



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 5 Winifred Moody Road, West End
Southampton, SO30 3LB

Contact: Tobias Whiting
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Report Issue Date: 20/09/2022

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Plot 28	Issued on Date	20/09/2022
Assessment Reference	As Built	Prop Type Ref	Kh
Property	5 Winifred Moody Road, West End, Southampton, SO30 3LB		
SAP Rating	89 B	DER	12.94
Environmental	88 B	TER	16.35
CO ₂ Emissions (t/year)	1.26	% DER<TER	20.86
General Requirements Compliance	Pass	DfEE	46.75
		TfEE	56.58
		% DfEE<TfEE	17.37
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)	16.35	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	12.94	kgCO ₂ /m ²	Pass
	-3.41 (-20.9%)	kgCO ₂ /m ²	

1b TfEE and DfEE

Target Fabric Energy Efficiency (TfEE)	56.58	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DfEE)	46.75	kWh/m ² /yr	
	-9.8 (-17.3%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	Pass
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	Pass
Openings	1.19 (max. 2.00)	1.20 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.33 (measured in this dwelling)	m ³ /(h.m ²) @ 50 Pa	
Maximum	10.0	m ³ /(h.m ²) @ 50 Pa	Pass

Limiting System Efficiencies

4 Heating efficiency

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

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Main heating system

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

14.81 m², No overhang

Windows facing East

1.26 m², No overhang

Windows facing South

6.58 m², Overhang twice as wide as window, ratio 0.44

Air change rate

4.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

4.33 (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
Photovoltaic array	1.15	kW

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THERMAL BRIDGING

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Plot 28	Issued on Date	20/09/2022
Assessment Reference	As Built	Prop Type Ref	Kh
Property	5 Winifred Moody Road, West End, Southampton, SO30 3LB		

SAP Rating	89 B	DER	12.94	TER	16.35
Environmental	88 B	% DER<TER	20.86		
CO ₂ Emissions (t/year)	1.26	DFEE	46.75	TFEE	56.58
General Requirements Compliance	Pass	% DFEE<TFEE	17.37		

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	1.51	0.11	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.070	1.41	0.10	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.056	2.77	0.16	Birtley Supatherm
External wall	E3 Sill	Independently assessed	0.210	10.58	2.22	Knauf P5
External wall	E4 Jamb	Independently assessed	0.016	36.60	0.59	Knauf P6
External wall	E5 Ground floor (normal)	Independently assessed	0.105	35.55	3.73	LABC E5MCF11
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	18.16	0.80	Knauf P21
External wall	E16 Corner (normal)	Independently assessed	0.039	29.78	1.16	Knauf P23
External wall	E17 Corner (inverted – internal area greater than external area)	Independently assessed	-0.091	9.52	-0.87	Knauf P24

Total: **10.44** W/mK:
Y-Value: **0.033** W/m²K:

FULL SAP CALCULATION PRINTOUT

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Environmental	88 B	% DER<TER	20.86		
CO ₂ Emissions (t/year)	1.26	DFEE	46.75	TFEE	56.58
General Requirements Compliance	Pass	% DFEE<TFEE	17.37		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com			Assessor ID	E477-0001
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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) 16.35 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 12.94 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)56.6 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)46.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.19 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 4.33 (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: 14.81 m², No overhang
Windows facing East: 1.26 m², No overhang
Windows facing South: 6.58 m², Overhang twice as wide as window, ratio 0.44
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
Photovoltaic array 1.15 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 2.6700 (2c)	= 181.1328 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.2300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 346.9749 (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) = 0.1441 (8)
Pressure test					Yes
Measured/design AP50					4.3300
Infiltration rate					0.3606 (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) =	0.3065 (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	0.3908	0.3831	0.3755	0.3372	0.3295	0.2912	0.2912	0.2835	0.3065	0.3295	0.3448	0.3602 (22b)
Effective ac	0.5764	0.5734	0.5705	0.5568	0.5543	0.5424	0.5424	0.5402	0.5470	0.5543	0.5595	0.5649 (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	172.9900	24.7700	148.2200	0.2400	35.5728	42.2200	6257.8484 (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)			311.7700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	79.1057		(33)
GF Block			61.5800			75.0000	4618.5000 (32c)
GF Stud			44.7400			9.0000	402.6600 (32c)
FF Stud			160.2000			9.0000	1441.8000 (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) = 21623.2574 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 157.5695 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.4422 (36)
Total fabric heat loss (33) + (36) = 89.5480 (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	65.9946	65.6551	65.3223	63.7591	63.4666	62.1051	62.1051	61.8530	62.6296	63.4666	64.0583	64.6768 (38)
Heat transfer coeff	155.5426	155.2030	154.8702	153.3070	153.0146	151.6531	151.6531	151.4010	152.1775	153.0146	153.6062	154.2248 (39)
Average = Sum(39)m / 12 =												153.3056 (39)
HLP	1.1334	1.1310	1.1285	1.1172	1.1150	1.1051	1.1051	1.1033	1.1089	1.1150	1.1193	1.1238 (40)
HLP (average)												1.1171 (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													(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													(59)
23.2624 21.0112 23.2624 22.5120 23.2624 22.5120 23.2624 23.2624 22.5120 23.2624 22.5120 23.2624 22.5120													
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													(63)
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 =													
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 =													(64)
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 (69)													
Pumps, fans													(70)
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													
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				14.8100	10.6334		0.6300	0.7000		0.7700	48.1281 (74)	
East				1.2600	19.6403		0.6300	0.7000		0.7700	7.5629 (76)	
South				6.5800	46.7521		0.6300	0.7000		0.7700	94.0153 (78)	
Solar gains	149.7063	260.7428	376.7872	508.2479	612.7199	628.9084	597.6426	515.5495	421.1317	293.1138	180.2425	127.5792 (83)
Total gains	685.4319	794.0932	892.4760	995.1805	1069.8475	1057.8462	1008.6182	933.2228	853.8931	754.8674	675.3024	648.2021 (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	38.6162	38.7007	38.7838	39.1793	39.2542	39.6066	39.6066	39.6725	39.4701	39.2542	39.1030	38.9461	
alpha	3.5744	3.5800	3.5856	3.6120	3.6169	3.6404	3.6404	3.6448	3.6313	3.6169	3.6069	3.5964	
util living area	0.9937	0.9887	0.9776	0.9482	0.8792	0.7495	0.6032	0.6586	0.8569	0.9634	0.9892	0.9949 (86)	
MIT	19.1389	19.3347	19.6648	20.1111	20.5292	20.8262	20.9424	20.9199	20.6889	20.1568	19.5700	19.1053 (87)	
Th 2	19.9736	19.9756	19.9776	19.9868	19.9886	19.9967	19.9967	19.9982	19.9936	19.9886	19.9851	19.9814 (88)	
util rest of house	0.9923	0.9861	0.9722	0.9345	0.8446	0.6748	0.4881	0.5465	0.8029	0.9512	0.9863	0.9937 (89)	
MIT 2	18.2666	18.4629	18.7917	19.2362	19.6327	19.8944	19.9743	19.9642	19.7871	19.2874	18.7051	18.2390 (90)	
Living area fraction									fLA = Living area / (4) =			0.1323 (91)	
MIT	18.3820	18.5782	18.9072	19.3520	19.7514	20.0177	20.1024	20.0907	19.9064	19.4025	18.8196	18.3536 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.3820	18.5782	18.9072	19.3520	19.7514	20.0177	20.1024	20.0907	19.9064	19.4025	18.8196	18.3536 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.9891 0.9813 0.9647 0.9237 0.8350 0.6766 0.5012 0.5579 0.7973 0.9419 0.9816 0.9910 (94)													
Useful gains	677.9907	779.2219	860.9760	919.2397	893.3050	715.7145	505.4932	520.6777	680.7948	710.9737	662.8808	642.3957 (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	2190.3487	2122.9025	1921.5119	1602.3623	1231.9779	821.6076	531.1551	558.7682	883.6051	1346.9073	1800.1977	2182.8376 (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	1125.1943	902.9534	789.0387	491.8483	251.9727	0.0000	0.0000	0.0000	0.0000	473.1346	818.8682	1146.0887 (98)	
Space heating												5999.0990 (98)	
Space heating per m2												(98) / (4) = 43.7157 (99)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.8000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													6606.9373 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1125.1943	902.9534	789.0387	491.8483	251.9727	0.0000	0.0000	0.0000	0.0000	473.1346	818.8682	1146.0887	(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)	1239.2008	994.4421	868.9854	541.6832	277.5029	0.0000	0.0000	0.0000	0.0000	521.0733	901.8373	1262.2123	(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	88.8528	88.6990	88.3713	87.6235	86.0195	80.1000	80.1000	80.1000	80.1000	87.4533	88.4718	80.1000	(216)
Fuel for water heating, kWh/month	248.5184	219.4178	231.2746	209.0682	208.6830	200.2194	192.2639	211.0082	210.6465	217.2148	227.0675	242.3480	(219)
Water heating fuel used												2617.7304	(219)
Annual totals kWh/year													
Space heating fuel - main system												6606.9373	(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 * 1.15 * 1080 * 1.00) =													-993.1627
Total delivered energy for all uses													8806.5095 (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	6606.9373	0.2160	1427.0984 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2617.7304	0.2160	565.4298 (264)
Space and water heating			1992.5282 (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	-993.1627	0.5190	-515.4514 (269)
Total CO2, kg/year			1775.5042 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			12.9400 (273)

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

DER			12.9400 ZC1
Total Floor Area		TFA	137.2300
Assumed number of occupants		N	2.9116
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			13.2239 ZC2
CO2 emissions from cooking, equation (L16)			1.3764 ZC3
Total CO2 emissions			27.5403 ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000 ZC7
Net CO2 emissions			27.5403 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	69.3900 (1b)	x 2.3900 (2b)	= 165.8421 (1b) - (3b)
First floor	67.8400 (1c)	x 2.6700 (2c)	= 181.1328 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.2300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 346.9749 (5)

2. Ventilation rate

										main	secondary	other	total	m3 per hour			
										heating	heating						
Number of chimneys										0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues										0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans																4 * 10 =	40.0000 (7a)
Number of passive vents																0 * 10 =	0.0000 (7b)
Number of flueless gas fires																0 * 40 =	0.0000 (7c)
										Air changes per hour							
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) =	0.1153 (8)	
Pressure test															Yes		
Measured/design AP50															5.0000		
Infiltration rate															0.3653 (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) =					0.3105 (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	0.3959	0.3881	0.3804	0.3415	0.3338	0.2950	0.2950	0.2872	0.3105	0.3338	0.3493	0.3648 (22b)					
Effective ac	0.5784	0.5753	0.5723	0.5583	0.5557	0.5435	0.5435	0.5412	0.5482	0.5557	0.5610	0.5665 (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	172.9900	24.7700	148.2200	0.1800	26.6796		(29a)					
Pitched Roof	69.3900		69.3900	0.1300	9.0207		(30)					
Total net area of external elements Aum(A, m2)			311.7700				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		76.8694		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.7679 (36)					
Total fabric heat loss						(33) + (36) =	90.6373 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 66.2230	Feb 65.8746	Mar 65.5331	Apr 63.9291	May 63.6290	Jun 62.2319	Jul 62.2319	Aug 61.9732	Sep 62.7701	Oct 63.6290	Nov 64.2361	Dec 64.8708 (38)
Heat transfer coeff	156.8603	156.5119	156.1704	154.5664	154.2663	152.8693	152.8693	152.6105	153.4074	154.2663	154.8734	155.5081 (39)
Average = Sum(39)m / 12 =												154.5650 (39)
HLP	Jan 1.1430	Feb 1.1405	Mar 1.1380	Apr 1.1263	May 1.1241	Jun 1.1140	Jul 1.1140	Aug 1.1121	Sep 1.1179	Oct 1.1241	Nov 1.1286	Dec 1.1332 (40)
HLP (average)												1.1263 (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)

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 (58)
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 (59)
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)

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)

[Jan	Area	Solar flux	g	FF	Access	Gains
	m2	Table 6a	Specific data	Specific data	factor	W
		W/m2	or Table 6b	or Table 6c	Table 6d	

North	14.8100	10.6334	0.6300	0.7000	0.7700	48.1281 (74)
East	1.2600	19.6403	0.6300	0.7000	0.7700	7.5629 (76)
South	6.5800	46.7521	0.6300	0.7000	0.7700	94.0153 (78)

MIT	19.6742	19.8158	20.0556	20.3855	20.6991	20.9113	20.9792	20.9667	20.8077	20.4100	19.9840	19.6512 (87)
Th 2	19.9658	19.9679	19.9699	19.9794	19.9812	19.9894	19.9894	19.9910	19.9863	19.9812	19.9776	19.9738 (88)
util rest of house												
	0.9989	0.9973	0.9925	0.9729	0.9010	0.7184	0.5056	0.5712	0.8597	0.9826	0.9974	0.9992 (89)
MIT 2	18.1866	18.3950	18.7465	19.2300	19.6653	19.9249	19.9811	19.9758	19.8159	19.2706	18.6483	18.1586 (90)
Living area fraction									fLA = Living area / (4) =			0.1323 (91)
MIT	18.3835	18.5831	18.9197	19.3829	19.8021	20.0554	20.1132	20.1069	19.9471	19.4214	18.8251	18.3561 (92)
Temperature adjustment												0.0000
adjusted MIT	18.3835	18.5831	18.9197	19.3829	19.8021	20.0554	20.1132	20.1069	19.9471	19.4214	18.8251	18.3561 (93)

Regs Region: England
Elmhurst Energy Systems
SAP2012 Calculator (Design
System) version 4.14r19

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													6378.7642 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1134.6486	907.7731	786.1840	474.2604	218.2290	0.0000	0.0000	0.0000	0.0000	463.4859	823.2534	1156.3103	(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)	1213.5279	970.8804	840.8385	507.2303	233.4000	0.0000	0.0000	0.0000	0.0000	495.7069	880.4849	1236.6955	(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	88.5659	88.4078	88.0643	87.2414	85.3369	79.8000	79.8000	79.8000	79.8000	87.1056	88.1813	79.8000	(216)
Fuel for water heating, kWh/month	249.2437	220.0684	232.0006	209.9055	210.2695	200.8864	192.8982	211.7129	211.3527	218.0008	227.7380	243.0515	(219)
Water heating fuel used												2627.1283	(219)
Annual totals kWh/year													
Space heating fuel - main system												6378.7642	(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												9580.8971	(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	6378.7642	0.2160	1377.8131	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2627.1283	0.2160	567.4597	(264)
Space and water heating			1945.2728	(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			2243.7002	(272)
Emissions per m2 for space and water heating			14.1753	(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) = (14.1753 * 1.00) + 1.8910 + 0.2836, rounded to 2 d.p.			16.3500	(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 2.6700 (2c)	= 181.1328 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.2300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 346.9749 (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) = 0.1153 (8)
Pressure test					Yes
Measured/design AP50					4.3300
Infiltration rate					0.3318 (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) =	0.2820 (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	0.3596	0.3525	0.3455	0.3102	0.3032	0.2679	0.2679	0.2609	0.2820	0.3032	0.3173	0.3314 (22b)
Effective ac	0.5646	0.5621	0.5597	0.5481	0.5460	0.5359	0.5359	0.5340	0.5398	0.5460	0.5503	0.5549 (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	172.9900	24.7700	148.2200	0.2400	35.5728	42.2200	6257.8484 (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)			311.7700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	79.1057		(33)
GF Block			61.5800			75.0000	4618.5000 (32c)
GF Stud			44.7400			9.0000	402.6600 (32c)
FF Stud			160.2000			9.0000	1441.8000 (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

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 64.6528	Feb 64.3654	Mar 64.0836	Apr 62.7603	May 62.5128	Jun 61.3602	Jul 61.3602	Aug 61.1468	Sep 61.8042	Oct 62.5128	Nov 63.0136	Dec 63.5373 (38)
Heat transfer coeff	154.2008	153.9133	153.6316	152.3083	152.0607	150.9082	150.9082	150.6947	151.3521	152.0607	152.5616	153.0852 (39)
Average = Sum(39)m / 12 =												152.3071 (39)

HLP	Jan 1.1237	Feb 1.1216	Mar 1.1195	Apr 1.1099	May 1.1081	Jun 1.0997	Jul 1.0997	Aug 1.0981	Sep 1.1029	Oct 1.1081	Nov 1.1117	Dec 1.1155 (40)
HLP (average)												1.1099 (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)

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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	Specific data or Table 6b	g Specific data or Table 6c	FF Access factor Table 6d	Gains W	
North	14.8100	10.6334	0.6300	0.7000	0.7700	48.1281	(74)
East	1.2600	19.6403	0.6300	0.7000	0.7700	7.5629	(76)
South	6.5800	46.7521	0.6300	0.7000	0.7700	94.0153	(78)

Solar gains	149.7063	260.7428	376.7872	508.2479	612.7199	628.9084	597.6426	515.5495	421.1317	293.1138	180.2425	127.5792	(83)
Total gains	599.0861	708.6090	808.7811	913.9180	990.1642	980.3866	933.0486	855.2316	775.0415	673.4981	591.0902	562.7144	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	37.8523	37.9230	37.9926	38.3227	38.3851	38.6782	38.6782	38.7330	38.5648	38.3851	38.2590	38.1282	
alpha	3.5235	3.5282	3.5328	3.5548	3.5590	3.5785	3.5785	3.5822	3.5710	3.5590	3.5506	3.5419	
util living area	0.9955	0.9914	0.9821	0.9566	0.8950	0.7757	0.6347	0.6935	0.8805	0.9719	0.9922	0.9964	(86)
MIT	19.0341	19.2351	19.5744	20.0341	20.4733	20.7947	20.9282	20.8999	20.6385	20.0754	19.4711	18.9977	(87)
Th 2	19.9816	19.9833	19.9849	19.9928	19.9942	20.0011	20.0011	20.0024	19.9985	19.9942	19.9913	19.9882	(88)
util rest of house	0.9945	0.9894	0.9777	0.9450	0.8640	0.7045	0.5189	0.5828	0.8328	0.9624	0.9902	0.9956	(89)
MIT 2	18.1711	18.3725	18.7109	19.1693	19.5895	19.8768	19.9720	19.9579	19.7514	19.2158	18.6145	18.1396	(90)
Living area fraction	18.2853	18.4866	18.8252	19.2837	19.7065	19.9982	20.0986	20.0826	19.8688	19.3295	18.7278	18.2531	(91)
Temperature adjustment	18.2853	18.4866	18.8252	19.2837	19.7065	19.9982	20.0986	20.0826	19.8688	19.3295	18.7278	18.2531	(92)
adjusted MIT	18.2853	18.4866	18.8252	19.2837	19.7065	19.9982	20.0986	20.0826	19.8688	19.3295	18.7278	18.2531	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9921	0.9854	0.9710	0.9345	0.8534	0.7043	0.5313	0.5928	0.8252	0.9539	0.9864	0.9936	(94)
Ext temp.	594.3277	698.2396	785.3392	854.0798	844.9698	690.4699	495.7106	506.9419	639.5800	642.4332	583.0751	559.1108	(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	2156.5434	2091.1650	1893.5369	1581.5246	1217.4726	814.6363	527.9605	554.9412	873.1238	1327.4207	1773.9609	2151.3270	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(98)
Space heating per m2	1162.2885	936.0459	824.4991	523.7602	277.1421	0.0000	0.0000	0.0000	0.0000	509.6307	857.4378	1184.6089	(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	1418.5367	1116.7204	1145.2799	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7357	0.8117	0.7733	0.0000	0.0000	0.0000	0.0000	(101)

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Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1043.6155	906.4137	885.6890	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1267.6587	1209.5672	1121.0735	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	161.3111	225.5462	175.1260	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												561.9833 (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	40.3278	56.3865	43.7815	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												140.4958 (107)
Space cooling per m2												1.0238 (108)
Energy for space heating												45.7292 (99)
Energy for space cooling												1.0238 (108)
Total												46.7530 (109)
Dwelling Fabric Energy Efficiency (DFEE)												46.8 (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 2.6700 (2c)	= 181.1328 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.2300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 346.9749 (5)

2. Ventilation rate

										main	secondary	other	total	m3 per hour			
										heating	heating						
Number of chimneys										0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues										0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans																4 * 10 =	40.0000 (7a)
Number of passive vents																0 * 10 =	0.0000 (7b)
Number of flueless gas fires																0 * 40 =	0.0000 (7c)
										Air changes per hour							
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =				40.0000	/ (5) =	0.1153 (8)	
Pressure test										Yes							
Measured/design AP50										5.0000							
Infiltration rate										0.3653 (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) =				0.3105 (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	0.3959	0.3881	0.3804	0.3415	0.3338	0.2950	0.2950	0.2872	0.3105	0.3338	0.3493	0.3648	(22b)				
Effective ac	0.5784	0.5753	0.5723	0.5583	0.5557	0.5435	0.5435	0.5412	0.5482	0.5557	0.5610	0.5665	(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	172.9900	24.7700	148.2200	0.1800	26.6796		(29a)					
Pitched Roof	69.3900		69.3900	0.1300	9.0207		(30)					
Total net area of external elements Aum(A, m2)			311.7700				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		76.8694		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.7679 (36)					
Total fabric heat loss						(33) + (36) =	90.6373 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 66.2230	Feb 65.8746	Mar 65.5331	Apr 63.9291	May 63.6290	Jun 62.2319	Jul 62.2319	Aug 61.9732	Sep 62.7701	Oct 63.6290	Nov 64.2361	Dec 64.8708 (38)
Heat transfer coeff	156.8603	156.5119	156.1704	154.5664	154.2663	152.8693	152.8693	152.6105	153.4074	154.2663	154.8734	155.5081 (39)
Average = Sum(39)m / 12 =												154.5650 (39)
HLP	Jan 1.1430	Feb 1.1405	Mar 1.1380	Apr 1.1263	May 1.1241	Jun 1.1140	Jul 1.1140	Aug 1.1121	Sep 1.1179	Oct 1.1241	Nov 1.1286	Dec 1.1332 (40)
HLP (average)												1.1263 (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	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	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	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	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	Solar flux		g		FF		Access		Gains	
			m2	Table 6a		Specific data		Specific data		factor		W	
				W/m2		or Table 6b		or Table 6c		Table 6d			
North			14.8100	10.6334		0.6300		0.7000		0.7700		48.1281	(74)
East			1.2600	19.6403		0.6300		0.7000		0.7700		7.5629	(76)
South			6.5800	46.7521		0.6300		0.7000		0.7700		94.0153	(78)

Solar gains	149.7063	260.7428	376.7872	508.2479	612.7199	628.9084	597.6426	515.5495	421.1317	293.1138	180.2425	127.5792	(83)
Total gains	599.0861	708.6090	808.7811	913.9180	990.1642	980.3866	933.0486	855.2316	775.0415	673.4981	591.0902	562.7144	(84)

7. Mean internal temperature (heating season)													

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	60.7538	60.8890	61.0222	61.6554	61.7754	62.3399	62.3399	62.4456	62.1213	61.7754	61.5332	61.2821	
alpha	5.0503	5.0593	5.0681	5.1104	5.1184	5.1560	5.1560	5.1630	5.1414	5.1184	5.1022	5.0855	
util living area	0.9996	0.9988	0.9965	0.9867	0.9482	0.8367	0.6779	0.7454	0.9367	0.9931	0.9990	0.9997	(86)
MIT	19.6153	19.7577	19.9997	20.3343	20.6591	20.8911	20.9724	20.9556	20.7711	20.3567	19.9267	19.5927	(87)
Th 2	19.9658	19.9679	19.9699	19.9794	19.9812	19.9894	19.9894	19.9910	19.9863	19.9812	19.9776	19.9738	(88)
util rest of house	0.9994	0.9984	0.9951	0.9807	0.9227	0.7571	0.5431	0.6161	0.8939	0.9892	0.9986	0.9996	(89)
MIT 2	18.6922	18.8362	19.0791	19.4184	19.7310	19.9332	19.9816	19.9764	19.8416	19.4442	19.0129	18.6761	(90)
Living area fraction									fLA = Living area / (4) =			0.1323	(91)
MIT	18.8144	18.9581	19.2010	19.5396	19.8538	20.0600	20.1127	20.1060	19.9646	19.5649	19.1338	18.7974	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8144	18.9581	19.2010	19.5396	19.8538	20.0600	20.1127	20.1060	19.9646	19.5649	19.1338	18.7974	(93)

8. Space heating requirement													

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9991	0.9978	0.9937	0.9773	0.9187	0.7636	0.5609	0.6326	0.8927	0.9869	0.9980	0.9994	(94)
Ext temp.	598.5652	707.0511	803.6802	893.1744	909.6201	748.5828	523.3259	541.0034	691.8812	664.6994	589.9374	562.3627	(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	2276.7314	2200.2621	1983.5129	1644.5258	1257.8525	834.6619	536.9844	565.5726	899.6683	1382.9885	1863.7124	2270.0082	(97)
Space heating kWh	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	1248.5557	1003.4378	877.7955	540.9730	259.0849	0.0000	0.0000	0.0000	0.0000	534.4071	917.1180	1270.4883	(98)
Space heating per m2												6651.8603	(98)
										(98) / (4) =		48.4723	(99)

8c. Space cooling requirement													

Calculated for June, July and August. See Table 10b													
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	1436.9710	1131.2325	1159.8401	0.0000	0.0000	0.0000	0.0000	(100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.7809	0.8642	0.8232	0.0000	0.0000	0.0000	0.0000	(101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1122.1454	977.6642	954.7505	0.0000	0.0000	0.0000	0.0000	(102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1267.6587	1209.5672	1121.0735	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	104.7696	172.5358	123.7443	0.0000	0.0000	0.0000	0.0000	(104)
												401.0497	(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	26.1924	43.1339	30.9361	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												100.2624 (107)
Space cooling per m2												0.7306 (108)
Energy for space heating												48.4723 (99)
Energy for space cooling												0.7306 (108)
Total												49.2030 (109)
Target Fabric Energy Efficiency (TFEE)												56.6 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (Version 9.92, January 2014)
CALCULATION OF HEAT DEMAND 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	69.3900 (1b)	x 2.3900 (2b)	= 165.8421 (1b) - (3b)
First floor	67.8400 (1c)	x 2.6700 (2c)	= 181.1328 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.2300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 346.9749 (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) = 0.1441 (8)
Pressure test					Yes
Measured/design AP50					4.3300
Infiltration rate					0.3606 (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) =	0.3065 (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	0.3602	0.3372	0.3372	0.3065	0.3142	0.2988	0.2988	0.2912	0.2912	0.3142	0.3065	0.3142 (22b)
Effective ac	0.5649	0.5568	0.5568	0.5470	0.5494	0.5447	0.5447	0.5424	0.5424	0.5494	0.5470	0.5494 (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	172.9900	24.7700	148.2200	0.2400	35.5728	42.2200	6257.8484 (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)			311.7700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	79.1057		(33)
GF Block			61.5800			75.0000	4618.5000 (32c)
GF Stud			44.7400			9.0000	402.6600 (32c)
FF Stud			160.2000			9.0000	1441.8000 (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) = 21623.2574 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 157.5695 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.4422 (36)
Total fabric heat loss (33) + (36) = 89.5480 (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	64.6768	63.7591	63.7591	62.6296	62.9019	62.3640	62.3640	62.1051	62.1051	62.9019	62.6296	62.9019 (38)
Heat transfer coeff	154.2248	153.3070	153.3070	152.1775	152.4498	151.9119	151.9119	151.6531	151.6531	152.4498	152.1775	152.4498 (39)
Average = Sum(39)m / 12 =												152.4728 (39)
HLP	1.1238	1.1172	1.1172	1.1089	1.1109	1.1070	1.1070	1.1051	1.1051	1.1109	1.1089	1.1109 (40)
HLP (average)												1.1111 (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	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)
RHI water heating demand													2241 (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													
(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					14.8100	13.4684	0.6300	0.7000	0.7700	60.9598 (74)			
East					1.2600	25.1733	0.6300	0.7000	0.7700	9.6935 (76)			
South					6.5800	56.5862	0.6300	0.7000	0.7700	113.7911 (78)			

Solar gains	184.4444	274.5362	407.2861	556.9270	635.1728	722.3846	659.2227	591.2617	478.4799	333.9550	221.5609	148.6711	(83)
Total gains	960.4125	1044.9460	1149.0459	1254.0816	1286.0591	1332.4151	1245.8161	1187.7360	1101.0306	1001.3471	938.7224	904.0617	(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	38.9461	39.1793	39.1793	39.4701	39.3996	39.5391	39.5391	39.6066	39.6066	39.3996	39.4701	39.3996	
alpha	3.5964	3.6120	3.6120	3.6313	3.6266	3.6359	3.6359	3.6404	3.6404	3.6266	3.6313	3.6266	
util living area	0.9767	0.9676	0.9420	0.8783	0.7574	0.5446	0.3935	0.3991	0.6734	0.8847	0.9586	0.9801	(86)
MIT	19.6010	19.7433	20.0521	20.4554	20.7751	20.9520	20.9891	20.9890	20.8946	20.5400	20.0352	19.5871	(87)
Th 2	19.9814	19.9868	19.9868	19.9936	19.9919	19.9951	19.9951	19.9967	19.9967	19.9919	19.9936	19.9919	(88)
util rest of house	0.9714	0.9603	0.9286	0.8494	0.6987	0.4508	0.2779	0.2785	0.5831	0.8494	0.9475	0.9755	(89)
MIT 2	18.7304	18.8743	19.1755	19.5631	19.8434	19.9742	19.9927	19.9944	19.9428	19.6475	19.1683	18.7251	(90)
Living area fraction	18.8456	18.9893	19.2915	19.6812	19.9667	20.1036	20.1246	20.1260	20.0688	19.7656	19.2830	18.8392	(91)
MIT	18.8456	18.9893	19.2915	19.6812	19.9667	20.1036	20.1246	20.1260	20.0688	19.7656	19.2830	18.8392	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8456	18.9893	19.2915	19.6812	19.9667	20.1036	20.1246	20.1260	20.0688	19.7656	19.2830	18.8392	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	925.6133	993.9825	1054.0484	1052.0476	896.5104	614.8592	365.2241	349.7487	649.8863	841.0631	880.1232	875.6433	(94)
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	2042.8010	1991.3525	1792.3889	1458.0458	1046.8250	638.5731	368.3238	352.7446	708.0342	1168.6237	1625.7174	2003.0615	(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	831.1876	670.2326	549.3254	292.3187	111.8340	0.0000	0.0000	0.0000	0.0000	243.7051	536.8278	838.7991	(98)
Space heating												4074.2304	(98)
RHI space heating demand												4074	(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 2.6700 (2c)	= 181.1328 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.2300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 346.9749 (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) = 0.1441 (8)
Pressure test					Yes
Measured/design AP50					4.3300
Infiltration rate					0.3606 (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) =	0.3065 (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	0.3908	0.3831	0.3755	0.3372	0.3295	0.2912	0.2912	0.2835	0.3065	0.3295	0.3448	0.3602 (22b)
Effective ac	0.5764	0.5734	0.5705	0.5568	0.5543	0.5424	0.5424	0.5402	0.5470	0.5543	0.5595	0.5649 (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	172.9900	24.7700	148.2200	0.2400	35.5728	42.2200	6257.8484 (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)			311.7700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	79.1057		(33)
GF Block			61.5800			75.0000	4618.5000 (32c)
GF Stud			44.7400			9.0000	402.6600 (32c)
FF Stud			160.2000			9.0000	1441.8000 (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) = 21623.2574 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 157.5695 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.4422 (36)
Total fabric heat loss (33) + (36) = 89.5480 (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	65.9946	65.6551	65.3223	63.7591	63.4666	62.1051	62.1051	61.8530	62.6296	63.4666	64.0583	64.6768 (38)
Heat transfer coeff	155.5426	155.2030	154.8702	153.3070	153.0146	151.6531	151.6531	151.4010	152.1775	153.0146	153.6062	154.2248 (39)
Average = Sum(39)m / 12 =												153.3056 (39)
HLP	1.1334	1.1310	1.1285	1.1172	1.1150	1.1051	1.1051	1.1033	1.1089	1.1150	1.1193	1.1238 (40)
HLP (average)												1.1171 (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)
Total per year (kWh/year) = Sum(64)m =													2240.9912 (64)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	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				14.8100	10.6334	0.6300	0.7000	0.7700	48.1281 (74)			
East				1.2600	19.6403	0.6300	0.7000	0.7700	7.5629 (76)			
South				6.5800	46.7521	0.6300	0.7000	0.7700	94.0153 (78)			
Solar gains	149.7063	260.7428	376.7872	508.2479	612.7199	628.9084	597.6426	515.5495	421.1317	293.1138	180.2425	127.5792 (83)
Total gains	925.6744	1031.1525	1118.5470	1205.4025	1263.6063	1238.9390	1184.2361	1112.0239	1043.6825	960.5059	897.4040	882.9697 (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	38.6162	38.7007	38.7838	39.1793	39.2542	39.6066	39.6066	39.6725	39.4701	39.2542	39.1030	38.9461	
alpha	3.5744	3.5800	3.5856	3.6120	3.6169	3.6404	3.6404	3.6448	3.6313	3.6169	3.6069	3.5964	
util living area	0.9838	0.9749	0.9570	0.9145	0.8274	0.6805	0.5307	0.5783	0.7864	0.9293	0.9741	0.9862	(86)
MIT	19.3618	19.5486	19.8573	20.2659	20.6316	20.8752	20.9620	20.9478	20.7760	20.3182	19.7709	19.3253	(87)
Th 2	19.9736	19.9756	19.9776	19.9868	19.9886	19.9967	19.9967	19.9982	19.9936	19.9886	19.9851	19.9814	(88)
util rest of house	0.9803	0.9695	0.9474	0.8943	0.7848	0.6026	0.4229	0.4706	0.7212	0.9085	0.9676	0.9832	(89)
MIT 2	18.4873	18.6734	18.9784	19.3805	19.7187	19.9263	19.9826	19.9772	19.8526	19.4382	18.9023	18.4571	(90)
Living area fraction									fLA = Living area / (4) =			0.1323	(91)
MIT	18.6030	18.7892	19.0947	19.4977	19.8395	20.0519	20.1122	20.1057	19.9748	19.5547	19.0173	18.5720	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6030	18.7892	19.0947	19.4977	19.8395	20.0519	20.1122	20.1057	19.9748	19.5547	19.0173	18.5720	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	901.7112	991.4097	1048.0775	1063.8362	982.7165	752.3067	516.2534	537.0766	751.2045	861.9283	861.0734	863.2876	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	2224.7281	2155.6496	1950.5500	1624.6979	1245.4682	826.7979	532.6411	561.0404	894.0122	1370.1959	1830.5645	2216.5139	(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	984.3245	782.3692	671.4395	403.8204	195.4873	0.0000	0.0000	0.0000	0.0000	378.1511	698.0335	1006.8004	(98)
Space heating												5120.4260	(98)
Space heating per m2												37.3127	(99)
												(98) / (4) =	

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													5639.2356 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	984.3245	782.3692	671.4395	403.8204	195.4873	0.0000	0.0000	0.0000	0.0000	378.1511	698.0335	1006.8004	(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)	1084.0579	861.6401	739.4708	444.7362	215.2943	0.0000	0.0000	0.0000	0.0000	416.4660	768.7594	1108.8110	(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	88.6307	88.4464	88.0551	87.1662	85.3427	80.1000	80.1000	80.1000	80.1000	86.9177	88.1679	80.1000	(216)
Fuel for water heating, kWh/month	249.1414	220.0444	232.1052	210.1650	210.3379	200.2194	192.2639	211.0082	210.6465	218.5533	227.8502	242.9198	(219)
Water heating fuel used												2625.2553	(219)
Annual totals kWh/year													
Space heating fuel - main system												5639.2356	(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 * 1.15 * 1080 * 1.00) =										-993.1627		-993.1627	(233)
Total delivered energy for all uses												7846.3328	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	5639.2356	3.4800	196.2454 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2625.2553	3.4800	91.3589 (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	-993.1627	13.1900	-130.9982 (252)
Total energy cost			352.4492 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)		0.8123 (257)
SAP value	$[(255) \times (256)] / [(4) + 45.0] =$	88.6682
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	5639.2356	0.2160	1218.0749 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2625.2553	0.2160	567.0551 (264)
Space and water heating			1785.1300 (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	-993.1627	0.5190	-515.4514 (269)
Total kg/year			1568.1060 (272)
CO2 emissions per m2			11.4300 (273)
EI value			88.4692
EI rating			88 (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	$3.48 / 0.8515 = 4.087$, stars = 4
Water heating environmental impact	$0.216 / 0.8515 = 0.2537$, 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 2.6700 (2c)	= 181.1328 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.2300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 346.9749 (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) = 0.1441 (8)
Pressure test					Yes
Measured/design AP50					4.3300
Infiltration rate					0.3606 (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) =	0.3065 (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	0.3602	0.3372	0.3372	0.3065	0.3142	0.2988	0.2988	0.2912	0.2912	0.3142	0.3065	0.3142 (22b)
Effective ac	0.5649	0.5568	0.5568	0.5470	0.5494	0.5447	0.5447	0.5424	0.5424	0.5494	0.5470	0.5494 (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	172.9900	24.7700	148.2200	0.2400	35.5728	42.2200	6257.8484 (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)			311.7700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	79.1057		(33)
GF Block			61.5800			75.0000	4618.5000 (32c)
GF Stud			44.7400			9.0000	402.6600 (32c)
FF Stud			160.2000			9.0000	1441.8000 (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) = 21623.2574 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 157.5695 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.4422 (36)
Total fabric heat loss (33) + (36) = 89.5480 (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	64.6768	63.7591	63.7591	62.6296	62.9019	62.3640	62.3640	62.1051	62.1051	62.9019	62.6296	62.9019 (38)
Heat transfer coeff	154.2248	153.3070	153.3070	152.1775	152.4498	151.9119	151.9119	151.6531	151.6531	152.4498	152.1775	152.4498 (39)
Average = Sum(39)m / 12 =												152.4728 (39)
HLP	1.1238	1.1172	1.1172	1.1089	1.1109	1.1070	1.1070	1.1051	1.1051	1.1109	1.1089	1.1109 (40)
HLP (average)												1.1111 (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 28.0260 (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)
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					14.8100	13.4684	0.6300	0.7000	0.7700		60.9598 (74)	
East					1.2600	25.1733	0.6300	0.7000	0.7700		9.6935 (76)	
South					6.5800	56.5862	0.6300	0.7000	0.7700		113.7911 (78)	
Solar gains	184.4444	274.5362	407.2861	556.9270	635.1728	722.3846	659.2227	591.2617	478.4799	333.9550	221.5609	148.6711 (83)
Total gains	960.4125	1044.9460	1149.0459	1254.0816	1286.0591	1332.4151	1245.8161	1187.7360	1101.0306	1001.3471	938.7224	904.0617 (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	38.9461	39.1793	39.1793	39.4701	39.3996	39.5391	39.5391	39.6066	39.6066	39.3996	39.4701	39.3996	
alpha	3.5964	3.6120	3.6120	3.6313	3.6266	3.6359	3.6359	3.6404	3.6404	3.6266	3.6313	3.6266	
util living area	0.9767	0.9676	0.9420	0.8783	0.7574	0.5446	0.3935	0.3991	0.6734	0.8847	0.9586	0.9801	(86)
MIT	19.6010	19.7433	20.0521	20.4554	20.7751	20.9520	20.9891	20.9890	20.8946	20.5400	20.0352	19.5871	(87)
Th 2	19.9814	19.9868	19.9868	19.9936	19.9919	19.9951	19.9951	19.9967	19.9967	19.9919	19.9936	19.9919	(88)
util rest of house	0.9714	0.9603	0.9286	0.8494	0.6987	0.4508	0.2779	0.2785	0.5831	0.8494	0.9475	0.9755	(89)
MIT 2	18.7304	18.8743	19.1755	19.5631	19.8434	19.9742	19.9927	19.9944	19.9428	19.6475	19.1683	18.7251	(90)
Living area fraction									fLA = Living area / (4) =			0.1323	(91)
MIT	18.8456	18.9893	19.2915	19.6812	19.9667	20.1036	20.1246	20.1260	20.0688	19.7656	19.2830	18.8392	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8456	18.9893	19.2915	19.6812	19.9667	20.1036	20.1246	20.1260	20.0688	19.7656	19.2830	18.8392	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.9638 0.9512 0.9173 0.8389 0.6971 0.4615 0.2932 0.2945 0.5903 0.8399 0.9376 0.9686 (94)													
Useful gains	925.6133	993.9825	1054.0484	1052.0476	896.5104	614.8592	365.2241	349.7487	649.8863	841.0631	880.1232	875.6433	(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	2042.8010	1991.3525	1792.3889	1458.0458	1046.8250	638.5731	368.3238	352.7446	708.0342	1168.6237	1625.7174	2003.0615	(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	831.1876	670.2326	549.3254	292.3187	111.8340	0.0000	0.0000	0.0000	0.0000	243.7051	536.8278	838.7991	(98)
Space heating												4074.2304	(98)
Space heating per m2												29.6891	(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													4487.0378 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	831.1876	670.2326	549.3254	292.3187	111.8340	0.0000	0.0000	0.0000	0.0000	243.7051	536.8278	838.7991	(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)	915.4049	738.1417	604.9839	321.9369	123.1652	0.0000	0.0000	0.0000	0.0000	268.3977	591.2201	923.7876	(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	88.3235	88.1501	87.6259	86.3558	83.8949	80.1000	80.1000	80.1000	80.1000	85.7806	87.6130	80.1000	(216)
Fuel for water heating, kWh/month	250.0078	220.7839	233.2420	212.1372	213.9678	200.2194	192.2639	211.0082	210.6465	221.4504	229.2935	243.8105	(219)
Water heating fuel used												2638.8311	(219)
Annual totals kWh/year													
Space heating fuel - main system												4487.0378	(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 * 1.15 * 1206 * 1.00) =										-1109.5294		-1109.5294	(233)
Total delivered energy for all uses												6591.3441	(238)

10a. Fuel costs - using BEDF prices (505)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4487.0378	3.7400	167.8152 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2638.8311	3.7400	98.6923 (247)
Pumps and fans for heating	75.0000	20.4300	15.3225 (249)
Energy for lighting	500.0046	20.4300	102.1509 (250)
Additional standing charges			95.0000 (251)
Energy saving/generation technologies			
PV Unit	-1109.5294	20.4300	-226.6769 (252)
Total energy cost			252.3041 (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	4487.0378	0.2160	969.2002 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2638.8311	0.2160	569.9875 (264)
Space and water heating			1539.1877 (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	-1109.5294	0.5190	-575.8458 (269)
Total kg/year			1261.7693 (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	4487.0378	1.2200	5474.1862 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2638.8311	1.2200	3219.3740 (264)
Space and water heating			8693.5602 (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	-1109.5294	3.0700	-3406.2553 (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

7052.5689 (272)
51.3923 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 89
Current environmental impact rating: B 88

(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	+ 1.2	-£ 41	-269 kg (21.3%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£41 1.96 kg/m ²	B 90	B 90
Total Savings	£41 1.96 kg/m ²		

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

Fuel prices for cost data on this page from database revision number 505 TEST (31 Aug 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	£117	£128	-£10
Mains gas	£362	£310	£51
Space heating	£278	£280	-£2
Water heating	£99	£56	£43
Lighting	£102	£102	£0
Generated (PV)	-£227	-£227	£0
Total cost of fuels	£252	£211	£41
Total cost of uses	£252	£211	£41
Delivered energy	48 kWh/m ²	38 kWh/m ²	10 kWh/m ²
Carbon dioxide emissions	1.3 tonnes	1.0 tonnes	0.3 tonnes
CO2 emissions per m ²	9 kg/m ²	7 kg/m ²	2 kg/m ²
Primary energy	51 kWh/m ²	40 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 2.6700 (2c)	= 181.1328 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.2300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 346.9749 (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) = 0.1441 (8)
Pressure test					Yes
Measured/design AP50					4.3300
Infiltration rate					0.3606 (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) =	0.3065 (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	0.3908	0.3831	0.3755	0.3372	0.3295	0.2912	0.2912	0.2835	0.3065	0.3295	0.3448	0.3602 (22b)
Effective ac	0.5764	0.5734	0.5705	0.5568	0.5543	0.5424	0.5424	0.5402	0.5470	0.5543	0.5595	0.5649 (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	172.9900	24.7700	148.2200	0.2400	35.5728	42.2200	6257.8484 (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)			311.7700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	79.1057		(33)
GF Block			61.5800			75.0000	4618.5000 (32c)
GF Stud			44.7400			9.0000	402.6600 (32c)
FF Stud			160.2000			9.0000	1441.8000 (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) = 21623.2574 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 157.5695 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.4422 (36)
Total fabric heat loss (33) + (36) = 89.5480 (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	65.9946	65.6551	65.3223	63.7591	63.4666	62.1051	62.1051	61.8530	62.6296	63.4666	64.0583	64.6768 (38)
Heat transfer coeff	155.5426	155.2030	154.8702	153.3070	153.0146	151.6531	151.6531	151.4010	152.1775	153.0146	153.6062	154.2248 (39)
Average = Sum(39)m / 12 =												153.3056 (39)
HLP	1.1334	1.1310	1.1285	1.1172	1.1150	1.1051	1.1051	1.1033	1.1089	1.1150	1.1193	1.1238 (40)
HLP (average)												1.1171 (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												
(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												
Specific data												
g												
or Table 6b												
Specific data												
or Table 6c												
Access												
factor												
Table 6d												
Gains												
W												
North			14.8100		10.6334		0.6300		0.7000			48.1281 (74)
East			1.2600		19.6403		0.6300		0.7000		0.7700	7.5629 (76)
South			6.5800		46.7521		0.6300		0.7000		0.7700	94.0153 (78)
Solar gains	149.7063	260.7428	376.7872	508.2479	612.7199	628.9084	597.6426	515.5495	421.1317	293.1138	180.2425	127.5792 (83)
Total gains	914.8116	1020.2897	1106.1835	1187.0357	1238.9861	1214.0687	1159.3658	1088.1542	1026.8165	948.1423	886.5412	872.1070 (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	38.6162	38.7007	38.7838	39.1793	39.2542	39.6066	39.6066	39.6725	39.4701	39.2542	39.1030	38.9461
alpha	3.5744	3.5800	3.5856	3.6120	3.6169	3.6404	3.6404	3.6448	3.6313	3.6169	3.6069	3.5964
util living area												
0.9843 0.9756 0.9583 0.9177 0.8341 0.6896 0.5401 0.5882 0.7928 0.9316 0.9750 0.9867 (86)												
MIT	19.3519	19.5391	19.8472	20.2533	20.6198	20.8695	20.9598	20.9448	20.7693	20.3091	19.7614	19.3153 (87)
Th 2	19.9736	19.9756	19.9776	19.9868	19.9886	19.9967	19.9967	19.9982	19.9936	19.9886	19.9851	19.9814 (88)
util rest of house												
0.9810 0.9704 0.9490 0.8981 0.7925 0.6118 0.4311 0.4797 0.7282 0.9113 0.9688 0.9838 (89)												
MIT 2	18.4776	18.6641	18.9687	19.3689	19.7091	19.9227	19.9817	19.9759	19.8478	19.4299	18.8930	18.4472 (90)
Living area fraction												
MIT	18.5933	18.7799	19.0850	19.4859	19.8296	20.0480	20.1111	20.1041	19.9697	19.5463	19.0079	0.1323 (91)
Temperature adjustment												
adjusted MIT	18.5933	18.7799	19.0850	19.4859	19.8296	20.0480	20.1111	20.1041	19.9697	19.5463	19.0079	18.5621 (92)
												0.0000
												18.5621 (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	0.9749	0.9625	0.9387	0.8864	0.7850	0.6162	0.4443	0.4920	0.7265	0.9003	0.9608	0.9785	(94)
Useful gains	891.8943	982.0538	1038.3665	1052.1292	972.5668	748.1007	515.0586	535.3719	745.9403	853.5912	851.7898	853.3384	(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	2223.2122	2154.1992	1949.0386	1622.8932	1243.9498	826.2070	532.4765	560.8054	893.2440	1368.9106	1829.1352	2214.9899	(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	990.5005	787.6817	677.5400	410.9501	201.9089	0.0000	0.0000	0.0000	0.0000	383.3976	703.6887	1013.0687	(98)
Space heating												5168.7362	(98)
Space heating per m2												37.6648	(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													5692.4407 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	990.5005	787.6817	677.5400	410.9501	201.9089	0.0000	0.0000	0.0000	0.0000	383.3976	703.6887	1013.0687	(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)	1090.8596	867.4909	746.1894	452.5882	222.3666	0.0000	0.0000	0.0000	0.0000	422.2441	774.9876	1115.7144	(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	88.9443	89.0077	89.0725	89.2291	89.3562	80.1000	80.1000	80.1000	80.1000	87.9968	88.6221	88.9856	(216)
Fuel for water heating, kWh/month	206.1234	157.0766	129.1904	69.9136	31.0922	14.1491	7.3519	46.9644	84.9224	136.4361	179.0069	205.0698	(219)
Water heating fuel used												1267.2968	(219)
Annual totals kWh/year													
Space heating fuel - main system												5692.4407	(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 * 1.15 * 1080 * 1.00) =										-993.1627		-993.1627	(233)
Total delivered energy for all uses												6591.5794	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	5692.4407	3.4800	198.0969	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1267.2968	3.4800	44.1019	(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	-993.1627	13.1900	-130.9982	(252)
Total energy cost			313.6388	(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] =	0.7229	(257)
SAP value			89.9160	
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	5692.4407	0.2160	1229.5672	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1267.2968	0.2160	273.7361	(264)
Space and water heating			1503.3033	(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	-993.1627	0.5190	-515.4514	(269)
Total kg/year			1312.2293	(272)
CO2 emissions per m2			9.5600	(273)
EI value			90.3507	
EI rating			90	(274)
EI band			B	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	69.3900 (1b)	x 2.3900 (2b)	= 165.8421 (1b) - (3b)
First floor	67.8400 (1c)	x 2.6700 (2c)	= 181.1328 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.2300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 346.9749 (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																5 * 10 =	50.0000 (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) =					50.0000	/ (5) =	0.1441 (8)
Pressure test										Yes							
Measured/design AP50										4.3300							
Infiltration rate										0.3606 (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) =					0.3065 (21)		
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000	(22)				
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250	(22a)				
Adj infilt rate	0.3602	0.3372	0.3372	0.3065	0.3142	0.2988	0.2988	0.2912	0.2912	0.3142	0.3065	0.3142	(22b)				
Effective ac	0.5649	0.5568	0.5568	0.5470	0.5494	0.5447	0.5447	0.5424	0.5424	0.5494	0.5470	0.5494	(25)				

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
Front Door			2.1200	1.1000	2.3320			(26)					
Windows (Uw = 1.20)			22.6500	1.1450	25.9351			(27)					
Ground Floor			69.3900	0.1200	8.3268	84.0000	5828.7600	(28a)					
Brick and Block	172.9900	24.7700	148.2200	0.2400	35.5728	42.2200	6257.8484	(29a)					
Pitched Roof	69.3900		69.3900	0.1000	6.9390	9.1000	631.4490	(30)					
Total net area of external elements Aum(A, m2)			311.7700					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	79.1057			(33)					
GF Block			61.5800			75.0000	4618.5000	(32c)					
GF Stud			44.7400			9.0000	402.6600	(32c)					
FF Stud			160.2000			9.0000	1441.8000	(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) =	21623.2574	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							157.5695	(35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.4422	(36)					
Total fabric heat loss						(33) + (36) =	89.5480	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 64.6768	Feb 63.7591	Mar 63.7591	Apr 62.6296	May 62.9019	Jun 62.3640	Jul 62.3640	Aug 62.1051	Sep 62.1051	Oct 62.9019	Nov 62.6296	Dec 62.9019	(38)
Heat transfer coeff	154.2248	153.3070	153.3070	152.1775	152.4498	151.9119	151.9119	151.6531	151.6531	152.4498	152.1775	152.4498	(39)
Average = Sum(39)m / 12 =												152.4728	(39)
HLP	Jan 1.1238	Feb 1.1172	Mar 1.1172	Apr 1.1089	May 1.1109	Jun 1.1070	Jul 1.1070	Aug 1.1051	Sep 1.1051	Oct 1.1109	Nov 1.1089	Dec 1.1109	(40)
HLP (average)												1.1111	(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)

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				14.8100	13.4684	0.6300	0.7000			0.7700			60.9598 (74)
East				1.2600	25.1733	0.6300	0.7000			0.7700			9.6935 (76)
South				6.5800	56.5862	0.6300	0.7000			0.7700			113.7911 (78)

Solar gains	184.4444	274.5362	407.2861	556.9270	635.1728	722.3846	659.2227	591.2617	478.4799	333.9550	221.5609	148.6711	(83)
Total gains	949.5497	1034.0832	1136.6823	1235.7148	1261.4390	1307.5449	1220.9459	1163.8663	1084.1646	988.9835	927.8596	893.1989	(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	38.9461	39.1793	39.1793	39.4701	39.3996	39.5391	39.5391	39.6066	39.6066	39.3996	39.4701	39.3996	
alpha	3.5964	3.6120	3.6120	3.6313	3.6266	3.6359	3.6359	3.6404	3.6404	3.6266	3.6313	3.6266	
util living area	0.9775	0.9685	0.9436	0.8824	0.7654	0.5530	0.4009	0.4067	0.6804	0.8879	0.9599	0.9808 (86)	
MIT	19.5913	19.7341	20.0426	20.4445	20.7666	20.9495	20.9885	20.9883	20.8909	20.5324	20.0262	19.5773 (87)	
Th 2	19.9814	19.9868	19.9868	19.9936	19.9919	19.9951	19.9951	19.9967	19.9967	19.9919	19.9936	19.9919 (88)	
util rest of house	0.9724	0.9615	0.9306	0.8541	0.7073	0.4585	0.2834	0.2841	0.5902	0.8533	0.9492	0.9764 (89)	
MIT 2	18.7210	18.8653	19.1665	19.5535	19.8371	19.9730	19.9926	19.9942	19.9407	19.6411	19.1598	18.7155 (90)	
Living area fraction	18.8362	18.9803	19.2824	19.6714	19.9601	20.1022	20.1244	20.1258	20.0664	19.7590	19.2744	18.8295 (92)	
MIT	18.8362	18.9803	19.2824	19.6714	19.9601	20.1022	20.1244	20.1258	20.0664	19.7590	19.2744	18.8295 (93)	
Temperature adjustment												0.0000	
adjusted MIT	18.8362	18.9803	19.2824	19.6714	19.9601	20.1022	20.1244	20.1258	20.0664	19.7590	19.2744	18.8295 (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	0.9649	0.9525	0.9194	0.8434	0.7052	0.4691	0.2989	0.3003	0.5971	0.8437	0.9394	0.9696	(94)
Useful gains	916.1782	984.9899	1045.0494	1042.2504	889.6239	613.3710	364.9818	349.5125	647.3342	834.4463	871.5878	866.0405	(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	2041.3462	1989.9667	1790.9974	1456.5584	1045.8262	638.3692	368.2886	352.7100	707.6768	1167.6182	1624.4063	2001.5961	(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	837.1250	675.3444	554.9853	298.3017	116.2145	0.0000	0.0000	0.0000	0.0000	247.8799	542.0293	844.8533	(98)
Space heating												4116.7334	(98)
Space heating per m2											(98) / (4) =	29.9988	(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													4533.8474 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	837.1250	675.3444	554.9853	298.3017	116.2145	0.0000	0.0000	0.0000	0.0000	247.8799	542.0293	844.8533	(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)	921.9438	743.7714	611.2173	328.5261	127.9895	0.0000	0.0000	0.0000	0.0000	272.9954	596.9486	930.4552	(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	88.7159	88.7655	88.7831	88.8086	88.2027	80.1000	80.1000	80.1000	80.1000	87.1016	88.2040	80.1000	(216)
Fuel for water heating, kWh/month	201.3544	157.5785	128.0847	67.7557	37.2585	4.2323	4.0580	38.0004	77.9748	132.6092	173.6554	202.8799	(219)
Water heating fuel used												1225.4418	(219)
Annual totals kWh/year													
Space heating fuel - main system												4533.8474	(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 * 1.15 * 1206 * 1.00) =										-1109.5294		-1109.5294	(233)
Total delivered energy for all uses												5274.7643	(238)

10a. Fuel costs - using BEDF prices (505)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	4533.8474	3.7400	169.5659	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1225.4418	3.7400	45.8315	(247)
Pumps and fans for heating	75.0000	20.4300	15.3225	(249)
Pump for solar water heating	50.0000	20.4300	10.2150	(249)
Energy for lighting	500.0046	20.4300	102.1509	(250)
Additional standing charges			95.0000	(251)
Energy saving/generation technologies				
PV Unit	-1109.5294	20.4300	-226.6769	(252)
Total energy cost			211.4090	(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	4533.8474	0.2160	979.3110	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1225.4418	0.2160	264.6954	(264)
Space and water heating			1244.0065	(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	-1109.5294	0.5190	-575.8458 (269)
Total kg/year			992.5381 (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	4533.8474	1.2200	5531.2938 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1225.4418	1.2200	1495.0389 (264)
Space and water heating			7026.3327 (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	-1109.5294	3.0700	-3406.2553 (269)
Primary energy kWh/year			5538.8415 (272)
Primary energy kWh/m2/year			40.3617 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Plot 28	Issued on Date	20/09/2022
Assessment Reference	As Built	Prop Type Ref	Kh
Project	5 Winifred Moody Road, West End, Southampton, SO30 3LB		
Calculation Type	New Build (As Built)		

SAP Rating	89 B	DER	12.94	TER	16.35
Environmental	88 B	% DER<TER	20.86		
CO ₂ Emissions (t/year)	1.26	DFEE	46.75	TFEE	56.58
General Requirements Compliance	Pass	% DFEE<TFEE	17.37		

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 28	Issued on Date	20/09/2022
Assessment Reference	As Built	Prop Type Ref	Kh
Project	5 Winifred Moody Road, West End, Southampton, SO30 3LB		
Calculation Type	New Build (As Built)		

SAP Rating	89 B	DER	12.94	TER	16.35
Environmental	88 B	% DER<TER	20.86		
CO ₂ Emissions (t/year)	1.26	DFEE	46.75	TFEE	56.58
General Requirements Compliance	Pass	% DFEE<TFEE	17.37		

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 28	Issued on Date	20/09/2022
Assessment Reference	As Built	Prop Type Ref	Kh
Project	5 Winifred Moody Road, West End, Southampton, SO30 3LB		
Calculation Type	New Build (As Built)		

SAP Rating	89 B	DER	12.94	TER	16.35
Environmental	88 B	% DER<TER	20.86		
CO ₂ Emissions (t/year)	1.26	DFEE	46.75	TFEE	56.58
General Requirements Compliance	Pass	% DFEE<TFEE	17.37		

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 28	Issued on Date	20/09/2022
Assessment Reference	As Built	Prop Type Ref	Kh
Property	5 Winifred Moody Road, West End, Southampton, SO30 3LB		

SAP Rating	89 B	DER	12.94	TER	16.35
Environmental	88 B	% DER<TER	20.86		
CO ₂ Emissions (t/year)	1.26	DFEE	46.75	TFEE	56.58
General Requirements Compliance	Pass	% DFEE<TFEE	17.37		

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

Orientation	South
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	2.67 m

7.0 Living Area	18.16	m ²
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8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	157.57	kJ/m²K

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	172.99	148.22	

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	44.74	
FF Stud	Plasterboard on timber frame		9.00	160.20	

10.0 External Roofs						
Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Pitched Roof	External Plane Roof	Other	0.10	9.10	69.39	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	South							2.12	
Front Shaded	Window	[1] Brick and Block	South	None	0.44	Yes				0.84	
Front Elevation	Window	[1] Brick and Block	South	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	North	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)	1.51	0.070	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.41	0.070	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	2.77	0.056	No	Birtley Supatherm
Independently assessed	E3 Sill	10.58	0.210	No	Knauf P5
Independently assessed	E4 Jamb	36.60	0.016	No	Knauf P6
Independently assessed	E5 Ground floor (normal)	35.55	0.105	No	LABC E5MCFF11
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)	18.16	0.044	No	Knauf P21
Independently assessed	E16 Corner (normal)	29.78	0.039	No	Knauf P23
Independently assessed	E17 Corner (inverted – internal area greater than external area)	9.52	-0.091	No	Knauf P24

Y-value 0.033 W/m²K

18.0 Pressure Testing

Designed AP₅₀ 5.00 m³/(h.m²) @ 50 Pa

Property Tested ? Yes

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

As Built AP₅₀

4.33

m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather

Windows half open

Cross ventilation possible

Yes

Night Ventilation

Yes

Air change rate

4.00

Mechanical Ventilation

Mechanical Ventilation System Present

No

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				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

Description

Database

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
1.15	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	£41	B 90	