



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 11 Oram Way
West End, Southampton, SO30 3JW

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

Report Issue Date: 09/05/2022

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Plot 11	Issued on Date	09/05/2022
Assessment Reference	As Built	Prop Type Ref	K
Property	11 Oram Way, West End, Southampton, SO30 3JW		
SAP Rating	89 B	DER	12.12
Environmental	89 B	TER	15.43
CO ₂ Emissions (t/year)	1.18	% DER<TER	21.44
General Requirements Compliance	Pass	DfEE	42.93
		TfEE	51.85
		% DfEE<TfEE	17.20
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com		Assessor ID
			E477-0001
Client	Foreman Homes, FORE		

SUMMARY FOR INPUT DATA FOR New Build (As 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)	15.43	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	12.12	kgCO ₂ /m ²	Pass
	-3.31 (-21.5%)	kgCO ₂ /m ²	

1b TfEE and DfEE

Target Fabric Energy Efficiency (TfEE)	51.85	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DfEE)	42.93	kWh/m ² /yr	
	-8.9 (-17.2%)	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	3.97 (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

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Main heating system

Boiler system with radiators or underfloor - Mains gas
Data from database
Worcester Greenstar 4000 GR4700iW 15 S NG

Efficiency: 89.8% SEDBUK2009
Minimum: 88.0%

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

Measured cylinder loss: 1.73 kWh/day
Permitted by DBSCG 2.33

Pass

Primary pipework insulated

Yes

Pass

6 Controls

Space heating controls

Programmer, room thermostat and TRVs

Pass

Hot water controls

Cylinderstat

Pass

Independent timer for DHW

Pass

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100 %

Minimum

75 %

Pass

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Southern England)

Slight

Pass

Based on:

Overshading

Average

Windows facing North

6.58 m², Overhang twice as wide as window, ratio 0.46

Windows facing East

1.26 m², No overhang

Windows facing South

14.81 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

3.97 (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	0.033	W/m ² K
Air permeability	4.0	m ³ /m ² h
Photovoltaic array	1.11	kW

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THERMAL BRIDGING

Calculation Type: New Build (As Built)

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SAP Rating	89 B	DER	12.12	TER	15.43
Environmental	89 B	% DER<TER	21.44		
CO ₂ Emissions (t/year)	1.18	DFEE	42.93	TFEE	51.85
General Requirements Compliance	Pass	% DFEE<TFEE	17.20		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com	Assessor ID	E477-0001
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Client	Foreman Homes, FORE
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	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.093	0.63	0.06	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.070	2.75	0.19	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.067	7.20	0.48	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.070	2.92	0.20	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.059	2.77	0.16	Birtley Supatherm
External wall	E3 Sill	Independently assessed	0.021	10.57	0.22	Knauf P5
External wall	E4 Jamb	Independently assessed	0.016	36.60	0.59	Knauf P6
External wall	E5 Ground floor (normal)	Table K1 - Approved	0.160	35.55	5.69	
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	32.97	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	20.68	1.24	
External wall	E24 Eaves (insulation at ceiling level - inverted)	Independently assessed	0.151	3.14	0.47	Knauf P19
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.044	17.98	0.79	Knauf P21
External wall	E16 Corner (normal)	Independently assessed	0.039	29.64	1.16	Knauf P23
External wall	E17 Corner (inverted – internal area greater than external area)	Independently assessed	-0.091	9.54	-0.87	Knauf P24

Total: **10.39** W/mK:
Y-Value: **0.033** W/m²K:

FULL SAP CALCULATION PRINTOUT

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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 137 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) 15.43 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 12.12 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)51.8 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)42.9 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: 3.97 (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 4000 GR4700iW 15 S NG

Efficiency: 89.8% SEDBUK2009

Minimum: 88.0% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage Measured cylinder loss: 1.73 kWh/day

Permitted by DBSCG 2.33 OK

Primary pipework insulated: Yes OK

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls: Cylinderstat OK

Independent timer for DHW OK

Boiler interlock Yes OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%

Minimum 75% OK

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Southern England): Slight OK

Based on:

Overshading: Average

Windows facing North: 6.58 m², Overhang twice as wide as window, ratio 0.46

Windows facing East: 1.26 m², No overhang

Windows facing South: 14.81 m², No overhang

Air change rate: 4.00 ach

Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K

Roof U-value 0.10 W/m²K

Floor U-value 0.12 W/m²K

Door U-value 1.10 W/m²K

Thermal bridging y-value 0.033 W/m²K

Air permeability 4.0 m³/m²h

Photovoltaic array 1.11 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	69.3900 (1b)	x 2.3900 (2b)	= 165.8421 (1b) - (3b)
First floor	67.8400 (1c)	x 2.6400 (2c)	= 179.0976 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.2300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 344.9397 (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					5 * 10 = 50.0000 (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) =					50.0000 / (5) = 0.1450 (8)
Pressure test					Yes
Measured/design AP50					3.9700
Infiltration rate					0.3435 (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) =	0.2919 (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	0.3722	0.3649	0.3576	0.3211	0.3138	0.2773	0.2773	0.2700	0.2919	0.3138	0.3284	0.3430 (22b)
Effective ac	0.5693	0.5666	0.5639	0.5516	0.5492	0.5385	0.5385	0.5365	0.5426	0.5492	0.5539	0.5588 (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)			22.6500	1.1450	25.9351		(27)
Ground Floor			69.3900	0.1200	8.3268	84.0000	5828.7600 (28a)
Brick and Block	172.0100	24.7700	147.2400	0.2400	35.3376	42.2200	6216.4728 (29a)
Pitched Roof	69.3900		69.3900	0.1000	6.9390	9.1000	631.4490 (30)
Total net area of external elements Aum(A, m ²)			310.7900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	78.8705		(33)
GF Block			61.5800			75.0000	4618.5000 (32c)
GF Stud			44.6900			9.0000	402.2100 (32c)
FF Stud			157.6400			9.0000	1418.7600 (32c)
Internal Floor 1			67.8400			18.0000	1221.1200 (32d)
Internal Ceiling 1			67.8400			18.0000	1221.1200 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 21558.3918 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 157.0968 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.3908 (36)
Total fabric heat loss (33) + (36) = 89.2613 (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	64.8004	64.4942	64.1940	62.7843	62.5206	61.2928	61.2928	61.0654	61.7657	62.5206	63.0541	63.6120 (38)
Heat transfer coeff	154.0617	153.7555	153.4553	152.0456	151.7819	150.5540	150.5540	150.3267	151.0270	151.7819	152.3154	152.8733 (39)
Average = Sum(39)m / 12 =												152.0443 (39)
HLP	1.1227	1.1204	1.1182	1.1080	1.1060	1.0971	1.0971	1.0954	1.1005	1.1060	1.1099	1.1140 (40)
HLP (average)												1.1080 (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												2.9116 (42)
Average daily hot water use (litres/day)												103.3509 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	113.6860	109.5520	105.4179	101.2839	97.1499	93.0158	93.0158	97.1499	101.2839	105.4179	109.5520	113.6860 (44)
Energy conte	168.5931	147.4526	152.1578	132.6549	127.2855	109.8377	101.7808	116.7950	118.1899	137.7389	150.3528	163.2734 (45)
Energy content (annual)										Total = Sum(45)m =		1626.1122 (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	25.2890	22.1179	22.8237	19.8982	19.0928	16.4757	15.2671	17.5192	17.7285	20.6608	22.5529	24.4910	(46)
Water storage loss:													
Store volume													215.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.7300 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.9342 (55)
Total storage loss													
28.9602 26.1576 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 28.0260 28.9602 28.0260 28.9602 28.0260 28.9602 (56)													
If cylinder contains dedicated solar storage													
28.9602 26.1576 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 28.0260 28.9602 28.0260 28.9602 28.0260 28.9602 (57)													
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month													
220.8157 194.6214 204.3804 183.1929 179.5081 160.3757 154.0034 169.0176 168.7279 189.9615 200.8908 215.4960 (62)													
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =													0.0000 (63)
Output from w/h													
220.8157 194.6214 204.3804 183.1929 179.5081 160.3757 154.0034 169.0176 168.7279 189.9615 200.8908 215.4960 (64)													
Total per year (kWh/year) = Sum(64)m =													2240.9912 (64)
Heat gains from water heating, kWh/month													
97.8353 86.7630 92.3706 84.5382 84.1005 76.9514 75.6202 80.6124 79.7285 87.5763 90.4227 96.0665 (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	145.5809	145.5809	145.5809	145.5809	145.5809	145.5809	145.5809	145.5809	145.5809	145.5809	145.5809	145.5809	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
28.3123 25.1468 20.4507 15.4825 11.5734 9.7707 10.5576 13.7232 18.4192 23.3874 27.2966 29.0992 (67)													
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
306.2400 309.4178 301.4098 284.3617 262.8416 242.6158 229.1036 225.9258 233.9338 250.9819 272.5020 292.7278 (68)													
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
37.5581 37.5581 37.5581 37.5581 37.5581 37.5581 37.5581 37.5581 37.5581 37.5581 37.5581 37.5581 37.5581 (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	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)													
-116.4647 -116.4647 -116.4647 -116.4647 -116.4647 -116.4647 -116.4647 -116.4647 -116.4647 -116.4647 -116.4647 -116.4647 -116.4647 (71)													
Water heating gains (Table 5)													
131.4990 129.1116 124.1540 117.4141 113.0383 106.8770 101.6400 108.3500 110.7341 117.7100 125.5871 129.1216 (72)													
Total internal gains	535.7256	533.3504	515.6887	486.9326	457.1276	428.9377	410.9756	417.6733	432.7614	461.7536	495.0599	520.6229	(73)

6. Solar gains

[Jan]														
	Area m2				Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W	
North	6.5800				10.6334		0.6300		0.7000		0.7700		21.3830 (74)	
East	1.2600				19.6403		0.6300		0.7000		0.7700		7.5629 (76)	
South	14.8100				46.7521		0.6300		0.7000		0.7700		211.6059 (78)	
Solar gains	240.5518	402.2146	535.2535	646.0050	713.7185	705.7788	681.4874	630.3636	572.9716	439.9915	286.6339	206.8923	(83)	
Total gains	776.2774	935.5651	1050.9423	1132.9376	1170.8461	1134.7166	1092.4630	1048.0369	1005.7330	901.7451	781.6938	727.5152	(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	38.8704	38.9478	39.0240	39.3858	39.4543	39.7760	39.7760	39.8362	39.6515	39.4543	39.3161	39.1726	
alpha	3.5914	3.5965	3.6016	3.6257	3.6303	3.6517	3.6517	3.6557	3.6434	3.6303	3.6211	3.6115	
util living area	0.9905	0.9810	0.9634	0.9259	0.8507	0.7168	0.5638	0.6024	0.7983	0.9393	0.9827	0.9924	(86)
MIT	19.2395	19.4789	19.8152	20.2253	20.5927	20.8524	20.9543	20.9409	20.7652	20.2830	19.6791	19.1941	(87)
Th 2	19.9824	19.9842	19.9860	19.9943	19.9959	20.0032	20.0032	20.0046	20.0004	19.9959	19.9927	19.9894	(88)
util rest of house													
0.9884 0.9769 0.9551 0.9078 0.8116 0.6404 0.4528 0.4935 0.7349 0.9209 0.9783 0.9908 (89)													
MIT 2	18.3733	18.6119	18.9447	19.3494	19.6931	19.9180	19.9859	19.9804	19.8512	19.4120	18.8187	18.3335	(90)
Living area fraction													
fLA = Living area / (4) =													0.1323 (91)
MIT	18.4879	18.7266	19.0599	19.4653	19.8121	20.0416	20.1140	20.1075	19.9721	19.5273	18.9325	18.4474	(92)
Temperature adjustment													0.0000
adjusted MIT	18.4879	18.7266	19.0599	19.4653	19.8121	20.0416	20.1140	20.1075	19.9721	19.5273	18.9325	18.4474	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.9842 0.9701 0.9455 0.8963 0.8033 0.6437 0.4660 0.5057 0.7328 0.9101 0.9719 0.9872 (94)													
Useful gains	764.0149	907.5596	993.6341	1015.4247	940.5513	730.4123	509.0466	529.9487	737.0138	820.6628	759.7333	718.2215	(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													
2185.8153 2125.9143 1927.3865 1606.4072 1231.2772 819.2606 529.0498 557.3337 886.8493 1354.9972 1802.2749 2178.0396 (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													
1057.8195 818.7344 694.7118 425.5074 216.3000 0.0000 0.0000 0.0000 0.0000 397.5448 750.6299 1086.1047 (98)													
Space heating													5447.3524 (98)
Space heating per m2													(98) / (4) = 39.6951 (99)

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	69.3900 (1b)	x 2.3900 (2b)	= 165.8421 (1b) - (3b)
First floor	67.8400 (1c)	x 2.6400 (2c)	= 179.0976 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.2300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 344.9397 (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) =	0.1160 (8)
Pressure test										Yes							
Measured/design AP50										5.0000							
Infiltration rate										0.3660 (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) =					0.3111 (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	0.3966	0.3888	0.3811	0.3422	0.3344	0.2955	0.2955	0.2877	0.3111	0.3344	0.3500	0.3655 (22b)					
Effective ac	0.5787	0.5756	0.5726	0.5585	0.5559	0.5437	0.5437	0.5414	0.5484	0.5559	0.5612	0.5668 (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)			22.6500	1.3258	30.0284		(27)					
Ground Floor			69.3900	0.1300	9.0207		(28a)					
Brick and Block	172.0100	24.7700	147.2400	0.1800	26.5032		(29a)					
Pitched Roof	69.3900		69.3900	0.1300	9.0207		(30)					
Total net area of external elements Aum(A, m2)			310.7900				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		76.6930		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.7422 (36)					
Total fabric heat loss						(33) + (36) =	90.4352 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 65.8678	Feb 65.5202	Mar 65.1794	Apr 63.5789	May 63.2794	Jun 61.8854	Jul 61.8854	Aug 61.6272	Sep 62.4223	Oct 63.2794	Nov 63.8852	Dec 64.5185 (38)
Heat transfer coeff	156.3030	155.9554	155.6146	154.0141	153.7146	152.3206	152.3206	152.0624	152.8575	153.7146	154.3204	154.9538 (39)
Average = Sum(39)m / 12 =												154.0126 (39)
HLP	Jan 1.1390	Feb 1.1365	Mar 1.1340	Apr 1.1223	May 1.1201	Jun 1.1100	Jul 1.1100	Aug 1.1081	Sep 1.1139	Oct 1.1201	Nov 1.1245	Dec 1.1292 (40)
HLP (average)												1.1223 (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												2.9116 (42)
Average daily hot water use (litres/day)												103.3509 (43)
Daily hot water use	Jan 113.6860	Feb 109.5520	Mar 105.4179	Apr 101.2839	May 97.1499	Jun 93.0158	Jul 93.0158	Aug 97.1499	Sep 101.2839	Oct 105.4179	Nov 109.5520	Dec 113.6860 (44)
Energy conte	168.5931	147.4526	152.1578	132.6549	127.2855	109.8377	101.7808	116.7950	118.1899	137.7389	150.3528	163.2734 (45)
Energy content (annual)										Total = Sum(45)m =		1626.1122 (45)
Distribution loss (46)m = 0.15 x (45)m												
	25.2890	22.1179	22.8237	19.8982	19.0928	16.4757	15.2671	17.5192	17.7285	20.6608	22.5529	24.4910 (46)
Water storage loss:												
Store volume												215.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7258 (48)
Temperature factor from Table 2b												0.5400 (49)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Enter (49) or (54) in (55)													0.9319 (55)
Total storage loss	28.8896	26.0938	28.8896	27.9576	28.8896	27.9576	28.8896	28.8896	27.9576	28.8896	27.9576	28.8896	(56)
If cylinder contains dedicated solar storage	28.8896	26.0938	28.8896	27.9576	28.8896	27.9576	28.8896	28.8896	27.9576	28.8896	27.9576	28.8896	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month	220.7450	194.5575	204.3098	183.1245	179.4375	160.3074	153.9328	168.9469	168.6595	189.8908	200.8224	215.4253	(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	220.7450	194.5575	204.3098	183.1245	179.4375	160.3074	153.9328	168.9469	168.6595	189.8908	200.8224	215.4253	(64)
Heat gains from water heating, kWh/month	97.7788	86.7120	92.3140	84.4835	84.0440	76.8967	75.5637	80.5559	79.6738	87.5197	90.3680	96.0100	(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	145.5809	145.5809	145.5809	145.5809	145.5809	145.5809	145.5809	145.5809	145.5809	145.5809	145.5809	145.5809	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.3123	25.1468	20.4507	15.4825	11.5734	9.7707	10.5576	13.7232	18.4192	23.3874	27.2966	29.0992	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	306.2400	309.4178	301.4098	284.3617	262.8416	242.6158	229.1036	225.9258	233.9338	250.9819	272.5020	292.7278	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5581	37.5581	37.5581	37.5581	37.5581	37.5581	37.5581	37.5581	37.5581	37.5581	37.5581	37.5581	(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)	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647	(71)
Water heating gains (Table 5)	131.4231	129.0357	124.0780	117.3381	112.9624	106.8010	101.5641	108.2740	110.6581	117.6341	125.5111	129.0456	(72)
Total internal gains	535.6496	533.2745	515.6128	486.8566	457.0516	428.8618	410.8996	417.5973	432.6854	461.6776	494.9839	520.5470	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
North					6.5800	10.6334	0.6300	0.7000			0.7700			21.3830 (74)
East					1.2600	19.6403	0.6300	0.7000			0.7700			7.5629 (76)
South					14.8100	46.7521	0.6300	0.7000			0.7700			211.6059 (78)
Solar gains	240.5518	402.2146	535.2535	646.0050	713.7185	705.7788	681.4874	630.3636	572.9716	439.9915	286.6339			206.8923 (83)
Total gains	776.2014	935.4891	1050.8663	1132.8616	1170.7701	1134.6406	1092.3870	1047.9609	1005.6570	901.6691	781.6178			727.4392 (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	60.9704	61.1063	61.2401	61.8766	61.9971	62.5645	62.5645	62.6707	62.3447	61.9971	61.7537	61.5013	
alpha	5.0647	5.0738	5.0827	5.1251	5.1331	5.1710	5.1710	5.1780	5.1563	5.1331	5.1169	5.1001	
util living area	0.9985	0.9958	0.9889	0.9679	0.9080	0.7684	0.5936	0.6377	0.8568	0.9762	0.9964	0.9989	(86)
MIT	19.7415	19.9165	20.1645	20.4724	20.7478	20.9290	20.9850	20.9785	20.8670	20.5057	20.0606	19.7108	(87)
Th 2	19.9691	19.9712	19.9732	19.9827	19.9844	19.9927	19.9927	19.9942	19.9895	19.9844	19.9808	19.9771	(88)
util rest of house	0.9980	0.9944	0.9849	0.9552	0.8700	0.6804	0.4678	0.5128	0.7879	0.9644	0.9949	0.9985	(89)
MIT 2	18.2873	18.5441	18.9059	19.3533	19.7276	19.9428	19.9869	19.9850	19.8807	19.4070	18.7622	18.2481	(90)
Living area fraction	0.9980	0.9944	0.9849	0.9552	0.8700	0.6804	0.4678	0.5128	0.7879	0.9644	0.9949	0.9985	(91)
MIT	18.4797	18.7257	19.0725	19.5014	19.8626	20.0733	20.1190	20.1165	20.0112	19.5524	18.9340	18.4417	(92)
Temperature adjustment	18.4797	18.7257	19.0725	19.5014	19.8626	20.0733	20.1190	20.1165	20.0112	19.5524	18.9340	18.4417	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9968	0.9918	0.9799	0.9474	0.8645	0.6882	0.4843	0.5289	0.7897	0.9575	0.9925	0.9977	(94)
Ext temp.	773.7142	927.7853	1029.7266	1073.2275	1012.1209	780.8895	529.0532	554.2560	794.1333	863.3103	775.7709	725.7389	(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	2216.3350	2156.1924	1956.4600	1632.7572	1254.7077	833.7005	536.0148	565.1341	903.5707	1376.1109	1826.2267	2206.8052	(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	1073.3099	825.4896	689.4896	402.8614	180.4846	0.0000	0.0000	0.0000	0.0000	381.5237	756.3282	1101.9133	(98)
Space heating per m2													(98) / (4) =

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 %)												93.5000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												5787.5937 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	1073.3099	825.4896	689.4896	402.8614	180.4846	0.0000	0.0000	0.0000	0.0000	381.5237	756.3282	1101.9133 (98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000 (210)
Space heating fuel (main heating system)	1147.9250	882.8765	737.4220	430.8678	193.0316	0.0000	0.0000	0.0000	0.0000	408.0467	808.9071	1178.5169 (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	220.7450	194.5575	204.3098	183.1245	179.4375	160.3074	153.9328	168.9469	168.6595	189.8908	200.8224	215.4253 (64)
Efficiency of water heater (217)m	88.4763	88.2432	87.8087	86.8603	84.8294	79.8000	79.8000	79.8000	79.8000	86.6394	88.0236	79.8000 (216)
Fuel for water heating, kWh/month	249.4962	220.4788	232.6761	210.8264	211.5275	200.8864	192.8982	211.7129	211.3527	219.1736	228.1460	243.2585 (219)
Water heating fuel used												2632.4334 (219)
Annual totals kWh/year												
Space heating fuel - main system												5787.5937 (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)												500.0046 (232)
Total delivered energy for all uses												8995.0317 (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	5787.5937	0.2160	1250.1202 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2632.4334	0.2160	568.6056 (264)
Space and water heating			1818.7259 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	500.0046	0.5190	259.5024 (268)
Total CO2, kg/m2/year			2117.1532 (272)
Emissions per m2 for space and water heating			13.2531 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			1.8910 (272b)
Emissions per m2 for pumps and fans			0.2836 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.2531 * 1.00) + 1.8910 + 0.2836, rounded to 2 d.p.			15.4300 (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	69.3900 (1b)	x 2.3900 (2b)	= 165.8421 (1b) - (3b)
First floor	67.8400 (1c)	x 2.6400 (2c)	= 179.0976 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.2300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 344.9397 (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) = 0.1160 (8)
Pressure test					Yes
Measured/design AP50					3.9700
Infiltration rate					0.3145 (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) =	0.2673 (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	0.3408	0.3341	0.3274	0.2940	0.2873	0.2539	0.2539	0.2472	0.2673	0.2873	0.3007	0.3141 (22b)
Effective ac	0.5581	0.5558	0.5536	0.5432	0.5413	0.5322	0.5322	0.5306	0.5357	0.5413	0.5452	0.5493 (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)			22.6500	1.1450	25.9351		(27)
Ground Floor			69.3900	0.1200	8.3268	84.0000	5828.7600 (28a)
Brick and Block	172.0100	24.7700	147.2400	0.2400	35.3376	42.2200	6216.4728 (29a)
Pitched Roof	69.3900		69.3900	0.1000	6.9390	9.1000	631.4490 (30)
Total net area of external elements Aum(A, m ²)			310.7900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	78.8705		(33)
GF Block			61.5800			75.0000	4618.5000 (32c)
GF Stud			44.6900			9.0000	402.2100 (32c)
FF Stud			157.6400			9.0000	1418.7600 (32c)
Internal Floor 1			67.8400			18.0000	1221.1200 (32d)
Internal Ceiling 1			67.8400			9.0000	610.5600 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 20947.8318 (34)
152.6476 (35)
10.3908 (36)
(33) + (36) = 89.2613 (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	63.5254	63.2687	63.0171	61.8353	61.6142	60.5849	60.5849	60.3943	60.9814	61.6142	62.0615	62.5291 (38)
Heat transfer coeff	152.7867	152.5300	152.2784	151.0966	150.8755	149.8462	149.8462	149.6556	150.2427	150.8755	151.3228	151.7904 (39)
Average = Sum(39)m / 12 =												151.0955 (39)
HLP	1.1134	1.1115	1.1097	1.1010	1.0994	1.0919	1.0919	1.0905	1.0948	1.0994	1.1027	1.1061 (40)
HLP (average)												1.1010 (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												2.9116 (42)
Average daily hot water use (litres/day)												103.3509 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	113.6860	109.5520	105.4179	101.2839	97.1499	93.0158	93.0158	97.1499	101.2839	105.4179	109.5520	113.6860 (44)
Energy conte	168.5931	147.4526	152.1578	132.6549	127.2855	109.8377	101.7808	116.7950	118.1899	137.7389	150.3528	163.2734 (45)
Energy content (annual)										Total = Sum(45)m =		1626.1122 (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	35.8260	31.3337	32.3335	28.1892	27.0482	23.3405	21.6284	24.8189	25.1153	29.2695	31.9500	34.6956 (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	145.5809	145.5809	145.5809	145.5809	145.5809	145.5809	145.5809	145.5809	145.5809	145.5809	145.5809	145.5809	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.3123	25.1468	20.4507	15.4825	11.5734	9.7707	10.5576	13.7232	18.4192	23.3874	27.2966	29.0992	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	306.2400	309.4178	301.4098	284.3617	262.8416	242.6158	229.1036	225.9258	233.9338	250.9819	272.5020	292.7278	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5581	37.5581	37.5581	37.5581	37.5581	37.5581	37.5581	37.5581	37.5581	37.5581	37.5581	37.5581	(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)	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647	(71)
Water heating gains (Table 5)	48.1533	46.6275	43.4591	39.1516	36.3551	32.4174	29.0705	33.3588	34.8824	39.3407	44.3749	46.6339	(72)
Total internal gains	449.3798	447.8663	431.9938	405.6701	377.4443	351.4781	335.4060	339.6820	353.9097	380.3843	410.8478	435.1352	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W
North					6.5800	10.6334		0.6300	0.7000	0.7700		21.3830 (74)
East					1.2600	19.6403		0.6300	0.7000	0.7700		7.5629 (76)
South					14.8100	46.7521		0.6300	0.7000	0.7700		211.6059 (78)

Solar gains	240.5518	402.2146	535.2535	646.0050	713.7185	705.7788	681.4874	630.3636	572.9716	439.9915	286.6339	206.8923 (83)
Total gains	689.9316	850.0809	967.2473	1051.6751	1091.1628	1057.2569	1016.8934	970.0457	926.8814	820.3758	697.4817	642.0274 (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	38.0848	38.1488	38.2119	38.5107	38.5672	38.8321	38.8321	38.8816	38.7296	38.5672	38.4532	38.3347
alpha	3.5390	3.5433	3.5475	3.5674	3.5711	3.5888	3.5888	3.5921	3.5820	3.5711	3.5635	3.5556
util living area	0.9929	0.9846	0.9692	0.9358	0.8674	0.7425	0.5926	0.6339	0.8233	0.9504	0.9868	0.9944 (86)
MIT	19.1365	19.3831	19.7302	20.1545	20.5424	20.8252	20.9430	20.9261	20.7255	20.2089	19.5832	19.0878 (87)
Th 2	19.9899	19.9915	19.9930	20.0000	20.0013	20.0074	20.0074	20.0086	20.0051	20.0013	19.9986	19.9959 (88)
util rest of house	0.9913	0.9813	0.9622	0.9199	0.8316	0.6687	0.4801	0.5244	0.7643	0.9350	0.9834	0.9932 (89)
MIT 2	18.2794	18.5254	18.8697	19.2891	19.6556	19.9037	19.9849	19.9771	19.8257	19.3486	18.7312	18.2353 (90)
Living area fraction												
MIT	18.3928	18.6389	18.9836	19.4036	19.7729	20.0256	20.1117	20.1027	19.9448	19.4624	18.8439	18.3481 (92)
Temperature adjustment												0.0000
adjusted MIT	18.3928	18.6389	18.9836	19.4036	19.7729	20.0256	20.1117	20.1027	19.9448	19.4624	18.8439	18.3481 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9878	0.9753	0.9531	0.9083	0.8220	0.6702	0.4928	0.5358	0.7602	0.9244	0.9780	0.9904 (94)
Useful gains	681.5314	829.0746	921.9152	955.2108	896.9664	708.5500	501.1253	519.7065	704.5832	758.3294	682.1438	635.8540 (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	2153.1993	2095.5955	1900.9783	1587.0632	1218.0064	813.0089	526.2184	554.1272	878.1371	1337.1225	1777.1219	2147.5524 (97)
Month fracti	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 kWh	1094.9209	851.1021	728.4229	454.9337	238.8537	0.0000	0.0000	0.0000	0.0000	430.6221	788.3842	1124.7036 (98)
Space heating												5711.9433 (98)
Space heating per m2										(98) / (4) =		41.6231 (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	1408.5542	1108.8618	1137.3824	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7674	0.8415	0.8191	0.0000	0.0000	0.0000	0.0000 (101)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1080.9525	933.1061	931.5857	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1357.5072	1307.5676	1255.2718	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	199.1194	278.5994	240.8224	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												718.5413 (104)
Cooled fraction									FC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	49.7799	69.6499	60.2056	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												179.6353 (107)
Space cooling per m2												1.3090 (108)
Energy for space heating												41.6231 (99)
Energy for space cooling												1.3090 (108)
Total												42.9321 (109)
Dwelling Fabric Energy Efficiency (DFEE)												42.9 (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	69.3900 (1b)	x 2.3900 (2b)	= 165.8421 (1b) - (3b)
First floor	67.8400 (1c)	x 2.6400 (2c)	= 179.0976 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.2300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 344.9397 (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) = 0.1160 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3660 (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) =				0.3111 (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	0.3966	0.3888	0.3811	0.3422	0.3344	0.2955	0.2955	0.2877	0.3111	0.3344	0.3500	0.3655 (22b)
Effective ac	0.5787	0.5756	0.5726	0.5585	0.5559	0.5437	0.5437	0.5414	0.5484	0.5559	0.5612	0.5668 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.40)			22.6500	1.3258	30.0284		(27)
Ground Floor			69.3900	0.1300	9.0207		(28a)
Brick and Block	172.0100	24.7700	147.2400	0.1800	26.5032		(29a)
Pitched Roof	69.3900		69.3900	0.1300	9.0207		(30)
Total net area of external elements Aum(A, m ²)			310.7900				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	76.6930	(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.7422 (36)
Total fabric heat loss						(33) + (36) =	90.4352 (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	65.8678	65.5202	65.1794	63.5789	63.2794	61.8854	61.8854	61.6272	62.4223	63.2794	63.8852	64.5185 (38)
Heat transfer coeff	156.3030	155.9554	155.6146	154.0141	153.7146	152.3206	152.3206	152.0624	152.8575	153.7146	154.3204	154.9538 (39)
Average = Sum(39)m / 12 =												154.0126 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1390	1.1365	1.1340	1.1223	1.1201	1.1100	1.1100	1.1081	1.1139	1.1201	1.1245	1.1292 (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												2.9116 (42)
Average daily hot water use (litres/day)												103.3509 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	113.6860	109.5520	105.4179	101.2839	97.1499	93.0158	93.0158	97.1499	101.2839	105.4179	109.5520	113.6860 (44)
Energy conte	168.5931	147.4526	152.1578	132.6549	127.2855	109.8377	101.7808	116.7950	118.1899	137.7389	150.3528	163.2734 (45)
Energy content (annual)										Total = Sum(45)m =		1626.1122 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
	35.8260	31.3337	32.3335	28.1892	27.0482	23.3405	21.6284	24.8189	25.1153	29.2695	31.9500	34.6956 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan 145.5809	Feb 145.5809	Mar 145.5809	Apr 145.5809	May 145.5809	Jun 145.5809	Jul 145.5809	Aug 145.5809	Sep 145.5809	Oct 145.5809	Nov 145.5809	Dec 145.5809 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.3123	25.1468	20.4507	15.4825	11.5734	9.7707	10.5576	13.7232	18.4192	23.3874	27.2966	29.0992 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	306.2400	309.4178	301.4098	284.3617	262.8416	242.6158	229.1036	225.9258	233.9338	250.9819	272.5020	292.7278 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5581	37.5581	37.5581	37.5581	37.5581	37.5581	37.5581	37.5581	37.5581	37.5581	37.5581	37.5581 (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)	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647 (71)
Water heating gains (Table 5)	48.1533	46.6275	43.4591	39.1516	36.3551	32.4174	29.0705	33.3588	34.8824	39.3407	44.3749	46.6339 (72)
Total internal gains	449.3798	447.8663	431.9938	405.6701	377.4443	351.4781	335.4060	339.6820	353.9097	380.3843	410.8478	435.1352 (73)

6. Solar gains												

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d	Gains W
North				6.5800	10.6334		0.6300		0.7000		0.7700	21.3830 (74)
East				1.2600	19.6403		0.6300		0.7000		0.7700	7.5629 (76)
South				14.8100	46.7521		0.6300		0.7000		0.7700	211.6059 (78)

Solar gains	240.5518	402.2146	535.2535	646.0050	713.7185	705.7788	681.4874	630.3636	572.9716	439.9915	286.6339	206.8923 (83)
Total gains	689.9316	850.0809	967.2473	1051.6751	1091.1628	1057.2569	1016.8934	970.0457	926.8814	820.3758	697.4817	642.0274 (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	60.9704	61.1063	61.2401	61.8766	61.9971	62.5645	62.5645	62.6707	62.3447	61.9971	61.7537	61.5013
alpha	5.0647	5.0738	5.0827	5.1251	5.1331	5.1710	5.1710	5.1780	5.1563	5.1331	5.1169	5.1001
util living area	0.9991	0.9973	0.9922	0.9761	0.9269	0.8021	0.6309	0.6784	0.8865	0.9839	0.9978	0.9994 (86)
MIT	19.6827	19.8590	20.1100	20.4242	20.7123	20.9126	20.9803	20.9715	20.8395	20.4554	20.0037	19.6524 (87)
Th 2	19.9691	19.9712	19.9732	19.9827	19.9844	19.9927	19.9927	19.9942	19.9895	19.9844	19.9808	19.9771 (88)
util rest of house	0.9988	0.9963	0.9893	0.9662	0.8942	0.7174	0.5005	0.5504	0.8251	0.9754	0.9969	0.9992 (89)
MIT 2	18.7622	18.9397	19.1909	19.5075	19.7796	19.9493	19.9873	19.9855	19.8962	19.5425	19.0922	18.7383 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.8840	19.0614	19.3126	19.6288	19.9030	20.0768	20.1187	20.1160	20.0210	19.6633	19.2128	18.8593 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.8840	19.0614	19.3126	19.6288	19.9030	20.0768	20.1187	20.1160	20.0210	19.6633	19.2128	18.8593 (93)

8. Space heating requirement												

Utilisation	Jan 0.9984	Feb 0.9951	Mar 0.9868	Apr 0.9617	May 0.8910	Jun 0.7254	Jul 0.5178	Aug 0.5672	Sep 0.8274	Oct 0.9718	Nov 0.9959	Dec 0.9989 (94)
Useful gains	688.7998	845.9513	954.4862	1011.4119	972.2390	766.9461	526.5521	550.1670	766.9309	797.2201	694.6567	641.2950 (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	2279.5266	2208.5394	1993.8219	1652.3900	1260.9210	834.2275	535.9745	565.0669	905.0720	1393.1557	1869.2583	2271.5130 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	1183.5007	915.6592	773.2658	461.5042	214.7794	0.0000	0.0000	0.0000	0.0000	443.3761	845.7132	1212.8822 (98)
Space heating												6050.6807 (98)
Space heating per m2	(98) / (4) =											44.0915 (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	1431.8135	1127.1723	1155.6745	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8148	0.8933	0.8707	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1166.6776	1006.8746	1006.2416	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1357.5072	1307.5676	1255.2718	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	137.3973	223.7156	185.2785	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												546.3914 (104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Cooled fraction											FC = cooled area / (4) =	1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	34.3493	55.9289	46.3196	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												136.5979 (107)
Space cooling per m2												0.9954 (108)
Energy for space heating												44.0915 (99)
Energy for space cooling												0.9954 (108)
Total												45.0869 (109)
Target Fabric Energy Efficiency (TFEE)												51.8 (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	69.3900 (1b)	x 2.3900 (2b)	= 165.8421 (1b) - (3b)
First floor	67.8400 (1c)	x 2.6400 (2c)	= 179.0976 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.2300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 344.9397 (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					5 * 10 = 50.0000 (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)					50.0000 / (5) = 0.1450 (8)
Pressure test					Yes
Measured/design AP50					3.9700
Infiltration rate					0.3435 (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) =	0.2919 (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	0.3430	0.3211	0.3211	0.2919	0.2992	0.2846	0.2846	0.2773	0.2773	0.2992	0.2919	0.2992 (22b)
Effective ac	0.5588	0.5516	0.5516	0.5426	0.5448	0.5405	0.5405	0.5385	0.5385	0.5448	0.5426	0.5448 (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)			22.6500	1.1450	25.9351		(27)
Ground Floor			69.3900	0.1200	8.3268	84.0000	5828.7600 (28a)
Brick and Block	172.0100	24.7700	147.2400	0.2400	35.3376	42.2200	6216.4728 (29a)
Pitched Roof	69.3900		69.3900	0.1000	6.9390	9.1000	631.4490 (30)
Total net area of external elements Aum(A, m ²)			310.7900				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	78.8705	(33)
GF Block			61.5800			75.0000	4618.5000 (32c)
GF Stud			44.6900			9.0000	402.2100 (32c)
FF Stud			157.6400			9.0000	1418.7600 (32c)
Internal Floor 1			67.8400			18.0000	1221.1200 (32d)
Internal Ceiling 1			67.8400			18.0000	1221.1200 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 21558.3918 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 157.0968 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.3908 (36)
Total fabric heat loss (33) + (36) = 89.2613 (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	63.6120	62.7843	62.7843	61.7657	62.0113	61.5262	61.5262	61.2928	61.2928	62.0113	61.7657	62.0113 (38)
Heat transfer coeff	152.8733	152.0456	152.0456	151.0270	151.2725	150.7875	150.7875	150.5540	150.5540	151.2725	151.0270	151.2725 (39)
Average = Sum(39)m / 12 =												151.2933 (39)
HLP	1.1140	1.1080	1.1080	1.1005	1.1023	1.0988	1.0988	1.0971	1.0971	1.1023	1.1005	1.1023 (40)
HLP (average)												1.1025 (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												2.9116 (42)
Average daily hot water use (litres/day)												103.3509 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	113.6860	109.5520	105.4179	101.2839	97.1499	93.0158	93.0158	97.1499	101.2839	105.4179	109.5520	113.6860 (44)
Energy conte	168.5931	147.4526	152.1578	132.6549	127.2855	109.8377	101.7808	116.7950	118.1899	137.7389	150.3528	163.2734 (45)
Energy content (annual)										Total = Sum(45)m =		1626.1122 (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	25.2890	22.1179	22.8237	19.8982	19.0928	16.4757	15.2671	17.5192	17.7285	20.6608	22.5529	24.4910 (46)
Water storage loss:												
Store volume												215.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7300 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9342 (55)
Total storage loss												
28.9602 26.1576 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 (56)												
If cylinder contains dedicated solar storage												
28.9602 26.1576 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 (57)												
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624 (59)
Total heat required for water heating calculated for each month												
220.8157 194.6214 204.3804 183.1929 179.5081 160.3757 154.0034 169.0176 168.7279 189.9615 200.8908 215.4960 (62)												
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h	220.8157	194.6214	204.3804	183.1929	179.5081	160.3757	154.0034	169.0176	168.7279	189.9615	200.8908	215.4960 (64)
Total per year (kWh/year) = Sum(64)m =												2241 (64)
RHI water heating demand												
Heat gains from water heating, kWh/month	97.8353	86.7630	92.3706	84.5382	84.1005	76.9514	75.6202	80.6124	79.7285	87.5763	90.4227	96.0665 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	174.6970	174.6970	174.6970	174.6970	174.6970	174.6970	174.6970	174.6970	174.6970	174.6970	174.6970	174.6970 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	70.7808	62.8669	51.1268	38.7063	28.9334	24.4268	26.3940	34.3079	46.0480	58.4686	68.2414	72.7480 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	457.0746	461.8176	449.8654	424.4205	392.3009	362.1131	341.9457	337.2027	349.1550	374.5998	406.7194	436.9072 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.3813	55.3813	55.3813	55.3813	55.3813	55.3813	55.3813	55.3813	55.3813	55.3813	55.3813	55.3813 (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)	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647 (71)
Water heating gains (Table 5)	131.4990	129.1116	124.1540	117.4141	113.0383	106.8770	101.6400	108.3500	110.7341	117.7100	125.5871	129.1216 (72)
Total internal gains	775.9681	770.4098	741.7598	697.1545	650.8863	610.0305	586.5935	596.4743	622.5507	667.3921	717.1615	755.3905 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
North					6.5800	13.4684	0.6300	0.7000	0.7700		27.0841 (74)	
East					1.2600	25.1733	0.6300	0.7000	0.7700		9.6935 (76)	
South					14.8100	56.5862	0.6300	0.7000	0.7700		256.1165 (78)	

Solar gains	292.8941	416.4402	565.1863	689.7526	723.0382	794.2975	735.6186	704.9663	634.7709	491.6344	347.7255	238.5820 (83)
Total gains	1068.8622	1186.8500	1306.9461	1386.9072	1373.9245	1404.3281	1322.2121	1301.4407	1257.3216	1159.0264	1064.8870	993.9725 (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	39.1726	39.3858	39.3858	39.6515	39.5871	39.7145	39.7760	39.7760	39.5871	39.6515	39.5871	
alpha	3.6115	3.6257	3.6257	3.6434	3.6391	3.6476	3.6517	3.6517	3.6391	3.6434	3.6391	
util living area	0.9676	0.9528	0.9178	0.8463	0.7267	0.5183	0.3696	0.3639	0.6097	0.8390	0.9405	0.9731 (86)
MIT	19.7089	19.8735	20.1791	20.5362	20.8071	20.9596	20.9913	20.9920	20.9249	20.6331	20.1449	19.6782 (87)
Th 2	19.9894	19.9943	19.9943	20.0004	19.9989	20.0018	20.0018	20.0032	20.0032	19.9989	20.0004	19.9989 (88)
util rest of house	0.9607	0.9429	0.9004	0.8131	0.6664	0.4278	0.2610	0.2536	0.5212	0.7962	0.9258	0.9672 (89)
MIT 2	18.8421	19.0061	19.3009	19.6397	19.8734	19.9844	19.9999	20.0016	19.9662	19.7320	19.2780	18.8200 (90)
Living area fraction									fLA = Living area / (4) =			0.1323 (91)
MIT	18.9568	19.1209	19.4172	19.7583	19.9969	20.1134	20.1311	20.1326	20.0930	19.8513	19.3927	18.9335 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9568	19.1209	19.4172	19.7583	19.9969	20.1134	20.1311	20.1326	20.0930	19.8513	19.3927	18.9335 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9515	0.9322	0.8884	0.8040	0.6663	0.4383	0.2754	0.2682	0.5297	0.7890	0.9147	0.9590 (94)
Useful gains	1017.0657	1106.4259	1161.1385	1115.0433	915.4656	615.5605	364.1122	349.0358	666.0572	914.4385	974.0222	953.2306 (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	2041.9004	1994.9794	1796.7458	1458.6650	1043.3180	635.3294	366.5786	351.1861	706.5575	1172.5554	1629.9946	2001.8717 (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	762.4770	597.1080	472.8919	247.4076	95.1222	0.0000	0.0000	0.0000	0.0000	192.0390	472.3001	780.1889 (98)
Space heating												3619.5349 (98)
RHI space heating demand												3620 (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	69.3900 (1b)	x 2.3900 (2b)	= 165.8421 (1b) - (3b)
First floor	67.8400 (1c)	x 2.6400 (2c)	= 179.0976 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.2300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 344.9397 (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					5 * 10 = 50.0000 (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) =					50.0000 / (5) = 0.1450 (8)
Pressure test					Yes
Measured/design AP50					3.9700
Infiltration rate					0.3435 (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) =	0.2919 (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	0.3722	0.3649	0.3576	0.3211	0.3138	0.2773	0.2773	0.2700	0.2919	0.3138	0.3284	0.3430 (22b)
Effective ac	0.5693	0.5666	0.5639	0.5516	0.5492	0.5385	0.5385	0.5365	0.5426	0.5492	0.5539	0.5588 (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)			22.6500	1.1450	25.9351		(27)
Ground Floor			69.3900	0.1200	8.3268	84.0000	5828.7600 (28a)
Brick and Block	172.0100	24.7700	147.2400	0.2400	35.3376	42.2200	6216.4728 (29a)
Pitched Roof	69.3900		69.3900	0.1000	6.9390	9.1000	631.4490 (30)
Total net area of external elements Aum(A, m ²)			310.7900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	78.8705		(33)
GF Block			61.5800			75.0000	4618.5000 (32c)
GF Stud			44.6900			9.0000	402.2100 (32c)
FF Stud			157.6400			9.0000	1418.7600 (32c)
Internal Floor 1			67.8400			18.0000	1221.1200 (32d)
Internal Ceiling 1			67.8400			18.0000	1221.1200 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	21558.3918 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							157.0968 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.3908 (36)
Total fabric heat loss						(33) + (36) =	89.2613 (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	64.8004	64.4942	64.1940	62.7843	62.5206	61.2928	61.2928	61.0654	61.7657	62.5206	63.0541	63.6120 (38)
Heat transfer coeff	154.0617	153.7555	153.4553	152.0456	151.7819	150.5540	150.5540	150.3267	151.0270	151.7819	152.3154	152.8733 (39)
Average = Sum(39)m / 12 =												152.0443 (39)
HLP	1.1227	1.1204	1.1182	1.1080	1.1060	1.0971	1.0971	1.0954	1.1005	1.1060	1.1099	1.1140 (40)
HLP (average)												1.1080 (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												2.9116 (42)
Average daily hot water use (litres/day)												103.3509 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	113.6860	109.5520	105.4179	101.2839	97.1499	93.0158	93.0158	97.1499	101.2839	105.4179	109.5520	113.6860 (44)
Energy conte	168.5931	147.4526	152.1578	132.6549	127.2855	109.8377	101.7808	116.7950	118.1899	137.7389	150.3528	163.2734 (45)
Energy content (annual)										Total = Sum(45)m =		1626.1122 (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	25.2890	22.1179	22.8237	19.8982	19.0928	16.4757	15.2671	17.5192	17.7285	20.6608	22.5529	24.4910	(46)
Water storage loss:													
Store volume													215.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.7300 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.9342 (55)
Total storage loss													
28.9602 26.1576 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 28.0260 28.9602 28.0260 28.9602 28.0260													(56)
If cylinder contains dedicated solar storage													
28.9602 26.1576 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 28.0260 28.9602 28.0260 28.9602 28.0260													(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
220.8157 194.6214 204.3804 183.1929 179.5081 160.3757 154.0034 169.0176 168.7279 189.9615 200.8908 215.4960													(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =													0.0000 (63)
Output from w/h	220.8157	194.6214	204.3804	183.1929	179.5081	160.3757	154.0034	169.0176	168.7279	189.9615	200.8908	215.4960	(64)
Heat gains from water heating, kWh/month	97.8353	86.7630	92.3706	84.5382	84.1005	76.9514	75.6202	80.6124	79.7285	87.5763	90.4227	96.0665	(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	174.6970	174.6970	174.6970	174.6970	174.6970	174.6970	174.6970	174.6970	174.6970	174.6970	174.6970	174.6970	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	70.7808	62.8669	51.1268	38.7063	28.9334	24.4268	26.3940	34.3079	46.0480	58.4686	68.2414	72.7480	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	457.0746	461.8176	449.8654	424.4205	392.3009	362.1131	341.9457	337.2027	349.1550	374.5998	406.7194	436.9072	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.3813	55.3813	55.3813	55.3813	55.3813	55.3813	55.3813	55.3813	55.3813	55.3813	55.3813	55.3813	(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)	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647	(71)
Water heating gains (Table 5)	131.4990	129.1116	124.1540	117.4141	113.0383	106.8770	101.6400	108.3500	110.7341	117.7100	125.5871	129.1216	(72)
Total internal gains	775.9681	770.4098	741.7598	697.1545	650.8863	610.0305	586.5935	596.4743	622.5507	667.3921	717.1615	755.3905	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
North				6.5800	10.6334		0.6300	0.7000	0.7700		21.3830 (74)	
East				1.2600	19.6403		0.6300	0.7000	0.7700		7.5629 (76)	
South				14.8100	46.7521		0.6300	0.7000	0.7700		211.6059 (78)	

Solar gains	240.5518	402.2146	535.2535	646.0050	713.7185	705.7788	681.4874	630.3636	572.9716	439.9915	286.6339	206.8923 (83)
Total gains	1016.5199	1172.6244	1277.0133	1343.1595	1364.6048	1315.8094	1268.0809	1226.8380	1195.5224	1107.3836	1003.7955	962.2828 (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	38.8704	38.9478	39.0240	39.3858	39.4543	39.7760	39.7760	39.8362	39.6515	39.4543	39.3161	39.1726	
alpha	3.5914	3.5965	3.6016	3.6257	3.6303	3.6517	3.6517	3.6557	3.6434	3.6303	3.6211	3.6115	
util living area	0.9781	0.9630	0.9375	0.8875	0.7971	0.6502	0.4979	0.5312	0.7278	0.8978	0.9636	0.9818	(86)
MIT	19.4595	19.6854	19.9956	20.3654	20.6826	20.8939	20.9695	20.9608	20.8312	20.4273	19.8740	19.4120	(87)
Th 2	19.9824	19.9842	19.9860	19.9943	19.9959	20.0032	20.0032	20.0046	20.0004	19.9959	19.9927	19.9894	(88)
util rest of house	0.9736	0.9555	0.9245	0.8631	0.7515	0.5726	0.3951	0.4290	0.6580	0.8707	0.9549	0.9780	(89)
MIT 2	18.5904	18.8136	19.1175	19.4775	19.7668	19.9442	19.9921	19.9892	19.8979	19.5431	19.0085	18.5489	(90)
Living area fraction	18.7054	18.9289	19.2337	19.5950	19.8880	20.0699	20.1214	20.1178	20.0214	19.6601	19.1230	18.6631	(91)
MIT	18.7054	18.9289	19.2337	19.5950	19.8880	20.0699	20.1214	20.1178	20.0214	19.6601	19.1230	18.6631	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7054	18.9289	19.2337	19.5950	19.8880	20.0699	20.1214	20.1178	20.0214	19.6601	19.1230	18.6631	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.9662 0.9457 0.9128 0.8518 0.7460 0.5782 0.4078 0.4412 0.6596 0.8599 0.9454 0.9714													(94)
Useful gains	982.2067	1108.9897	1165.6794	1144.0765	1017.9623	760.7655	517.1687	541.2534	788.5854	952.2285	948.9663	934.7502	(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	2219.3182	2157.0241	1954.0544	1626.1243	1242.7904	823.5125	530.1647	558.8848	894.2860	1375.1645	1831.2896	2211.0262	(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	920.4109	704.2791	586.5510	347.0744	167.2721	0.0000	0.0000	0.0000	0.0000	314.6643	635.2728	949.5494	(98)
Space heating												4625.0741	(98)
Space heating per m2												(98) / (4) =	33.7031 (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 %)													90.8000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													5093.6940 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	920.4109	704.2791	586.5510	347.0744	167.2721	0.0000	0.0000	0.0000	0.0000	314.6643	635.2728	949.5494	(98)
Space heating efficiency (main heating system 1)	90.8000	90.8000	90.8000	90.8000	90.8000	0.0000	0.0000	0.0000	0.0000	90.8000	90.8000	90.8000	(210)
Space heating fuel (main heating system)	1013.6684	775.6378	645.9813	382.2406	184.2203	0.0000	0.0000	0.0000	0.0000	346.5466	699.6397	1045.7592	(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	220.8157	194.6214	204.3804	183.1929	179.5081	160.3757	154.0034	169.0176	168.7279	189.9615	200.8908	215.4960	(64)
Efficiency of water heater (217)m	88.5122	88.2477	87.7703	86.7945	84.9274	80.1000	80.1000	80.1000	80.1000	86.4526	87.9765	80.1000	(216)
Fuel for water heating, kWh/month	249.4747	220.5399	232.8583	211.0651	211.3665	200.2194	192.2639	211.0082	210.6465	219.7290	228.3459	243.1945	(219)
Water heating fuel used												2630.7119	(219)
Annual totals kWh/year													
Space heating fuel - main system												5093.6940	(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)												500.0046	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.11 * 1080 * 1.00) =												-958.6179	(233)
Total delivered energy for all uses												7340.7926	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	5093.6940	3.4800	177.2606 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2630.7119	3.4800	91.5488 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	500.0046	13.1900	65.9506 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-958.6179	13.1900	-126.4417 (252)
Total energy cost			338.2107 (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] =	0.7795 (257)
SAP value		89.1260
SAP rating (Section 12)		89 (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	5093.6940	0.2160	1100.2379 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2630.7119	0.2160	568.2338 (264)
Space and water heating			1668.4717 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	500.0046	0.5190	259.5024 (268)
Energy saving/generation technologies			
PV Unit	-958.6179	0.5190	-497.5227 (269)
Total kg/year			1469.3764 (272)
CO2 emissions per m2			10.7100 (273)
EI value			89.1952
EI rating			89 (274)
EI band			B

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9080 = 3.833$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9080 = 0.2379$, stars = 4
Water heating energy efficiency	$3.48 / 0.8497 = 4.095$, stars = 4
Water heating environmental impact	$0.216 / 0.8497 = 0.2542$, 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	69.3900 (1b)	x 2.3900 (2b)	= 165.8421 (1b) - (3b)
First floor	67.8400 (1c)	x 2.6400 (2c)	= 179.0976 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.2300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 344.9397 (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					5 * 10 = 50.0000 (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)					50.0000 / (5) = 0.1450 (8)
Pressure test					Yes
Measured/design AP50					3.9700
Infiltration rate					0.3435 (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) =	0.2919 (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	0.3430	0.3211	0.3211	0.2919	0.2992	0.2846	0.2846	0.2773	0.2773	0.2992	0.2919	0.2992 (22b)
Effective ac	0.5588	0.5516	0.5516	0.5426	0.5448	0.5405	0.5405	0.5385	0.5385	0.5448	0.5426	0.5448 (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)			22.6500	1.1450	25.9351		(27)
Ground Floor			69.3900	0.1200	8.3268	84.0000	5828.7600 (28a)
Brick and Block	172.0100	24.7700	147.2400	0.2400	35.3376	42.2200	6216.4728 (29a)
Pitched Roof	69.3900		69.3900	0.1000	6.9390	9.1000	631.4490 (30)
Total net area of external elements Aum(A, m ²)			310.7900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	78.8705		(33)
GF Block			61.5800			75.0000	4618.5000 (32c)
GF Stud			44.6900			9.0000	402.2100 (32c)
FF Stud			157.6400			9.0000	1418.7600 (32c)
Internal Floor 1			67.8400			18.0000	1221.1200 (32d)
Internal Ceiling 1			67.8400			18.0000	1221.1200 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	21558.3918 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							157.0968 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.3908 (36)
Total fabric heat loss						(33) + (36) =	89.2613 (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	63.6120	62.7843	62.7843	61.7657	62.0113	61.5262	61.5262	61.2928	61.2928	62.0113	61.7657	62.0113 (38)
Heat transfer coeff	152.8733	152.0456	152.0456	151.0270	151.2725	150.7875	150.7875	150.5540	150.5540	151.2725	151.0270	151.2725 (39)
Average = Sum(39)m / 12 =												151.2933 (39)
HLP	1.1140	1.1080	1.1080	1.1005	1.1023	1.0988	1.0988	1.0971	1.0971	1.1023	1.1005	1.1023 (40)
HLP (average)												1.1025 (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												2.9116 (42)
Average daily hot water use (litres/day)												103.3509 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	113.6860	109.5520	105.4179	101.2839	97.1499	93.0158	93.0158	97.1499	101.2839	105.4179	109.5520	113.6860 (44)
Energy conte	168.5931	147.4526	152.1578	132.6549	127.2855	109.8377	101.7808	116.7950	118.1899	137.7389	150.3528	163.2734 (45)
Energy content (annual)										Total = Sum(45)m =		1626.1122 (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	25.2890	22.1179	22.8237	19.8982	19.0928	16.4757	15.2671	17.5192	17.7285	20.6608	22.5529	24.4910 (46)
Water storage loss:												
Store volume												215.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7300 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9342 (55)
Total storage loss												
28.9602 26.1576 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 (56)												
If cylinder contains dedicated solar storage												
28.9602 26.1576 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 (57)												
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
220.8157 194.6214 204.3804 183.1929 179.5081 160.3757 154.0034 169.0176 168.7279 189.9615 200.8908 215.4960 (62)												
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h	220.8157	194.6214	204.3804	183.1929	179.5081	160.3757	154.0034	169.0176	168.7279	189.9615	200.8908	215.4960 (64)
Total per year (kWh/year) = Sum(64)m =												2240.9912 (64)
Heat gains from water heating, kWh/month												
97.8353 86.7630 92.3706 84.5382 84.1005 76.9514 75.6202 80.6124 79.7285 87.5763 90.4227 96.0665 (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	174.6970	174.6970	174.6970	174.6970	174.6970	174.6970	174.6970	174.6970	174.6970	174.6970	174.6970	174.6970 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
70.7808 62.8669 51.1268 38.7063 28.9334 24.4268 26.3940 34.3079 46.0480 58.4686 68.2414 72.7480 (67)												
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
457.0746 461.8176 449.8654 424.4205 392.3009 362.1131 341.9457 337.2027 349.1550 374.5998 406.7194 436.9072 (68)												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
55.3813 55.3813 55.3813 55.3813 55.3813 55.3813 55.3813 55.3813 55.3813 55.3813 55.3813 55.3813 (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)												
-116.4647 -116.4647 -116.4647 -116.4647 -116.4647 -116.4647 -116.4647 -116.4647 -116.4647 -116.4647 -116.4647 -116.4647 (71)												
Water heating gains (Table 5)												
131.4990 129.1116 124.1540 117.4141 113.0383 106.8770 101.6400 108.3500 110.7341 117.7100 125.5871 129.1216 (72)												
Total internal gains	775.9681	770.4098	741.7598	697.1545	650.8863	610.0305	586.5935	596.4743	622.5507	667.3921	717.1615	755.3905 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W		
North					6.5800	13.4684	0.6300	0.7000	0.7700	27.0841 (74)		
East					1.2600	25.1733	0.6300	0.7000	0.7700	9.6935 (76)		
South					14.8100	56.5862	0.6300	0.7000	0.7700	256.1165 (78)		
Solar gains	292.8941	416.4402	565.1863	689.7526	723.0382	794.2975	735.6186	704.9663	634.7709	491.6344	347.7255	238.5820 (83)
Total gains	1068.8622	1186.8500	1306.9461	1386.9072	1373.9245	1404.3281	1322.2121	1301.4407	1257.3216	1159.0264	1064.8870	993.9725 (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	39.1726	39.3858	39.3858	39.6515	39.5871	39.7145	39.7145	39.7760	39.7760	39.5871	39.6515	39.5871
alpha	3.6115	3.6257	3.6257	3.6434	3.6391	3.6476	3.6476	3.6517	3.6517	3.6391	3.6434	3.6391
util living area	0.9676	0.9528	0.9178	0.8463	0.7267	0.5183	0.3696	0.3639	0.6097	0.8390	0.9405	0.9731 (86)
MIT	19.7089	19.8735	20.1791	20.5362	20.8071	20.9596	20.9913	20.9920	20.9249	20.6331	20.1449	19.6782 (87)
Th 2	19.9894	19.9943	19.9943	20.0004	19.9989	20.0018	20.0018	20.0032	20.0032	19.9989	20.0004	19.9989 (88)
util rest of house												
0.9607 0.9429 0.9004 0.8131 0.6664 0.4278 0.2610 0.2536 0.5212 0.7962 0.9258 0.9672 (89)												
MIT 2	18.8421	19.0061	19.3009	19.6397	19.8734	19.9844	19.9999	20.0016	19.9662	19.7320	19.2780	18.8200 (90)
Living area fraction									fLA = Living area / (4) =			0.1323 (91)
MIT	18.9568	19.1209	19.4172	19.7583	19.9969	20.1134	20.1311	20.1326	20.0930	19.8513	19.3927	18.9335 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9568	19.1209	19.4172	19.7583	19.9969	20.1134	20.1311	20.1326	20.0930	19.8513	19.3927	18.9335 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.9515 0.9322 0.8884 0.8040 0.6663 0.4383 0.2754 0.2682 0.5297 0.7890 0.9147 0.9590 (94)												
Useful gains	1017.0657	1106.4259	1161.1385	1115.0433	915.4656	615.5605	364.1122	349.0358	666.0572	914.4385	974.0222	953.2306 (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	2041.9004	1994.9794	1796.7458	1458.6650	1043.3180	635.3294	366.5786	351.1861	706.5575	1172.5554	1629.9946	2001.8717 (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	762.4770	597.1080	472.8919	247.4076	95.1222	0.0000	0.0000	0.0000	0.0000	192.0390	472.3001	780.1889 (98)
Space heating												3619.5349 (98)
Space heating per m2										(98) / (4) =		26.3757 (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 %)													90.8000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3986.2719 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	762.4770	597.1080	472.8919	247.4076	95.1222	0.0000	0.0000	0.0000	0.0000	192.0390	472.3001	780.1889	(98)
Space heating efficiency (main heating system 1)	90.8000	90.8000	90.8000	90.8000	90.8000	0.0000	0.0000	0.0000	0.0000	90.8000	90.8000	90.8000	(210)
Space heating fuel (main heating system)	839.7324	657.6079	520.8060	272.4754	104.7602	0.0000	0.0000	0.0000	0.0000	211.4967	520.1543	859.2389	(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	220.8157	194.6214	204.3804	183.1929	179.5081	160.3757	154.0034	169.0176	168.7279	189.9615	200.8908	215.4960	(64)
Efficiency of water heater (217)m	88.1555	87.9132	87.2816	85.9172	83.5085	80.1000	80.1000	80.1000	80.1000	85.1440	87.3192	80.1000	(216)
Fuel for water heating, kWh/month	250.4843	221.3790	234.1622	213.2202	214.9579	200.2194	192.2639	211.0082	210.6465	223.1061	230.0649	244.1919	(219)
Water heating fuel used												2645.7046	(219)
Annual totals kWh/year													
Space heating fuel - main system												3986.2719	(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)												500.0046	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.11 * 1206 * 1.00) =										-1070.9371		-1070.9371	(233)
Total delivered energy for all uses												6136.0439	(238)

10a. Fuel costs - using BEDF prices (493)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3986.2719	3.6300	144.7017	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	2645.7046	3.6300	96.0391	(247)
Pumps and fans for heating	75.0000	19.4400	14.5800	(249)
Energy for lighting	500.0046	19.4400	97.2009	(250)
Additional standing charges			95.0000	(251)
Energy saving/generation technologies				
PV Unit	-1070.9371	19.4400	-208.1902	(252)
Total energy cost			239.3315	(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	3986.2719	0.2160	861.0347	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2645.7046	0.2160	571.4722	(264)
Space and water heating			1432.5069	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	500.0046	0.5190	259.5024	(268)
Energy saving/generation technologies				
PV Unit	-1070.9371	0.5190	-555.8163	(269)
Total kg/year			1175.1179	(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	3986.2719	1.2200	4863.2517	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2645.7046	1.2200	3227.7596	(264)
Space and water heating			8091.0112	(265)
Pumps and fans	75.0000	3.0700	230.2500	(267)
Energy for lighting	500.0046	3.0700	1535.0140	(268)
Energy saving/generation technologies				
PV Unit	-1070.9371	3.0700	-3287.7768	(269)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Primary energy kWh/year
Primary energy kWh/m²/year

6568.4984 (272)
47.8649 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 89
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
F	Already installed
G	Not considered
H	Not considered
I	Not considered
J	Not considered
K	Not considered
M	Not considered
N	Solar water heating
O	Recommended
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U	Solar photovoltaic panels
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
L2	Not applicable
Q3	Not considered
O3	Not considered

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.3	-£ 40	-271 kg (23.1%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£40 1.98 kg/m ²	B 90	B 91
Total Savings	£40 1.98 kg/m ²		

Potential energy efficiency rating: B 90
Potential environmental impact rating: B 91

Fuel prices for cost data on this page from database revision number 493 TEST (31 Mar 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	£112	£122	-£10
Mains gas	£336	£286	£50
Space heating	£254	£256	-£2
Water heating	£96	£54	£42
Lighting	£97	£97	£0
Generated (PV)	-£208	-£208	£0
Total cost of fuels	£240	£200	£40
Total cost of uses	£239	£199	£40
Delivered energy	45 kWh/m ²	35 kWh/m ²	10 kWh/m ²
Carbon dioxide emissions	1.2 tonnes	0.9 tonnes	0.3 tonnes
CO2 emissions per m ²	9 kg/m ²	7 kg/m ²	2 kg/m ²
Primary energy	48 kWh/m ²	37 kWh/m ²	11 kWh/m ²

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	69.3900 (1b)	x 2.3900 (2b)	= 165.8421 (1b) - (3b)
First floor	67.8400 (1c)	x 2.6400 (2c)	= 179.0976 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.2300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 344.9397 (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					5 * 10 = 50.0000 (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) =					50.0000 / (5) = 0.1450 (8)
Pressure test					Yes
Measured/design AP50					3.9700
Infiltration rate					0.3435 (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) =	0.2919 (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	0.3722	0.3649	0.3576	0.3211	0.3138	0.2773	0.2773	0.2700	0.2919	0.3138	0.3284	0.3430 (22b)
Effective ac	0.5693	0.5666	0.5639	0.5516	0.5492	0.5385	0.5385	0.5365	0.5426	0.5492	0.5539	0.5588 (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)			22.6500	1.1450	25.9351		(27)
Ground Floor			69.3900	0.1200	8.3268	84.0000	5828.7600 (28a)
Brick and Block	172.0100	24.7700	147.2400	0.2400	35.3376	42.2200	6216.4728 (29a)
Pitched Roof	69.3900		69.3900	0.1000	6.9390	9.1000	631.4490 (30)
Total net area of external elements Aum(A, m ²)			310.7900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	78.8705		(33)
GF Block			61.5800			75.0000	4618.5000 (32c)
GF Stud			44.6900			9.0000	402.2100 (32c)
FF Stud			157.6400			9.0000	1418.7600 (32c)
Internal Floor 1			67.8400			18.0000	1221.1200 (32d)
Internal Ceiling 1			67.8400			18.0000	1221.1200 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	21558.3918 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							157.0968 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.3908 (36)
Total fabric heat loss						(33) + (36) =	89.2613 (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	64.8004	64.4942	64.1940	62.7843	62.5206	61.2928	61.2928	61.0654	61.7657	62.5206	63.0541	63.6120 (38)
Heat transfer coeff	154.0617	153.7555	153.4553	152.0456	151.7819	150.5540	150.5540	150.3267	151.0270	151.7819	152.3154	152.8733 (39)
Average = Sum(39)m / 12 =												152.0443 (39)
HLP	1.1227	1.1204	1.1182	1.1080	1.1060	1.0971	1.0971	1.0954	1.1005	1.1060	1.1099	1.1140 (40)
HLP (average)												1.1080 (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												2.9116 (42)
Average daily hot water use (litres/day)												103.3509 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	113.6860	109.5520	105.4179	101.2839	97.1499	93.0158	93.0158	97.1499	101.2839	105.4179	109.5520	113.6860 (44)
Energy conte	168.5931	147.4526	152.1578	132.6549	127.2855	109.8377	101.7808	116.7950	118.1899	137.7389	150.3528	163.2734 (45)
Energy content (annual)										Total = Sum(45)m =		1626.1122 (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	25.2890	22.1179	22.8237	19.8982	19.0928	16.4757	15.2671	17.5192	17.7285	20.6608	22.5529	24.4910 (46)
Water storage loss:												
Store volume												215.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7300 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9342 (55)
Total storage loss												
28.9602 26.1576 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 (56)												
If cylinder contains dedicated solar storage												
18.8578 17.0329 18.8578 18.2495 18.8578 18.2495 18.8578 18.2495 18.8578 18.2495 18.8578 18.2495 18.8578 (57)												
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
210.7133 185.4966 192.8823 166.6628 156.6114 137.9925 130.8741 146.8187 153.5485 178.4633 191.1143 205.3936 (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												1.1153 (H8)
Utilisation factor												0.5921 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												117.0000 (H13)
Daily hot water demand												103.3509 (H14)
Volume ratio Veff/V												1.1321 (H15)
Solar storage volume factor												1.0000 (H16)
Solar input												-944.1413 (H17)
Solar input	-27.3782	-45.6864	-77.8091	-104.2796	-128.8286	-126.6590	-124.9852	-109.2002	-85.5257	-58.4040	-32.4745	-22.9109 (63)
Solar input (sum of months) = Sum (63)m =												-944.1413 (63)
Output from w/h												
183.3350 139.8102 115.0732 62.3832 27.7828 11.3335 5.8889 37.6185 68.0228 120.0594 158.6397 182.4827 (64)												
Total per year (kWh/year) = Sum (64)m =												1112.4299 (64)
Heat gains from water heating, kWh/month												
89.7534 79.4632 83.1720 71.3141 65.7831 59.0449 57.1167 62.8533 67.5850 78.3777 82.6015 87.9846 (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	174.6970	174.6970	174.6970	174.6970	174.6970	174.6970	174.6970	174.6970	174.6970	174.6970	174.6970	174.6970 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	70.7808	62.8669	51.1268	38.7063	28.9334	24.4268	26.3940	34.3079	46.0480	58.4686	68.2414	72.7480 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	457.0746	461.8176	449.8654	424.4205	392.3009	362.1131	341.9457	337.2027	349.1550	374.5998	406.7194	436.9072 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.3813	55.3813	55.3813	55.3813	55.3813	55.3813	55.3813	55.3813	55.3813	55.3813	55.3813	55.3813 (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)	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647 (71)
Water heating gains (Table 5)	120.6362	118.2488	111.7904	99.0473	88.4182	82.0067	76.7698	84.4803	93.8681	105.3464	114.7243	118.2588 (72)
Total internal gains	765.1053	759.5470	729.3962	678.7877	626.2662	585.1603	561.7232	572.6046	605.6847	655.0285	706.2988	744.5277 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W
North					6.5800	10.6334	0.6300	0.7000			0.7700	21.3830 (74)
East					1.2600	19.6403	0.6300	0.7000			0.7700	7.5629 (76)
South					14.8100	46.7521	0.6300	0.7000			0.7700	211.6059 (78)

Solar gains	240.5518	402.2146	535.2535	646.0050	713.7185	705.7788	681.4874	630.3636	572.9716	439.9915	286.6339	206.8923 (83)
Total gains	1005.6571	1161.7616	1264.6497	1324.7927	1339.9847	1290.9391	1243.2107	1202.9683	1178.6564	1095.0200	992.9327	951.4200 (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	38.8704	38.9478	39.0240	39.3858	39.4543	39.7760	39.7760	39.8362	39.6515	39.4543	39.3161	39.1726	
alpha	3.5914	3.5965	3.6016	3.6257	3.6303	3.6517	3.6517	3.6557	3.6434	3.6303	3.6211	3.6115	
util living area	0.9788	0.9640	0.9391	0.8910	0.8040	0.6589	0.5064	0.5399	0.7339	0.9005	0.9647	0.9824 (86)	
MIT	19.4498	19.6763	19.9863	20.3541	20.6723	20.8890	20.9678	20.9587	20.8262	20.4193	19.8649	19.4021 (87)	
Th 2	19.9824	19.9842	19.9860	19.9943	19.9959	20.0032	20.0032	20.0046	20.0004	19.9959	19.9927	19.9894 (88)	
util rest of house	0.9745	0.9567	0.9264	0.8672	0.7590	0.5813	0.4025	0.4367	0.6645	0.8739	0.9563	0.9787 (89)	
MIT 2	18.5809	18.8047	19.1086	19.4673	19.7586	19.9412	19.9914	19.9883	19.8944	19.5360	18.9996	18.5392 (90)	
Living area fraction									fLA = Living area / (4) =			0.1323 (91)	
MIT	18.6959	18.9200	19.2248	19.5846	19.8795	20.0667	20.1206	20.1167	20.0178	19.6529	19.1141	18.6534 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.6959	18.9200	19.2248	19.5846	19.8795	20.0667	20.1206	20.1167	20.0178	19.6529	19.1141	18.6534 (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	0.9672	0.9470	0.9147	0.8558	0.7532	0.5866	0.4153	0.4489	0.6658	0.8630	0.9469	0.9723	(94)
Useful gains	972.6827	1100.1797	1156.8328	1133.7468	1009.2229	757.2787	516.2596	540.0666	784.7582	945.0562	940.1726	925.0417	(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	2217.8490	2155.6589	1952.6824	1624.5481	1241.5023	823.0282	530.0401	558.7225	893.7405	1374.0698	1829.9364	2209.5402	(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	926.4037	709.2820	592.1121	353.3769	172.8159	0.0000	0.0000	0.0000	0.0000	319.1861	640.6299	955.6669	(98)
Space heating												4669.4736	(98)
Space heating per m2												34.0266	(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 %)													90.8000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													5142.5921 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	926.4037	709.2820	592.1121	353.3769	172.8159	0.0000	0.0000	0.0000	0.0000	319.1861	640.6299	955.6669	(98)
Space heating efficiency (main heating system 1)	90.8000	90.8000	90.8000	90.8000	90.8000	0.0000	0.0000	0.0000	0.0000	90.8000	90.8000	90.8000	(210)
Space heating fuel (main heating system)	1020.2684	781.1476	652.1058	389.1816	190.3259	0.0000	0.0000	0.0000	0.0000	351.5266	705.5396	1052.4966	(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	183.3350	139.8102	115.0732	62.3832	27.7828	11.3335	5.8889	37.6185	68.0228	120.0594	158.6397	182.4827	(64)
Efficiency of water heater (217)m	88.8394	88.8458	88.8683	89.0158	89.1506	80.1000	80.1000	80.1000	80.1000	87.6015	88.4547	88.8960	(216)
Fuel for water heating, kWh/month	206.3667	157.3628	129.4873	70.0811	31.1639	14.1491	7.3519	46.9644	84.9224	137.0518	179.3457	205.2765	(219)
Water heating fuel used												1269.5236	(219)
Annual totals kWh/year													
Space heating fuel - main system												5142.5921	(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)												500.0046	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.11 * 1080 * 1.00) =										-958.6179		-958.6179	(233)
Total delivered energy for all uses												6078.5024	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	5142.5921	3.4800	178.9622	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1269.5236	3.4800	44.1794	(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	500.0046	13.1900	65.9506	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	-958.6179	13.1900	-126.4417	(252)
Total energy cost			299.1380	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):			0.4200	(256)
Energy cost factor (ECF)			0.6894	(257)
SAP value		[(255) x (256)] / [(4) + 45.0] =	90.3822	
SAP rating (Section 12)			90	(258)
SAP band			B	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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	5142.5921	0.2160	1110.7999 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1269.5236	0.2160	274.2171 (264)
Space and water heating			1385.0170 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	500.0046	0.5190	259.5024 (268)
Energy saving/generation technologies			
PV Unit	-958.6179	0.5190	-497.5227 (269)
Total kg/year			1211.8717 (272)
CO2 emissions per m2			8.8300 (273)
EI value			91.0887
EI rating			91 (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	69.3900 (1b)	x 2.3900 (2b)	= 165.8421 (1b) - (3b)
First floor	67.8400 (1c)	x 2.6400 (2c)	= 179.0976 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.2300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 344.9397 (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					5 * 10 = 50.0000 (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) =					50.0000 / (5) = 0.1450 (8)
Pressure test					Yes
Measured/design AP50					3.9700
Infiltration rate					0.3435 (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) =	0.2919 (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												
Effective ac	0.3430	0.3211	0.3211	0.2919	0.2992	0.2846	0.2846	0.2773	0.2773	0.2992	0.2919	0.2992 (22b)
	0.5588	0.5516	0.5516	0.5426	0.5448	0.5405	0.5405	0.5385	0.5385	0.5448	0.5426	0.5448 (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)			22.6500	1.1450	25.9351		(27)
Ground Floor			69.3900	0.1200	8.3268	84.0000	5828.7600 (28a)
Brick and Block	172.0100	24.7700	147.2400	0.2400	35.3376	42.2200	6216.4728 (29a)
Pitched Roof	69.3900		69.3900	0.1000	6.9390	9.1000	631.4490 (30)
Total net area of external elements Aum(A, m ²)			310.7900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	78.8705		(33)
GF Block			61.5800			75.0000	4618.5000 (32c)
GF Stud			44.6900			9.0000	402.2100 (32c)
FF Stud			157.6400			9.0000	1418.7600 (32c)
Internal Floor 1			67.8400			18.0000	1221.1200 (32d)
Internal Ceiling 1			67.8400			18.0000	1221.1200 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 21558.3918 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 157.0968 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.3908 (36)
Total fabric heat loss (33) + (36) = 89.2613 (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	63.6120	62.7843	62.7843	61.7657	62.0113	61.5262	61.5262	61.2928	61.2928	62.0113	61.7657	62.0113 (38)
Heat transfer coeff	152.8733	152.0456	152.0456	151.0270	151.2725	150.7875	150.7875	150.5540	150.5540	151.2725	151.0270	151.2725 (39)
Average = Sum(39)m / 12 =												151.2933 (39)
HLP	1.1140	1.1080	1.1080	1.1005	1.1023	1.0988	1.0988	1.0971	1.0971	1.1023	1.1005	1.1023 (40)
HLP (average)												1.1025 (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												2.9116 (42)
Average daily hot water use (litres/day)												103.3509 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	113.6860	109.5520	105.4179	101.2839	97.1499	93.0158	93.0158	97.1499	101.2839	105.4179	109.5520	113.6860 (44)
Energy conte	168.5931	147.4526	152.1578	132.6549	127.2855	109.8377	101.7808	116.7950	118.1899	137.7389	150.3528	163.2734 (45)
Energy content (annual)										Total = Sum(45)m =		1626.1122 (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	25.2890	22.1179	22.8237	19.8982	19.0928	16.4757	15.2671	17.5192	17.7285	20.6608	22.5529	24.4910 (46)
Water storage loss:												
Store volume												215.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7300 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9342 (55)
Total storage loss												
28.9602 26.1576 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 (56)												
If cylinder contains dedicated solar storage												
18.8578 17.0329 18.8578 18.2495 18.8578 18.2495 18.8578 18.2495 18.8578 18.2495 18.8578 18.2495 18.8578 (57)												
Primary loss												
23.2624 21.0112 21.8667 15.7584 10.4681 9.9053 10.2355 11.1660 17.1091 21.8667 22.5120 23.2624 (59)												
Total heat required for water heating calculated for each month												
210.7133 185.4966 192.8823 166.6628 156.6114 137.9925 130.8741 146.8187 153.5485 178.4633 191.1143 205.3936 (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												1.2460 (H8)
Utilisation factor												0.5518 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												117.0000 (H13)
Daily hot water demand												103.3509 (H14)
Volume ratio Veff/V												1.1321 (H15)
Solar storage volume factor												1.0000 (H16)
Solar input												-983.1046 (H17)
Solar input	-32.0800	-45.6213	-79.1647	-106.4899	-123.7484	-134.6024	-127.6236	-116.3804	-91.0906	-62.9586	-37.9433	-25.4014 (63)
Solar input (sum of months) = Sum (63)m =												-983.1046 (63)
Output from w/h												
178.6333 139.8753 113.7176 60.1729 32.8630 3.3901 3.2505 30.4384 62.4578 115.5048 153.1710 179.9922 (64)												
Total per year (kWh/year) = Sum (64)m =												1073.4667 (64)
Heat gains from water heating, kWh/month												
89.7534 79.4632 83.1720 71.3141 65.7831 59.0449 57.1167 62.8533 67.5850 78.3777 82.6015 87.9846 (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	174.6970	174.6970	174.6970	174.6970	174.6970	174.6970	174.6970	174.6970	174.6970	174.6970	174.6970	174.6970 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	70.7808	62.8669	51.1268	38.7063	28.9334	24.4268	26.3940	34.3079	46.0480	58.4686	68.2414	72.7480 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	457.0746	461.8176	449.8654	424.4205	392.3009	362.1131	341.9457	337.2027	349.1550	374.5998	406.7194	436.9072 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.3813	55.3813	55.3813	55.3813	55.3813	55.3813	55.3813	55.3813	55.3813	55.3813	55.3813	55.3813 (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)	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647	-116.4647 (71)
Water heating gains (Table 5)	120.6362	118.2488	111.7904	99.0473	88.4182	82.0067	76.7698	84.4803	93.8681	105.3464	114.7243	118.2588 (72)
Total internal gains	765.1053	759.5470	729.3962	678.7877	626.2662	585.1603	561.7232	572.6046	605.6847	655.0285	706.2988	744.5277 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W
North					6.5800	13.4684	0.6300	0.7000			0.7700	27.0841 (74)
East					1.2600	25.1733	0.6300	0.7000			0.7700	9.6935 (76)
South					14.8100	56.5862	0.6300	0.7000			0.7700	256.1165 (78)

Solar gains	292.8941	416.4402	565.1863	689.7526	723.0382	794.2975	735.6186	704.9663	634.7709	491.6344	347.7255	238.5820 (83)
Total gains	1057.9994	1175.9872	1294.5825	1368.5404	1349.3044	1379.4578	1297.3418	1277.5709	1240.4556	1146.6629	1054.0242	983.1097 (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	39.1726	39.3858	39.3858	39.6515	39.5871	39.7145	39.7145	39.7760	39.7760	39.5871	39.6515	39.5871
alpha	3.6115	3.6257	3.6257	3.6434	3.6391	3.6476	3.6476	3.6517	3.6517	3.6391	3.6434	3.6391
util living area	0.9686	0.9540	0.9197	0.8506	0.7345	0.5261	0.3763	0.3704	0.6159	0.8425	0.9421	0.9740 (86)
MIT	19.6996	19.8647	20.1705	20.5267	20.7999	20.9575	20.9908	20.9915	20.9223	20.6270	20.1365	19.6687 (87)
Th 2	19.9894	19.9943	19.9943	20.0004	19.9989	20.0018	20.0018	20.0032	20.0032	19.9989	20.0004	19.9989 (88)
util rest of house	0.9618	0.9443	0.9026	0.8179	0.6746	0.4348	0.2659	0.2582	0.5272	0.8003	0.9277	0.9682 (89)
MIT 2	18.8331	18.9977	19.2929	19.6315	19.8681	19.9834	19.9998	20.0015	19.9648	19.7270	19.2702	18.8107 (90)
Living area fraction	18.9477	19.1125	19.4090	19.7500	19.9914	20.1123	20.1309	20.1325	fLa = Living area / (4) =	20.0915	19.8461	19.3848
MIT	18.9477	19.1125	19.4090	19.7500	19.9914	20.1123	20.1309	20.1325	20.0915	19.8461	19.3848	18.9242 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9477	19.1125	19.4090	19.7500	19.9914	20.1123	20.1309	20.1325	20.0915	19.8461	19.3848	18.9242 (93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9528	0.9337	0.8907	0.8086	0.6742	0.4454	0.2805	0.2731	0.5356	0.7929	0.9167	0.9602	(94)
Useful gains	1008.0628	1098.0662	1153.1051	1106.6173	909.6371	614.3539	363.9282	348.8784	664.3706	909.1367	966.2116	943.9752	(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	2040.5130	1993.6923	1795.5112	1457.4034	1042.4846	635.1651	366.5519	351.1631	706.3254	1171.7649	1628.7977	2000.4591	(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	768.1429	601.8607	477.9501	252.5660	98.8386	0.0000	0.0000	0.0000	0.0000	195.3954	477.0620	786.0240	(98)
Space heating												3657.8398	(98)
Space heating per m2												26.6548	(99)

(98) / (4) = 26.6548 (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 %)													90.8000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													4028.4579 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	768.1429	601.8607	477.9501	252.5660	98.8386	0.0000	0.0000	0.0000	0.0000	195.3954	477.0620	786.0240	(98)
Space heating efficiency (main heating system 1)	90.8000	90.8000	90.8000	90.8000	90.8000	0.0000	0.0000	0.0000	0.0000	90.8000	90.8000	90.8000	(210)
Space heating fuel (main heating system)	845.9724	662.8422	526.3768	278.1564	108.8531	0.0000	0.0000	0.0000	0.0000	215.1932	525.3987	865.6652	(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	178.6333	139.8753	113.7176	60.1729	32.8630	3.3901	3.2505	30.4384	62.4578	115.5048	153.1710	179.9922	(64)
Efficiency of water heater (217)m	88.5678	88.5689	88.5271	88.5247	87.8710	80.1000	80.1000	80.1000	80.1000	86.5068	87.9448	88.5949	(216)
Fuel for water heating, kWh/month	201.6911	157.9283	128.4551	67.9730	37.3991	4.2323	4.0580	38.0004	77.9748	133.5210	174.1672	203.1631	(219)
Water heating fuel used												1228.5635	(219)
Annual totals kWh/year													
Space heating fuel - main system												4028.4579	(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)												500.0046	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.11 * 1206 * 1.00) =										-1070.9371		-1070.9371	(233)
Total delivered energy for all uses												4811.0889	(238)

10a. Fuel costs - using BEDF prices (493)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	4028.4579	3.6300	146.2330	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1228.5635	3.6300	44.5969	(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	500.0046	19.4400	97.2009	(250)
Additional standing charges			95.0000	(251)
Energy saving/generation technologies				
PV Unit	-1070.9371	19.4400	-208.1902	(252)
Total energy cost			199.1406	(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	4028.4579	0.2160	870.1469	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1228.5635	0.2160	265.3697	(264)
Space and water heating			1135.5166	(265)
Pumps and fans	125.0000	0.5190	64.8750	(267)
Energy for lighting	500.0046	0.5190	259.5024	(268)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Energy saving/generation technologies			
PV Unit	-1070.9371	0.5190	-555.8163 (269)
Total kg/year			904.0777 (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	4028.4579	1.2200	4914.7187 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1228.5635	1.2200	1498.8474 (264)
Space and water heating			6413.5661 (265)
Pumps and fans	125.0000	3.0700	383.7500 (267)
Energy for lighting	500.0046	3.0700	1535.0140 (268)
Energy saving/generation technologies			
PV Unit	-1070.9371	3.0700	-3287.7768 (269)
Primary energy kWh/year			5044.5533 (272)
Primary energy kWh/m2/year			36.7598 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Plot 11	Issued on Date	09/05/2022
Assessment Reference	As Built	Prop Type Ref	K
Project	11 Oram Way, West End, Southampton, SO30 3JW		
Calculation Type	New Build (As Built)		

SAP Rating	89 B	DER	12.12	TER	15.43
Environmental	89 B	% DER<TER	21.44		
CO ₂ Emissions (t/year)	1.18	DFEE	42.93	TTEE	51.85
General Requirements Compliance	Pass	% DFEE<TFEE	17.20		

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

Building Elements

Roof 000002 - Mineral Wool between and above

Roof Type: Pitched Roof, insulated flat ceiling

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

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

Unheated space: None

Total thickness: 463 mm

U-value: 0.10 W/m² K

Kappa: 9.10 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Plot 11	Issued on Date	09/05/2022
Assessment Reference	As Built	Prop Type Ref	K
Project	11 Oram Way, West End, Southampton, SO30 3JW		
Calculation Type	New Build (As Built)		

SAP Rating	89 B	DER	12.12	TER	15.43
Environmental	89 B	% DER<TER	21.44		
CO ₂ Emissions (t/year)	1.18	DFEE	42.93	TFEE	51.85
General Requirements Compliance	Pass	% DFEE<TFEE	17.20		

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

Wall 000001

Wall Type: Standard Wall

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

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

Unheated space: None

Total thickness: 330 mm

U-value: 0.24 W/m² K

Kappa: 42.22 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Plot 11	Issued on Date	09/05/2022
Assessment Reference	As Built	Prop Type Ref	K
Project	11 Oram Way, West End, Southampton, SO30 3JW		
Calculation Type	New Build (As Built)		

SAP Rating	89 B	DER	12.12	TER	15.43
Environmental	89 B	% DER<TER	21.44		
CO ₂ Emissions (t/year)	1.18	DFEE	42.93	TFEE	51.85
General Requirements Compliance	Pass	% DFEE<TFEE	17.20		

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

Building Elements

Floor 000003 - Worst Case Slab

Floor Type: Slab On Ground Floor

Area = 35.11 m², Perimeter = 16.79 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 11	Issued on Date	09/05/2022
Assessment Reference	As Built	Prop Type Ref	K
Property	11 Oram Way, West End, Southampton, SO30 3JW		
SAP Rating	89 B	DER	12.12
Environmental	89 B	TER	15.43
CO ₂ Emissions (t/year)	1.18	% DER<TER	21.44
General Requirements Compliance	Pass	DFEE	42.93
		TFEE	51.85
		% DFEE<TFEE	17.20
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com		Assessor ID
			E477-0001
Client	Foreman Homes, FORE		

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

Orientation	North
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: 35.55 m	69.39 m ²	2.39 m
	1st Storey: 32.97 m	67.84 m ²	2.64 m

7.0 Living Area	18.16	m ²
8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	157.1	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	172.01	147.24

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	61.58	
GF Stud	Plasterboard on timber frame	9.00	44.69	
FF Stud	Plasterboard on timber frame	9.00	157.64	

10.0 External Roofs					
Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)
Pitched Roof	External Plane Roof	Other	0.10	9.10	69.39

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	67.84

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	69.39

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	67.84

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	North							2.12	
Front Shaded	Window	[1] Brick and Block	North	None	0.46	Yes				0.84	
Front Elevation	Window	[1] Brick and Block	North	None	0.00					5.74	
Side Elevation	Window	[1] Brick and Block	East	None	0.00					1.26	
Rear Elevation	Window	[1] Brick and Block	South	None	0.00					14.81	

14.0 Conservatory

None

15.0 Draught Proofing

100 %

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	0.63	0.093	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	2.75	0.070	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	7.20	0.067	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	2.92	0.070	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	2.77	0.059	No	Birtley Supatherm
Independently assessed	E3 Sill	10.57	0.021	No	Knauf P5
Independently assessed	E4 Jamb	36.60	0.016	No	Knauf P6
Table K1 - Approved	E5 Ground floor (normal)	35.55	0.160	No	
Independently assessed	E6 Intermediate floor within a dwelling	32.97	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	20.68	0.060	No	
Independently assessed	E24 Eaves (insulation at ceiling level - inverted)	3.14	0.151	No	Knauf P19
Independently assessed	E12 Gable (insulation at ceiling level)	17.98	0.044	No	Knauf P21
Independently assessed	E16 Corner (normal)	29.64	0.039	No	Knauf P23
Independently assessed	E17 Corner (inverted – internal area greater than external area)	9.54	-0.091	No	Knauf P24

Y-value 0.033 W/m²K

18.0 Pressure Testing

Designed AP ₅₀	5.00	m³/(h.m²) @ 50 Pa
Property Tested ?	Yes	
As Built AP ₅₀	3.97	m³/(h.m²) @ 50 Pa

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

19.0 Mechanical Ventilation

Summer Overheating

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

Mechanical Ventilation

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

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				5
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	28	
Total number of L.E.L. fittings	28	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	Yes
Light and motion sensor	Yes

23.0 Electricity Tariff

Standard

24.0 Main Heating 1

0 Main Heating 1	Database	
Description	Gas Combi	
Percentage of Heat	100	%
Database Ref. No.	18912	
Fuel Type	Mains gas	
Main Heating	BGB	
SAP Code	102	
In Winter	90.8	
In Summer	80.1	
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)	

25.0 Main Heating 2

None

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Community Heating	None			
28.0 Water Heating	HWP From main heating 1			
Water Heating	Main Heating 1			
Flue Gas Heat Recovery System	No			
Waste Water Heat Recovery Instantaneous System 1	No			
Waste Water Heat Recovery Instantaneous System 2	No			
Waste Water Heat Recovery Storage System	No			
Solar Panel	No			
Water use <= 125 litres/person/day	Yes			
SAP Code	901			
29.0 Hot Water Cylinder	Hot Water Cylinder			
Cylinder Stat	Yes			
Cylinder In Heated Space	Yes			
Independent Time Control	Yes			
Insulation Type	Measured Loss			
Cylinder Volume	215.00	L		
Loss	1.73	kWh/day		
Pipes insulation	Fully insulated primary pipework			
31.0 Thermal Store	None			
32.0 Photovoltaic Unit	One Dwelling			
PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
1.11	South	30°	None Or Little	Yes
Recommendations				
Lower cost measures				
None				
Further measures to achieve even higher standards				
	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar water heating	£4,000 - £6,000	£40	B 90	