



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 3 Robert Place
WEST END, SO30 3JY

Contact: Tobias Whiting
Abacus Energy (UK) Ltd
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Report Issue Date: 18/07/2022

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Plot 19	Issued on Date	18/07/2022
Assessment Reference	As Built	Prop Type Ref	F
Property	3 Robert Place, WEST END, SO30 3JY		
SAP Rating	89 B	DER	12.38
Environmental	88 B	TER	15.37
CO ₂ Emissions (t/year)	1.43	% DER<TER	19.44
General Requirements Compliance	Pass	DLEE	45.46
		TLEE	54.80
		% DLEE<TLEE	17.05
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 TLEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	15.37	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	12.38	kgCO ₂ /m ²	Pass
	-2.99 (-19.5%)	kgCO ₂ /m ²	

1b TLEE and DLEE

Target Fabric Energy Efficiency (TLEE)	54.80	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DLEE)	45.46	kWh/m ² /yr	
	-9.3 (-17.0%)	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	4.21 (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 18 S NG

Efficiency: 89.5% 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

Time and temperature zone control

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

9.54 m², Overhang twice as wide as window, ratio 1.17

Windows facing East

0.96 m², No overhang

Windows facing South

16.84 m², No overhang

Windows facing West

2.17 m², No overhang

Air change rate

4.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

4.21 (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	0.032	W/m ² K
Photovoltaic array	0.97	kW

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THERMAL BRIDGING

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Plot 19	Issued on Date	18/07/2022
Assessment Reference	As Built	Prop Type Ref	F
Property	3 Robert Place, WEST END, SO30 3JY		

SAP Rating	89 B	DER	12.38	TER	15.37
Environmental	88 B	% DER<TER	19.44		
CO ₂ Emissions (t/year)	1.43	DFEE	45.46	TFEE	54.80
General Requirements Compliance	Pass	% DFEE<TFEE	17.05		

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	0.077	2.52	0.19	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.070	9.15	0.64	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.071	1.02	0.07	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.064	4.14	0.26	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.056	5.54	0.31	Birtley Supatherm
External wall	E3 Sill	Independently assessed	0.021	15.82	0.33	Knauf P5
External wall	E4 Jamb	Independently assessed	0.016	50.10	0.80	Knauf P6
External wall	E5 Ground floor (normal)	Table K1 - Approved	0.160	40.65	6.50	
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	40.65	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	25.64	1.54	
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.044	14.94	0.66	Knauf P20
External wall	E16 Corner (normal)	Independently assessed	0.039	30.30	1.18	Knauf P23
External wall	E17 Corner (inverted – internal area greater than external area)	Independently assessed	-0.091	10.10	-0.92	Knauf P24

Total: **11.58** W/mK:
Y-Value: **0.032** W/m²K:

FULL SAP CALCULATION PRINTOUT

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CO ₂ Emissions (t/year)	1.43	DFEE	45.46	TFEE	54.80
General Requirements Compliance	Pass	% DFEE<TFEE	17.05		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com			Assessor ID	E477-0001
Client	Foreman Homes, FORE				

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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 157 m²

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

1a TER and DER

Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 15.37 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 12.38 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)54.8 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)45.5 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: 4.21 (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 18 S NG

Efficiency: 89.5% 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: Time and temperature zone control 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: 9.54 m², Overhang twice as wide as window, ratio 1.17
Windows facing East: 0.96 m², No overhang
Windows facing South: 16.84 m², No overhang
Windows facing West: 2.17 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.10 W/m²K
Floor U-value 0.12 W/m²K
Door U-value 1.10 W/m²K
Thermal bridging y-value 0.032 W/m²K
Photovoltaic array 0.97 kW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	78.2900 (1b)	x 2.3900 (2b)	= 187.1131 (1b) - (3b)
First floor	78.2900 (1c)	x 2.6700 (2c)	= 209.0343 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	156.5800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 396.1474 (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) = 0.1262 (8)
Pressure test					Yes
Measured/design AP50					4.2100
Infiltration rate					0.3367 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3115 (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	0.3971	0.3893	0.3815	0.3426	0.3348	0.2959	0.2959	0.2881	0.3115	0.3348	0.3504	0.3660 (22b)
Effective ac	0.5788	0.5758	0.5728	0.5587	0.5561	0.5438	0.5438	0.5415	0.5485	0.5561	0.5614	0.5670 (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)			29.5100	1.1450	33.7901		(27)
Ground Floor			78.2900	0.1200	9.3948	84.0000	6576.3600 (28a)
Brick and Block	205.6900	31.6300	174.0600	0.2400	41.7744	42.2200	7348.8132 (29a)
Pitched Roof	78.2900		78.2900	0.1000	7.8290	9.1000	712.4390 (30)
Total net area of external elements Aum(A, m ²)			362.2700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	95.1203		(33)
GF Block			76.4100			75.0000	5730.7500 (32c)
GF Stud			27.4300			9.0000	246.8700 (32c)
FF Stud			171.1400			9.0000	1540.2600 (32c)
Internal Floor 1			78.2900			18.0000	1409.2200 (32d)
Internal Ceiling 1			78.2900			18.0000	1409.2200 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 24973.9322 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 159.4963 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.5783 (36)
Total fabric heat loss (33) + (36) = 106.6986 (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	75.6722	75.2720	74.8796	73.0368	72.6920	71.0870	71.0870	70.7898	71.7052	72.6920	73.3895	74.1187 (38)
Heat transfer coeff	182.3709	181.9706	181.5782	179.7354	179.3906	177.7856	177.7856	177.4884	178.4038	179.3906	180.0881	180.8173 (39)
Average = Sum(39)m / 12 =												179.7338 (39)
HLP	1.1647	1.1622	1.1597	1.1479	1.1457	1.1354	1.1354	1.1335	1.1394	1.1457	1.1501	1.1548 (40)
HLP (average)												1.1479 (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												2.9440 (42)
Average daily hot water use (litres/day)												104.1209 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	114.5330	110.3682	106.2033	102.0385	97.8737	93.7088	93.7088	97.8737	102.0385	106.2033	110.3682	114.5330 (44)
Energy conte	169.8491	148.5512	153.2915	133.6432	128.2339	110.6561	102.5391	117.6651	119.0704	138.7651	151.4730	164.4898 (45)
Energy content (annual)										Total = Sum(45)m =		1638.2275 (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	25.4774	22.2827	22.9937	20.0465	19.2351	16.5984	15.3809	17.6498	17.8606	20.8148	22.7209	24.6735 (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												
222.0717 195.7200 205.5141 184.1812 180.4565 161.1941 154.7617 169.8877 169.6084 190.9877 202.0110 216.7124 (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	222.0717	195.7200	205.5141	184.1812	180.4565	161.1941	154.7617	169.8877	169.6084	190.9877	202.0110	216.7124 (64)
Total per year (kWh/year) = Sum(64)m =												2253.1065 (64)
Heat gains from water heating, kWh/month												
98.2529 87.1283 92.7475 84.8668 84.4158 77.2235 75.8723 80.9017 80.0213 87.9175 90.7952 96.4709 (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	147.2019	147.2019	147.2019	147.2019	147.2019	147.2019	147.2019	147.2019	147.2019	147.2019	147.2019	147.2019	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
29.6248 26.3124 21.3987 16.2002 12.1098 10.2236 11.0470 14.3593 19.2730 24.4716 28.5619 30.4481 (67)													
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
327.5926 330.9920 322.4257 304.1889 281.1683 259.5322 245.0780 241.6786 250.2449 268.4817 291.5023 313.1384 (68)													
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
37.7202 37.7202 37.7202 37.7202 37.7202 37.7202 37.7202 37.7202 37.7202 37.7202 37.7202 37.7202 37.7202 (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)													
-117.7616 -117.7616 -117.7616 -117.7616 -117.7616 -117.7616 -117.7616 -117.7616 -117.7616 -117.7616 -117.7616 -117.7616 (71)													
Water heating gains (Table 5)													
132.0604 129.6552 124.6606 117.8705 113.4621 107.2549 101.9789 108.7389 111.1407 118.1687 126.1044 129.6653 (72)													
Total internal gains	559.4384	557.1203	538.6456	508.4203	476.9009	447.1714	428.2645	434.9374	450.8193	481.2825	516.3292	543.4123	(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	9.5400	10.6334	0.6300	0.7000	0.7700	31.0022 (74)
East	0.9600	19.6403	0.6300	0.7000	0.7700	5.7622 (76)
South	16.8400	46.7521	0.6300	0.7000	0.7700	240.6106 (78)
West	2.1700	19.6403	0.6300	0.7000	0.7700	13.0250 (80)

Solar gains	290.4000	490.0567	663.1599	817.3055	917.2048	912.8804	879.0403	803.1416	715.7934	539.1633	346.8763	249.2043 (83)
Total gains	849.8384	1047.1770	1201.8055	1325.7258	1394.1058	1360.0518	1307.3048	1238.0790	1166.6127	1020.4458	863.2054	792.6167 (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	38.0390	38.1227	38.2050	38.5968	38.6709	39.0201	39.0201	39.0854	38.8848	38.6709	38.5212	38.3658	
alpha	3.5359	3.5415	3.5470	3.5731	3.5781	3.6013	3.6013	3.6057	3.5923	3.5781	3.5681	3.5577	
util living area	0.9921	0.9830	0.9654	0.9257	0.8458	0.7082	0.5566	0.6008	0.8027	0.9442	0.9852	0.9938 (86)	
MIT	19.1562	19.4082	19.7656	20.2033	20.5884	20.8527	20.9540	20.9387	20.7519	20.2411	19.6113	19.1117 (87)	
Th 2	19.9483	19.9504	19.9524	19.9619	19.9637	19.9720	19.9720	19.9735	19.9688	19.9637	19.9601	19.9563 (88)	
util rest of house	0.9903	0.9792	0.9573	0.9071	0.8049	0.6294	0.4432	0.4888	0.7381	0.9265	0.9813	0.9924 (89)	
MIT 2	17.4811	17.8483	18.3660	18.9946	19.5198	19.8496	19.9471	19.9376	19.7394	19.0590	18.1524	17.4212 (90)	
Living area fraction									fLA = Living area / (4) =				0.1787 (91)
MIT	17.7805	18.1271	18.6161	19.2106	19.7108	20.0288	20.1270	20.1165	19.9203	19.2702	18.4131	17.7233 (92)	
Temperature adjustment												0.0000	
adjusted MIT	17.7805	18.1271	18.6161	19.2106	19.7108	20.0288	20.1270	20.1165	19.9203	19.2702	18.4131	17.7233 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9846	0.9697	0.9432	0.8903	0.7933	0.6342	0.4613	0.5056	0.7346	0.9109	0.9725	0.9876	(94)
Useful gains	836.7333	1015.4092	1133.5828	1180.2676	1105.8974	862.4935	603.0933	625.9506	856.9992	929.5683	839.5064	782.8255	(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	2458.4463	2406.9389	2200.0153	1853.1730	1437.0546	965.1683	627.0571	659.6362	1038.3653	1555.3609	2037.3466	2445.2395	(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	1206.5544	935.1079	793.4258	484.4919	246.3809	0.0000	0.0000	0.0000	0.0000	465.5897	862.4450	1236.8361	(98)
Space heating												6230.8317	(98)
Space heating per m2												39.7933	(99)
										(98) / (4) =			

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 %)																90.5000 (206)
Efficiency of secondary/supplementary heating system, %																0.0000 (208)
Space heating requirement																6884.8969 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec				
Space heating requirement	1206.5544	935.1079	793.4258	484.4919	246.3809	0.0000	0.0000	0.0000	0.0000	465.5897	862.4450	1236.8361	(98)			
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)			
Space heating fuel (main heating system)	1333.2093	1033.2685	876.7136	535.3501	272.2441	0.0000	0.0000	0.0000	0.0000	514.4637	952.9779	1366.6697	(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	222.0717	195.7200	205.5141	184.1812	180.4565	161.1941	154.7617	169.8877	169.6084	190.9877	202.0110	216.7124	(64)			
Efficiency of water heater (217)m	88.6522	88.4474	88.0705	87.2766	85.6450	79.8000	79.8000	79.8000	79.8000	87.1027	88.2542	88.7263	(216)			
Fuel for water heating, kWh/month	250.4976	221.2840	233.3517	211.0316	210.7029	201.9976	193.9370	212.8919	212.5419	219.2672	228.8966	244.2483	(219)			
Water heating fuel used												2640.6484	(219)			
Annual totals kWh/year																
Space heating fuel - main system												6884.8969	(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)												523.1825	(232)			
Energy saving/generation technologies (Appendices M, N and Q)																
PV Unit 0 (0.80 + 0.97 * 1068 * 1.00) =										-828.8227		-828.8227	(233)			
Total delivered energy for all uses												9294.9051	(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	6884.8969	0.2160	1487.1377	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2640.6484	0.2160	570.3801	(264)
Space and water heating			2057.5178	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	523.1825	0.5190	271.5317	(268)
Energy saving/generation technologies				
PV Unit	-828.8227	0.5190	-430.1590	(269)
Total CO2, kg/year			1937.8155	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			12.3800	(273)

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

DER			12.3800	ZC1
Total Floor Area		TFA	156.5800	
Assumed number of occupants		N	2.9440	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			12.3978	ZC2
CO2 emissions from cooking, equation (L16)			1.2112	ZC3
Total CO2 emissions			25.9890	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			25.9890	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	78.2900 (1b)	x 2.3900 (2b)	= 187.1131 (1b) - (3b)
First floor	78.2900 (1c)	x 2.6700 (2c)	= 209.0343 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	156.5800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 396.1474 (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) = 0.1010 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3510 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3246 (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	0.4139	0.4058	0.3977	0.3571	0.3490	0.3084	0.3084	0.3003	0.3246	0.3490	0.3652	0.3815 (22b)
Effective ac	0.5857	0.5823	0.5791	0.5638	0.5609	0.5476	0.5476	0.5451	0.5527	0.5609	0.5667	0.5728 (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)			29.5100	1.3258	39.1231		(27)					
Ground Floor			78.2900	0.1300	10.1777		(28a)					
Brick and Block	205.6900	31.6300	174.0600	0.1800	31.3308		(29a)					
Pitched Roof	78.2900		78.2900	0.1300	10.1777		(30)					
Total net area of external elements Aum(A, m2)			362.2700				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	92.9293		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.1713 (36)					
Total fabric heat loss						(33) + (36) =	108.1006 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	76.5636	76.1287	75.7025	73.7003	73.3257	71.5818	71.5818	71.2589	72.2535	73.3257	74.0835	74.8758 (38)
Heat transfer coeff	184.6642	184.2293	183.8031	181.8009	181.4263	179.6825	179.6825	179.3595	180.3542	181.4263	182.1841	182.9764 (39)
Average = Sum(39)m / 12 =												181.7991 (39)
HLP	Jan 1.1794	Feb 1.1766	Mar 1.1739	Apr 1.1611	May 1.1587	Jun 1.1475	Jul 1.1475	Aug 1.1455	Sep 1.1518	Oct 1.1587	Nov 1.1635	Dec 1.1686 (40)
HLP (average)												1.1611 (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												2.9440 (42)
Average daily hot water use (litres/day)												104.1209 (43)
Daily hot water use	114.5330	110.3682	106.2033	102.0385	97.8737	93.7088	93.7088	97.8737	102.0385	106.2033	110.3682	114.5330 (44)
Energy conte	169.8491	148.5512	153.2915	133.6432	128.2339	110.6561	102.5391	117.6651	119.0704	138.7651	151.4730	164.4898 (45)
Energy content (annual)										Total = Sum(45)m =		1638.2275 (45)
Distribution loss (46)m = 0.15 x (45)m	25.4774	22.2827	22.9937	20.0465	19.2351	16.5984	15.3809	17.6498	17.8606	20.8148	22.7209	24.6735 (46)
Water storage loss:												
Store volume												215.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7258 (48)
Temperature factor from Table 2b												0.5400 (49)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Enter (49) or (54) in (55)													0.9319 (55)
Total storage loss													
28.8896	26.0938	28.8896	27.9576	28.8896	27.9576	28.8896	28.8896	27.9576	28.8896	27.9576	28.8896	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	28.8896	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	(59)
Total heat required for water heating calculated for each month													
222.0011	195.6561	205.4434	184.1129	180.3858	161.1257	154.6911	169.8171	169.5401	190.9171	201.9426	216.6418	216.6418	(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													
222.0011	195.6561	205.4434	184.1129	180.3858	161.1257	154.6911	169.8171	169.5401	190.9171	201.9426	216.6418	216.6418	(64)
Heat gains from water heating, kWh/month													
98.1964	87.0772	92.6910	84.8121	84.3593	77.1688	75.8158	80.8452	79.9666	87.8610	90.7405	96.4144	96.4144	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
147.2019	147.2019	147.2019	147.2019	147.2019	147.2019	147.2019	147.2019	147.2019	147.2019	147.2019	147.2019	147.2019	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
29.6248	26.3124	21.3987	16.2002	12.1098	10.2236	11.0470	14.3593	19.2730	24.4716	28.5619	30.4481	30.4481	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
327.5926	330.9920	322.4257	304.1889	281.1683	259.5322	245.0780	241.6786	250.2449	268.4817	291.5023	313.1384	313.1384	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
37.7202	37.7202	37.7202	37.7202	37.7202	37.7202	37.7202	37.7202	37.7202	37.7202	37.7202	37.7202	37.7202	(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)													
-117.7616	-117.7616	-117.7616	-117.7616	-117.7616	-117.7616	-117.7616	-117.7616	-117.7616	-117.7616	-117.7616	-117.7616	-117.7616	(71)
Water heating gains (Table 5)													
131.9844	129.5792	124.5846	117.7946	113.3862	107.1790	101.9030	108.6629	111.0648	118.0927	126.0284	129.5893	129.5893	(72)
Total internal gains													
559.3624	557.0443	538.5696	508.3443	476.8250	447.0954	428.1885	434.8614	450.7433	481.2065	516.2532	543.3364	543.3364	(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					9.5400	10.6334	0.6300	0.7000	0.7700		31.0022 (74)	
East					0.9600	19.6403	0.6300	0.7000	0.7700		5.7622 (76)	
South					16.8400	46.7521	0.6300	0.7000	0.7700		240.6106 (78)	
West					2.1700	19.6403	0.6300	0.7000	0.7700		13.0250 (80)	

Solar gains	290.4000	490.0567	663.1599	817.3055	917.2048	912.8804	879.0403	803.1416	715.7934	539.1633	346.8763	249.2043 (83)
Total gains	849.7624	1047.1010	1201.7295	1325.6498	1394.0298	1359.9758	1307.2288	1238.0030	1166.5367	1020.3698	863.1294	792.5407 (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)													
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
58.8831	59.0221	59.1590	59.8105	59.9340	60.5157	60.5157	60.6247	60.2903	59.9340	59.6847	59.4263	59.4263	
alpha	4.9255	4.9348	4.9439	4.9874	4.9956	5.0344	5.0344	5.0416	5.0194	4.9956	4.9790	4.9618	
util living area													
0.9987	0.9962	0.9892	0.9666	0.9018	0.7574	0.5848	0.6350	0.8596	0.9782	0.9969	0.9991	0.9991	(86)
MIT	19.6665	19.8522	20.1183	20.4503	20.7424	20.9281	20.9843	20.9766	20.8551	20.4678	19.9997	19.6358	(87)
Th 2	19.9365	19.9388	19.9410	19.9513	19.9532	19.9622	19.9622	19.9639	19.9587	19.9532	19.9493	19.9452	(88)
util rest of house													
0.9983	0.9949	0.9852	0.9534	0.8615	0.6668	0.4570	0.5072	0.7901	0.9670	0.9956	0.9988	0.9988	(89)
MIT 2	18.1547	18.4273	18.8157	19.2978	19.6933	19.9124	19.9563	19.9540	19.8402	19.3303	18.6509	18.1159	(90)
Living area fraction													
18.4248	18.6819	19.0484	19.5038	19.8807	20.0939	20.1400	20.1367	20.0215	19.5335	18.8919	18.3875	18.3875	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4248	18.6819	19.0484	19.5038	19.8807	20.0939	20.1400	20.1367	20.0215	19.5335	18.8919	18.3875	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.9973	0.9925	0.9805	0.9460	0.8582	0.6795	0.4798	0.5298	0.7950	0.9608	0.9936	0.9981	0.9981	(94)
Useful gains	847.4737	1039.2845	1178.3188	1254.0760	1196.3479	924.1069	627.2695	655.9326	927.4210	980.4206	857.5955	791.0114	(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													
2608.3477	2539.0365	2306.4433	1927.7757	1484.2000	987.1610	636.0730	670.2162	1067.9734	1620.7807	2148.3018	2595.9736	2595.9736	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
1310.0903	1007.8334	839.3246	485.0638	214.1619	0.0000	0.0000	0.0000	0.0000	476.4279	929.3086	1342.8919	1342.8919	(98)
Space heating												6605.1023	(98)
Space heating per m ²												42.1836	(99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													7064.2806 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1310.0903	1007.8334	839.3246	485.0638	214.1619	0.0000	0.0000	0.0000	0.0000	476.4279	929.3086	1342.8919	(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)	1401.1660	1077.8966	897.6734	518.7848	229.0502	0.0000	0.0000	0.0000	0.0000	509.5485	993.9129	1436.2480	(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	222.0011	195.6561	205.4434	184.1129	180.3858	161.1257	154.6911	169.8171	169.5401	190.9171	201.9426	216.6418	(64)
Efficiency of water heater (217)m	88.7752	88.5693	88.1751	87.2801	85.2725	79.8000	79.8000	79.8000	79.8000	87.1567	88.3844	88.8451	(217)
Fuel for water heating, kWh/month	250.0711	220.9074	232.9948	210.9448	211.5404	201.9119	193.8485	212.8034	212.4562	219.0504	228.4821	243.8420	(219)
Water heating fuel used												2638.8529	(219)
Annual totals kWh/year													
Space heating fuel - main system												7064.2806	(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)												523.1825	(232)
Total delivered energy for all uses												10301.3159	(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	7064.2806	0.2160	1525.8846 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2638.8529	0.2160	569.9922 (264)
Space and water heating			2095.8768 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	523.1825	0.5190	271.5317 (268)
Total CO2, kg/m2/year			2406.3335 (272)
Emissions per m2 for space and water heating			13.3853 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			1.7341 (272b)
Emissions per m2 for pumps and fans			0.2486 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.3853 * 1.00) + 1.7341 + 0.2486, rounded to 2 d.p.			15.3700 (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	78.2900 (1b)	x 2.3900 (2b)	= 187.1131 (1b) - (3b)
First floor	78.2900 (1c)	x 2.6700 (2c)	= 209.0343 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	156.5800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 396.1474 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) = 0.1010 (8)
Pressure test					Yes
Measured/design AP50					4.2100
Infiltration rate					0.3115 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.2881 (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	0.3673	0.3601	0.3529	0.3169	0.3097	0.2737	0.2737	0.2665	0.2881	0.3097	0.3241	0.3385 (22b)
Effective ac	0.5675	0.5649	0.5623	0.5502	0.5480	0.5375	0.5375	0.5355	0.5415	0.5480	0.5525	0.5573 (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)			29.5100	1.1450	33.7901		(27)
Ground Floor			78.2900	0.1200	9.3948	84.0000	6576.3600 (28a)
Brick and Block	205.6900	31.6300	174.0600	0.2400	41.7744	42.2200	7348.8132 (29a)
Pitched Roof	78.2900		78.2900	0.1000	7.8290	9.1000	712.4390 (30)
Total net area of external elements Aum(A, m ²)			362.2700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	95.1203		(33)
GF Block			76.4100			75.0000	5730.7500 (32c)
GF Stud			27.4300			9.0000	246.8700 (32c)
FF Stud			171.1400			9.0000	1540.2600 (32c)
Internal Floor 1			78.2900			18.0000	1409.2200 (32d)
Internal Ceiling 1			78.2900			9.0000	704.6100 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 24269.3222 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 154.9963 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.5783 (36)
Total fabric heat loss (33) + (36) = 106.6986 (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	74.1846	73.8421	73.5064	71.9295	71.6345	70.2611	70.2611	70.0068	70.7901	71.6345	72.2313	72.8553 (38)
Heat transfer coeff	180.8833	180.5407	180.2050	178.6282	178.3331	176.9597	176.9597	176.7054	177.4887	178.3331	178.9300	179.5539 (39)
Average = Sum(39)m / 12 =												178.6267 (39)
HLP	1.1552	1.1530	1.1509	1.1408	1.1389	1.1302	1.1302	1.1285	1.1335	1.1389	1.1427	1.1467 (40)
HLP (average)												1.1408 (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												2.9440 (42)
Average daily hot water use (litres/day)												104.1209 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	114.5330	110.3682	106.2033	102.0385	97.8737	93.7088	93.7088	97.8737	102.0385	106.2033	110.3682	114.5330 (44)
Energy conte	169.8491	148.5512	153.2915	133.6432	128.2339	110.6561	102.5391	117.6651	119.0704	138.7651	151.4730	164.4898 (45)
Energy content (annual)										Total = Sum(45)m =		1638.2275 (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	36.0929	31.5671	32.5744	28.3992	27.2497	23.5144	21.7896	25.0038	25.3025	29.4876	32.1880	34.9541 (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	147.2019	147.2019	147.2019	147.2019	147.2019	147.2019	147.2019	147.2019	147.2019	147.2019	147.2019	147.2019	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.6248	26.3124	21.3987	16.2002	12.1098	10.2236	11.0470	14.3593	19.2730	24.4716	28.5619	30.4481	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.5926	330.9920	322.4257	304.1889	281.1683	259.5322	245.0780	241.6786	250.2449	268.4817	291.5023	313.1384	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.7202	37.7202	37.7202	37.7202	37.7202	37.7202	37.7202	37.7202	37.7202	37.7202	37.7202	37.7202	(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)	-117.7616	-117.7616	-117.7616	-117.7616	-117.7616	-117.7616	-117.7616	-117.7616	-117.7616	-117.7616	-117.7616	-117.7616	(71)
Water heating gains (Table 5)	48.5120	46.9749	43.7828	39.4433	36.6259	32.6589	29.2870	33.6073	35.1423	39.6339	44.7056	46.9813	(72)
Total internal gains	472.8900	471.4399	454.7678	426.9931	397.0647	369.5754	352.5726	356.8058	371.8209	399.7477	431.9303	457.7284	(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				9.5400	10.6334		0.6300		0.7000		0.7700		31.0022 (74)
East				0.9600	19.6403		0.6300		0.7000		0.7700		5.7622 (76)
South				16.8400	46.7521		0.6300		0.7000		0.7700		240.6106 (78)
West				2.1700	19.6403		0.6300		0.7000		0.7700		13.0250 (80)
Solar gains	290.4000	490.0567	663.1599	817.3055	917.2048	912.8804	879.0403	803.1416	715.7934	539.1633	346.8763		249.2043 (83)
Total gains	763.2900	961.4967	1117.9277	1244.2986	1314.2696	1282.4558	1231.6129	1159.9474	1087.6143	938.9110	778.8066		706.9327 (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	37.2698	37.3405	37.4100	37.7403	37.8027	38.0961	38.0961	38.1510	37.9826	37.8027	37.6766	37.5457	
alpha	3.4847	3.4894	3.4940	3.5160	3.5202	3.5397	3.5397	3.5434	3.5322	3.5202	3.5118	3.5030	
util living area	0.9938	0.9858	0.9699	0.9336	0.8593	0.7289	0.5798	0.6265	0.8231	0.9529	0.9883	0.9952	(86)
MIT	19.0631	19.3219	19.6896	20.1409	20.5451	20.8296	20.9444	20.9258	20.7163	20.1745	19.5247	19.0153	(87)
Th 2	19.9560	19.9578	19.9595	19.9676	19.9692	19.9763	19.9763	19.9776	19.9735	19.9692	19.9661	19.9629	(88)
util rest of house	0.9924	0.9826	0.9629	0.9170	0.8213	0.6522	0.4651	0.5142	0.7626	0.9378	0.9852	0.9942	(89)
MIT 2	18.1799	18.4382	18.8031	19.2492	19.6293	19.8772	19.9550	19.9468	19.7900	19.2896	18.6477	18.1373	(90)
Living area fraction									fLA = Living area / (4) =			0.1787	(91)
MIT	18.3377	18.5961	18.9615	19.4085	19.7929	20.0474	20.1318	20.1217	19.9556	19.4478	18.8044	18.2942	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3377	18.5961	18.9615	19.4085	19.7929	20.0474	20.1318	20.1217	19.9556	19.4478	18.8044	18.2942	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	755.1544	939.4180	1066.6212	1127.1836	1069.4206	843.9900	595.7485	616.3852	828.0208	871.2843	763.4659	701.0671	(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	2539.1868	2472.7101	2245.6318	1877.1158	1443.2381	963.9668	624.9858	657.6472	1039.2955	1577.8480	2094.2657	2530.6659	(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	1327.3201	1030.3723	877.1839	539.9512	278.1202	0.0000	0.0000	0.0000	0.0000	525.6834	958.1758	1361.2215	(98)
Space heating												6898.0285	(98)
Space heating per m2											(98) / (4) =	44.0543	(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	1663.4214	1309.5019	1342.9609	0.0000	0.0000	0.0000	0.0000	(100)

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Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7710	0.8433	0.8170	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1282.5477	1104.3508	1097.1402	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1627.0717	1564.6313	1483.4459	0.0000	0.0000	0.0000	0.0000 (103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	248.0572	342.4487	287.4115	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												877.9174 (104)
Cooled fraction									FC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)												
Intermittency factor	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	62.0143	85.6122	71.8529	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												219.4793 (107)
Space cooling per m2												1.4017 (108)
Energy for space heating												44.0543 (99)
Energy for space cooling												1.4017 (108)
Total												45.4560 (109)
Dwelling Fabric Energy Efficiency (DFEE)												45.5 (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	78.2900 (1b)	x 2.3900 (2b)	= 187.1131 (1b) - (3b)
First floor	78.2900 (1c)	x 2.6700 (2c)	= 209.0343 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	156.5800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 396.1474 (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) =	0.1010 (8)	
Pressure test											Yes			
Measured/design AP50													5.0000	
Infiltration rate													0.3510 (18)	
Number of sides sheltered													1 (19)	
Shelter factor											(20) = 1 - [0.075 x (19)] =		0.9250 (20)	
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =		0.3246 (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	0.4139	0.4058	0.3977	0.3571	0.3490	0.3084	0.3084	0.3003	0.3246	0.3490	0.3652	0.3815 (22b)		
Effective ac	0.5857	0.5823	0.5791	0.5638	0.5609	0.5476	0.5476	0.5451	0.5527	0.5609	0.5667	0.5728 (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)			29.5100	1.3258	39.1231		(27)					
Ground Floor			78.2900	0.1300	10.1777		(28a)					
Brick and Block	205.6900	31.6300	174.0600	0.1800	31.3308		(29a)					
Pitched Roof	78.2900		78.2900	0.1300	10.1777		(30)					
Total net area of external elements Aum(A, m2)			362.2700				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	92.9293		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.1713 (36)					
Total fabric heat loss						(33) + (36) =	108.1006 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 76.5636	Feb 76.1287	Mar 75.7025	Apr 73.7003	May 73.3257	Jun 71.5818	Jul 71.5818	Aug 71.2589	Sep 72.2535	Oct 73.3257	Nov 74.0835	Dec 74.8758 (38)
Heat transfer coeff	184.6642	184.2293	183.8031	181.8009	181.4263	179.6825	179.6825	179.3595	180.3542	181.4263	182.1841	182.9764 (39)
Average = Sum(39)m / 12 =												181.7991 (39)
HLP	Jan 1.1794	Feb 1.1766	Mar 1.1739	Apr 1.1611	May 1.1587	Jun 1.1475	Jul 1.1475	Aug 1.1455	Sep 1.1518	Oct 1.1587	Nov 1.1635	Dec 1.1686 (40)
HLP (average)												1.1611 (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												2.9440 (42)
Average daily hot water use (litres/day)												104.1209 (43)
Daily hot water use	Jan 114.5330	Feb 110.3682	Mar 106.2033	Apr 102.0385	May 97.8737	Jun 93.7088	Jul 93.7088	Aug 97.8737	Sep 102.0385	Oct 106.2033	Nov 110.3682	Dec 114.5330 (44)
Energy conte	169.8491	148.5512	153.2915	133.6432	128.2339	110.6561	102.5391	117.6651	119.0704	138.7651	151.4730	164.4898 (45)
Energy content (annual)										Total = Sum(45)m =		1638.2275 (45)
Distribution loss (46)m = 0.15 x (45)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

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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)
	36.0929	31.5671	32.5744	28.3992	27.2497	23.5144	21.7896	25.0038	25.3025	29.4876	32.1880	34.9541	(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	147.2019	147.2019	147.2019	147.2019	147.2019	147.2019	147.2019	147.2019	147.2019	147.2019	147.2019	147.2019	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.6248	26.3124	21.3987	16.2002	12.1098	10.2236	11.0470	14.3593	19.2730	24.4716	28.5619	30.4481	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.5926	330.9920	322.4257	304.1889	281.1683	259.5322	245.0780	241.6786	250.2449	268.4817	291.5023	313.1384	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.7202	37.7202	37.7202	37.7202	37.7202	37.7202	37.7202	37.7202	37.7202	37.7202	37.7202	37.7202	(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)	-117.7616	-117.7616	-117.7616	-117.7616	-117.7616	-117.7616	-117.7616	-117.7616	-117.7616	-117.7616	-117.7616	-117.7616	(71)
Water heating gains (Table 5)	48.5120	46.9749	43.7828	39.4433	36.6259	32.6589	29.2870	33.6073	35.1423	39.6339	44.7056	46.9813	(72)
Total internal gains	472.8900	471.4399	454.7678	426.9931	397.0647	369.5754	352.5726	356.8058	371.8209	399.7477	431.9303	457.7284	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W	
North	9.5400	10.6334	0.6300		0.7000	0.7700	31.0022	(74)
East	0.9600	19.6403	0.6300		0.7000	0.7700	5.7622	(76)
South	16.8400	46.7521	0.6300		0.7000	0.7700	240.6106	(78)
West	2.1700	19.6403	0.6300		0.7000	0.7700	13.0250	(80)

Solar gains	290.4000	490.0567	663.1599	817.3055	917.2048	912.8804	879.0403	803.1416	715.7934	539.1633	346.8763	249.2043	(83)
Total gains	763.2900	961.4967	1117.9277	1244.2986	1314.2696	1282.4558	1231.6129	1159.9474	1087.6143	938.9110	778.8066	706.9327	(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	58.8831	59.0221	59.1590	59.8105	59.9340	60.5157	60.5157	60.6247	60.2903	59.9340	59.6847	59.4263		
alpha	4.9255	4.9348	4.9439	4.9874	4.9956	5.0344	5.0344	5.0416	5.0194	4.9956	4.9790	4.9618		
util living area	0.9992	0.9974	0.9920	0.9738	0.9183	0.7857	0.6154	0.6690	0.8846	0.9844	0.9980	0.9995	(86)	
MIT	19.6152	19.8019	20.0707	20.4085	20.7123	20.9146	20.9804	20.9706	20.8307	20.4236	19.9499	19.5848	(87)	
Th 2	19.9365	19.9388	19.9410	19.9513	19.9532	19.9622	19.9622	19.9639	19.9587	19.9532	19.9493	19.9452	(88)	
util rest of house	0.9990	0.9965	0.9890	0.9630	0.8825	0.6974	0.4835	0.5385	0.8216	0.9761	0.9972	0.9993	(89)	
MIT 2	18.6687	18.8569	19.1259	19.4659	19.7511	19.9207	19.9570	19.9551	19.8610	19.4858	19.0133	18.6453	(90)	
Living area fraction									fLA = Living area / (4) =			0.1787	(91)	
MIT	18.8379	19.0258	19.2947	19.6343	19.9229	20.0983	20.1399	20.1365	20.0342	19.6534	19.1807	18.8132	(92)	
Temperature adjustment												0.0000		
adjusted MIT	18.8379	19.0258	19.2947	19.6343	19.9229	20.0983	20.1399	20.1365	20.0342	19.6534	19.1807	18.8132	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains	0.9985	0.9954	0.9866	0.9588	0.8813	0.7104	0.5073	0.5618	0.8271	0.9728	0.9963	0.9990	(94)	
Ext temp.	762.1748	957.0308	1102.9039	1193.0449	1158.2174	911.0116	624.8008	651.7057	899.5589	913.4110	775.9474	706.2257	(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	2684.6240	2602.3823	2351.7105	1951.5124	1491.8421	987.9534	636.0549	670.1851	1070.2658	1642.5230	2200.9109	2673.8703	(97)	
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)	
Space heating	1430.3022	1105.6762	929.1122	546.0966	248.2167	0.0000	0.0000	0.0000	0.0000	542.4593	1025.9737	1463.9276	(98)	
Space heating per m2												7291.7646	(98)	
										(98) / (4) =		46.5689	(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	1689.0151	1329.6502	1363.1324	0.0000	0.0000	0.0000	0.0000	(100)	
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8183	0.8942	0.8677	0.0000	0.0000	0.0000	0.0000	(101)	
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1382.1463	1188.9254	1182.7484	0.0000	0.0000	0.0000	0.0000	(102)	
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1627.0717	1564.6313	1483.4459	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	176.3462	279.5252	223.7190	0.0000	0.0000	0.0000	0.0000	(104)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling												679.5904 (104)
Cooled fraction												1.0000 (105)
Intermittency factor (Table 10b)												
	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)	
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	44.0866	69.8813	55.9297	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												169.8976 (107)
Space cooling per m2												1.0851 (108)
Energy for space heating												46.5689 (99)
Energy for space cooling												1.0851 (108)
Total												47.6540 (109)
Target Fabric Energy Efficiency (TFEE)												54.8 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	78.2900 (1b)	x 2.3900 (2b)	= 187.1131 (1b) - (3b)
First floor	78.2900 (1c)	x 2.6700 (2c)	= 209.0343 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	156.5800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 396.1474 (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) = 0.1262 (8)
Pressure test					Yes
Measured/design AP50					4.2100
Infiltration rate					0.3367 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3115 (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	0.3660	0.3426	0.3426	0.3115	0.3192	0.3037	0.3037	0.2959	0.2959	0.3192	0.3115	0.3192 (22b)
Effective ac	0.5670	0.5587	0.5587	0.5485	0.5510	0.5461	0.5461	0.5438	0.5438	0.5510	0.5485	0.5510 (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)			29.5100	1.1450	33.7901		(27)
Ground Floor			78.2900	0.1200	9.3948	84.0000	6576.3600 (28a)
Brick and Block	205.6900	31.6300	174.0600	0.2400	41.7744	42.2200	7348.8132 (29a)
Pitched Roof	78.2900		78.2900	0.1000	7.8290	9.1000	712.4390 (30)
Total net area of external elements Aum(A, m ²)			362.2700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	95.1203		(33)
GF Block			76.4100			75.0000	5730.7500 (32c)
GF Stud			27.4300			9.0000	246.8700 (32c)
FF Stud			171.1400			9.0000	1540.2600 (32c)
Internal Floor 1			78.2900			18.0000	1409.2200 (32d)
Internal Ceiling 1			78.2900			18.0000	1409.2200 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 24973.9322 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 159.4963 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.5783 (36)
Total fabric heat loss (33) + (36) = 106.6986 (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	74.1187	73.0368	73.0368	71.7052	72.0262	71.3921	71.3921	71.0870	71.0870	72.0262	71.7052	72.0262 (38)
Heat transfer coeff	180.8173	179.7354	179.7354	178.4038	178.7248	178.0908	178.0908	177.7856	177.7856	178.7248	178.4038	178.7248 (39)
Average = Sum(39)m / 12 =												178.7519 (39)
HLP	1.1548	1.1479	1.1479	1.1394	1.1414	1.1374	1.1374	1.1354	1.1354	1.1414	1.1394	1.1414 (40)
HLP (average)												1.1416 (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												2.9440 (42)
Average daily hot water use (litres/day)												104.1209 (43)
Daily hot water use	114.5330	110.3682	106.2033	102.0385	97.8737	93.7088	93.7088	97.8737	102.0385	106.2033	110.3682	114.5330 (44)
Energy conte	169.8491	148.5512	153.2915	133.6432	128.2339	110.6561	102.5391	117.6651	119.0704	138.7651	151.4730	164.4898 (45)
Energy content (annual)										Total = Sum(45)m =		1638.2275 (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	25.4774	22.2827	22.9937	20.0465	19.2351	16.5984	15.3809	17.6498	17.8606	20.8148	22.7209	24.6735 (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												
222.0717 195.7200 205.5141 184.1812 180.4565 161.1941 154.7617 169.8877 169.6084 190.9877 202.0110 216.7124 (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	222.0717	195.7200	205.5141	184.1812	180.4565	161.1941	154.7617	169.8877	169.6084	190.9877	202.0110	216.7124 (64)
RHI water heating demand												2253.1065 (64)
Heat gains from water heating, kWh/month	98.2529	87.1283	92.7475	84.8668	84.4158	77.2235	75.8723	80.9017	80.0213	87.9175	90.7952	96.4709 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	176.6423	176.6423	176.6423	176.6423	176.6423	176.6423	176.6423	176.6423	176.6423	176.6423	176.6423	176.6423 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	74.0619	65.7811	53.4968	40.5005	30.2746	25.5591	27.6175	35.8983	48.1826	61.1789	71.4048	76.1203 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	488.9442	494.0179	481.2324	454.0134	419.6543	387.3615	365.7880	360.7143	373.4999	400.7189	435.0780	467.3707 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.6083	55.6083	55.6083	55.6083	55.6083	55.6083	55.6083	55.6083	55.6083	55.6083	55.6083	55.6083 (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)	-117.7616	-117.7616	-117.7616	-117.7616	-117.7616	-117.7616	-117.7616	-117.7616	-117.7616	-117.7616	-117.7616	-117.7616 (71)
Water heating gains (Table 5)	132.0604	129.6552	124.6606	117.8705	113.4621	107.2549	101.9789	108.7389	111.1407	118.1687	126.1044	129.6653 (72)
Total internal gains	812.5556	806.9433	776.8788	729.8734	680.8801	637.6646	612.8735	622.8405	650.3123	697.5555	750.0762	790.6453 (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				9.5400	13.4684		0.6300	0.7000	0.7700		39.2678 (74)	
East				0.9600	25.1733		0.6300	0.7000	0.7700		7.3855 (76)	
South				16.8400	56.5862		0.6300	0.7000	0.7700		291.2223 (78)	
West				2.1700	25.1733		0.6300	0.7000	0.7700		16.6944 (80)	

Solar gains	354.5700	509.1973	703.4186	876.7785	932.9135	1030.9454	952.3983	902.2392	796.7667	604.8365	422.0696	288.1104 (83)
Total gains	1167.1256	1316.1406	1480.2975	1606.6519	1613.7936	1668.6100	1565.2718	1525.0797	1447.0790	1302.3920	1172.1458	1078.7557 (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	38.3658	38.5968	38.5968	38.8848	38.8150	38.9532	38.9532	39.0201	39.0201	38.8150	38.8848	38.8150
alpha	3.5577	3.5731	3.5731	3.5923	3.5877	3.5969	3.5969	3.6013	3.6013	3.5877	3.5923	3.5877
util living area	0.9732	0.9590	0.9241	0.8501	0.7271	0.5147	0.3685	0.3663	0.6200	0.8527	0.9492	0.9782 (86)
MIT	19.6163	19.7945	20.1252	20.5123	20.7991	20.9583	20.9908	20.9913	20.9170	20.5957	20.0736	19.5859 (87)
Th 2	19.9563	19.9619	19.9619	19.9688	19.9671	19.9704	19.9704	19.9720	19.9720	19.9671	19.9688	19.9671 (88)
util rest of house	0.9671	0.9500	0.9073	0.8165	0.6651	0.4219	0.2568	0.2519	0.5285	0.8109	0.9360	0.9731 (89)
MIT 2	18.1529	18.4115	18.8798	19.4150	19.7773	19.9446	19.9676	19.9695	19.9127	19.5356	18.8197	18.1169 (90)
Living area fraction									fLA = Living area / (4) =			0.1787 (91)
MIT	18.4144	18.6586	19.1024	19.6111	19.9599	20.1258	20.1504	20.1521	20.0922	19.7250	19.0438	18.3794 (92)
Temperature adjustment												0.0000
adjusted MIT	18.4144	18.6586	19.1024	19.6111	19.9599	20.1258	20.1504	20.1521	20.0922	19.7250	19.0438	18.3794 (93)

8. Space heating requirement

Utilisation	0.9547	0.9351	0.8901	0.8031	0.6647	0.4365	0.2768	0.2723	0.5400	0.7994	0.9203	0.9622 (94)
Useful gains	1114.3063	1230.6712	1317.5414	1290.2699	1072.6416	728.3830	433.2048	415.2813	781.4133	1041.1182	1078.7744	1037.9833 (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	2317.0708	2275.2017	2067.3865	1696.8205	1226.0325	752.5709	436.3959	418.1622	834.1984	1362.7787	1863.2096	2266.1226 (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	894.8568	701.9245	557.8848	292.7164	114.1228	0.0000	0.0000	0.0000	0.0000	239.3154	564.7934	913.7356 (98)
Space heating												4279.3497 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

RHI space heating demand

4279 (98)

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	78.2900 (1b)	x 2.3900 (2b)	= 187.1131 (1b) - (3b)
First floor	78.2900 (1c)	x 2.6700 (2c)	= 209.0343 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	156.5800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 396.1474 (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) = 0.1262 (8)
Pressure test					Yes
Measured/design AP50					4.2100
Infiltration rate					0.3367 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3115 (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	0.3971	0.3893	0.3815	0.3426	0.3348	0.2959	0.2959	0.2881	0.3115	0.3348	0.3504	0.3660 (22b)
Effective ac	0.5788	0.5758	0.5728	0.5587	0.5561	0.5438	0.5438	0.5415	0.5485	0.5561	0.5614	0.5670 (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)			29.5100	1.1450	33.7901		(27)
Ground Floor			78.2900	0.1200	9.3948	84.0000	6576.3600 (28a)
Brick and Block	205.6900	31.6300	174.0600	0.2400	41.7744	42.2200	7348.8132 (29a)
Pitched Roof	78.2900		78.2900	0.1000	7.8290	9.1000	712.4390 (30)
Total net area of external elements Aum(A, m ²)			362.2700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	95.1203		(33)
GF Block			76.4100			75.0000	5730.7500 (32c)
GF Stud			27.4300			9.0000	246.8700 (32c)
FF Stud			171.1400			9.0000	1540.2600 (32c)
Internal Floor 1			78.2900			18.0000	1409.2200 (32d)
Internal Ceiling 1			78.2900			18.0000	1409.2200 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 24973.9322 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 159.4963 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.5783 (36)
Total fabric heat loss (33) + (36) = 106.6986 (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	75.6722	75.2720	74.8796	73.0368	72.6920	71.0870	71.0870	70.7898	71.7052	72.6920	73.3895	74.1187 (38)
Heat transfer coeff	182.3709	181.9706	181.5782	179.7354	179.3906	177.7856	177.7856	177.4884	178.4038	179.3906	180.0881	180.8173 (39)
Average = Sum(39)m / 12 =												179.7338 (39)
HLP	1.1647	1.1622	1.1597	1.1479	1.1457	1.1354	1.1354	1.1335	1.1394	1.1457	1.1501	1.1548 (40)
HLP (average)												1.1479 (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												2.9440 (42)
Average daily hot water use (litres/day)												104.1209 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	114.5330	110.3682	106.2033	102.0385	97.8737	93.7088	93.7088	97.8737	102.0385	106.2033	110.3682	114.5330 (44)
Energy conte	169.8491	148.5512	153.2915	133.6432	128.2339	110.6561	102.5391	117.6651	119.0704	138.7651	151.4730	164.4898 (45)
Energy content (annual)										Total = Sum(45)m =		1638.2275 (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	25.4774	22.2827	22.9937	20.0465	19.2351	16.5984	15.3809	17.6498	17.8606	20.8148	22.7209	24.6735 (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												
222.0717 195.7200 205.5141 184.1812 180.4565 161.1941 154.7617 169.8877 169.6084 190.9877 202.0110 216.7124 (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	222.0717	195.7200	205.5141	184.1812	180.4565	161.1941	154.7617	169.8877	169.6084	190.9877	202.0110	216.7124 (64)
Total per year (kWh/year) = Sum(64)m =												2253.1065 (64)
Heat gains from water heating, kWh/month												
98.2529 87.1283 92.7475 84.8668 84.4158 77.2235 75.8723 80.9017 80.0213 87.9175 90.7952 96.4709 (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	176.6423	176.6423	176.6423	176.6423	176.6423	176.6423	176.6423	176.6423	176.6423	176.6423	176.6423	176.6423	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	74.0619	65.7811	53.4968	40.5005	30.2746	25.5591	27.6175	35.8983	48.1826	61.1789	71.4048	76.1203	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	488.9442	494.0179	481.2324	454.0134	419.6543	387.3615	365.7880	360.7143	373.4999	400.7189	435.0780	467.3707	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	55.6083	55.6083	55.6083	55.6083	55.6083	55.6083	55.6083	55.6083	55.6083	55.6083	55.6083	55.6083	(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)													
	-117.7616	-117.7616	-117.7616	-117.7616	-117.7616	-117.7616	-117.7616	-117.7616	-117.7616	-117.7616	-117.7616	-117.7616	(71)
Water heating gains (Table 5)													
	132.0604	129.6552	124.6606	117.8705	113.4621	107.2549	101.9789	108.7389	111.1407	118.1687	126.1044	129.6653	(72)
Total internal gains													
	812.5556	806.9433	776.8788	729.8734	680.8801	637.6646	612.8735	622.8405	650.3123	697.5555	750.0762	790.6453	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W
North	9.5400	10.6334	0.6300	0.7000	0.7700	31.0022 (74)
East	0.9600	19.6403	0.6300	0.7000	0.7700	5.7622 (76)
South	16.8400	46.7521	0.6300	0.7000	0.7700	240.6106 (78)
West	2.1700	19.6403	0.6300	0.7000	0.7700	13.0250 (80)

Solar gains	290.4000	490.0567	663.1599	817.3055	917.2048	912.8804	879.0403	803.1416	715.7934	539.1633	346.8763	249.2043 (83)
Total gains	1102.9556	1297.0000	1440.0387	1547.1789	1598.0849	1550.5450	1491.9138	1425.9822	1366.1057	1236.7188	1096.9525	1039.8497 (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	38.0390	38.1227	38.2050	38.5968	38.6709	39.0201	39.0201	39.0854	38.8848	38.6709	38.5212	38.3658	
alpha	3.5359	3.5415	3.5470	3.5731	3.5781	3.6013	3.6013	3.6057	3.5923	3.5781	3.5681	3.5577	
util living area													
	0.9822	0.9681	0.9430	0.8917	0.7981	0.6494	0.4986	0.5371	0.7398	0.9087	0.9697	0.9854 (86)	
MIT	19.3574	19.5977	19.9314	20.3315	20.6694	20.8896	20.9677	20.9573	20.8144	20.3759	19.7905	19.3105 (87)	
Th 2	19.9483	19.9504	19.9524	19.9619	19.9637	19.9720	19.9720	19.9735	19.9688	19.9637	19.9601	19.9563 (88)	
util rest of house													
	0.9784	0.9614	0.9307	0.8673	0.7513	0.5697	0.3927	0.4312	0.6688	0.8830	0.9622	0.9822 (89)	
MIT 2	17.7725	18.1201	18.5991	19.1661	19.6165	19.8833	19.9551	19.9495	19.8042	19.2396	18.4089	17.7098 (90)	
Living area fraction													
									fLA = Living area / (4) =			0.1787 (91)	
MIT	18.0557	18.3842	18.8372	19.3743	19.8047	20.0632	20.1361	20.1296	19.9847	19.4427	18.6558	17.9958 (92)	
Temperature adjustment													0.0000
adjusted MIT	18.0557	18.3842	18.8372	19.3743	19.8047	20.0632	20.1361	20.1296	19.9847	19.4427	18.6558	17.9958 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9686	0.9478	0.9140	0.8508	0.7432	0.5773	0.4103	0.4481	0.6700	0.8670	0.9491	0.9736 (94)
Useful gains	1068.3074	1229.3222	1316.1324	1316.3446	1187.7313	895.0985	612.1673	639.0016	915.3322	1072.2657	1041.1530	1012.3785 (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	2508.6349	2453.7200	2240.1593	1882.6080	1453.9064	971.2724	628.6624	661.9617	1049.8607	1586.2898	2081.0536	2494.5261 (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	1071.6037	822.7953	687.4760	407.7097	198.0343	0.0000	0.0000	0.0000	0.0000	382.4339	748.7285	1102.7179 (98)
Space heating												5421.4991 (98)
Space heating per m2											(98) / (4) =	34.6245 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)																0.0000 (201)
Fraction of space heat from main system(s)																1.0000 (202)
Efficiency of main space heating system 1 (in %)																90.5000 (206)
Efficiency of secondary/supplementary heating system, %																0.0000 (208)
Space heating requirement																5990.6067 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec				
Space heating requirement	1071.6037	822.7953	687.4760	407.7097	198.0343	0.0000	0.0000	0.0000	0.0000	382.4339	748.7285	1102.7179	(98)			
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)			
Space heating fuel (main heating system)	1184.0924	909.1661	759.6420	450.5079	218.8225	0.0000	0.0000	0.0000	0.0000	422.5789	827.3243	1218.4728	(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	222.0717	195.7200	205.5141	184.1812	180.4565	161.1941	154.7617	169.8877	169.6084	190.9877	202.0110	216.7124	(64)			
Efficiency of water heater (217)m	88.4638	88.2267	87.7909	86.8752	85.0621	79.8000	79.8000	79.8000	79.8000	86.6311	87.9931	88.5499	(216)			
Fuel for water heating, kWh/month	251.0311	221.8374	234.0950	212.0066	212.1468	201.9976	193.9370	212.8919	212.5419	220.4609	229.5760	244.7349	(219)			
Water heating fuel used												2647.2571	(219)			
Annual totals kWh/year																
Space heating fuel - main system												5990.6067	(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)												523.1825	(232)			
Energy saving/generation technologies (Appendices M ,N and Q)																
PV Unit 0 (0.80 + 0.97 + 1068 + 1.00) =										-828.8227		-828.8227	(233)			
Total delivered energy for all uses												8407.2237	(238)			

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	5990.6067	3.4800	208.4731 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2647.2571	3.4800	92.1245 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	523.1825	13.1900	69.0078 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-828.8227	13.1900	-109.3217 (252)
Total energy cost			390.1762 (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] =	0.8129 (257)
SAP value		88.6594
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	5990.6067	0.2160	1293.9711 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2647.2571	0.2160	571.8075 (264)
Space and water heating			1865.7786 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	523.1825	0.5190	271.5317 (268)
Energy saving/generation technologies			
PV Unit	-828.8227	0.5190	-430.1590 (269)
Total kg/year			1746.0763 (272)
CO2 emissions per m2			11.1500 (273)
EI value			88.3930
EI rating			88 (274)
EI band			B

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CALCULATION OF ENERGY RATINGS 09 Jan 2014

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9050 = 3.845$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9050 = 0.2387$, stars = 4
Water heating energy efficiency	$3.48 / 0.8490 = 4.099$, stars = 4
Water heating environmental impact	$0.216 / 0.8490 = 0.2544$, 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	78.2900 (1b)	x 2.3900 (2b)	= 187.1131 (1b) - (3b)
First floor	78.2900 (1c)	x 2.6700 (2c)	= 209.0343 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	156.5800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 396.1474 (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																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) =	0.1262 (8)
Pressure test										Yes							
Measured/design AP50										4.2100							
Infiltration rate										0.3367 (18)							
Number of sides sheltered										1 (19)							
Shelter factor										(20) = 1 - [0.075 x (19)] =					0.9250 (20)		
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =					0.3115 (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	0.3660	0.3426	0.3426	0.3115	0.3192	0.3037	0.3037	0.2959	0.2959	0.3192	0.3115	0.3192	(22b)				
Effective ac	0.5670	0.5587	0.5587	0.5485	0.5510	0.5461	0.5461	0.5438	0.5438	0.5510	0.5485	0.5510	(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)			29.5100	1.1450	33.7901			(27)					
Ground Floor			78.2900	0.1200	9.3948	84.0000	6576.3600	(28a)					
Brick and Block	205.6900	31.6300	174.0600	0.2400	41.7744	42.2200	7348.8132	(29a)					
Pitched Roof	78.2900		78.2900	0.1000	7.8290	9.1000	712.4390	(30)					
Total net area of external elements Aum(A, m2)			362.2700					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	95.1203			(33)					
GF Block			76.4100			75.0000	5730.7500	(32c)					
GF Stud			27.4300			9.0000	246.8700	(32c)					
FF Stud			171.1400			9.0000	1540.2600	(32c)					
Internal Floor 1			78.2900			18.0000	1409.2200	(32d)					
Internal Ceiling 1			78.2900			18.0000	1409.2200	(32e)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		24973.9322	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							159.4963	(35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.5783	(36)					
Total fabric heat loss						(33) + (36) =	106.6986	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 74.1187	Feb 73.0368	Mar 73.0368	Apr 71.7052	May 72.0262	Jun 71.3921	Jul 71.3921	Aug 71.0870	Sep 71.0870	Oct 72.0262	Nov 71.7052	Dec 72.0262	(38)
Heat transfer coeff	180.8173	179.7354	179.7354	178.4038	178.7248	178.0908	178.0908	177.7856	177.7856	178.7248	178.4038	178.7248	(39)
Average = Sum(39)m / 12 =												178.7519	(39)
HLP	Jan 1.1548	Feb 1.1479	Mar 1.1479	Apr 1.1394	May 1.1414	Jun 1.1374	Jul 1.1374	Aug 1.1354	Sep 1.1354	Oct 1.1414	Nov 1.1394	Dec 1.1414	(40)
HLP (average)												1.1416	(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												2.9440 (42)
Average daily hot water use (litres/day)												104.1209 (43)
Daily hot water use	Jan 114.5330	Feb 110.3682	Mar 106.2033	Apr 102.0385	May 97.8737	Jun 93.7088	Jul 93.7088	Aug 97.8737	Sep 102.0385	Oct 106.2033	Nov 110.3682	Dec 114.5330 (44)
Energy conte	169.8491	148.5512	153.2915	133.6432	128.2339	110.6561	102.5391	117.6651	119.0704	138.7651	151.4730	164.4898 (45)
Energy content (annual)										Total = Sum(45)m =		1638.2275 (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	25.4774	22.2827	22.9937	20.0465	19.2351	16.5984	15.3809	17.6498	17.8606	20.8148	22.7209	24.6735 (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												
222.0717 195.7200 205.5141 184.1812 180.4565 161.1941 154.7617 169.8877 169.6084 190.9877 202.0110 216.7124 (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	222.0717	195.7200	205.5141	184.1812	180.4565	161.1941	154.7617	169.8877	169.6084	190.9877	202.0110	216.7124 (64)
Total per year (kWh/year) = Sum(64)m =												2253.1065 (64)
Heat gains from water heating, kWh/month												
98.2529 87.1283 92.7475 84.8668 84.4158 77.2235 75.8723 80.9017 80.0213 87.9175 90.7952 96.4709 (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	176.6423	176.6423	176.6423	176.6423	176.6423	176.6423	176.6423	176.6423	176.6423	176.6423	176.6423	176.6423	176.6423 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
74.0619 65.7811 53.4968 40.5005 30.2746 25.5591 27.6175 35.8983 48.1826 61.1789 71.4048 76.1203 (67)													
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
488.9442 494.0179 481.2324 454.0134 419.6543 387.3615 365.7880 360.7143 373.4999 400.7189 435.0780 467.3707 (68)													
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
55.6083 55.6083 55.6083 55.6083 55.6083 55.6083 55.6083 55.6083 55.6083 55.6083 55.6083 55.6083 (69)													
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)													
-117.7616 -117.7616 -117.7616 -117.7616 -117.7616 -117.7616 -117.7616 -117.7616 -117.7616 -117.7616 -117.7616 -117.7616 (71)													
Water heating gains (Table 5)													
132.0604 129.6552 124.6606 117.8705 113.4621 107.2549 101.9789 108.7389 111.1407 118.1687 126.1044 129.6653 (72)													
Total internal gains	812.5556	806.9433	776.8788	729.8734	680.8801	637.6646	612.8735	622.8405	650.3123	697.5555	750.0762	790.6453 (73)	

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W
North	9.5400	13.4684	0.6300	0.7000	0.7700	39.2678 (74)
East	0.9600	25.1733	0.6300	0.7000	0.7700	7.3855 (76)
South	16.8400	56.5862	0.6300	0.7000	0.7700	291.2223 (78)
West	2.1700	25.1733	0.6300	0.7000	0.7700	16.6944 (80)

Solar gains	354.5700	509.1973	703.4186	876.7785	932.9135	1030.9454	952.3983	902.2392	796.7667	604.8365	422.0696	288.1104 (83)
Total gains	1167.1256	1316.1406	1480.2975	1606.6519	1613.7936	1668.6100	1565.2718	1525.0797	1447.0790	1302.3920	1172.1458	1078.7557 (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	38.3658	38.5968	38.5968	38.8848	38.8150	38.9532	38.9532	39.0201	39.0201	38.8150	38.8848	38.8150	
alpha	3.5577	3.5731	3.5731	3.5923	3.5877	3.5969	3.5969	3.6013	3.6013	3.5877	3.5923	3.5877	
util living area	0.9732	0.9590	0.9241	0.8501	0.7271	0.5147	0.3685	0.3663	0.6200	0.8527	0.9492	0.9782 (86)	
MIT	19.6163	19.7945	20.1252	20.5123	20.7991	20.9583	20.9908	20.9913	20.9170	20.5957	20.0736	19.5859 (87)	
Th 2	19.9563	19.9619	19.9619	19.9688	19.9671	19.9704	19.9704	19.9720	19.9720	19.9671	19.9688	19.9671 (88)	
util rest of house													
0.9671 0.9500 0.9073 0.8165 0.6651 0.4219 0.2568 0.2519 0.5285 0.8109 0.9360 0.9731 (89)													
MIT 2	18.1529	18.4115	18.8798	19.4150	19.7773	19.9446	19.9676	19.9695	19.9127	19.5356	18.8197	18.1169 (90)	
Living area fraction													
MIT	18.4144	18.6586	19.1024	19.6111	19.9599	20.1258	20.1504	20.1521	20.0922	19.7250	19.0438	18.3794 (91)	
Temperature adjustment													
adjusted MIT	18.4144	18.6586	19.1024	19.6111	19.9599	20.1258	20.1504	20.1521	20.0922	19.7250	19.0438	18.3794 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	1114.3063	1230.6712	1317.5414	1290.2699	1072.6416	728.3830	433.2048	415.2813	781.4133	1041.1182	1078.7744	1037.9833 (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													
2317.0708 2275.2017 2067.3865 1696.8205 1226.0325 752.5709 436.3959 418.1622 834.1984 1362.7787 1863.2096 2266.1226 (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	894.8568	701.9245	557.8848	292.7164	114.1228	0.0000	0.0000	0.0000	0.0000	239.3154	564.7934	913.7356 (98)	
Space heating													
Space heating per m2													
(98) / (4) =													27.3301 (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 %)												90.5000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												4728.5632	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	894.8568	701.9245	557.8848	292.7164	114.1228	0.0000	0.0000	0.0000	0.0000	239.3154	564.7934	913.7356	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	988.7920	775.6072	616.4473	323.4436	126.1026	0.0000	0.0000	0.0000	0.0000	264.4369	624.0811	1009.6526	(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	222.0717	195.7200	205.5141	184.1812	180.4565	161.1941	154.7617	169.8877	169.6084	190.9877	202.0110	216.7124	(64)
Efficiency of water heater (217)m	88.1500	87.9293	87.3470	86.0442	83.6306	79.8000	79.8000	79.8000	79.8000	85.4166	87.4122	88.2320	(216)
Fuel for water heating, kWh/month	251.9249	222.5878	235.2846	214.0541	215.7779	201.9976	193.9370	212.8919	212.5419	223.5955	231.1015	245.6166	(219)
Water heating fuel used												2661.3112	(219)
Annual totals kWh/year													
Space heating fuel - main system												4728.5632	(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)												523.1825	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.97 * 1184 * 1.00) =										-918.7195		-918.7195	(233)
Total delivered energy for all uses												7069.3374	(238)

10a. Fuel costs - using BEDF prices (500)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4728.5632	3.6300	171.6468 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2661.3112	3.6300	96.6056 (247)
Pumps and fans for heating	75.0000	19.4400	14.5800 (249)
Energy for lighting	523.1825	19.4400	101.7067 (250)
Additional standing charges			95.0000 (251)
Energy saving/generation technologies			
PV Unit	-918.7195	19.4400	-178.5991 (252)
Total energy cost			300.9400 (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	4728.5632	0.2160	1021.3697 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2661.3112	0.2160	574.8432 (264)
Space and water heating			1596.2129 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	523.1825	0.5190	271.5317 (268)
Energy saving/generation technologies			
PV Unit	-918.7195	0.5190	-476.8154 (269)
Total kg/year			1429.8542 (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	4728.5632	1.2200	5768.8472 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2661.3112	1.2200	3246.7996 (264)
Space and water heating			9015.6468 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	523.1825	3.0700	1606.1703 (268)
Energy saving/generation technologies			

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

PV Unit	-918.7195	3.0700	-2820.4690 (269)
Primary energy kWh/year			8031.5982 (272)
Primary energy kWh/m2/year			51.2939 (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	Already installed
F	Not considered
G	Not considered
H	Not considered
I	Not considered
J	Not considered
K	Not considered
M	Not considered
N Solar water heating	Recommended
O	Not considered
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U Solar photovoltaic panels	Already installed
A2	Not considered
A3	Not considered
T2	Not considered
W	Not considered
X	Not considered
Y	Not considered
J2	Not considered
Q2	Not considered
Z1	Not considered
Z2	Not considered
Z3	Not considered
Z4	Not considered
Z5	Not considered
V2 Wind turbine	Not applicable
L2	Not considered
Q3	Not considered
O3	Not considered

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.1	-£ 41	-273 kg (19.1%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£41 1.74 kg/m²	B 90	B 90
Total Savings	£41 1.74 kg/m²		
Potential energy efficiency rating:		B 90	
Potential environmental impact rating:			B 90

Fuel prices for cost data on this page from database revision number 500 TEST (30 Jun 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	£116	£126	-£10
Mains gas	£363	£313	£50
Space heating	£281	£283	-£1
Water heating	£97	£55	£42
Lighting	£102	£102	£0
Generated (PV)	-£179	-£179	£0
Total cost of fuels	£300	£260	£40
Total cost of uses	£301	£261	£41
Delivered energy	45 kWh/m²	37 kWh/m²	9 kWh/m²
Carbon dioxide emissions	1.4 tonnes	1.2 tonnes	0.3 tonnes
CO2 emissions per m²	9 kg/m²	7 kg/m²	2 kg/m²
Primary energy	51 kWh/m²	41 kWh/m²	10 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	78.2900 (1b)	x 2.3900 (2b)	= 187.1131 (1b) - (3b)
First floor	78.2900 (1c)	x 2.6700 (2c)	= 209.0343 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	156.5800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 396.1474 (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) = 0.1262 (8)
Pressure test					Yes
Measured/design AP50					4.2100
Infiltration rate					0.3367 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3115 (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	0.3971	0.3893	0.3815	0.3426	0.3348	0.2959	0.2959	0.2881	0.3115	0.3348	0.3504	0.3660 (22b)
Effective ac	0.5788	0.5758	0.5728	0.5587	0.5561	0.5438	0.5438	0.5415	0.5485	0.5561	0.5614	0.5670 (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)			29.5100	1.1450	33.7901		(27)
Ground Floor			78.2900	0.1200	9.3948	84.0000	6576.3600 (28a)
Brick and Block	205.6900	31.6300	174.0600	0.2400	41.7744	42.2200	7348.8132 (29a)
Pitched Roof	78.2900		78.2900	0.1000	7.8290	9.1000	712.4390 (30)
Total net area of external elements Aum(A, m ²)			362.2700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	95.1203		(33)
GF Block			76.4100			75.0000	5730.7500 (32c)
GF Stud			27.4300			9.0000	246.8700 (32c)
FF Stud			171.1400			9.0000	1540.2600 (32c)
Internal Floor 1			78.2900			18.0000	1409.2200 (32d)
Internal Ceiling 1			78.2900			18.0000	1409.2200 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 24973.9322 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 159.4963 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.5783 (36)
Total fabric heat loss (33) + (36) = 106.6986 (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	75.6722	75.2720	74.8796	73.0368	72.6920	71.0870	71.0870	70.7898	71.7052	72.6920	73.3895	74.1187 (38)
Heat transfer coeff	182.3709	181.9706	181.5782	179.7354	179.3906	177.7856	177.7856	177.4884	178.4038	179.3906	180.0881	180.8173 (39)
Average = Sum(39)m / 12 =												179.7338 (39)
HLP	1.1647	1.1622	1.1597	1.1479	1.1457	1.1354	1.1354	1.1335	1.1394	1.1457	1.1501	1.1548 (40)
HLP (average)												1.1479 (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												2.9440 (42)
Average daily hot water use (litres/day)												104.1209 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	114.5330	110.3682	106.2033	102.0385	97.8737	93.7088	93.7088	97.8737	102.0385	106.2033	110.3682	114.5330 (44)
Energy content (annual)	169.8491	148.5512	153.2915	133.6432	128.2339	110.6561	102.5391	117.6651	119.0704	138.7651	151.4730	164.4898 (45)
										Total = Sum(45)m =		1638.2275 (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	25.4774	22.2827	22.9937	20.0465	19.2351	16.5984	15.3809	17.6498	17.8606	20.8148	22.7209	24.6735 (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												
211.9694 186.5952 194.0159 167.6511 157.5597 138.8108 131.6324 147.6889 154.4290 179.4896 192.2345 206.6100 (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												1.1071 (H8)
Utilisation factor												0.5948 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												117.0000 (H13)
Daily hot water demand												104.1209 (H14)
Volume ratio Veff/V												1.1237 (H15)
Solar storage volume factor												1.0000 (H16)
Solar input												-948.4726 (H17)
Solar input	-27.5038	-45.8960	-78.1661	-104.7580	-129.4196	-127.2401	-125.5586	-109.7012	-85.9180	-58.6719	-32.6235	-23.0160 (63)
Solar input (sum of months) = Sum (63)m =												-948.4726 (63)
Output from w/h												
184.4655 140.6992 115.8499 62.8932 28.1401 11.5707 6.0738 37.9877 68.5110 120.8177 159.6110 183.5940 (64)												
Total per year (kWh/year) = Sum (64)m =												1120.2139 (64)
Heat gains from water heating, kWh/month												
90.1710 79.8285 83.5490 71.6427 66.0985 59.3170 57.3689 63.1427 67.8778 78.7190 82.9740 88.3890 (65)												

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

Metabolic gains (Table 5), Watts												
(66)m	176.6423	176.6423	176.6423	176.6423	176.6423	176.6423	176.6423	176.6423	176.6423	176.6423	176.6423	176.6423 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
74.0619 65.7811 53.4968 40.5005 30.2746 25.5591 27.6175 35.8983 48.1826 61.1789 71.4048 76.1203 (67)												
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
488.9442 494.0179 481.2324 454.0134 419.6543 387.3615 365.7880 360.7143 373.4999 400.7189 435.0780 467.3707 (68)												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
55.6083 55.6083 55.6083 55.6083 55.6083 55.6083 55.6083 55.6083 55.6083 55.6083 55.6083 55.6083 (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)												
-117.7616 -117.7616 -117.7616 -117.7616 -117.7616 -117.7616 -117.7616 -117.7616 -117.7616 -117.7616 -117.7616 -117.7616 (71)												
Water heating gains (Table 5)												
121.1976 118.7924 112.2970 99.5037 88.8420 82.3847 77.1087 84.8692 94.2747 105.8051 115.2416 118.8025 (72)												
Total internal gains	801.6928	796.0805	764.5152	711.5067	656.2599	612.7944	588.0033	598.9708	633.4463	685.1919	739.2135	779.7825 (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					9.5400	10.6334	0.6300	0.7000	0.7700	31.0022 (74)		
East					0.9600	19.6403	0.6300	0.7000	0.7700	5.7622 (76)		
South					16.8400	46.7521	0.6300	0.7000	0.7700	240.6106 (78)		
West					2.1700	19.6403	0.6300	0.7000	0.7700	13.0250 (80)		

Solar gains	290.4000	490.0567	663.1599	817.3055	917.2048	912.8804	879.0403	803.1416	715.7934	539.1633	346.8763	249.2043 (83)
Total gains	1092.0928	1286.1372	1427.6751	1528.8122	1573.4648	1525.6748	1467.0435	1402.1124	1349.2397	1224.3552	1086.0897	1028.9869 (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)												
tau	38.0390	38.1227	38.2050	38.5968	38.6709	39.0201	39.0201	39.0854	38.8848	38.6709	38.5212	38.3658
alpha	3.5359	3.5415	3.5470	3.5731	3.5781	3.6013	3.6013	3.6057	3.5923	3.5781	3.5681	3.5577
util living area	0.9828	0.9689	0.9443	0.8947	0.8038	0.6568	0.5059	0.5446	0.7450	0.9109	0.9706	0.9858 (86)
MIT	19.3489	19.5897	19.9232	20.3215	20.6606	20.8855	20.9661	20.9554	20.8098	20.3688	19.7824	19.3020 (87)
Th 2	19.9483	19.9504	19.9524	19.9619	19.9637	19.9720	19.9720	19.9735	19.9688	19.9637	19.9601	19.9563 (88)
util rest of house												
0.9791 0.9623 0.9323 0.8708 0.7577 0.5770 0.3989 0.4378 0.6744 0.8857 0.9632 0.9828 (89)												
MIT 2	17.7603	18.1087	18.5876	19.1530	19.6062	19.8796	19.9543	19.9483	19.7996	19.2302	18.3974	17.6974 (90)
Living area fraction												
MIT	18.0442	18.3734	18.8263	19.3618	19.7946	20.0594	20.1351	20.1283	19.9801	19.4336	18.6449	17.9841 (92)
Temperature adjustment												0.0000

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CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

adjusted MIT 18.0442 18.3734 18.8263 19.3618 19.7946 20.0594 20.1351 20.1283 19.9801 19.4336 18.6449 17.9841 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9694	0.9489	0.9156	0.8542	0.7492	0.5843	0.4166	0.4548	0.6753	0.8696	0.9504	0.9743	(94)
Useful gains	1058.6655	1220.3863	1307.1462	1305.8449	1178.8054	891.4500	611.1711	637.6575	911.1025	1064.7484	1032.1793	1002.5613	(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	2506.5328	2451.7573	2238.1820	1880.3505	1452.0902	970.5971	628.4869	661.7237	1049.0404	1584.6693	2079.0992	2492.4058	(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	1077.2133	827.4813	692.6906	413.6440	203.3239	0.0000	0.0000	0.0000	0.0000	386.8211	753.7823	1108.4443	(98)
Space heating													(98)
Space heating per m2													(98) / (4) = 34.8921 (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 %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													6036.9071 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1077.2133	827.4813	692.6906	413.6440	203.3239	0.0000	0.0000	0.0000	0.0000	386.8211	753.7823	1108.4443	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	1190.2910	914.3440	765.4040	457.0652	224.6673	0.0000	0.0000	0.0000	0.0000	427.4267	832.9086	1224.8003	(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	184.4655	140.6992	115.8499	62.8932	28.1401	11.5707	6.0738	37.9877	68.5110	120.8177	159.6110	183.5940	(64)
Efficiency of water heater (217)m	88.7599	88.7702	88.7941	88.9263	89.0484	79.8000	79.8000	79.8000	79.8000	87.7013	88.4281	88.8079	(216)
Fuel for water heating, kWh/month	207.8252	158.4982	130.4703	70.7250	31.6009	14.4997	7.6113	47.6037	85.8534	137.7605	180.4981	206.7316	(219)
Water heating fuel used													(219)
Annual totals kWh/year													
Space heating fuel - main system													6036.9071 (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)													523.1825 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.97 * 1068 * 1.00) =										-828.8227		-828.8227	(233)
Total delivered energy for all uses													7135.9448 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	6036.9071	3.4800	210.0844 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1279.6778	3.4800	44.5328 (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	523.1825	13.1900	69.0078 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-828.8227	13.1900	-109.3217 (252)
Total energy cost			350.7907 (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] =	0.7309 (257)
SAP value		89.8041
SAP rating (Section 12)		90 (258)
SAP band		B

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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	6036.9071	0.2160	1303.9719 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1279.6778	0.2160	276.4104 (264)
Space and water heating			1580.3823 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	523.1825	0.5190	271.5317 (268)
Energy saving/generation technologies			
PV Unit	-828.8227	0.5190	-430.1590 (269)
Total kg/year			1486.6301 (272)
CO2 emissions per m2			9.4900 (273)
EI value			90.1176
EI rating			90 (274)
EI band			B

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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	78.2900 (1b)	x 2.3900 (2b)	= 187.1131 (1b) - (3b)
First floor	78.2900 (1c)	x 2.6700 (2c)	= 209.0343 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	156.5800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 396.1474 (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																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) =	0.1262 (8)
Pressure test										Yes							
Measured/design AP50										4.2100							
Infiltration rate										0.3367 (18)							
Number of sides sheltered										1 (19)							
Shelter factor										(20) = 1 - [0.075 x (19)] =					0.9250 (20)		
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =					0.3115 (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	0.3660	0.3426	0.3426	0.3115	0.3192	0.3037	0.3037	0.2959	0.2959	0.3192	0.3115	0.3192	(22b)				
Effective ac	0.5670	0.5587	0.5587	0.5485	0.5510	0.5461	0.5461	0.5438	0.5438	0.5510	0.5485	0.5510	(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)			29.5100	1.1450	33.7901			(27)					
Ground Floor			78.2900	0.1200	9.3948	84.0000	6576.3600	(28a)					
Brick and Block	205.6900	31.6300	174.0600	0.2400	41.7744	42.2200	7348.8132	(29a)					
Pitched Roof	78.2900		78.2900	0.1000	7.8290	9.1000	712.4390	(30)					
Total net area of external elements Aum(A, m2)			362.2700					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	95.1203			(33)					
GF Block			76.4100			75.0000	5730.7500	(32c)					
GF Stud			27.4300			9.0000	246.8700	(32c)					
FF Stud			171.1400			9.0000	1540.2600	(32c)					
Internal Floor 1			78.2900			18.0000	1409.2200	(32d)					
Internal Ceiling 1			78.2900			18.0000	1409.2200	(32e)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		24973.9322	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							159.4963	(35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.5783	(36)					
Total fabric heat loss						(33) + (36) =	106.6986	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 74.1187	Feb 73.0368	Mar 73.0368	Apr 71.7052	May 72.0262	Jun 71.3921	Jul 71.3921	Aug 71.0870	Sep 71.0870	Oct 72.0262	Nov 71.7052	Dec 72.0262	(38)
Heat transfer coeff	180.8173	179.7354	179.7354	178.4038	178.7248	178.0908	178.0908	177.7856	177.7856	178.7248	178.4038	178.7248	(39)
Average = Sum(39)m / 12 =												178.7519	(39)
HLP	Jan 1.1548	Feb 1.1479	Mar 1.1479	Apr 1.1394	May 1.1414	Jun 1.1374	Jul 1.1374	Aug 1.1354	Sep 1.1354	Oct 1.1414	Nov 1.1394	Dec 1.1414	(40)
HLP (average)												1.1416	(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												2.9440 (42)
Average daily hot water use (litres/day)												104.1209 (43)
Daily hot water use	Jan 114.5330	Feb 110.3682	Mar 106.2033	Apr 102.0385	May 97.8737	Jun 93.7088	Jul 93.7088	Aug 97.8737	Sep 102.0385	Oct 106.2033	Nov 110.3682	Dec 114.5330 (44)
Energy conte	169.8491	148.5512	153.2915	133.6432	128.2339	110.6561	102.5391	117.6651	119.0704	138.7651	151.4730	164.4898 (45)
Energy content (annual)										Total = Sum(45)m =		1638.2275 (45)

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Calculation Type: New Build (As Built)

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Distribution loss (46)m = 0.15 x (45)m	25.4774	22.2827	22.9937	20.0465	19.2351	16.5984	15.3809	17.6498	17.8606	20.8148	22.7209	24.6735 (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												
211.9694 186.5952 194.0159 167.6511 157.5597 138.8108 131.6324 147.6889 154.4290 179.4896 192.2345 206.6100 (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												1.2368 (H8)
Utilisation factor												0.5545 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												117.0000 (H13)
Daily hot water demand												104.1209 (H14)
Volume ratio Veff/V												1.1237 (H15)
Solar storage volume factor												1.0000 (H16)
Solar input												-987.8646 (H17)
Solar input	-32.2353	-45.8422	-79.5480	-107.0055	-124.3476	-135.2541	-128.2415	-116.9439	-91.5317	-63.2634	-38.1270	-25.5244 (63)
Solar input (sum of months) = Sum (63)m =												-987.8646 (63)
Output from w/h												
179.7341 140.7530 114.4679 60.6456 33.2121 3.5567 3.3908 30.7450 62.8973 116.2261 154.1074 181.0856 (64)												
Total per year (kWh/year) = Sum (64)m =												1080.8219 (64)
Heat gains from water heating, kWh/month												
90.1710 79.8285 83.5490 71.6427 66.0985 59.3170 57.3689 63.1427 67.8778 78.7190 82.9740 88.3890 (65)												

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

Metabolic gains (Table 5), Watts												
(66)m	176.6423	176.6423	176.6423	176.6423	176.6423	176.6423	176.6423	176.6423	176.6423	176.6423	176.6423	176.6423 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	74.0619	65.7811	53.4968	40.5005	30.2746	25.5591	27.6175	35.8983	48.1826	61.1789	71.4048	76.1203 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	488.9442	494.0179	481.2324	454.0134	419.6543	387.3615	365.7880	360.7143	373.4999	400.7189	435.0780	467.3707 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.6083	55.6083	55.6083	55.6083	55.6083	55.6083	55.6083	55.6083	55.6083	55.6083	55.6083	55.6083 (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)	-117.7616	-117.7616	-117.7616	-117.7616	-117.7616	-117.7616	-117.7616	-117.7616	-117.7616	-117.7616	-117.7616	-117.7616 (71)
Water heating gains (Table 5)	121.1976	118.7924	112.2970	99.5037	88.8420	82.3847	77.1087	84.8692	94.2747	105.8051	115.2416	118.8025 (72)
Total internal gains	801.6928	796.0805	764.5152	711.5067	656.2599	612.7944	588.0033	598.9708	633.4463	685.1919	739.2135	779.7825 (73)

6. Solar gains

[Jan]												Gains
	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	9.5400				13.4684		0.6300		0.7000		0.7700	39.2678 (74)
East	0.9600				25.1733		0.6300		0.7000		0.7700	7.3855 (76)
South	16.8400				56.5862		0.6300		0.7000		0.7700	291.2223 (78)
West	2.1700				25.1733		0.6300		0.7000		0.7700	16.6944 (80)

Solar gains	354.5700	509.1973	703.4186	876.7785	932.9135	1030.9454	952.3983	902.2392	796.7667	604.8365	422.0696	288.1104 (83)
Total gains	1156.2628	1305.2778	1467.9339	1588.2851	1589.1734	1643.7397	1540.4015	1501.2100	1430.2130	1290.0284	1161.2830	1067.8929 (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)												
tau	38.3658	38.5968	38.5968	38.8848	38.8150	38.9532	38.9532	39.0201	39.0201	38.8150	38.8848	38.8150
alpha	3.5577	3.5731	3.5731	3.5923	3.5877	3.5969	3.5969	3.6013	3.6013	3.5877	3.5923	3.5877
util living area	0.9739	0.9599	0.9257	0.8537	0.7336	0.5212	0.3741	0.3717	0.6254	0.8556	0.9505	0.9788 (86)
MIT	19.6081	19.7868	20.1176	20.5040	20.7928	20.9566	20.9903	20.9908	20.9147	20.5900	20.0661	19.5775 (87)
Th 2	19.9563	19.9619	19.9619	19.9688	19.9671	19.9704	19.9704	19.9720	19.9720	19.9671	19.9688	19.9671 (88)
util rest of house	0.9680	0.9511	0.9092	0.8206	0.6721	0.4277	0.2609	0.2558	0.5337	0.8144	0.9375	0.9739 (89)
MIT 2	18.1413	18.4006	18.8694	19.4045	19.7707	19.9435	19.9674	19.9693	19.9108	19.5287	18.8094	18.1049 (90)
Living area fraction									fLA = Living area / (4) =			0.1787 (91)
MIT	18.4034	18.6483	19.0925	19.6010	19.9533	20.1245	20.1502	20.1519	20.0902	19.7183	19.0340	18.3680 (92)
Temperature adjustment												0.0000

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

adjusted MIT 18.4034 18.6483 19.0925 19.6010 19.9533 20.1245 20.1502 20.1519 20.0902 19.7183 19.0340 18.3680 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9558	0.9363	0.8920	0.8069	0.6712	0.4424	0.2811	0.2765	0.5450	0.8026	0.9220	0.9632	(94)
Useful gains	1105.1453	1222.1524	1309.3356	1281.6470	1066.6108	727.1154	433.0002	415.0984	779.4941	1035.4089	1070.7095	1028.5753	(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	2315.0728	2273.3429	2065.6009	1695.0165	1224.8612	752.3468	436.3589	418.1290	833.8491	1361.5880	1861.4595	2264.0945	(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	900.1861	706.4001	562.6613	297.6261	117.7383	0.0000	0.0000	0.0000	0.0000	242.6773	569.3400	919.2263	(98)
Space heating												4315.8555	(98)
Space heating per m2												(98) / (4) =	27.5633 (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 %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													4768.9011 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	900.1861	706.4001	562.6613	297.6261	117.7383	0.0000	0.0000	0.0000	0.0000	242.6773	569.3400	919.2263	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	994.6807	780.5526	621.7252	328.8686	130.0975	0.0000	0.0000	0.0000	0.0000	268.1517	629.1050	1015.7197	(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	179.7341	140.7530	114.4679	60.6456	33.2121	3.5567	3.3908	30.7450	62.8973	116.2261	154.1074	181.0856	(64)
Efficiency of water heater (217)m	88.5245	88.5278	88.4941	88.4915	87.9066	79.8000	79.8000	79.8000	79.8000	86.7339	87.9869	88.5460	(216)
Fuel for water heating, kWh/month	203.0332	158.9930	129.3509	68.5327	37.7811	4.4570	4.2492	38.5276	78.8187	134.0032	175.1482	204.5102	(219)
Water heating fuel used												1237.4051	(219)
Annual totals kWh/year													
Space heating fuel - main system												4768.9011	(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)												523.1825	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.97 * 1184 * 1.00) =										-918.7195		-918.7195	(233)
Total delivered energy for all uses												5735.7692	(238)

10a. Fuel costs - using BEDF prices (500)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4768.9011	3.6300	173.1111 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1237.4051	3.6300	44.9178 (247)
Pumps and fans for heating	75.0000	19.4400	14.5800 (249)
Pump for solar water heating	50.0000	19.4400	9.7200 (249)
Energy for lighting	523.1825	19.4400	101.7067 (250)
Additional standing charges			95.0000 (251)
Energy saving/generation technologies			
PV Unit	-918.7195	19.4400	-178.5991 (252)
Total energy cost			260.4365 (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	4768.9011	0.2160	1030.0826 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1237.4051	0.2160	267.2795 (264)
Space and water heating			1297.3621 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)

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 for lighting	523.1825	0.5190	271.5317 (268)
Energy saving/generation technologies			
PV Unit	-918.7195	0.5190	-476.8154 (269)
Total kg/year			1156.9534 (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	4768.9011	1.2200	5818.0593 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1237.4051	1.2200	1509.6343 (264)
Space and water heating			7327.6935 (265)
Pumps and fans	125.0000	3.0700	383.7500 (267)
Energy for lighting	523.1825	3.0700	1606.1703 (268)
Energy saving/generation technologies			
PV Unit	-918.7195	3.0700	-2820.4690 (269)
Primary energy kWh/year			6497.1449 (272)
Primary energy kWh/m2/year			41.4941 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Plot 19	Issued on Date	18/07/2022
Assessment Reference	As Built	Prop Type Ref	F
Project	3 Robert Place, WEST END, SO30 3JY		
Calculation Type	New Build (As Built)		

SAP Rating	89 B	DER	12.38	TER	15.37
Environmental	88 B	% DER<TER	19.44		
CO ₂ Emissions (t/year)	1.43	DFEE	45.46	TTEE	54.80
General Requirements Compliance	Pass	% DFEE<TTEE	17.05		

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 19	Issued on Date	18/07/2022
Assessment Reference	As Built	Prop Type Ref	F
Project	3 Robert Place, WEST END, SO30 3JY		
Calculation Type	New Build (As Built)		

SAP Rating	89 B	DER	12.38	TER	15.37
Environmental	88 B	% DER<TER	19.44		
CO ₂ Emissions (t/year)	1.43	DFEE	45.46	TFEE	54.80
General Requirements Compliance	Pass	% DFEE<TFEE	17.05		

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 19	Issued on Date	18/07/2022
Assessment Reference	As Built	Prop Type Ref	F
Project	3 Robert Place, WEST END, SO30 3JY		
Calculation Type	New Build (As Built)		

SAP Rating	89 B	DER	12.38	TER	15.37
Environmental	88 B	% DER<TER	19.44		
CO ₂ Emissions (t/year)	1.43	DFEE	45.46	TFEE	54.80
General Requirements Compliance	Pass	% DFEE<TFEE	17.05		

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

Floor 000003 - Worst Case Slab

Floor Type: Slab On Ground Floor

Area = 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 19	Issued on Date	18/07/2022
Assessment Reference	As Built	Prop Type Ref	F
Property	3 Robert Place, WEST END, SO30 3JY		
SAP Rating	89 B	DER	12.38
Environmental	88 B	TER	15.37
CO ₂ Emissions (t/year)	1.43	% DER<TER	19.44
General Requirements Compliance	Pass	DfEE	45.46
		TFEE	54.80
		% DfEE<TFEE	17.05
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com		Assessor ID
			E477-0001
Client	Foreman Homes, FORE		

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

Orientation	North
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	House, Detached
2.0 Number of Storeys	2
3.0 Date Built	2020
4.0 Sheltered Sides	1
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements		Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	Ground Floor:	40.65 m	78.29 m ²	2.39 m
	1st Storey:	40.65 m	78.29 m ²	2.67 m

7.0 Living Area	27.98	m ²
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8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	159.5	kJ/m ² K

9.0 External Walls			U-Value	Kappa	Gross Area	Nett Area
Description	Type	Construction	(W/m ² K)	(kJ/m ² K)	(m ²)	(m ²)
Brick and Block	Cavity Wall	Other	0.24	42.22	205.69	174.06

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

9.2 Internal Walls			Kappa	Area
Description	Construction		(kJ/m ² K)	(m ²)
GF Block	Dense block, plasterboard on dabs		75.00	76.41
GF Stud	Plasterboard on timber frame		9.00	27.43
FF Stud	Plasterboard on timber frame		9.00	171.14

10.0 External Roofs			U-Value	Kappa	Gross Area	Nett Area
Description	Type	Construction	(W/m ² K)	(kJ/m ² K)	(m ²)	(m ²)
Pitched Roof	External Plane Roof	Other	0.10	9.10	78.29	78.29

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	78.29

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	78.29

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	78.29

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Front Door	Manufacturer	Solid Door							1.10
Windows	Manufacturer	Window	Double Low-E Soft 0.1			0.63		0.70	1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
Front Door	Solid Door	[1] Brick and Block	North							2.12	
Front Shaded	Window	[1] Brick and Block	North	None	1.17	Yes				1.92	
Front Elevation	Window	[1] Brick and Block	North	None	0.00					7.62	
Side Elevation	Window	[1] Brick and Block	West	None	0.00					2.17	
North Elevation	Window	[1] Brick and Block	South	None	0.00					16.84	
Side Elevation	Window	[1] Brick and Block	East	None	0.00					0.96	

14.0 Conservatory

None

15.0 Draught Proofing

100 %

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	2.52	0.077	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	9.15	0.070	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.02	0.071	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	4.14	0.064	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	5.54	0.056	No	Birtley Supatherm
Independently assessed	E3 Sill	15.82	0.021	No	Knauf P5
Independently assessed	E4 Jamb	50.10	0.016	No	Knauf P6
Table K1 - Approved	E5 Ground floor (normal)	40.65	0.160	No	
Independently assessed	E6 Intermediate floor within a dwelling	40.65	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	25.64	0.060	No	
Independently assessed	E12 Gable (insulation at ceiling level)	14.94	0.044	No	Knauf P20
Independently assessed	E16 Corner (normal)	30.30	0.039	No	Knauf P23
Independently assessed	E17 Corner (inverted – internal area greater than external area)	10.10	-0.091	No	Knauf P24

Y-value	0.032	W/m²K
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18.0 Pressure Testing

Designed AP ₅₀	5.00	m³/(h.m²) @ 50 Pa
Property Tested ?	Yes	
As Built AP ₅₀	4.21	m³/(h.m²) @ 50 Pa

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

19.0 Mechanical Ventilation

Summer Overheating

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

Mechanical Ventilation

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

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				5
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System

No

22.0 Lighting

Internal

Total number of light fittings	26	
Total number of L.E.L. fittings	26	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	Yes
Light and motion sensor	Yes

23.0 Electricity Tariff

Standard

24.0 Main Heating 1

	Database	
Description	Gas Combi	
Percentage of Heat	100	%
Database Ref. No.	18911	
Fuel Type	Mains gas	
Main Heating	BGB	
SAP Code	102	
In Winter	90.5	
In Summer	79.8	
Controls	CBI Time and temperature zone control	
PCDF Controls	0	
Delayed Start Stat	No	
Sap Code	2110	
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
0.97	South	45°	None Or Little	Yes
Recommendations				
Lower cost measures				
None				
Further measures to achieve even higher standards				
	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar water heating	£4,000 - £6,000	£41	B 90	