for water heating calculated for each month	193.1022	169.6757	176.9515	156.8925	152.4837	134.4362	127.3938	142.1666	142.6657	162.7703	174.2894	187.8707 (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	193.1022	169.6757	176.9515	156.8925	152.4837	134.4362	127.3938	142.1666	142.6657	162.7703	174.2894	187.8707 (64)
Heat gains from water heating, kWh/month	61.9323	54.3632	56.5633	49.9688	48.4316	42.5064	40.0931	45.0026	45.2403	51.8500	55.7516	60.1935 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1920.6982 (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	141.6365	141.6365	141.6365	141.6365	141.6365	141.6365	141.6365	141.6365	141.6365	141.6365	141.6365	141.6365 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.9619	22.1709	18.0306	13.6503	10.2038	8.6145	9.3082	12.0992	16.2395	20.6198	24.0663	25.6556 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	276.0757	278.9405	271.7213	256.3525	236.9521	218.7184	206.5372	203.6724	210.8916	226.2605	245.6609	263.8945 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.1637	37.1637	37.1637	37.1637	37.1637	37.1637	37.1637	37.1637	37.1637	37.1637	37.1637	37.1637 (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)	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092 (71)
Water heating gains (Table 5)	83.2424	80.8977	76.0260	69.4010	65.0962	59.0367	53.8886	60.4873	62.8338	69.6909	77.4328	80.9053 (72)
Total internal gains	452.7709	450.5000	434.2688	407.8948	380.7430	354.8605	338.2250	344.7499	358.4559	385.0621	415.6509	438.9464 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
North	0.9600	10.6334	0.6300	0.7000	0.7700	3.1197 (74)
East	8.8900	19.6403	0.6300	0.7000	0.7700	53.3606 (76)
South	2.8800	46.7521	0.6300	0.7000	0.7700	41.1496 (78)
West	8.6300	19.6403	0.6300	0.7000	0.7700	51.8000 (80)

Solar gains	149.4299	279.0708	434.7625	607.3961	728.5631	740.6418	707.1235	616.6334	495.8786	323.8859	183.7478	124.6367 (83)
Total gains	602.2008	729.5709	869.0313	1015.2909	1109.3061	1095.5023	1045.3486	961.3832	854.3345	708.9480	599.3987	563.5831 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	41.8706	41.9508	42.0297	42.4044	42.4752	42.8081	42.8081	42.8703	42.6793	42.4752	42.3321	42.1836
alpha	3.7914	3.7967	3.8020	3.8270	3.8317	3.8539	3.8539	3.8580	3.8453	3.8317	3.8221	3.8122
util living area	0.9946	0.9883	0.9714	0.9238	0.8239	0.6677	0.5159	0.5736	0.8088	0.9574	0.9901	0.9958 (86)
MIT	19.2699	19.4917	19.8566	20.3134	20.6847	20.9016	20.9721	20.9583	20.7845	20.2731	19.6808	19.2288 (87)
Th 2	19.9528	19.9546	19.9563	19.9646	19.9661	19.9733	19.9733	19.9747	19.9705	19.9661	19.9630	19.9597 (88)
util rest of house	0.9932	0.9854	0.9641	0.9039	0.7782	0.5857	0.4059	0.4618	0.7424	0.9424	0.9871	0.9947 (89)
MIT 2	18.3712	18.5929	18.9545	19.4022	19.7415	19.9208	19.9639	19.9592	19.8379	19.3735	18.7885	18.3354 (90)
Living area fraction												0.1224 (91)
MIT	18.4812	18.7029	19.0649	19.5137	19.8570	20.0409	20.0874	20.0815	19.9538	19.4836	18.8978	18.4448 (92)
Temperature adjustment												0.0000
adjusted MIT	18.4812	18.7029	19.0649	19.5137	19.8570	20.0409	20.0874	20.0815	19.9538	19.4836	18.8978	18.4448 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9906	0.9807	0.9561	0.8934	0.7727	0.5915	0.4187	0.4742	0.7411	0.9333	0.9829	0.9926 (94)
Ext temp.	596.5224	715.5082	830.8599	907.0764	857.1856	648.0236	437.6911	455.9041	633.1738	661.6908	589.1680	559.3911 (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	1860.8565	1807.7546	1642.5296	1375.2017	1055.1202	698.3232	447.5899	471.8270	753.5775	1149.1131	1531.2248	1855.3362 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating per m2	940.6645	733.9896	603.8822	337.0502	147.2633	0.0000	0.0000	0.0000	0.0000	362.6422	678.2809	964.1832 (98)
												4767.9561 (98)
												(98) / (4) = 42.1198 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													90.7000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													5256.8425	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	940.6645	733.9896	603.8822	337.0502	147.2633	0.0000	0.0000	0.0000	0.0000	362.6422	678.2809	964.1832	(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)	1037.1163	809.2498	665.8018	371.6099	162.3631	0.0000	0.0000	0.0000	0.0000	399.8260	747.8290	1063.0465	(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	193.1022	169.6757	176.9515	156.8925	152.4837	134.4362	127.3938	142.1666	142.6657	162.7703	174.2894	187.8707	(64)	
Efficiency of water heater (217)m	90.2106	90.1607	90.0499	89.7915	89.2537	87.9000	87.9000	87.9000	87.9000	89.8137	90.1132	90.2313	(217)	
Fuel for water heating, kWh/month	214.0572	188.1924	196.5037	174.7298	170.8430	152.9422	144.9304	161.7367	162.3045	181.2311	193.4117	208.2101	(219)	
Water heating fuel used												2149.0928	(219)	
Annual totals kWh/year														
Space heating fuel - main system													5256.8425	(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)													440.8342	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.97 * 853 * 1.00) =										-661.9512			-661.9512	(233)
Total delivered energy for all uses													7259.8182	(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	5256.8425	0.2160	1135.4780	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2149.0928	0.2160	464.2040	(264)
Space and water heating			1599.6820	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	440.8342	0.5190	228.7929	(268)
Energy saving/generation technologies				
PV Unit	-661.9512	0.5190	-343.5527	(269)
Total CO2, kg/year			1523.8473	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			13.4600	(273)

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

DER			13.4600	ZC1
Total Floor Area		TFA	113.2000	
Assumed number of occupants		N	2.8327	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			14.4520	ZC2
CO2 emissions from cooking, equation (L16)			1.6518	ZC3
Total CO2 emissions			29.5638	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			29.5638	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	56.6000 (1b)	x 2.3900 (2b)	= 135.2740 (1b) - (3b)
First floor	56.6000 (1c)	x 2.6700 (2c)	= 151.1220 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	113.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 286.3960 (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																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) =	0.1397 (8)
Pressure test										Yes							
Measured/design AP50										5.0000							
Infiltration rate										0.3897 (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) =					0.3312 (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)					
	0.4223	0.4140	0.4057	0.3643	0.3561	0.3147	0.3147	0.3064	0.3312	0.3561	0.3726	0.3892 (22b)					
Effective ac	0.5892	0.5857	0.5823	0.5664	0.5634	0.5495	0.5495	0.5469	0.5549	0.5634	0.5694	0.5757 (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)			21.3600	1.3258	28.3182		(27)					
Ground Floor			56.6000	0.1300	7.3580		(28a)					
Brick and Block	155.8500	23.4800	132.3700	0.1800	23.8266		(29a)					
Pitched Roof	56.6000		56.6000	0.1300	7.3580		(30)					
Total net area of external elements Aum(A, m2)			269.0500				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		68.9808		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.1985 (36)					
Total fabric heat loss						(33) + (36) =	81.1793 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 55.6828	Feb 55.3555	Mar 55.0348	Apr 53.5281	May 53.2462	Jun 51.9340	Jul 51.9340	Aug 51.6910	Sep 52.4395	Oct 53.2462	Nov 53.8165	Dec 54.4127 (38)
Heat transfer coeff	136.8621	136.5348	136.2140	134.7074	134.4255	133.1133	133.1133	132.8703	133.6187	134.4255	134.9958	135.5920 (39)
Average = Sum(39)m / 12 =												134.7061 (39)
HLP	Jan 1.2090	Feb 1.2061	Mar 1.2033	Apr 1.1900	May 1.1875	Jun 1.1759	Jul 1.1759	Aug 1.1738	Sep 1.1804	Oct 1.1875	Nov 1.1925	Dec 1.1978 (40)
HLP (average)												1.1900 (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												2.8327 (42)
Average daily hot water use (litres/day)												101.4773 (43)
Daily hot water use	Jan 111.6251	Feb 107.5660	Mar 103.5069	Apr 99.4478	May 95.3887	Jun 91.3296	Jul 91.3296	Aug 95.3887	Sep 99.4478	Oct 103.5069	Nov 107.5660	Dec 111.6251 (44)
Energy conte	165.5368	144.7795	149.3995	130.2501	124.9781	107.8466	99.9357	114.6777	116.0473	135.2419	147.6271	160.3135 (45)
Energy content (annual)										Total = Sum(45)m =		1596.6337 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	24.8305	21.7169	22.4099	19.5375	18.7467	16.1770	14.9904	17.2017	17.4071	20.2863	22.1441	24.0470 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As 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	50.9589	49.0427	48.6090	45.0393	46.5406	48.6090	49.0427	50.9589	49.3151	50.9589 (61)
Solar input	216.4957	190.8069	200.3584	179.2928	173.5871	152.8858	146.4763	163.2867	165.0900	186.2008	196.9422	211.2724 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	67.7807	59.6460	62.4151	55.5688	53.7075	47.1188	44.8638	50.2826	50.8464	57.7077	61.4148	66.0440 (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	141.6365	141.6365	141.6365	141.6365	141.6365	141.6365	141.6365	141.6365	141.6365	141.6365	141.6365	141.6365	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.9619	22.1709	18.0306	13.6503	10.2038	8.6145	9.3082	12.0992	16.2395	20.6198	24.0663	25.6556	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	276.0757	278.9405	271.7213	256.3525	236.9521	218.7184	206.5372	203.6724	210.8916	226.2605	245.6609	263.8945	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.1637	37.1637	37.1637	37.1637	37.1637	37.1637	37.1637	37.1637	37.1637	37.1637	37.1637	37.1637	(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)	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	(71)
Water heating gains (Table 5)	91.1031	88.7590	83.8912	77.1789	72.1875	65.4428	60.3008	67.5841	70.6200	77.5641	85.2983	88.7688	(72)
Total internal gains	460.6316	458.3613	442.1340	415.6727	387.8342	361.2666	344.6372	351.8467	366.2421	392.9353	423.5165	446.8099	(73)

6. Solar gains

[Jan]			Area m2		Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North			0.9600		10.6334		0.6300		0.7000		0.7700		3.1197 (74)
East			8.8900		19.6403		0.6300		0.7000		0.7700		53.3606 (76)
South			2.8800		46.7521		0.6300		0.7000		0.7700		41.1496 (78)
West			8.6300		19.6403		0.6300		0.7000		0.7700		51.8000 (80)
Solar gains	149.4299	279.0708	434.7625	607.3961	728.5631	740.6418	707.1235	616.6334	495.8786	323.8859	183.7478	124.6367	(83)
Total gains	610.0615	737.4322	876.8966	1023.0688	1116.3973	1101.9084	1051.7607	968.4801	862.1207	716.8211	607.2642	571.4466	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	57.4382	57.5759	57.7115	58.3569	58.4793	59.0558	59.0558	59.1638	58.8324	58.4793	58.2323	57.9762	
alpha	4.8292	4.8384	4.8474	4.8905	4.8986	4.9371	4.9371	4.9443	4.9222	4.8986	4.8822	4.8651	
util living area	0.9988	0.9966	0.9890	0.9592	0.8738	0.7102	0.5427	0.6055	0.8578	0.9812	0.9973	0.9991	(86)
MIT	19.6241	19.7983	20.0897	20.4658	20.7737	20.9428	20.9877	20.9795	20.8494	20.4275	19.9538	19.5960	(87)
Th 2	19.9128	19.9151	19.9174	19.9280	19.9300	19.9393	19.9393	19.9410	19.9357	19.9300	19.9260	19.9218	(88)
util rest of house	0.9983	0.9954	0.9850	0.9435	0.8267	0.6166	0.4191	0.4787	0.7869	0.9713	0.9961	0.9988	(89)
MIT 2	18.0761	18.3321	18.7574	19.3003	19.7086	19.9015	19.9349	19.9327	19.8132	19.2566	18.5676	18.0413	(90)
Living area fraction	18.2656	18.5117	18.9205	19.4430	19.8390	20.0290	20.0638	20.0609	19.9401	19.4000	18.7373	18.2317	(92)
Temperature adjustment	18.2656	18.5117	18.9205	19.4430	19.8390	20.0290	20.0638	20.0609	19.9401	19.4000	18.7373	18.2317	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9973	0.9931	0.9796	0.9342	0.8220	0.6252	0.4342	0.4938	0.7872	0.9643	0.9941	0.9980	(94)
Ext temp.	608.3873	732.3286	859.0477	955.8013	917.6579	688.9238	456.6260	478.2423	678.6775	691.2076	603.6547	570.2962	(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	1911.3635	1858.4644	1691.8459	1420.2241	1094.0955	722.6709	461.0753	486.4195	780.3451	1182.9425	1570.9852	1902.5808	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating per m2	969.4143	756.7632	619.6018	334.3845	131.2696	0.0000	0.0000	0.0000	0.0000	365.8508	696.4780	991.2198	(98)
												4864.9820	(98)
												42.9769	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													5208.7601 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	969.4143	756.7632	619.6018	334.3845	131.2696	0.0000	0.0000	0.0000	0.0000	365.8508	696.4780	991.2198	(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)	1037.9168	810.2390	663.3853	358.0133	140.5456	0.0000	0.0000	0.0000	0.0000	391.7032	745.6938	1061.2631	(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	216.4957	190.8069	200.3584	179.2928	173.5871	152.8858	146.4763	163.2867	165.0900	186.2008	196.9422	211.2724	(64)
Efficiency of water heater (217)m	88.3709	88.1670	87.7045	86.5982	84.3583	80.3000	80.3000	80.3000	80.3000	86.7210	87.9612	88.4455	(216)
Fuel for water heating, kWh/month	244.9854	216.4154	228.4471	207.0399	205.7735	190.3933	182.4113	203.3458	205.5916	214.7125	223.8967	238.8731	(219)
Water heating fuel used												2561.8856	(219)
Annual totals kWh/year													
Space heating fuel - main system												5208.7601	(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)												440.8342	(232)
Total delivered energy for all uses												8286.4799	(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	5208.7601	0.2160	1125.0922 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2561.8856	0.2160	553.3673 (264)
Space and water heating			1678.4595 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	440.8342	0.5190	228.7929 (268)
Total CO2, kg/m2/year			1946.1774 (272)
Emissions per m2 for space and water heating			14.8274 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.0211 (272b)
Emissions per m2 for pumps and fans			0.3439 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.8274 * 1.00) + 2.0211 + 0.3439, rounded to 2 d.p.			17.1900 (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	56.6000 (1b)	x 2.3900 (2b)	= 135.2740 (1b) - (3b)
First floor	56.6000 (1c)	x 2.6700 (2c)	= 151.1220 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	113.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 286.3960 (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) = 0.1397 (8)
Pressure test					Yes
Measured/design AP50					4.0300
Infiltration rate					0.3412 (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) =	0.2900 (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	0.3697	0.3625	0.3552	0.3190	0.3117	0.2755	0.2755	0.2682	0.2900	0.3117	0.3262	0.3407 (22b)
Effective ac	0.5684	0.5657	0.5631	0.5509	0.5486	0.5379	0.5379	0.5360	0.5420	0.5486	0.5532	0.5581 (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)			21.3600	1.1450	24.4580		(27)
Ground Floor			56.6000	0.1200	6.7920	84.0000	4754.4000 (28a)
Brick and Block	155.8500	23.4800	132.3700	0.2400	31.7688	42.2200	5588.6614 (29a)
Pitched Roof	56.6000		56.6000	0.1000	5.6600	9.1000	515.0600 (30)
Total net area of external elements Aum(A, m ²)			269.0500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	71.0108		(33)
GF Block			73.3100			75.0000	5498.2500 (32c)
GF Stud			30.9100			9.0000	278.1900 (32c)
FF Stud			123.0200			9.0000	1107.1800 (32c)
Internal Floor 1			56.6000			18.0000	1018.8000 (32d)
Internal Ceiling 1			56.6000			9.0000	509.4000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 19269.9414 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 170.2292 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.4937 (36)
Total fabric heat loss (33) + (36) = 77.5045 (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	53.7155	53.4646	53.2187	52.0638	51.8477	50.8418	50.8418	50.6555	51.2293	51.8477	52.2849	52.7419 (38)
Heat transfer coeff	131.2200	130.9691	130.7232	129.5683	129.3522	128.3463	128.3463	128.1600	128.7338	129.3522	129.7894	130.2464 (39)
Average = Sum(39)m / 12 =												129.5673 (39)
HLP	1.1592	1.1570	1.1548	1.1446	1.1427	1.1338	1.1338	1.1322	1.1372	1.1427	1.1465	1.1506 (40)
HLP (average)												1.1446 (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												2.8327 (42)
Average daily hot water use (litres/day)												101.4773 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	111.6251	107.5660	103.5069	99.4478	95.3887	91.3296	91.3296	95.3887	99.4478	103.5069	107.5660	111.6251 (44)
Energy conte	165.5368	144.7795	149.3995	130.2501	124.9781	107.8466	99.9357	114.6777	116.0473	135.2419	147.6271	160.3135 (45)
Energy content (annual)										Total = Sum(45)m =		1596.6337 (45)

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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	35.1766	30.7656	31.7474	27.6781	26.5578	22.9174	21.2363	24.3690	24.6600	28.7389	31.3708	34.0666 (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	141.6365	141.6365	141.6365	141.6365	141.6365	141.6365	141.6365	141.6365	141.6365	141.6365	141.6365	141.6365	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.9619	22.1709	18.0306	13.6503	10.2038	8.6145	9.3082	12.0992	16.2395	20.6198	24.0663	25.6556	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	276.0757	278.9405	271.7213	256.3525	236.9521	218.7184	206.5372	203.6724	210.8916	226.2605	245.6609	263.8945	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.1637	37.1637	37.1637	37.1637	37.1637	37.1637	37.1637	37.1637	37.1637	37.1637	37.1637	37.1637	(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)	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	(71)
Water heating gains (Table 5)	47.2803	45.7822	42.6712	38.4419	35.6960	31.8297	28.5435	32.7540	34.2501	38.6276	43.5705	45.7885	(72)
Total internal gains	413.8088	412.3846	397.9141	373.9356	348.3428	324.6535	309.8799	314.0166	326.8721	350.9988	378.7886	400.8296	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North				0.9600	10.6334	0.6300		0.7000		0.7700		3.1197 (74)
East				8.8900	19.6403	0.6300		0.7000		0.7700		53.3606 (76)
South				2.8800	46.7521	0.6300		0.7000		0.7700		41.1496 (78)
West				8.6300	19.6403	0.6300		0.7000		0.7700		51.8000 (80)

Solar gains	149.4299	279.0708	434.7625	607.3961	728.5631	740.6418	707.1235	616.6334	495.8786	323.8859	183.7478	124.6367 (83)
Total gains	563.2388	691.4554	832.6766	981.3317	1076.9059	1065.2953	1017.0034	930.6500	822.7508	674.8846	562.5364	525.4663 (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	40.7923	40.8704	40.9473	41.3123	41.3813	41.7056	41.7056	41.7662	41.5801	41.3813	41.2419	41.0972	
alpha	3.7195	3.7247	3.7298	3.7542	3.7588	3.7804	3.7804	3.7844	3.7720	3.7588	3.7495	3.7398	
util living area	0.9952	0.9894	0.9734	0.9278	0.8312	0.6782	0.5269	0.5870	0.8196	0.9613	0.9913	0.9963 (86)	
MIT	19.1946	19.4222	19.7976	20.2697	20.6578	20.8898	20.9678	20.9518	20.7619	20.2258	19.6159	19.1534 (87)	
Th 2	19.9528	19.9546	19.9563	19.9646	19.9661	19.9733	19.9733	19.9747	19.9705	19.9661	19.9630	19.9597 (88)	
util rest of house	0.9941	0.9868	0.9667	0.9090	0.7870	0.5970	0.4159	0.4746	0.7556	0.9476	0.9887	0.9954 (89)	
MIT 2	18.2988	18.5264	18.8989	19.3628	19.7197	19.9135	19.9622	19.9563	19.8214	19.3304	18.7267	18.2629 (90)	
Living area fraction									fLA = Living area / (4) =				0.1224 (91)
MIT	18.4085	18.6361	19.0090	19.4739	19.8346	20.0330	20.0853	20.0782	19.9365	19.4400	18.8356	18.3719 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.4085	18.6361	19.0090	19.4739	19.8346	20.0330	20.0853	20.0782	19.9365	19.4400	18.8356	18.3719 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9916	0.9823	0.9587	0.8981	0.7806	0.6021	0.4286	0.4867	0.7532	0.9385	0.9848	0.9935 (94)
Useful gains	558.5338	679.2342	798.2903	881.3053	840.6423	641.4041	435.8659	452.9539	619.6665	633.3994	553.9895	522.0343 (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	1851.3159	1799.0060	1635.2125	1370.0384	1052.2263	697.3094	447.3242	471.3972	751.3571	1143.4748	1523.1559	1845.8391 (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	961.8299	752.4867	622.6701	351.8879	157.4185	0.0000	0.0000	0.0000	0.0000	379.4961	697.7998	984.9108 (98)
Space heating												4908.4997 (98)
Space heating per m2										(98) / (4) =		43.3613 (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	1206.4553	949.7627	974.0163	0.0000	0.0000	0.0000	0.0000 (100)

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Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8346	0.8938	0.8644	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1006.8920	848.8807	841.9411	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1356.9802	1298.0703	1199.2147	0.0000	0.0000	0.0000	0.0000 (103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	252.0635	334.1970	265.8116	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												852.0721 (104)
Cooled fraction									FC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)												
Intermittency factor	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	63.0159	83.5493	66.4529	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												213.0180 (107)
Space cooling per m2												1.8818 (108)
Energy for space heating												43.3613 (99)
Energy for space cooling												1.8818 (108)
Total												45.2431 (109)
Dwelling Fabric Energy Efficiency (DFEE)												45.2 (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	56.6000 (1b)	x 2.3900 (2b)	= 135.2740 (1b) - (3b)
First floor	56.6000 (1c)	x 2.6700 (2c)	= 151.1220 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	113.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 286.3960 (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) =	0.1397 (8)
Pressure test											Yes	
Measured/design AP50											5.0000	
Infiltration rate											0.3897 (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) =	0.3312 (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	0.4223	0.4140	0.4057	0.3643	0.3561	0.3147	0.3147	0.3064	0.3312	0.3561	0.3726	0.3892 (22b)
Effective ac	0.5892	0.5857	0.5823	0.5664	0.5634	0.5495	0.5495	0.5469	0.5549	0.5634	0.5694	0.5757 (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)			21.3600	1.3258	28.3182		(27)					
Ground Floor			56.6000	0.1300	7.3580		(28a)					
Brick and Block	155.8500	23.4800	132.3700	0.1800	23.8266		(29a)					
Pitched Roof	56.6000		56.6000	0.1300	7.3580		(30)					
Total net area of external elements Aum(A, m2)			269.0500				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	68.9808		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.1985 (36)					
Total fabric heat loss						(33) + (36) =	81.1793 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 55.6828	Feb 55.3555	Mar 55.0348	Apr 53.5281	May 53.2462	Jun 51.9340	Jul 51.9340	Aug 51.6910	Sep 52.4395	Oct 53.2462	Nov 53.8165	Dec 54.4127 (38)
Heat transfer coeff	136.8621	136.5348	136.2140	134.7074	134.4255	133.1133	133.1133	132.8703	133.6187	134.4255	134.9958	135.5920 (39)
Average = Sum(39)m / 12 =												134.7061 (39)
HLP	Jan 1.2090	Feb 1.2061	Mar 1.2033	Apr 1.1900	May 1.1875	Jun 1.1759	Jul 1.1759	Aug 1.1738	Sep 1.1804	Oct 1.1875	Nov 1.1925	Dec 1.1978 (40)
HLP (average)												1.1900 (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												2.8327 (42)
Average daily hot water use (litres/day)												101.4773 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
Energy content (annual)	111.6251	107.5660	103.5069	99.4478	95.3887	91.3296	91.3296	95.3887	99.4478	103.5069	107.5660	111.6251 (44)
Energy content (annual)	165.5368	144.7795	149.3995	130.2501	124.9781	107.8466	99.9357	114.6777	116.0473	135.2419	147.6271	160.3135 (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	0.0000 (56)
If cylinder contains dedicated solar storage												

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Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
	35.1766	30.7656	31.7474	27.6781	26.5578	22.9174	21.2363	24.3690	24.6600	28.7389	31.3708	34.0666 (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	141.6365	141.6365	141.6365	141.6365	141.6365	141.6365	141.6365	141.6365	141.6365	141.6365	141.6365	141.6365	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.9619	22.1709	18.0306	13.6503	10.2038	8.6145	9.3082	12.0992	16.2395	20.6198	24.0663	25.6556	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	276.0757	278.9405	271.7213	256.3525	236.9521	218.7184	206.5372	203.6724	210.8916	226.2605	245.6609	263.8945	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.1637	37.1637	37.1637	37.1637	37.1637	37.1637	37.1637	37.1637	37.1637	37.1637	37.1637	37.1637	(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)	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	(71)
Water heating gains (Table 5)	47.2803	45.7822	42.6712	38.4419	35.6960	31.8297	28.5435	32.7540	34.2501	38.6276	43.5705	45.7885	(72)
Total internal gains	413.8088	412.3846	397.9141	373.9356	348.3428	324.6535	309.8799	314.0166	326.8721	350.9988	378.7886	400.8296	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
North					0.9600	10.6334	0.6300	0.7000	0.7700		3.1197 (74)	
East					8.8900	19.6403	0.6300	0.7000	0.7700		53.3606 (76)	
South					2.8800	46.7521	0.6300	0.7000	0.7700		41.1496 (78)	
West					8.6300	19.6403	0.6300	0.7000	0.7700		51.8000 (80)	
Solar gains	149.4299	279.0708	434.7625	607.3961	728.5631	740.6418	707.1235	616.6334	495.8786	323.8859	183.7478	124.6367 (83)
Total gains	563.2388	691.4554	832.6766	981.3317	1076.9059	1065.2953	1017.0034	930.6500	822.7508	674.8846	562.5364	525.4663 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	57.4382	57.5759	57.7115	58.3569	58.4793	59.0558	59.0558	59.1638	58.8324	58.4793	58.2323	57.9762	
alpha	4.8292	4.8384	4.8474	4.8905	4.8986	4.9371	4.9371	4.9443	4.9222	4.8986	4.8822	4.8651	
util living area	0.9991	0.9975	0.9912	0.9650	0.8860	0.7274	0.5593	0.6260	0.8747	0.9852	0.9980	0.9994	(86)
MIT	19.5858	19.7611	20.0553	20.4374	20.7560	20.9364	20.9860	20.9764	20.8331	20.3959	19.9174	19.5583	(87)
Th 2	19.9128	19.9151	19.9174	19.9280	19.9300	19.9393	19.9393	19.9410	19.9357	19.9300	19.9260	19.9218	(88)
util rest of house	0.9988	0.9965	0.9878	0.9511	0.8415	0.6341	0.4329	0.4968	0.8081	0.9772	0.9972	0.9992	(89)
MIT 2	18.6206	18.7974	19.0915	19.4732	19.7651	19.9102	19.9358	19.9343	19.8409	19.4400	18.9623	18.6003	(90)
Living area fraction													(91)
MIT	18.7388	18.9154	19.2095	19.5912	19.8864	20.0358	20.0644	20.0619	19.9624	19.5570	19.0793	18.7176	(92)
Temperature adjustment													(93)
adjusted MIT	18.7388	18.9154	19.2095	19.5912	19.8864	20.0358	20.0644	20.0619	19.9624	19.5570	19.0793	18.7176	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	562.2995	688.2403	820.0629	927.8525	903.8752	685.3531	456.0330	476.9540	666.5130	656.8914	560.4161	524.8421	(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	1976.1251	1913.5848	1731.2131	1440.1871	1100.4630	723.5828	461.1584	486.5606	783.3267	1204.0524	1617.1525	1968.4649	(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	1051.8862	823.4316	677.8957	368.8809	146.2613	0.0000	0.0000	0.0000	0.0000	407.0877	760.8502	1074.0554	(98)
Space heating													(98)
Space heating per m2													(98) / (4) =

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	1251.2650	985.0384	1009.8142	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8634	0.9234	0.8945	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1080.3588	909.5485	903.3046	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1356.9802	1298.0703	1199.2147	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	199.1674	289.0602	220.1571	0.0000	0.0000	0.0000	0.0000	(104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling												708.3847 (104)
Cooled fraction												1.0000 (105)
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	0.0000	49.7918	72.2651	55.0393	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												177.0962 (107)
Space cooling per m2												1.5645 (108)
Energy for space heating												46.9112 (99)
Energy for space cooling												1.5645 (108)
Total												48.4757 (109)
Target Fabric Energy Efficiency (TFEE)												55.7 (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	56.6000 (1b)	x 2.3900 (2b)	= 135.2740 (1b) - (3b)
First floor	56.6000 (1c)	x 2.6700 (2c)	= 151.1220 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	113.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 286.3960 (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																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) =							0.1397 (8)
Pressure test										Yes							
Measured/design AP50																	4.0300
Infiltration rate																	0.3412 (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) =							0.2900 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
	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	0.3407	0.3190	0.3190	0.2900	0.2972	0.2827	0.2827	0.2755	0.2755	0.2972	0.2900	0.2972	(22b)				
Effective ac	0.5581	0.5509	0.5509	0.5420	0.5442	0.5400	0.5400	0.5379	0.5379	0.5442	0.5420	0.5442	(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)			21.3600	1.1450	24.4580		(27)
Ground Floor			56.6000	0.1200	6.7920	84.0000	4754.4000 (28a)
Brick and Block	155.8500	23.4800	132.3700	0.2400	31.7688	42.2200	5588.6614 (29a)
Pitched Roof	56.6000		56.6000	0.1000	5.6600	9.1000	515.0600 (30)
Total net area of external elements Aum(A, m ²)			269.0500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	71.0108		(33)
GF Block			73.3100			75.0000	5498.2500 (32c)
GF Stud			30.9100			9.0000	278.1900 (32c)
FF Stud			123.0200			9.0000	1107.1800 (32c)
Internal Floor 1			56.6000			18.0000	1018.8000 (32d)
Internal Ceiling 1			56.6000			18.0000	1018.8000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 19779.3414 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 174.7292 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.4937 (36)
Total fabric heat loss (33) + (36) = 77.5045 (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	52.7419	52.0638	52.0638	51.2293	51.4305	51.0331	51.0331	50.8418	50.8418	51.4305	51.2293	51.4305 (38)
Heat transfer coeff	130.2464	129.5683	129.5683	128.7338	128.9350	128.5376	128.5376	128.3463	128.3463	128.9350	128.7338	128.9350 (39)
Average = Sum(39)m / 12 =												128.9519 (39)
HLP	1.1506	1.1446	1.1446	1.1372	1.1390	1.1355	1.1355	1.1338	1.1338	1.1390	1.1372	1.1390 (40)
HLP (average)												1.1392 (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												2.8327 (42)
Average daily hot water use (litres/day)												101.4773 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	111.6251	107.5660	103.5069	99.4478	95.3887	91.3296	91.3296	95.3887	99.4478	103.5069	107.5660	111.6251 (44)
Energy conte	165.5368	144.7795	149.3995	130.2501	124.9781	107.8466	99.9357	114.6777	116.0473	135.2419	147.6271	160.3135 (45)
Energy content (annual)										Total = Sum(45)m =		1596.6337 (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	24.8305	21.7169	22.4099	19.5375	18.7467	16.1770	14.9904	17.2017	17.4071	20.2863	22.1441	24.0470 (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	27.5654	24.8962	27.5520	26.6424	27.5056	26.5896	27.4581	27.4889	26.6184	27.5284	26.6623	27.5572 (61)
Total heat required for water heating calculated for each month	193.1022	169.6757	176.9515	156.8925	152.4837	134.4362	127.3938	142.1666	142.6657	162.7703	174.2894	187.8707 (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	193.1022	169.6757	176.9515	156.8925	152.4837	134.4362	127.3938	142.1666	142.6657	162.7703	174.2894	187.8707 (64)
RHI water heating demand												
Heat gains from water heating, kWh/month	61.9323	54.3632	56.5633	49.9688	48.4316	42.5064	40.0931	45.0026	45.2403	51.8500	55.7516	60.1935 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1920.6982 (64)												
1921 (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	169.9638	169.9638	169.9638	169.9638	169.9638	169.9638	169.9638	169.9638	169.9638	169.9638	169.9638	169.9638 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	62.4046	55.4272	45.0765	34.1258	25.5094	21.5361	23.2705	30.2479	40.5987	51.5494	60.1658	64.1391 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	412.0533	416.3291	405.5542	382.6156	353.6598	326.4454	308.2645	303.9887	314.7636	337.7022	366.6580	393.8724 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.8291	54.8291	54.8291	54.8291	54.8291	54.8291	54.8291	54.8291	54.8291	54.8291	54.8291	54.8291 (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)	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092 (71)
Water heating gains (Table 5)	83.2424	80.8977	76.0260	69.4010	65.0962	59.0367	53.8886	60.4873	62.8338	69.6909	77.4328	80.9053 (72)
Total internal gains	672.1840	667.1378	641.1403	600.6262	558.7492	521.5019	499.9074	509.2077	532.6799	573.4262	618.7403	653.4005 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
North					0.9600	13.4684	0.6300	0.7000	0.7700		3.9515 (74)	
East					8.8900	25.1733	0.6300	0.7000	0.7700		68.3932 (76)	
South					2.8800	56.5862	0.6300	0.7000	0.7700		49.8052 (78)	
West					8.6300	25.1733	0.6300	0.7000	0.7700		66.3930 (80)	

Solar gains	188.5429	299.9740	475.7278	666.3136	751.1802	844.5954	774.8957	705.6978	567.7478	375.7251	231.1663	148.8095 (83)
Total gains	860.7269	967.1118	1116.8681	1266.9398	1309.9294	1366.0973	1274.8031	1214.9054	1100.4276	949.1514	849.9066	802.2100 (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	42.1836	42.4044	42.4044	42.6793	42.6127	42.7444	42.7444	42.8081	42.8081	42.6127	42.6793	42.6127
alpha	3.8122	3.8270	3.8270	3.8453	3.8408	3.8496	3.8496	3.8539	3.8539	3.8408	3.8453	3.8408
util living area	0.9769	0.9640	0.9252	0.8321	0.6841	0.4647	0.3295	0.3346	0.6029	0.8612	0.9565	0.9810 (86)
MIT	19.7318	19.8976	20.2337	20.6188	20.8663	20.9773	20.9955	20.9954	20.9396	20.6397	20.1445	19.7056 (87)
Th 2	19.9597	19.9646	19.9646	19.9705	19.9691	19.9720	19.9720	19.9733	19.9733	19.9691	19.9705	19.9691 (88)
util rest of house	0.9713	0.9555	0.9077	0.7948	0.6188	0.3772	0.2285	0.2290	0.5102	0.8190	0.9441	0.9763 (89)
MIT 2	18.8338	18.9994	19.3232	19.6825	19.8871	19.9631	19.9711	19.9725	19.9454	19.7101	19.2483	18.8157 (90)
Living area fraction									fLA = Living area / (4) =			0.1224 (91)
MIT	18.9437	19.1094	19.4347	19.7972	20.0070	20.0873	20.0965	20.0978	20.0672	19.8239	19.3580	18.9246 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9437	19.1094	19.4347	19.7972	20.0070	20.0873	20.0965	20.0978	20.0672	19.8239	19.3580	18.9246 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	829.8556	915.4553	1001.7382	997.9785	813.9635	529.0807	307.0574	293.9542	571.3775	770.7530	794.4801	778.1183 (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	1737.9714	1698.5605	1533.3990	1248.3511	890.5575	538.2210	308.0446	294.9088	599.0130	995.8849	1384.9188	1705.1170 (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	675.6382	526.2467	395.5556	180.2683	56.9859	0.0000	0.0000	0.0000	0.0000	167.4981	425.1159	689.6870 (98)
Space heating												3116.9956 (98)
RHI space heating demand												3117 (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	56.6000 (1b)	x 2.3900 (2b)	= 135.2740 (1b) - (3b)
First floor	56.6000 (1c)	x 2.6700 (2c)	= 151.1220 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	113.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 286.3960 (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																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) =							0.1397 (8)
Pressure test										Yes							
Measured/design AP50																	4.0300
Infiltration rate																	0.3412 (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) =							0.2900 (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)				
	0.3697	0.3625	0.3552	0.3190	0.3117	0.2755	0.2755	0.2682	0.2900	0.3117	0.3262	0.3407	(22b)				
Effective ac	0.5684	0.5657	0.5631	0.5509	0.5486	0.5379	0.5379	0.5360	0.5420	0.5486	0.5532	0.5581	(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)			21.3600	1.1450	24.4580			(27)					
Ground Floor			56.6000	0.1200	6.7920	84.0000	4754.4000	(28a)					
Brick and Block	155.8500	23.4800	132.3700	0.2400	31.7688	42.2200	5588.6614	(29a)					
Pitched Roof	56.6000		56.6000	0.1000	5.6600	9.1000	515.0600	(30)					
Total net area of external elements Aum(A, m2)			269.0500					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	71.0108			(33)					
GF Block			73.3100			75.0000	5498.2500	(32c)					
GF Stud			30.9100			9.0000	278.1900	(32c)					
FF Stud			123.0200			9.0000	1107.1800	(32c)					
Internal Floor 1			56.6000			18.0000	1018.8000	(32d)					
Internal Ceiling 1			56.6000			18.0000	1018.8000	(32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	19779.3414	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							174.7292	(35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.4937	(36)					
Total fabric heat loss						(33) + (36) =	77.5045	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 53.7155	Feb 53.4646	Mar 53.2187	Apr 52.0638	May 51.8477	Jun 50.8418	Jul 50.8418	Aug 50.6555	Sep 51.2293	Oct 51.8477	Nov 52.2849	Dec 52.7419	(38)
Heat transfer coeff	131.2200	130.9691	130.7232	129.5683	129.3522	128.3463	128.3463	128.1600	128.7338	129.3522	129.7894	130.2464	(39)
Average = Sum(39)m / 12 =												129.5673	(39)
HLP	Jan 1.1592	Feb 1.1570	Mar 1.1548	Apr 1.1446	May 1.1427	Jun 1.1338	Jul 1.1338	Aug 1.1322	Sep 1.1372	Oct 1.1427	Nov 1.1465	Dec 1.1506	(40)
HLP (average)												1.1446	(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												2.8327 (42)
Average daily hot water use (litres/day)												101.4773 (43)
Daily hot water use	Jan 111.6251	Feb 107.5660	Mar 103.5069	Apr 99.4478	May 95.3887	Jun 91.3296	Jul 91.3296	Aug 95.3887	Sep 99.4478	Oct 103.5069	Nov 107.5660	Dec 111.6251 (44)
Energy conte	165.5368	144.7795	149.3995	130.2501	124.9781	107.8466	99.9357	114.6777	116.0473	135.2419	147.6271	160.3135 (45)
Energy content (annual)										Total = Sum(45)m =		1596.6337 (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	24.8305	21.7169	22.4099	19.5375	18.7467	16.1770	14.9904	17.2017	17.4071	20.2863	22.1441	24.0470 (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	27.5654	24.8962	27.5520	26.6424	27.5056	26.5896	27.4581	27.4889	26.6184	27.5284	26.6623	27.5572 (61)
Total heat required for water heating calculated for each month	193.1022	169.6757	176.9515	156.8925	152.4837	134.4362	127.3938	142.1666	142.6657	162.7703	174.2894	187.8707 (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	193.1022	169.6757	176.9515	156.8925	152.4837	134.4362	127.3938	142.1666	142.6657	162.7703	174.2894	187.8707 (64)
Heat gains from water heating, kWh/month	61.9323	54.3632	56.5633	49.9688	48.4316	42.5064	40.0931	45.0026	45.2403	51.8500	55.7516	60.1935 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1920.6982 (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	169.9638	169.9638	169.9638	169.9638	169.9638	169.9638	169.9638	169.9638	169.9638	169.9638	169.9638	169.9638 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	62.4046	55.4272	45.0765	34.1258	25.5094	21.5361	23.2705	30.2479	40.5987	51.5494	60.1658	64.1391 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	412.0533	416.3291	405.5542	382.6156	353.6598	326.4454	308.2645	303.9887	314.7636	337.7022	366.6580	393.8724 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.8291	54.8291	54.8291	54.8291	54.8291	54.8291	54.8291	54.8291	54.8291	54.8291	54.8291	54.8291 (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)	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092 (71)
Water heating gains (Table 5)	83.2424	80.8977	76.0260	69.4010	65.0962	59.0367	53.8886	60.4873	62.8338	69.6909	77.4328	80.9053 (72)
Total internal gains	672.1840	667.1378	641.1403	600.6262	558.7492	521.5019	499.9074	509.2077	532.6799	573.4262	618.7403	653.4005 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
North	0.9600	10.6334	0.6300	0.7000	0.7700	3.1197 (74)
East	8.8900	19.6403	0.6300	0.7000	0.7700	53.3606 (76)
South	2.8800	46.7521	0.6300	0.7000	0.7700	41.1496 (78)
West	8.6300	19.6403	0.6300	0.7000	0.7700	51.8000 (80)

Solar gains	149.4299	279.0708	434.7625	607.3961	728.5631	740.6418	707.1235	616.6334	495.8786	323.8859	183.7478	124.6367 (83)
Total gains	821.6139	946.2086	1075.9029	1208.0223	1287.3122	1262.1437	1207.0310	1125.8410	1028.5585	897.3121	802.4881	778.0372 (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	41.8706	41.9508	42.0297	42.4044	42.4752	42.8081	42.8081	42.8703	42.6793	42.4752	42.3321	42.1836
alpha	3.7914	3.7967	3.8020	3.8270	3.8317	3.8539	3.8539	3.8580	3.8453	3.8317	3.8221	3.8122
util living area	0.9847	0.9731	0.9462	0.8818	0.7653	0.6012	0.4542	0.5022	0.7318	0.9178	0.9744	0.9874 (86)
MIT	19.4982	19.7088	20.0458	20.4521	20.7625	20.9316	20.9820	20.9735	20.8520	20.4310	19.8862	19.4542 (87)
Th 2	19.9528	19.9546	19.9563	19.9646	19.9661	19.9733	19.9733	19.9747	19.9705	19.9661	19.9630	19.9597 (88)
util rest of house	0.9812	0.9670	0.9338	0.8547	0.7139	0.5209	0.3542	0.3993	0.6579	0.8928	0.9675	0.9845 (89)
MIT 2	18.5971	18.8060	19.1360	19.5273	19.8023	19.9382	19.9674	19.9653	19.8842	19.5185	18.9898	18.5590 (90)
Living area fraction	18.7075	18.9165	19.2474	19.6405	19.9199	20.0598	20.0917	20.0887	20.0027	19.6302	19.0995	0.1224 (91)
MIT	18.7075	18.9165	19.2474	19.6405	19.9199	20.0598	20.0917	20.0887	20.0027	19.6302	19.0995	18.6686 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7075	18.9165	19.2474	19.6405	19.9199	20.0598	20.0917	20.0887	20.0027	19.6302	19.0995	18.6686 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9756	0.9592	0.9235	0.8449	0.7114	0.5281	0.3661	0.4112	0.6605	0.8828	0.9599	0.9796 (94)
Ext temp.	801.5256	907.5699	993.5829	1020.6197	915.7671	666.5008	441.9033	462.9602	679.3383	792.1894	770.3206	762.1407 (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	1890.5476	1835.7288	1666.3758	1391.6285	1063.2562	700.7448	448.1421	472.7484	759.8805	1168.0754	1557.4124	1884.4817 (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	810.2323	623.7228	500.5580	267.1263	109.7319	0.0000	0.0000	0.0000	0.0000	279.6592	566.7061	835.0217 (98)
Space heating per m2												3992.7583 (98)
(98) / (4) = 35.2717 (99)												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													90.7000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													4402.1591	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	810.2323	623.7228	500.5580	267.1263	109.7319	0.0000	0.0000	0.0000	0.0000	279.6592	566.7061	835.0217	(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)	893.3102	687.6767	551.8831	294.5163	120.9834	0.0000	0.0000	0.0000	0.0000	308.3343	624.8138	920.6414	(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	193.1022	169.6757	176.9515	156.8925	152.4837	134.4362	127.3938	142.1666	142.6657	162.7703	174.2894	187.8707	(64)	
Efficiency of water heater	90.1473	90.0863	89.9516	89.6434	89.0504	87.9000	87.9000	87.9000	87.9000	89.6494	90.0255	90.1724	(216)	
Fuel for water heating, kWh/month	214.2073	188.3479	196.7185	175.0184	171.2329	152.9422	144.9304	161.7367	162.3045	181.5632	193.6001	208.3460	(219)	
Water heating fuel used												2150.9482	(219)	
Annual totals kWh/year														
Space heating fuel - main system													4402.1591	(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)													440.8342	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.97 * 853 * 1.00) =										-661.9512			-661.9512	(233)
Total delivered energy for all uses													6406.9903	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4402.1591	3.4800	153.1951 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2150.9482	3.4800	74.8530 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	440.8342	13.1900	58.1460 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-661.9512	13.1900	-87.3114 (252)
Total energy cost			328.7753 (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] =	0.8729 (257)
SAP value		87.8237
SAP rating (Section 12)		88 (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	4402.1591	0.2160	950.8664 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2150.9482	0.2160	464.6048 (264)
Space and water heating			1415.4712 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	440.8342	0.5190	228.7929 (268)
Energy saving/generation technologies			
PV Unit	-661.9512	0.5190	-343.5527 (269)
Total kg/year			1339.6364 (272)
CO2 emissions per m2			11.8300 (273)
EI value			88.6529
EI rating			89 (274)
EI band			B

Calculation of stars for heating and DHW

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Calculation Type: New Build (As Built)



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Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9070 = 3.837$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9070 = 0.2381$, stars = 4
Water heating energy efficiency	$3.48 / 0.8919 = 3.902$, stars = 4
Water heating environmental impact	$0.216 / 0.8919 = 0.2422$, 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	56.6000 (1b)	x 2.3900 (2b)	= 135.2740 (1b) - (3b)
First floor	56.6000 (1c)	x 2.6700 (2c)	= 151.1220 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	113.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 286.3960 (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) = 0.1397 (8)
Pressure test					Yes
Measured/design AP50					4.0300
Infiltration rate					0.3412 (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) =	0.2900 (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	0.3407	0.3190	0.3190	0.2900	0.2972	0.2827	0.2827	0.2755	0.2755	0.2972	0.2900	0.2972 (22b)
Effective ac	0.5581	0.5509	0.5509	0.5420	0.5442	0.5400	0.5400	0.5379	0.5379	0.5442	0.5420	0.5442 (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)			21.3600	1.1450	24.4580		(27)
Ground Floor			56.6000	0.1200	6.7920	84.0000	4754.4000 (28a)
Brick and Block	155.8500	23.4800	132.3700	0.2400	31.7688	42.2200	5588.6614 (29a)
Pitched Roof	56.6000		56.6000	0.1000	5.6600	9.1000	515.0600 (30)
Total net area of external elements Aum(A, m ²)			269.0500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	71.0108		(33)
GF Block			73.3100			75.0000	5498.2500 (32c)
GF Stud			30.9100			9.0000	278.1900 (32c)
FF Stud			123.0200			9.0000	1107.1800 (32c)
Internal Floor 1			56.6000			18.0000	1018.8000 (32d)
Internal Ceiling 1			56.6000			18.0000	1018.8000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 19779.3414 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 174.7292 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.4937 (36)
Total fabric heat loss (33) + (36) = 77.5045 (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	52.7419	52.0638	52.0638	51.2293	51.4305	51.0331	51.0331	50.8418	50.8418	51.4305	51.2293	51.4305 (38)
Heat transfer coeff	130.2464	129.5683	129.5683	128.7338	128.9350	128.5376	128.5376	128.3463	128.3463	128.9350	128.7338	128.9350 (39)
Average = Sum(39)m / 12 =												128.9519 (39)
HLP	1.1506	1.1446	1.1446	1.1372	1.1390	1.1355	1.1355	1.1338	1.1338	1.1390	1.1372	1.1390 (40)
HLP (average)												1.1392 (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												2.8327 (42)
Average daily hot water use (litres/day)												101.4773 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	111.6251	107.5660	103.5069	99.4478	95.3887	91.3296	91.3296	95.3887	99.4478	103.5069	107.5660	111.6251 (44)
Energy conte	165.5368	144.7795	149.3995	130.2501	124.9781	107.8466	99.9357	114.6777	116.0473	135.2419	147.6271	160.3135 (45)
Energy content (annual)										Total = Sum(45)m =		1596.6337 (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	24.8305	21.7169	22.4099	19.5375	18.7467	16.1770	14.9904	17.2017	17.4071	20.2863	22.1441	24.0470 (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	27.5654	24.8962	27.5520	26.6424	27.5056	26.5896	27.4581	27.4889	26.6184	27.5284	26.6623	27.5572 (61)
Total heat required for water heating calculated for each month	193.1022	169.6757	176.9515	156.8925	152.4837	134.4362	127.3938	142.1666	142.6657	162.7703	174.2894	187.8707 (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	193.1022	169.6757	176.9515	156.8925	152.4837	134.4362	127.3938	142.1666	142.6657	162.7703	174.2894	187.8707 (64)
Heat gains from water heating, kWh/month	61.9323	54.3632	56.5633	49.9688	48.4316	42.5064	40.0931	45.0026	45.2403	51.8500	55.7516	60.1935 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1920.6982 (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	169.9638	169.9638	169.9638	169.9638	169.9638	169.9638	169.9638	169.9638	169.9638	169.9638	169.9638	169.9638 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	62.4046	55.4272	45.0765	34.1258	25.5094	21.5361	23.2705	30.2479	40.5987	51.5494	60.1658	64.1391 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	412.0533	416.3291	405.5542	382.6156	353.6598	326.4454	308.2645	303.9887	314.7636	337.7022	366.6580	393.8724 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.8291	54.8291	54.8291	54.8291	54.8291	54.8291	54.8291	54.8291	54.8291	54.8291	54.8291	54.8291 (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)	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092 (71)
Water heating gains (Table 5)	83.2424	80.8977	76.0260	69.4010	65.0962	59.0367	53.8886	60.4873	62.8338	69.6909	77.4328	80.9053 (72)
Total internal gains	672.1840	667.1378	641.1403	600.6262	558.7492	521.5019	499.9074	509.2077	532.6799	573.4262	618.7403	653.4005 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
North	0.9600	13.4684	0.6300	0.7000	0.7700	3.9515 (74)
East	8.8900	25.1733	0.6300	0.7000	0.7700	68.3932 (76)
South	2.8800	56.5862	0.6300	0.7000	0.7700	49.8052 (78)
West	8.6300	25.1733	0.6300	0.7000	0.7700	66.3930 (80)

Solar gains	188.5429	299.9740	475.7278	666.3136	751.1802	844.5954	774.8957	705.6978	567.7478	375.7251	231.1663	148.8095 (83)
Total gains	860.7269	967.1118	1116.8681	1266.9398	1309.9294	1366.0973	1274.8031	1214.9054	1100.4276	949.1514	849.9066	802.2100 (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	42.1836	42.4044	42.4044	42.6793	42.6127	42.7444	42.7444	42.8081	42.8081	42.6127	42.6793	42.6127
alpha	3.8122	3.8270	3.8270	3.8453	3.8408	3.8496	3.8496	3.8539	3.8539	3.8408	3.8453	3.8408
util living area	0.9769	0.9640	0.9252	0.8321	0.6841	0.4647	0.3295	0.3346	0.6029	0.8612	0.9565	0.9810 (86)
MIT	19.7318	19.8976	20.2337	20.6188	20.8663	20.9773	20.9955	20.9954	20.9396	20.6397	20.1445	19.7056 (87)
Th 2	19.9597	19.9646	19.9646	19.9705	19.9691	19.9720	19.9720	19.9733	19.9733	19.9691	19.9705	19.9691 (88)
util rest of house	0.9713	0.9555	0.9077	0.7948	0.6188	0.3772	0.2285	0.2290	0.5102	0.8190	0.9441	0.9763 (89)
MIT 2	18.8338	18.9994	19.3232	19.6825	19.8871	19.9631	19.9711	19.9725	19.9454	19.7101	19.2483	18.8157 (90)
Living area fraction									fLA = Living area / (4) =			0.1224 (91)
MIT	18.9437	19.1094	19.4347	19.7972	20.0070	20.0873	20.0965	20.0978	20.0672	19.8239	19.3580	18.9246 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9437	19.1094	19.4347	19.7972	20.0070	20.0873	20.0965	20.0978	20.0672	19.8239	19.3580	18.9246 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	829.8556	915.4553	1001.7382	997.9785	813.9635	529.0807	307.0574	293.9542	571.3775	770.7530	794.4801	778.1183 (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	1737.9714	1698.5605	1533.3990	1248.3511	890.5575	538.2210	308.0446	294.9088	599.0130	995.8849	1384.9188	1705.1170 (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	675.6382	526.2467	395.5556	180.2683	56.9859	0.0000	0.0000	0.0000	0.0000	167.4981	425.1159	689.6870 (98)
Space heating												3116.9956 (98)
Space heating per m2										(98) / (4) =		27.5353 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													90.7000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													3436.5994	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	675.6382	526.2467	395.5556	180.2683	56.9859	0.0000	0.0000	0.0000	0.0000	167.4981	425.1159	689.6870	(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)	744.9153	580.2059	436.1142	198.7522	62.8290	0.0000	0.0000	0.0000	0.0000	184.6726	468.7055	760.4046	(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	193.1022	169.6757	176.9515	156.8925	152.4837	134.4362	127.3938	142.1666	142.6657	162.7703	174.2894	187.8707	(64)	
Efficiency of water heater (217)m	90.0623	90.0010	89.8157	89.3752	88.6445	87.9000	87.9000	87.9000	87.9000	89.2981	89.8676	90.0857	(216)	
Fuel for water heating, kWh/month	214.4096	188.5264	197.0162	175.5437	172.0171	152.9422	144.9304	161.7367	162.3045	182.2775	193.9402	208.5467	(219)	
Water heating fuel used												2154.1911	(219)	
Annual totals kWh/year														
Space heating fuel - main system													3436.5994	(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)													440.8342	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.97 * 966 * 1.00) =										-749.4513			-749.4513	(233)
Total delivered energy for all uses													5357.1733	(238)

10a. Fuel costs - using BEDF prices (495)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3436.5994	3.6300	124.7486	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	2154.1911	3.6300	78.1971	(247)
Pumps and fans for heating	75.0000	19.4400	14.5800	(249)
Energy for lighting	440.8342	19.4400	85.6982	(250)
Additional standing charges			95.0000	(251)
Energy saving/generation technologies				
PV Unit	-749.4513	19.4400	-145.6933	(252)
Total energy cost			252.5305	(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	3436.5994	0.2160	742.3055	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2154.1911	0.2160	465.3053	(264)
Space and water heating			1207.6107	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	440.8342	0.5190	228.7929	(268)
Energy saving/generation technologies				
PV Unit	-749.4513	0.5190	-388.9652	(269)
Total kg/year			1086.3634	(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	3436.5994	1.2200	4192.6513	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2154.1911	1.2200	2628.1132	(264)
Space and water heating			6820.7644	(265)
Pumps and fans	75.0000	3.0700	230.2500	(267)
Energy for lighting	440.8342	3.0700	1353.3609	(268)
Energy saving/generation technologies				
PV Unit	-749.4513	3.0700	-2300.8155	(269)
Primary energy kWh/year			6103.5597	(272)
Primary energy kWh/m2/year			53.9184	(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 88
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	+ 1.0	-£ 28	-197 kg (18.1%)

		Typical annual savings	Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£28	1.74 kg/m²	B 89	B 90
Total Savings	£28	1.74 kg/m²		
Potential energy efficiency rating:			B 89	
Potential environmental impact rating:				B 90

Fuel prices for cost data on this page from database revision number 495 TEST (29 Apr 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	£100	£110	-£10
Mains gas	£298	£261	£37
Space heating	£234	£234	£0
Water heating	£78	£50	£28
Lighting	£86	£86	£0
Generated (PV)	-£146	-£146	£0
Total cost of fuels	£252	£225	£27
Total cost of uses	£252	£224	£28
Delivered energy	47 kWh/m²	39 kWh/m²	9 kWh/m²
Carbon dioxide emissions	1.1 tonnes	0.9 tonnes	0.2 tonnes
CO2 emissions per m²	10 kg/m²	8 kg/m²	2 kg/m²
Primary energy	54 kWh/m²	44 kWh/m²	10 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	56.6000 (1b)	x 2.3900 (2b)	= 135.2740 (1b) - (3b)
First floor	56.6000 (1c)	x 2.6700 (2c)	= 151.1220 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	113.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 286.3960 (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																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) =	0.1397 (8)
Pressure test										Yes							
Measured/design AP50										4.0300							
Infiltration rate										0.3412 (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) =					0.2900 (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	0.3697	0.3625	0.3552	0.3190	0.3117	0.2755	0.2755	0.2682	0.2900	0.3117	0.3262	0.3407	(22b)				
Effective ac	0.5684	0.5657	0.5631	0.5509	0.5486	0.5379	0.5379	0.5360	0.5420	0.5486	0.5532	0.5581	(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)			21.3600	1.1450	24.4580			(27)					
Ground Floor			56.6000	0.1200	6.7920	84.0000	4754.4000	(28a)					
Brick and Block	155.8500	23.4800	132.3700	0.2400	31.7688	42.2200	5588.6614	(29a)					
Pitched Roof	56.6000		56.6000	0.1000	5.6600	9.1000	515.0600	(30)					
Total net area of external elements Aum(A, m2)			269.0500					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	71.0108			(33)					
GF Block			73.3100			75.0000	5498.2500	(32c)					
GF Stud			30.9100			9.0000	278.1900	(32c)					
FF Stud			123.0200			9.0000	1107.1800	(32c)					
Internal Floor 1			56.6000			18.0000	1018.8000	(32d)					
Internal Ceiling 1			56.6000			18.0000	1018.8000	(32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	19779.3414	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							174.7292	(35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.4937	(36)					
Total fabric heat loss						(33) + (36) =	77.5045	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 53.7155	Feb 53.4646	Mar 53.2187	Apr 52.0638	May 51.8477	Jun 50.8418	Jul 50.8418	Aug 50.6555	Sep 51.2293	Oct 51.8477	Nov 52.2849	Dec 52.7419	(38)
Heat transfer coeff	131.2200	130.9691	130.7232	129.5683	129.3522	128.3463	128.3463	128.1600	128.7338	129.3522	129.7894	130.2464	(39)
Average = Sum(39)m / 12 =												129.5673	(39)
HLP	Jan 1.1592	Feb 1.1570	Mar 1.1548	Apr 1.1446	May 1.1427	Jun 1.1338	Jul 1.1338	Aug 1.1322	Sep 1.1372	Oct 1.1427	Nov 1.1465	Dec 1.1506	(40)
HLP (average)												1.1446	(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												2.8327 (42)
Average daily hot water use (litres/day)												101.4773 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	111.6251	107.5660	103.5069	99.4478	95.3887	91.3296	91.3296	95.3887	99.4478	103.5069	107.5660	111.6251 (44)
Energy conte	165.5368	144.7795	149.3995	130.2501	124.9781	107.8466	99.9357	114.6777	116.0473	135.2419	147.6271	160.3135 (45)
Energy content (annual)										Total = Sum(45)m =		1596.6337 (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	24.8305	21.7169	22.4099	19.5375	18.7467	16.1770	14.9904	17.2017	17.4071	20.2863	22.1441	24.0470 (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	27.5654	24.8962	27.5520	26.6424	27.5056	26.5896	27.4581	27.4889	26.6184	27.5284	26.6623	27.5572 (61)
Total heat required for water heating calculated for each month	193.1022	169.6757	176.9515	156.8925	152.4837	134.4362	127.3938	142.1666	142.6657	162.7703	174.2894	187.8707 (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												1.1359 (H8)
Utilisation factor												0.5854 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												101.4773 (H14)
Volume ratio Veff/V												0.7391 (H15)
Solar storage volume factor												0.9395 (H16)
Solar input	-25.4322	-42.4391	-72.2786	-96.8676	-119.6717	-117.6564	-116.1015	-101.4385	-79.4467	-54.2527	-30.1663	-877.0337 (H17)
Solar input (sum of months) = Sum (63)m =												-877.0337 (63)
Output from w/h	167.6700	127.2366	104.6728	60.0249	32.8119	16.7798	11.2923	40.7281	63.2190	108.5176	144.1231	166.5882 (64)
Total per year (kWh/year) = Sum (64)m =												1043.6644 (64)
Heat gains from water heating, kWh/month	61.9323	54.3632	56.5633	49.9688	48.4316	42.5064	40.0931	45.0026	45.2403	51.8500	55.7516	60.1935 (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	169.9638	169.9638	169.9638	169.9638	169.9638	169.9638	169.9638	169.9638	169.9638	169.9638	169.9638	169.9638	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	62.4046	55.4272	45.0765	34.1258	25.5094	21.5361	23.2705	30.2479	40.5987	51.5494	60.1658	64.1391	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	412.0533	416.3291	405.5542	382.6156	353.6598	326.4454	308.2645	303.9887	314.7636	337.7022	366.6580	393.8724	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.8291	54.8291	54.8291	54.8291	54.8291	54.8291	54.8291	54.8291	54.8291	54.8291	54.8291	54.8291	(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)	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	(71)
Water heating gains (Table 5)	83.2424	80.8977	76.0260	69.4010	65.0962	59.0367	53.8886	60.4873	62.8338	69.6909	77.4328	80.9053	(72)
Total internal gains	672.1840	667.1378	641.1403	600.6262	558.7492	521.5019	499.9074	509.2077	532.6799	573.4262	618.7403	653.4005	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W	
North	0.9600	10.6334	0.6300		0.7000	0.7700	3.1197 (74)	
East	8.8900	19.6403	0.6300		0.7000	0.7700	53.3606 (76)	
South	2.8800	46.7521	0.6300		0.7000	0.7700	41.1496 (78)	
West	8.6300	19.6403	0.6300		0.7000	0.7700	51.8000 (80)	

Solar gains	149.4299	279.0708	434.7625	607.3961	728.5631	740.6418	707.1235	616.6334	495.8786	323.8859	183.7478	124.6367 (83)
Total gains	821.6139	946.2086	1075.9029	1208.0223	1287.3122	1262.1437	1207.0310	1125.8410	1028.5585	897.3121	802.4881	778.0372 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	41.8706	41.9508	42.0297	42.4044	42.4752	42.8081	42.8081	42.8703	42.6793	42.4752	42.3321	42.1836	
alpha	3.7914	3.7967	3.8020	3.8270	3.8317	3.8539	3.8539	3.8580	3.8453	3.8317	3.8221	3.8122	
util living area	0.9847	0.9731	0.9462	0.8818	0.7653	0.6012	0.4542	0.5022	0.7318	0.9178	0.9744	0.9874 (86)	
MIT	19.4982	19.7088	20.0458	20.4521	20.7625	20.9316	20.9820	20.9735	20.8520	20.4310	19.8862	19.4542 (87)	
Th 2	19.9528	19.9546	19.9563	19.9646	19.9661	19.9733	19.9733	19.9747	19.9705	19.9661	19.9630	19.9597 (88)	
util rest of house	0.9812	0.9670	0.9338	0.8547	0.7139	0.5209	0.3542	0.3993	0.6579	0.8928	0.9675	0.9845 (89)	
MIT 2	18.5971	18.8060	19.1360	19.5273	19.8023	19.9382	19.9674	19.9653	19.8842	19.5185	18.9898	18.5590 (90)	
Living area fraction									fLA = Living area / (4) =			0.1224 (91)	
MIT	18.7075	18.9165	19.2474	19.6405	19.9199	20.0598	20.0917	20.0887	20.0027	19.6302	19.0995	18.6686 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.7075	18.9165	19.2474	19.6405	19.9199	20.0598	20.0917	20.0887	20.0027	19.6302	19.0995	18.6686 (93)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9756	0.9592	0.9235	0.8449	0.7114	0.5281	0.3661	0.4112	0.6605	0.8828	0.9599	0.9796	(94)
Useful gains	801.5256	907.5699	993.5829	1020.6197	915.7671	666.5008	441.9033	462.9602	679.3383	792.1894	770.3206	762.1407	(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	1890.5476	1835.7288	1666.3758	1391.6285	1063.2562	700.7448	448.1421	472.7484	759.8805	1168.0754	1557.4124	1884.4817	(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	810.2323	623.7228	500.5580	267.1263	109.7319	0.0000	0.0000	0.0000	0.0000	279.6592	566.7061	835.0217	(98)
Space heating												3992.7583	(98)
Space heating per m2											(98) / (4) =	35.2717	(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													4402.1591	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	810.2323	623.7228	500.5580	267.1263	109.7319	0.0000	0.0000	0.0000	0.0000	279.6592	566.7061	835.0217	(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)	893.3102	687.6767	551.8831	294.5163	120.9834	0.0000	0.0000	0.0000	0.0000	308.3343	624.8138	920.6414	(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	167.6700	127.2366	104.6728	60.0249	32.8119	16.7798	11.2923	40.7281	63.2190	108.5176	144.1231	166.5882	(64)	
Efficiency of water heater	90.2073	90.2131	90.2031	90.1730	90.0398	87.9000	87.9000	87.9000	87.9000	89.8994	90.1180	90.2220	(217)	
Fuel for water heating, kWh/month	185.8718	141.0400	116.0413	66.5664	36.4416	19.0897	12.8467	46.3346	71.9215	120.7100	159.9272	184.6426	(219)	
Water heating fuel used												1161.4335	(219)	
Annual totals kWh/year														
Space heating fuel - main system												4402.1591	(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)													440.8342	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.97 * 853 * 1.00) =										-661.9512		-661.9512	(233)	
Total delivered energy for all uses												5467.4755	(238)	

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4402.1591	3.4800	153.1951 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1161.4335	3.4800	40.4179 (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	440.8342	13.1900	58.1460 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-661.9512	13.1900	-87.3114 (252)
Total energy cost			300.9352 (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] =	0.7989 (257)
SAP value		88.8547
SAP rating (Section 12)		89 (258)
SAP band		B

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4402.1591	0.2160	950.8664	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1161.4335	0.2160	250.8696	(264)
Space and water heating			1201.7360	(265)
Pumps and fans	125.0000	0.5190	64.8750	(267)
Energy for lighting	440.8342	0.5190	228.7929	(268)
Energy saving/generation technologies				
PV Unit	-661.9512	0.5190	-343.5527	(269)
Total kg/year			1151.8512	(272)
CO2 emissions per m2			10.1800	(273)
EI value			90.2435	
EI rating			90	(274)
EI band			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	56.6000 (1b)	x 2.3900 (2b)	= 135.2740 (1b) - (3b)
First floor	56.6000 (1c)	x 2.6700 (2c)	= 151.1220 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	113.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 286.3960 (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) = 0.1397 (8)
Pressure test					Yes
Measured/design AP50					4.0300
Infiltration rate					0.3412 (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) =	0.2900 (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	0.3407	0.3190	0.3190	0.2900	0.2972	0.2827	0.2827	0.2755	0.2755	0.2972	0.2900	0.2972 (22b)
Effective ac	0.5581	0.5509	0.5509	0.5420	0.5442	0.5400	0.5400	0.5379	0.5379	0.5442	0.5420	0.5442 (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)			21.3600	1.1450	24.4580		(27)
Ground Floor			56.6000	0.1200	6.7920	84.0000	4754.4000 (28a)
Brick and Block	155.8500	23.4800	132.3700	0.2400	31.7688	42.2200	5588.6614 (29a)
Pitched Roof	56.6000		56.6000	0.1000	5.6600	9.1000	515.0600 (30)
Total net area of external elements Aum(A, m ²)			269.0500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	71.0108		(33)
GF Block			73.3100			75.0000	5498.2500 (32c)
GF Stud			30.9100			9.0000	278.1900 (32c)
FF Stud			123.0200			9.0000	1107.1800 (32c)
Internal Floor 1			56.6000			18.0000	1018.8000 (32d)
Internal Ceiling 1			56.6000			18.0000	1018.8000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	19779.3414 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							174.7292 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.4937 (36)
Total fabric heat loss						(33) + (36) =	77.5045 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	52.7419	52.0638	52.0638	51.2293	51.4305	51.0331	51.0331	50.8418	50.8418	51.4305	51.2293	51.4305 (38)
Average = Sum(39)m / 12 =	130.2464	129.5683	129.5683	128.7338	128.9350	128.5376	128.5376	128.3463	128.3463	128.9350	128.7338	128.9350 (39)
												128.9519 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1506	1.1446	1.1446	1.1372	1.1390	1.1355	1.1355	1.1338	1.1338	1.1390	1.1372	1.1390 (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												2.8327 (42)
Average daily hot water use (litres/day)												101.4773 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	111.6251	107.5660	103.5069	99.4478	95.3887	91.3296	91.3296	95.3887	99.4478	103.5069	107.5660	111.6251 (44)
Energy conte	165.5368	144.7795	149.3995	130.2501	124.9781	107.8466	99.9357	114.6777	116.0473	135.2419	147.6271	160.3135 (45)
Energy content (annual)										Total = Sum(45)m =		1596.6337 (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	24.8305	21.7169	22.4099	19.5375	18.7467	16.1770	14.9904	17.2017	17.4071	20.2863	22.1441	24.0470 (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	27.5654	24.8962	27.5520	26.6424	27.5056	26.5896	27.4581	27.4889	26.6184	27.5284	26.6623	27.5572 (61)
Total heat required for water heating calculated for each month	193.1022	169.6757	176.9515	156.8925	152.4837	134.4362	127.3938	142.1666	142.6657	162.7703	174.2894	187.8707 (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												1.2690 (H8)
Utilisation factor												0.5453 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												101.4773 (H14)
Volume ratio Veff/V												0.7391 (H15)
Solar storage volume factor												0.9395 (H16)
Solar input	-29.7814	-42.3524	-73.4924	-98.8596	-114.8816	-124.9578	-118.4791	-108.0414	-84.5638	-58.4475	-35.2246	-912.6627 (H17)
Solar input (sum of months) = Sum (63)m =												-912.6627 (63)
Output from w/h	163.3208	127.3233	103.4591	58.0329	37.6021	9.4784	8.9147	34.1252	58.1019	104.3229	139.0649	164.2893 (64)
Total per year (kWh/year) = Sum (64)m =												1008.0354 (64)
Heat gains from water heating, kWh/month	61.9323	54.3632	56.5633	49.9688	48.4316	42.5064	40.0931	45.0026	45.2403	51.8500	55.7516	60.1935 (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	169.9638	169.9638	169.9638	169.9638	169.9638	169.9638	169.9638	169.9638	169.9638	169.9638	169.9638	169.9638	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	62.4046	55.4272	45.0765	34.1258	25.5094	21.5361	23.2705	30.2479	40.5987	51.5494	60.1658	64.1391	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	412.0533	416.3291	405.5542	382.6156	353.6598	326.4454	308.2645	303.9887	314.7636	337.7022	366.6580	393.8724	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.8291	54.8291	54.8291	54.8291	54.8291	54.8291	54.8291	54.8291	54.8291	54.8291	54.8291	54.8291	(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)	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	-113.3092	(71)
Water heating gains (Table 5)	83.2424	80.8977	76.0260	69.4010	65.0962	59.0367	53.8886	60.4873	62.8338	69.6909	77.4328	80.9053	(72)
Total internal gains	672.1840	667.1378	641.1403	600.6262	558.7492	521.5019	499.9074	509.2077	532.6799	573.4262	618.7403	653.4005	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
North	0.9600	13.4684	0.6300	0.7000	0.7700	3.9515 (74)
East	8.8900	25.1733	0.6300	0.7000	0.7700	68.3932 (76)
South	2.8800	56.5862	0.6300	0.7000	0.7700	49.8052 (78)
West	8.6300	25.1733	0.6300	0.7000	0.7700	66.3930 (80)

Solar gains	188.5429	299.9740	475.7278	666.3136	751.1802	844.5954	774.8957	705.6978	567.7478	375.7251	231.1663	148.8095 (83)
Total gains	860.7269	967.1118	1116.8681	1266.9398	1309.9294	1366.0973	1274.8031	1214.9054	1100.4276	949.1514	849.9066	802.2100 (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	42.1836	42.4044	42.4044	42.6793	42.6127	42.7444	42.7444	42.8081	42.8081	42.6127	42.6793	42.6127
alpha	3.8122	3.8270	3.8270	3.8453	3.8408	3.8496	3.8496	3.8539	3.8539	3.8408	3.8453	3.8408
util living area	0.9769	0.9640	0.9252	0.8321	0.6841	0.4647	0.3295	0.3346	0.6029	0.8612	0.9565	0.9810 (86)
MIT	19.7318	19.8976	20.2337	20.6188	20.8663	20.9773	20.9955	20.9954	20.9396	20.6397	20.1445	19.7056 (87)
Th 2	19.9597	19.9646	19.9646	19.9705	19.9691	19.9720	19.9720	19.9733	19.9733	19.9691	19.9705	19.9691 (88)
util rest of house	0.9713	0.9555	0.9077	0.7948	0.6188	0.3772	0.2285	0.2290	0.5102	0.8190	0.9441	0.9763 (89)
MIT 2	18.8338	18.9994	19.3232	19.6825	19.8871	19.9631	19.9711	19.9725	19.9454	19.7101	19.2483	18.8157 (90)
Living area fraction									fLA = Living area / (4) =			0.1224 (91)
MIT	18.9437	19.1094	19.4347	19.7972	20.0070	20.0873	20.0965	20.0978	20.0672	19.8239	19.3580	18.9246 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9437	19.1094	19.4347	19.7972	20.0070	20.0873	20.0965	20.0978	20.0672	19.8239	19.3580	18.9246 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9641	0.9466	0.8969	0.7877	0.6214	0.3873	0.2409	0.2420	0.5192	0.8120	0.9348	0.9700 (94)
Useful gains	829.8556	915.4553	1001.7382	997.9785	813.9635	529.0807	307.0574	293.9542	571.3775	770.7530	794.4801	778.1183 (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	1737.9714	1698.5605	1533.3990	1248.3511	890.5575	538.2210	308.0446	294.9088	599.0130	995.8849	1384.9188	1705.1170 (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	675.6382	526.2467	395.5556	180.2683	56.9859	0.0000	0.0000	0.0000	0.0000	167.4981	425.1159	689.6870 (98)
Space heating												3116.9956 (98)
Space heating per m2												27.5353 (99)
										(98) / (4) =		

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	90.7000	(206)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	3436.5994	(211)

[illegible][illegible]

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)		440.8342 (232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV Unit 0 (0.80 * 0.97 * 966 * 1.00) =	-749.4513	-749.4513 (233)
Total delivered energy for all uses		4375.7449 (238)

10a. Fuel costs - using BEDF prices (495)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3436.5994	3.6300	124.7486 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1122.7627	3.6300	40.7563 (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	440.8342	19.4400	85.6982 (250)
Additional standing charges			95.0000 (251)
Energy saving/generation technologies			
PV Unit	-749.4513	19.4400	-145.6933 (252)
Total energy cost			224.8097 (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	3436.5994	0.2160	742.3055 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1122.7627	0.2160	242.5167 (264)
Space and water heating			984.8222 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	440.8342	0.5190	228.7929 (268)
Energy saving/generation technologies			
PV Unit	-749.4513	0.5190	-388.9652 (269)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Total kg/year 889.5249 (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	3436.5994	1.2200	4192.6513 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1122.7627	1.2200	1369.7705 (264)
Space and water heating			5562.4217 (265)
Pumps and fans	125.0000	3.0700	383.7500 (267)
Energy for lighting	440.8342	3.0700	1353.3609 (268)
Energy saving/generation technologies			
PV Unit	-749.4513	3.0700	-2300.8155 (269)
Primary energy kWh/year			4998.7171 (272)
Primary energy kWh/m2/year			44.1583 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Plot 14	Issued on Date	06/06/2022
Assessment Reference	As Built	Prop Type Ref	E
Project	15 Oram Way, West End, Southampton, SO30 3JW		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	13.46	TER	17.19
Environmental	89 B	% DER<TER	21.71		
CO ₂ Emissions (t/year)	1.09	DFEE	45.24	TFEE	55.75
General Requirements Compliance	Pass	% DFEE<TFEE	18.84		

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 14	Issued on Date	06/06/2022
Assessment Reference	As Built	Prop Type Ref	E
Project	15 Oram Way, West End, Southampton, SO30 3JW		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	13.46	TER	17.19
Environmental	89 B	% DER<TER	21.71		
CO ₂ Emissions (t/year)	1.09	DFEE	45.24	TFEE	55.75
General Requirements Compliance	Pass	% DFEE<TFEE	18.84		

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/m ² K	Kappa: 42.22 kJ/m ² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Plot 14	Issued on Date	06/06/2022
Assessment Reference	As Built	Prop Type Ref	E
Project	15 Oram Way, West End, Southampton, SO30 3JW		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	13.46	TER	17.19
Environmental	89 B	% DER<TER	21.71		
CO ₂ Emissions (t/year)	1.09	DFEE	45.24	TFEE	55.75
General Requirements Compliance	Pass	% DFEE<TFEE	18.84		

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 = 56.60 m², Perimeter = 30.80 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		
	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 14				Issued on Date	06/06/2022
Assessment Reference	As Built		Prop Type Ref	E		
Property	15 Oram Way, West End, Southampton, SO30 3JW					
SAP Rating	88 B		DER	13.46	TER	17.19
Environmental	89 B		% DER<TER	21.71		
CO ₂ Emissions (t/year)	1.09		DFEE	45.24	TFEE	55.75
General Requirements Compliance	Pass		% DFEE<TFEE	18.84		
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, 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:	30.80 m	56.60 m ²	2.39 m
	1st Storey:	30.80 m	56.60 m ²	2.67 m

7.0 Living Area	13.86	m ²
8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	174.73	kJ/m ² K

9.0 External Walls							
Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)	
Brick and Block	Cavity Wall	Other	0.24	42.22	155.85	132.37	

9.1 Party Walls						
Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)	
		Single plasterboard on dabs on both sides, dense blocks, cavity or cavity fill		70.00		

9.2 Internal Walls					
Description	Construction		Kappa (kJ/m ² K)	Area (m ²)	
GF Block	Dense block, plasterboard on dabs		75.00	73.31	
GF Stud	Plasterboard on timber frame		9.00	30.91	
FF Stud	Plasterboard on timber frame		9.00	123.02	

10.0 External Roofs						
Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Pitched Roof	External Plane Roof	Other	0.10	9.10	56.60	56.60

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	56.60

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	56.60

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	56.60

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 Shaded	Window	[1] Brick and Block	East	None	0.69	Yes				1.86	
Front Elevation	Window	[1] Brick and Block	East	None	0.00					7.03	
Side Elevation	Window	[1] Brick and Block	South	None	0.00					2.88	
Rear Elevation	Window	[1] Brick and Block	West	None	0.00					8.63	
Side Elevation	Window	[1] Brick and Block	North	None	0.00					0.96	

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)	1.89	0.093	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	0.92	0.070	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)	7.08	0.064	No	Birtley Supatherm
Independently assessed	E3 Sill	15.88	0.021	No	Knauf P5
Independently assessed	E4 Jamb	37.80	0.016	No	Knauf P6
Independently assessed	E5 Ground floor (normal)	30.80	0.052	No	CD0022
Independently assessed	E6 Intermediate floor within a dwelling	30.80	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	13.94	0.060	No	
Independently assessed	E12 Gable (insulation at ceiling level)	16.86	0.054	No	CD0031
Independently assessed	E16 Corner (normal)	25.25	0.050	No	CD0035
Independently assessed	E17 Corner (inverted – internal area greater than external area)	5.05	-0.065	No	CD0036

Y-value	0.024	W/m²K
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18.0 Pressure Testing

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

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

As Built AP₅₀

4.03

m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather

Windows half open

Cross ventilation possible

Yes

Night Ventilation

Yes

Air change rate

4.00

Mechanical Ventilation

Mechanical Ventilation System Present

No

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

23

Total number of L.E.L. fittings

23

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

	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	

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

25.0 Main Heating 2

Community Heating

28.0 Water Heating

Water Heating

Flue Gas Heat Recovery System

Waste Water Heat Recovery Instantaneous System 1

Waste Water Heat Recovery Instantaneous System 2

Waste Water Heat Recovery Storage System

Solar Panel

Water use <= 125 litres/person/day

SAP Code

29.0 Hot Water Cylinder

32.0 Photovoltaic Unit

PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
0.97	West	45°	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	£28	B 89	