



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 2 Robert Place, West End
SOUTHAMPTON, SO30 3JY

Contact: Tobias Whiting
Abacus Energy (UK) Ltd
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Report Issue Date: 08/08/2022

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Plot 18			Issued on Date	08/08/2022
Assessment Reference	As Built	Prop Type Ref	Fh		
Property	2 Robert Place, West End, SOUTHAMPTON, SO30 3JY				
SAP Rating	89 B	DER	11.80	TER	15.38
Environmental	89 B	% DER<TER	23.27		
CO ₂ Emissions (t/year)	1.31	DFEE	43.38	TFEE	54.80
General Requirements Compliance	Pass	% DFEE<TFEE	20.85		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com			Assessor ID	E477-0001
Client	Foreman Homes, FORE				

SUMMARY FOR INPUT DATA FOR New Build (As Built)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	15.38	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	11.80	kgCO ₂ /m ²	Pass
	-3.58 (-23.3%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	54.80	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	43.38	kWh/m ² /yr	
	-11.4 (-20.8%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.95 (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 1.18

Windows facing East

2.17 m², No overhang

Windows facing South

16.84 m², No overhang

Windows facing West

0.96 m², No overhang

Air change rate

4.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

3.95 (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	0.016	W/m ² K
Air permeability	4.0	m ³ /m ² h
Photovoltaic array	1.15	kW

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THERMAL BRIDGING

Calculation Type: New Build (As Built)

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Environmental	89 B	% DER<TER	23.27		
CO ₂ Emissions (t/year)	1.31	DFEE	43.38	TFEE	54.80
General Requirements Compliance	Pass	% DFEE<TFEE	20.85		

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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	1.01	0.07	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.064	3.54	0.23	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	15.21	0.32	Knauf P5
External wall	E4 Jamb	Independently assessed	0.016	50.10	0.80	Knauf P6
External wall	E5 Ground floor (normal)	Independently assessed	0.022	40.57	0.89	Knauf P10
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	40.57	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	25.68	1.54	
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.044	14.89	0.66	Knauf P21
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: **5.92** W/mK:
Y-Value: **0.016** W/m²K:

FULL SAP CALCULATION PRINTOUT

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

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DWELLING AS BUILT

Detached House, total floor area 156 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) 15.38 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 11.80 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)54.8 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)43.4 kWh/m²/yrOK

2 Fabric U-values

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.95 (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
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Hot water controls:	Cylinderstat	OK
	Independent timer for DHW	OK

Boiler interlock	Yes	OK
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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 m ² , Overhang twice as wide as window, ratio 1.18	
Windows facing East:	2.17 m ² , No overhang	
Windows facing South:	16.84 m ² , No overhang	
Windows facing West:	0.96 m ² , No overhang	
Air change rate:	4.00 ach	
Blinds/curtains:	None	

10 Key features

Party wall U-value	0.00 W/m ² K
Roof U-value	0.10 W/m ² K
Floor U-value	0.12 W/m ² K
Door U-value	1.10 W/m ² K
Thermal bridging y-value	0.016 W/m ² K
Air permeability	4.0 m ³ /m ² h
Photovoltaic array	1.15 kW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	78.1000 (1b)	x 2.3900 (2b)	= 186.6590 (1b) - (3b)
First floor	78.1000 (1c)	x 2.6700 (2c)	= 208.5270 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	156.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 395.1860 (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) = 0.1265 (8)
Pressure test					Yes
Measured/design AP50					3.9500
Infiltration rate					0.3240 (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) =	0.2997 (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	0.3821	0.3747	0.3672	0.3297	0.3222	0.2847	0.2847	0.2772	0.2997	0.3222	0.3372	0.3522 (22b)
Effective ac	0.5730	0.5702	0.5674	0.5543	0.5519	0.5405	0.5405	0.5384	0.5449	0.5519	0.5568	0.5620 (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			78.1000	0.1200	9.3720	84.0000	6560.4000 (28a)
Brick and Block	205.5000	31.6300	173.8700	0.2400	41.7288	42.2200	7340.7914 (29a)
Pitched Roof	78.1000		78.1000	0.1000	7.8100	9.1000	710.7100 (30)
Total net area of external elements Aum(A, m ²)			361.7000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	95.0329		(33)
GF Block			75.9400			75.0000	5695.5000 (32c)
GF Stud			27.3600			9.0000	246.2400 (32c)
First Floor Stud			172.3800			9.0000	1551.4200 (32c)
Internal Floor 1			78.1000			18.0000	1405.8000 (32d)
Internal Ceiling 1			78.1000			18.0000	1405.8000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 24916.6614 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 159.5177 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.9152 (36)
Total fabric heat loss (33) + (36) = 100.9480 (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	74.7280	74.3582	73.9958	72.2934	71.9749	70.4922	70.4922	70.2176	71.0633	71.9749	72.6192	73.2928 (38)
Heat transfer coeff	175.6760	175.3062	174.9438	173.2414	172.9229	171.4402	171.4402	171.1656	172.0113	172.9229	173.5673	174.2409 (39)
Average = Sum(39)m / 12 =												173.2399 (39)
HLP	1.1247	1.1223	1.1200	1.1091	1.1071	1.0976	1.0976	1.0958	1.1012	1.1071	1.1112	1.1155 (40)
HLP (average)												1.1091 (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												2.9435 (42)
Average daily hot water use (litres/day)												104.1079 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	114.5187	110.3543	106.1900	102.0257	97.8614	93.6971	93.6971	97.8614	102.0257	106.1900	110.3543	114.5187 (44)
Energy conte	169.8279	148.5325	153.2723	133.6265	128.2178	110.6422	102.5263	117.6504	119.0555	138.7477	151.4540	164.4692 (45)
Energy content (annual)										Total = Sum(45)m =		1638.0221 (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	25.4742	22.2799	22.9908	20.0440	19.2327	16.5963	15.3789	17.6476	17.8583	20.8122	22.7181	24.6704 (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 (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 (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												
222.0505 195.7013 205.4949 184.1645 180.4404 161.1802 154.7489 169.8730 169.5935 190.9703 201.9920 216.6918 (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	222.0505	195.7013	205.4949	184.1645	180.4404	161.1802	154.7489	169.8730	169.5935	190.9703	201.9920	216.6918 (64)
Total per year (kWh/year) = Sum(64)m =												2252.9011 (64)
Heat gains from water heating, kWh/month												
98.2458 87.1221 92.7411 84.8612 84.4105 77.2189 75.8681 80.8968 80.0164 87.9117 90.7888 96.4641 (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	147.1745	147.1745	147.1745	147.1745	147.1745	147.1745	147.1745	147.1745	147.1745	147.1745	147.1745	147.1745 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
29.5783 26.2712 21.3652 16.1748 12.0909 10.2076 11.0297 14.3368 19.2428 24.4332 28.5172 30.4004 (67)												
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
327.1888 330.5840 322.0282 303.8140 280.8218 259.2123 244.7759 241.3807 249.9365 268.1507 291.1429 312.7524 (68)												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
37.7174 37.7174 37.7174 37.7174 37.7174 37.7174 37.7174 37.7174 37.7174 37.7174 37.7174 37.7174 (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)												
-117.7396 -117.7396 -117.7396 -117.7396 -117.7396 -117.7396 -117.7396 -117.7396 -117.7396 -117.7396 -117.7396 -117.7396 (71)												
Water heating gains (Table 5)												
132.0509 129.6460 124.6520 117.8628 113.4550 107.2485 101.9732 108.7323 111.1338 118.1609 126.0956 129.6560 (72)												
Total internal gains	558.9704	556.6536	538.1978	508.0039	476.5199	446.8208	427.9311	434.6021	450.4655	480.8971	515.9081	542.9612 (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	2.1700	19.6403	0.6300	0.7000	0.7700	13.0250 (76)
South	16.8400	46.7521	0.6300	0.7000	0.7700	240.6106 (78)
West	0.9600	19.6403	0.6300	0.7000	0.7700	5.7622 (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	849.3704	1046.7103	1201.3577	1325.3094	1393.7248	1359.7012	1306.9714	1237.7437	1166.2589	1020.0605	862.7843	792.1655 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	39.3981	39.4812	39.5630	39.9517	40.0253	40.3715	40.3715	40.4362	40.2374	40.0253	39.8767	39.7226
alpha	3.6265	3.6321	3.6375	3.6634	3.6684	3.6914	3.6914	3.6957	3.6825	3.6684	3.6584	3.6482
util living area	0.9920	0.9827	0.9642	0.9223	0.8381	0.6957	0.5424	0.5867	0.7933	0.9418	0.9849	0.9938 (86)
MIT	19.5960	19.7845	20.0484	20.3684	20.6453	20.8300	20.8978	20.8877	20.7592	20.3914	19.9291	19.5622 (87)
Th 2	19.9807	19.9826	19.9845	19.9934	19.9951	20.0028	20.0028	20.0043	19.9998	19.9951	19.9917	19.9882 (88)
util rest of house	0.9903	0.9788	0.9559	0.9034	0.7969	0.6182	0.4335	0.4786	0.7287	0.9238	0.9810	0.9924 (89)
MIT 2	18.0897	18.3648	18.7471	19.2080	19.5845	19.8152	19.8799	19.8742	19.7378	19.2490	18.5836	18.0458 (90)
Living area fraction									fLA = Living area / (4) =			0.1800 (91)
MIT	18.3609	18.6203	18.9814	19.4169	19.7754	19.9979	20.0631	20.0567	19.9217	19.4547	18.8258	18.3188 (92)
Temperature adjustment												0.0000
adjusted MIT	18.3609	18.6203	18.9814	19.4169	19.7754	19.9979	20.0631	20.0567	19.9217	19.4547	18.8258	18.3188 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9862	0.9719	0.9454	0.8902	0.7866	0.6177	0.4405	0.4847	0.7229	0.9115	0.9746	0.9891 (94)
Ext temp.	837.6792	1017.2901	1135.7606	1179.7296	1096.2376	839.9449	575.6699	599.9434	843.0921	929.7625	840.8618	783.5178 (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	2470.1578	2405.2602	2183.5364	1821.9612	1396.4280	925.4201	593.7170	625.8930	1001.4028	1531.1779	2035.2177	2460.0728 (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	1214.5640	932.7159	779.5452	462.4068	223.3417	0.0000	0.0000	0.0000	0.0000	447.4531	859.9363	1247.3570 (98)
Space heating per m2												6167.3199 (98)
												(98) / (4) = 39.4835 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)																	0.0000 (201)
Fraction of space heat from main system(s)																	1.0000 (202)
Efficiency of main space heating system 1 (in %)																	90.5000 (206)
Efficiency of secondary/supplementary heating system, %																	0.0000 (208)
Space heating requirement																	6814.7181 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
Space heating requirement	1214.5640	932.7159	779.5452	462.4068	223.3417	0.0000	0.0000	0.0000	0.0000	447.4531	859.9363	1247.3570	(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)	1342.0597	1030.6253	861.3759	510.9467	246.7864	0.0000	0.0000	0.0000	0.0000	494.4233	950.2058	1378.2950	(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	222.0505	195.7013	205.4949	184.1645	180.4404	161.1802	154.7489	169.8730	169.5935	190.9703	201.9920	216.6918	(64)				
Efficiency of water heater (217)m	88.6625	88.4433	88.0374	87.1708	85.3838	79.8000	79.8000	79.8000	79.8000	87.0101	88.2492	88.7389	(216)				
Fuel for water heating, kWh/month	250.4447	221.2732	233.4177	211.2686	211.3285	201.9802	193.9209	212.8734	212.5232	219.4805	228.8881	244.1903	(219)				
Water heating fuel used												2641.5892	(219)				
Annual totals kWh/year																	
Space heating fuel - main system												6814.7181	(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)													522.3627	(232)			
Energy saving/generation technologies (Appendices M,N and Q)																	
PV Unit 0 (0.80 * 1.15 * 1068 * 1.00) =													-982.6248				
Total delivered energy for all uses													9071.0451	(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	6814.7181	0.2160	1471.9791 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2641.5892	0.2160	570.5833 (264)
Space and water heating			2042.5624 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	522.3627	0.5190	271.1063 (268)
Energy saving/generation technologies			
PV Unit	-982.6248	0.5190	-509.9823 (269)
Total CO2, kg/year			1842.6113 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			11.8000 (273)

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

DER			11.8000	ZC1
Total Floor Area		TFA	156.2000	
Assumed number of occupants		N	2.9435	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			12.4126	ZC2
CO2 emissions from cooking, equation (L16)			1.2141	ZC3
Total CO2 emissions			25.4267	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			25.4267	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	78.1000 (1b)	x 2.3900 (2b)	= 186.6590 (1b) - (3b)
First floor	78.1000 (1c)	x 2.6700 (2c)	= 208.5270 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	156.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 395.1860 (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) =	0.1012 (8)
Pressure test										Yes							
Measured/design AP50										5.0000							
Infiltration rate										0.3512 (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) =					0.3249 (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	0.4142	0.4061	0.3980	0.3574	0.3492	0.3086	0.3086	0.3005	0.3249	0.3492	0.3655	0.3817	(22b)				
Effective ac	0.5858	0.5825	0.5792	0.5639	0.5610	0.5476	0.5476	0.5452	0.5528	0.5610	0.5668	0.5729	(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			78.1000	0.1300	10.1530		(28a)					
Brick and Block	205.5000	31.6300	173.8700	0.1800	31.2966		(29a)					
Pitched Roof	78.1000		78.1000	0.1300	10.1530		(30)					
Total net area of external elements Aum(A, m2)			361.7000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		92.8457		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.0969 (36)					
Total fabric heat loss						(33) + (36) =	107.9426 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 76.3935	Feb 75.9590	Mar 75.5332	Apr 73.5331	May 73.1589	Jun 71.4168	Jul 71.4168	Aug 71.0942	Sep 72.0878	Oct 73.1589	Nov 73.9159	Dec 74.7073 (38)
Heat transfer coeff	184.3361	183.9016	183.4758	181.4757	181.1015	179.3594	179.3594	179.0368	180.0304	181.1015	181.8585	182.6499 (39)
Average = Sum(39)m / 12 =												181.4739 (39)
HLP	Jan 1.1801	Feb 1.1773	Mar 1.1746	Apr 1.1618	May 1.1594	Jun 1.1483	Jul 1.1483	Aug 1.1462	Sep 1.1526	Oct 1.1594	Nov 1.1643	Dec 1.1693 (40)
HLP (average)												1.1618 (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												2.9435 (42)
Average daily hot water use (litres/day)												104.1079 (43)
Daily hot water use	Jan 114.5187	Feb 110.3543	Mar 106.1900	Apr 102.0257	May 97.8614	Jun 93.6971	Jul 93.6971	Aug 97.8614	Sep 102.0257	Oct 106.1900	Nov 110.3543	Dec 114.5187 (44)
Energy conte	169.8279	148.5325	153.2723	133.6265	128.2178	110.6422	102.5263	117.6504	119.0555	138.7477	151.4540	164.4692 (45)
Energy content (annual)										Total = Sum(45)m =		1638.0221 (45)
Distribution loss (46)m = 0.15 x (45)m												
25.4742	22.2799	22.9908	20.0440	19.2327	16.5963	15.3789	17.6476	17.8583	20.8122	22.7181		24.6704 (46)
Water storage loss:												
Store volume												215.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7258 (48)
Temperature factor from Table 2b												0.5400 (49)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Enter (49) or (54) in (55)													0.9319 (55)
Total storage loss	28.8896	26.0938	28.8896	27.9576	28.8896	27.9576	28.8896	28.8896	27.9576	28.8896	27.9576	28.8896	(56)
If cylinder contains dedicated solar storage	28.8896	26.0938	28.8896	27.9576	28.8896	27.9576	28.8896	28.8896	27.9576	28.8896	27.9576	28.8896	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month	221.9798	195.6375	205.4242	184.0961	180.3697	161.1118	154.6782	169.8023	169.5251	190.8997	201.9236	216.6212	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Output from w/h	221.9798	195.6375	205.4242	184.0961	180.3697	161.1118	154.6782	169.8023	169.5251	190.8997	201.9236	216.6212	(64)
Heat gains from water heating, kWh/month	98.1893	87.0711	92.6846	84.8065	84.3540	77.1642	75.8115	80.8403	79.9617	87.8552	90.7341	96.4076	(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	147.1745	147.1745	147.1745	147.1745	147.1745	147.1745	147.1745	147.1745	147.1745	147.1745	147.1745	147.1745	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.5783	26.2712	21.3652	16.1748	12.0909	10.2076	11.0297	14.3368	19.2428	24.4332	28.5172	30.4004	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.1888	330.5840	322.0282	303.8140	280.8218	259.2123	244.7759	241.3807	249.9365	268.1507	291.1429	312.7524	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.7174	37.7174	37.7174	37.7174	37.7174	37.7174	37.7174	37.7174	37.7174	37.7174	37.7174	37.7174	(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)	-117.7396	-117.7396	-117.7396	-117.7396	-117.7396	-117.7396	-117.7396	-117.7396	-117.7396	-117.7396	-117.7396	-117.7396	(71)
Water heating gains (Table 5)	131.9749	129.5700	124.5761	117.7868	113.3790	107.1725	101.8972	108.6563	111.0579	118.0849	126.0197	129.5801	(72)
Total internal gains	558.8944	556.5776	538.1218	507.9280	476.4440	446.7448	427.8551	434.5262	450.3895	480.8212	515.8321	542.8852	(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			2.1700		19.6403		0.6300		0.7000		0.7700		13.0250 (76)
South			16.8400		46.7521		0.6300		0.7000		0.7700		240.6106 (78)
West			0.9600		19.6403		0.6300		0.7000		0.7700		5.7622 (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	849.2944	1046.6343	1201.2817	1325.2335	1393.6488	1359.6252	1306.8954	1237.6678	1166.1829	1019.9845	862.7083		792.0896 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.8448	58.9838	59.1207	59.7723	59.8958	60.4776	60.4776	60.5865	60.2522	59.8958	59.6465	59.3880	
alpha	4.9230	4.9323	4.9414	4.9848	4.9931	5.0318	5.0318	5.0391	5.0168	4.9931	4.9764	4.9592	
util living area	0.9987	0.9962	0.9891	0.9664	0.9012	0.7566	0.5840	0.6342	0.8590	0.9780	0.9969	0.9991	(86)
MIT	19.6664	19.8524	20.1188	20.4509	20.7430	20.9283	20.9844	20.9767	20.8555	20.4683	19.9998	19.6357	(87)
Th 2	19.9359	19.9382	19.9404	19.9507	19.9526	19.9616	19.9616	19.9633	19.9581	19.9526	19.9487	19.9446	(88)
util rest of house	0.9983	0.9948	0.9851	0.9531	0.8609	0.6659	0.4562	0.5064	0.7893	0.9668	0.9956	0.9988	(89)
MIT 2	18.1541	18.4272	18.8159	19.2983	19.6934	19.9121	19.9557	19.9534	19.8400	19.3305	18.6507	18.1153	(90)
Living area fraction	18.4264	18.6838	19.0505	19.5058	19.8824	20.0950	20.1409	20.1377	20.0228	19.5353	18.8936	18.3890	(91)
MIT	18.4264	18.6838	19.0505	19.5058	19.8824	20.0950	20.1409	20.1377	20.0228	19.5353	18.8936	18.3890	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4264	18.6838	19.0505	19.5058	19.8824	20.0950	20.1409	20.1377	20.0228	19.5353	18.8936	18.3890	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9973	0.9925	0.9804	0.9457	0.8576	0.6788	0.4793	0.5292	0.7944	0.9606	0.9935	0.9981	(94)
Ext temp.	846.9890	1038.7633	1177.7232	1253.2831	1195.2202	922.8567	626.3358	654.9673	926.3750	979.8202	857.1362	790.5487	(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	2604.0010	2534.8594	2302.7088	1924.6934	1481.8365	985.5823	635.0952	669.1784	1066.2860	1618.1990	2144.7624	2591.6179	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(98)
Space heating per m ²	1307.2170	1005.3766	836.9893	483.4154	213.2425	0.0000	0.0000	0.0000	0.0000	474.9538	927.0909	1339.9954	(99)
												6588.2809	(98)
												42.1785	(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													7046.2897 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1307.2170	1005.3766	836.9893	483.4154	213.2425	0.0000	0.0000	0.0000	0.0000	474.9538	927.0909	1339.9954	(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)	1398.0930	1075.2691	895.1757	517.0218	228.0669	0.0000	0.0000	0.0000	0.0000	507.9720	991.5410	1433.1502	(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	221.9798	195.6375	205.4242	184.0961	180.3697	161.1118	154.6782	169.8023	169.5251	190.8997	201.9236	216.6212	(64)
Efficiency of water heater (217)m	88.7721	88.5656	88.1702	87.2727	85.2613	79.8000	79.8000	79.8000	79.8000	87.1498	88.3805	88.8422	(217)
Fuel for water heating, kWh/month	250.0557	220.8956	232.9859	210.9436	211.5495	201.8945	193.8323	212.7849	212.4375	219.0478	228.4707	243.8267	(219)
Water heating fuel used												2638.7248	(219)
Annual totals kWh/year													
Space heating fuel - main system												7046.2897	(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)												522.3627	(232)
Total delivered energy for all uses												10282.3773	(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	7046.2897	0.2160	1521.9986 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2638.7248	0.2160	569.9646 (264)
Space and water heating			2091.9631 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	522.3627	0.5190	271.1063 (268)
Total CO2, kg/m2/year			2401.9944 (272)
Emissions per m2 for space and water heating			13.3928 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			1.7356 (272b)
Emissions per m2 for pumps and fans			0.2492 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.3928 * 1.00) + 1.7356 + 0.2492, rounded to 2 d.p.			15.3800 (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	78.1000 (1b)	x 2.3900 (2b)	= 186.6590 (1b) - (3b)
First floor	78.1000 (1c)	x 2.6700 (2c)	= 208.5270 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	156.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 395.1860 (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) = 0.1012 (8)
Pressure test					Yes
Measured/design AP50					3.9500
Infiltration rate					0.2987 (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) =	0.2763 (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	0.3523	0.3454	0.3385	0.3039	0.2970	0.2625	0.2625	0.2556	0.2763	0.2970	0.3109	0.3247 (22b)
Effective ac	0.5621	0.5596	0.5573	0.5462	0.5441	0.5345	0.5345	0.5327	0.5382	0.5441	0.5483	0.5527 (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			78.1000	0.1200	9.3720	84.0000	6560.4000 (28a)
Brick and Block	205.5000	31.6300	173.8700	0.2400	41.7288	42.2200	7340.7914 (29a)
Pitched Roof	78.1000		78.1000	0.1000	7.8100	9.1000	710.7100 (30)
Total net area of external elements Aum(A, m ²)			361.7000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	95.0329		(33)
GF Block			75.9400			75.0000	5695.5000 (32c)
GF Stud			27.3600			9.0000	246.2400 (32c)
First Floor Stud			172.3800			9.0000	1551.4200 (32c)
Internal Floor 1			78.1000			18.0000	1405.8000 (32d)
Internal Ceiling 1			78.1000			9.0000	702.9000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 24213.7614 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 155.0177 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.9152 (36)
Total fabric heat loss (33) + (36) = 100.9480 (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	73.2987	72.9845	72.6764	71.2296	70.9589	69.6987	69.6987	69.4654	70.1841	70.9589	71.5065	72.0790 (38)
Heat transfer coeff	174.2468	173.9325	173.6245	172.1776	171.9069	170.6468	170.6468	170.4134	171.1322	171.9069	172.4545	173.0271 (39)
Average = Sum(39)m / 12 =												172.1763 (39)
HLP	1.1155	1.1135	1.1116	1.1023	1.1006	1.0925	1.0925	1.0910	1.0956	1.1006	1.1041	1.1077 (40)
HLP (average)												1.1023 (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												2.9435 (42)
Average daily hot water use (litres/day)												104.1079 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	114.5187	110.3543	106.1900	102.0257	97.8614	93.6971	93.6971	97.8614	102.0257	106.1900	110.3543	114.5187 (44)
Energy conte	169.8279	148.5325	153.2723	133.6265	128.2178	110.6422	102.5263	117.6504	119.0555	138.7477	151.4540	164.4692 (45)
Energy content (annual)										Total = Sum(45)m =		1638.0221 (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	36.0884	31.5632	32.5704	28.3956	27.2463	23.5115	21.7868	25.0007	25.2993	29.4839	32.1840	34.9497 (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	147.1745	147.1745	147.1745	147.1745	147.1745	147.1745	147.1745	147.1745	147.1745	147.1745	147.1745	147.1745 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.5783	26.2712	21.3652	16.1748	12.0909	10.2076	11.0297	14.3368	19.2428	24.4332	28.5172	30.4004 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.1888	330.5840	322.0282	303.8140	280.8218	259.2123	244.7759	241.3807	249.9365	268.1507	291.1429	312.7524 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.7174	37.7174	37.7174	37.7174	37.7174	37.7174	37.7174	37.7174	37.7174	37.7174	37.7174	37.7174 (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)	-117.7396	-117.7396	-117.7396	-117.7396	-117.7396	-117.7396	-117.7396	-117.7396	-117.7396	-117.7396	-117.7396	-117.7396 (71)
Water heating gains (Table 5)	48.5059	46.9690	43.7774	39.4384	36.6213	32.6548	29.2834	33.6031	35.1379	39.6289	44.7000	46.9754 (72)
Total internal gains	472.4254	470.9766	454.3231	426.5795	396.6863	369.2271	352.2413	356.4729	371.4696	399.3651	431.5124	457.2805 (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			2.1700		19.6403		0.6300		0.7000		0.7700		13.0250 (76)
South			16.8400		46.7521		0.6300		0.7000		0.7700		240.6106 (78)
West			0.9600		19.6403		0.6300		0.7000		0.7700		5.7622 (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	762.8254	961.0333	1117.4830	1243.8850	1313.8912	1282.1075	1231.2816	1159.6145	1087.2629	938.5285	778.3886		706.4849 (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	38.6007	38.6704	38.7390	39.0646	39.1261	39.4150	39.4150	39.4690	39.3032	39.1261	39.0018	38.8728
alpha	3.5734	3.5780	3.5826	3.6043	3.6084	3.6277	3.6277	3.6313	3.6202	3.6084	3.6001	3.5915
util living area	0.9938	0.9856	0.9689	0.9308	0.8525	0.7172	0.5658	0.6129	0.8147	0.9511	0.9882	0.9953 (86)
MIT	19.1341	19.3922	19.7545	20.1946	20.5833	20.8494	20.9527	20.9361	20.7428	20.2206	19.5841	19.0851 (87)
Th 2	19.9882	19.9898	19.9914	19.9990	20.0004	20.0070	20.0070	20.0082	20.0044	20.0004	19.9975	19.9945 (88)
util rest of house	0.9924	0.9824	0.9618	0.9138	0.8141	0.6414	0.4553	0.5040	0.7540	0.9357	0.9850	0.9942 (89)
MIT 2	18.2742	18.5318	18.8911	19.3252	19.6893	19.9195	19.9888	19.9816	19.8382	19.3581	18.7298	18.2302 (90)
Living area fraction									fLA = Living area / (4) =			0.1800 (91)
MIT	18.4290	18.6867	19.0465	19.4817	19.8503	20.0869	20.1623	20.1534	20.0011	19.5134	18.8836	18.3841 (92)
Temperature adjustment												0.0000
adjusted MIT	18.4290	18.6867	19.0465	19.4817	19.8503	20.0869	20.1623	20.1534	20.0011	19.5134	18.8836	18.3841 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9895	0.9769	0.9532	0.9031	0.8074	0.6481	0.4736	0.5211	0.7537	0.9262	0.9803	0.9918 (94)
Useful gains	754.7883	938.8442	1065.2326	1123.3721	1060.8753	830.9688	583.1754	604.3268	819.5187	869.2760	763.0296	700.7205 (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	2461.9340	2397.9577	2178.3802	1821.9273	1401.0914	936.3166	607.9014	639.6361	1009.8636	1532.2712	2032.1400	2454.2353 (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	1270.1164	980.5243	828.1818	502.9597	253.1208	0.0000	0.0000	0.0000	0.0000	493.2684	913.7595	1304.6150 (98)
Space heating												6546.5460 (98)
Space heating per m2										(98) / (4) =		41.9113 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
	0.0000	0.0000	0.0000	0.0000	0.0000	1604.0795	1262.7860	1295.1418	0.0000	0.0000	0.0000	0.0000 (100)

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Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7893	0.8590	0.8337	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1266.1383	1084.7065	1079.8170	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1626.5352	1564.1186	1482.9260	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	259.4858	356.6826	299.9131	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												916.0814 (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	64.8714	89.1706	74.9783	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												229.0204 (107)
Space cooling per m2												1.4662 (108)
Energy for space heating												41.9113 (99)
Energy for space cooling												1.4662 (108)
Total												43.3775 (109)
Dwelling Fabric Energy Efficiency (DFEE)												43.4 (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	78.1000 (1b)	x 2.3900 (2b)	= 186.6590 (1b) - (3b)
First floor	78.1000 (1c)	x 2.6700 (2c)	= 208.5270 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	156.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	395.1860 (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) = 0.1012 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3512 (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) =	0.3249 (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	0.4142	0.4061	0.3980	0.3574	0.3492	0.3086	0.3086	0.3005	0.3249	0.3492	0.3655	0.3817 (22b)
Effective ac	0.5858	0.5825	0.5792	0.5639	0.5610	0.5476	0.5476	0.5452	0.5528	0.5610	0.5668	0.5729 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.40)			29.5100	1.3258	39.1231		(27)
Ground Floor			78.1000	0.1300	10.1530		(28a)
Brick and Block	205.5000	31.6300	173.8700	0.1800	31.2966		(29a)
Pitched Roof	78.1000		78.1000	0.1300	10.1530		(30)
Total net area of external elements Aum(A, m ²)			361.7000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		92.8457		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.0969 (36)
Total fabric heat loss						(33) + (36) =	107.9426 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	76.3935	75.9590	75.5332	73.5331	73.1589	71.4168	71.4168	71.0942	72.0878	73.1589	73.9159	74.7073 (38)
Heat transfer coeff	184.3361	183.9016	183.4758	181.4757	181.1015	179.3594	179.3594	179.0368	180.0304	181.1015	181.8585	182.6499 (39)
Average = Sum(39)m / 12 =												181.4739 (39)
HLP	1.1801	1.1773	1.1746	1.1618	1.1594	1.1483	1.1483	1.1462	1.1526	1.1594	1.1643	1.1693 (40)
HLP (average)												1.1618 (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												2.9435 (42)
Average daily hot water use (litres/day)												104.1079 (43)
Daily hot water use	114.5187	110.3543	106.1900	102.0257	97.8614	93.6971	93.6971	97.8614	102.0257	106.1900	110.3543	114.5187 (44)
Energy conte	169.8279	148.5325	153.2723	133.6265	128.2178	110.6422	102.5263	117.6504	119.0555	138.7477	151.4540	164.4692 (45)
Energy content (annual)										Total = Sum(45)m =		1638.0221 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
If cylinder contains dedicated solar storage												

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Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
	36.0884	31.5632	32.5704	28.3956	27.2463	23.5115	21.7868	25.0007	25.2993	29.4839	32.1840	34.9497 (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	147.1745	147.1745	147.1745	147.1745	147.1745	147.1745	147.1745	147.1745	147.1745	147.1745	147.1745	147.1745 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.5783	26.2712	21.3652	16.1748	12.0909	10.2076	11.0297	14.3368	19.2428	24.4332	28.5172	30.4004 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.1888	330.5840	322.0282	303.8140	280.8218	259.2123	244.7759	241.3807	249.9365	268.1507	291.1429	312.7524 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.7174	37.7174	37.7174	37.7174	37.7174	37.7174	37.7174	37.7174	37.7174	37.7174	37.7174	37.7174 (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)	-117.7396	-117.7396	-117.7396	-117.7396	-117.7396	-117.7396	-117.7396	-117.7396	-117.7396	-117.7396	-117.7396	-117.7396 (71)
Water heating gains (Table 5)	48.5059	46.9690	43.7774	39.4384	36.6213	32.6548	29.2834	33.6031	35.1379	39.6289	44.7000	46.9754 (72)
Total internal gains	472.4254	470.9766	454.3231	426.5795	396.6863	369.2271	352.2413	356.4729	371.4696	399.3651	431.5124	457.2805 (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				2.1700	19.6403	0.6300		0.7000		0.7700	13.0250 (76)	
South				16.8400	46.7521	0.6300		0.7000		0.7700	240.6106 (78)	
West				0.9600	19.6403	0.6300		0.7000		0.7700	5.7622 (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	762.8254	961.0333	1117.4830	1243.8850	1313.8912	1282.1075	1231.2816	1159.6145	1087.2629	938.5285	778.3886	706.4849 (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	58.8448	58.9838	59.1207	59.7723	59.8958	60.4776	60.4776	60.5865	60.2522	59.8958	59.6465	59.3880
alpha	4.9230	4.9323	4.9414	4.9848	4.9931	5.0318	5.0318	5.0391	5.0168	4.9931	4.9764	4.9592
util living area	0.9992	0.9974	0.9920	0.9736	0.9178	0.7849	0.6146	0.6682	0.8841	0.9843	0.9980	0.9995 (86)
MIT	19.6150	19.8021	20.0711	20.4092	20.7129	20.9149	20.9805	20.9707	20.8311	20.4240	19.9499	19.5846 (87)
Th 2	19.9359	19.9382	19.9404	19.9507	19.9526	19.9616	19.9616	19.9633	19.9581	19.9526	19.9487	19.9446 (88)
util rest of house	0.9989	0.9964	0.9890	0.9627	0.8819	0.6965	0.4827	0.5376	0.8208	0.9759	0.9972	0.9993 (89)
MIT 2	18.6681	18.8565	19.1258	19.4660	19.7510	19.9203	19.9564	19.9545	19.8607	19.4857	19.0129	18.6446 (90)
Living area fraction									fLA = Living area / (4) =			0.1800 (91)
MIT	18.8385	19.0267	19.2960	19.6358	19.9242	20.0994	20.1408	20.1375	20.0354	19.6546	19.1816	18.8138 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8385	19.0267	19.2960	19.6358	19.9242	20.0994	20.1408	20.1375	20.0354	19.6546	19.1816	18.8138 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9985	0.9953	0.9865	0.9586	0.8807	0.7096	0.5067	0.5612	0.8265	0.9727	0.9963	0.9990 (94)
Ext temp.	761.7016	956.5341	1102.3565	1192.3360	1157.1889	909.8152	623.8781	650.7590	898.5987	912.8775	775.5083	705.7722 (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	2679.9782	2597.9319	2347.7514	1948.2808	1489.4121	986.3628	635.0759	669.1454	1068.5495	1639.8061	2197.1401	2669.2137 (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	1427.1978	1103.0193	926.5738	544.2802	247.1740	0.0000	0.0000	0.0000	0.0000	540.8349	1023.5749	1460.8004 (98)
Space heating per m2												7273.4554 (98)
										(98) / (4) =		46.5650 (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	1685.9785	1327.2597	1360.6798	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8189	0.8946	0.8681	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1380.6289	1187.3122	1181.2460	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1626.5352	1564.1186	1482.9260	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	177.0525	280.3440	224.4499	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												681.8464 (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	44.2631	70.0860	56.1125	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												170.4616 (107)
Space cooling per m2												1.0913 (108)
Energy for space heating												46.5650 (99)
Energy for space cooling												1.0913 (108)
Total												47.6563 (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	78.1000 (1b)	x 2.3900 (2b)	= 186.6590 (1b) - (3b)
First floor	78.1000 (1c)	x 2.6700 (2c)	= 208.5270 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	156.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 395.1860 (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) = 0.1265 (8)
Pressure test					Yes
Measured/design AP50					3.9500
Infiltration rate					0.3240 (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) =	0.2997 (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	0.3522	0.3297	0.3297	0.2997	0.3072	0.2922	0.2922	0.2847	0.2847	0.3072	0.2997	0.3072 (22b)
Effective ac	0.5620	0.5543	0.5543	0.5449	0.5472	0.5427	0.5427	0.5405	0.5405	0.5472	0.5449	0.5472 (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			78.1000	0.1200	9.3720	84.0000	6560.4000 (28a)
Brick and Block	205.5000	31.6300	173.8700	0.2400	41.7288	42.2200	7340.7914 (29a)
Pitched Roof	78.1000		78.1000	0.1000	7.8100	9.1000	710.7100 (30)
Total net area of external elements Aum(A, m ²)			361.7000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	95.0329		(33)
GF Block			75.9400			75.0000	5695.5000 (32c)
GF Stud			27.3600			9.0000	246.2400 (32c)
First Floor Stud			172.3800			9.0000	1551.4200 (32c)
Internal Floor 1			78.1000			18.0000	1405.8000 (32d)
Internal Ceiling 1			78.1000			18.0000	1405.8000 (32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		24916.6614 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							159.5177 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.9152 (36)
Total fabric heat loss					(33) + (36) =		100.9480 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	73.2928	72.2934	72.2934	71.0633	71.3598	70.7741	70.7741	70.4922	70.4922	71.3598	71.0633	71.3598 (38)
Average = Sum(39)m / 12 =	174.2409	173.2414	173.2414	172.0113	172.3079	171.7221	171.7221	171.4402	171.4402	172.3079	172.0113	172.3079 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1155	1.1091	1.1091	1.1012	1.1031	1.0994	1.0994	1.0976	1.0976	1.1031	1.1012	1.1031 (40)
HLP (average)												1.1033 (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												2.9435 (42)
Average daily hot water use (litres/day)												104.1079 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	114.5187	110.3543	106.1900	102.0257	97.8614	93.6971	93.6971	97.8614	102.0257	106.1900	110.3543	114.5187 (44)
Energy conte	169.8279	148.5325	153.2723	133.6265	128.2178	110.6422	102.5263	117.6504	119.0555	138.7477	151.4540	164.4692 (45)
Energy content (annual)										Total = Sum(45)m =		1638.0221 (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	25.4742	22.2799	22.9908	20.0440	19.2327	16.5963	15.3789	17.6476	17.8583	20.8122	22.7181	24.6704 (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												
222.0505 195.7013 205.4949 184.1645 180.4404 161.1802 154.7489 169.8730 169.5935 190.9703 201.9920 216.6918 (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	222.0505	195.7013	205.4949	184.1645	180.4404	161.1802	154.7489	169.8730	169.5935	190.9703	201.9920	216.6918 (64)
RHI water heating demand												2252.9011 (64)
Heat gains from water heating, kWh/month	98.2458	87.1221	92.7411	84.8612	84.4105	77.2189	75.8681	80.8968	80.0164	87.9117	90.7888	96.4641 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	176.6093	176.6093	176.6093	176.6093	176.6093	176.6093	176.6093	176.6093	176.6093	176.6093	176.6093	176.6093 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	73.9458	65.6780	53.4130	40.4371	30.2272	25.5191	27.5742	35.8420	48.1071	61.0830	71.2929	76.0010 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	488.3415	493.4090	480.6392	453.4537	419.1370	386.8840	365.3371	360.2697	373.0395	400.2249	434.5417	466.7946 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.6044	55.6044	55.6044	55.6044	55.6044	55.6044	55.6044	55.6044	55.6044	55.6044	55.6044	55.6044 (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)	-117.7396	-117.7396	-117.7396	-117.7396	-117.7396	-117.7396	-117.7396	-117.7396	-117.7396	-117.7396	-117.7396	-117.7396 (71)
Water heating gains (Table 5)	132.0509	129.6460	124.6520	117.8628	113.4550	107.2485	101.9732	108.7323	111.1338	118.1609	126.0956	129.6560 (72)
Total internal gains	811.8124	806.2072	776.1784	729.2278	680.2933	637.1258	612.3588	622.3182	649.7546	696.9431	749.4044	789.9259 (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					2.1700	25.1733	0.6300	0.7000	0.7700		16.6944 (76)	
South					16.8400	56.5862	0.6300	0.7000	0.7700		291.2223 (78)	
West					0.9600	25.1733	0.6300	0.7000	0.7700		7.3855 (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	1166.3825	1315.4045	1479.5970	1606.0062	1613.2068	1668.0712	1564.7570	1524.5574	1446.5213	1301.7796	1171.4740	1078.0363 (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	39.7226	39.9517	39.9517	40.2374	40.1682	40.3052	40.3052	40.3715	40.3715	40.1682	40.2374	40.1682
alpha	3.6482	3.6634	3.6634	3.6825	3.6779	3.6870	3.6870	3.6914	3.6914	3.6779	3.6825	3.6779
util living area	0.9724	0.9575	0.9206	0.8427	0.7151	0.5007	0.3566	0.3545	0.6061	0.8455	0.9472	0.9776 (86)
MIT	19.9387	20.0714	20.3140	20.5931	20.7938	20.9007	20.9212	20.9216	20.8735	20.6498	20.2721	19.9149 (87)
Th 2	19.9882	19.9934	19.9934	19.9998	19.9983	20.0013	20.0013	20.0028	20.0028	19.9983	19.9998	19.9983 (88)
util rest of house	0.9662	0.9483	0.9035	0.8088	0.6539	0.4119	0.2514	0.2466	0.5174	0.8033	0.9337	0.9725 (89)
MIT 2	18.5917	18.7852	19.1280	19.5140	19.7654	19.8779	19.8923	19.8941	19.8575	19.5956	19.0800	18.5655 (90)
Living area fraction									fLA = Living area / (4) =			0.1800 (91)
MIT	18.8342	19.0167	19.3415	19.7083	19.9506	20.0620	20.0775	20.0791	20.0404	19.7854	19.2946	18.8084 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8342	19.0167	19.3415	19.7083	19.9506	20.0620	20.0775	20.0791	20.0404	19.7854	19.2946	18.8084 (93)

8. Space heating requirement

Utilisation	0.9571	0.9371	0.8902	0.7976	0.6507	0.4175	0.2596	0.2550	0.5210	0.7929	0.9216	0.9645 (94)
Useful gains	1116.3191	1232.6216	1317.0771	1280.9010	1049.6969	696.4174	406.1424	388.8140	753.6257	1032.1868	1079.6249	1039.7226 (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	2305.9352	2255.0359	2034.1086	1652.7346	1180.4066	714.7109	408.2760	390.7255	795.5547	1324.2525	1839.5976	2258.6794 (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	885.0743	687.0624	533.4714	267.7202	97.2480	0.0000	0.0000	0.0000	0.0000	217.2969	547.1803	906.9039 (98)
Space heating												4141.9576 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF HEAT DEMAND 09 Jan 2014

RHI space heating demand

4142 (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	78.1000 (1b)	x 2.3900 (2b)	= 186.6590 (1b) - (3b)
First floor	78.1000 (1c)	x 2.6700 (2c)	= 208.5270 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	156.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 395.1860 (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) = 0.1265 (8)
Pressure test					Yes
Measured/design AP50					3.9500
Infiltration rate					0.3240 (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) =	0.2997 (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	0.3821	0.3747	0.3672	0.3297	0.3222	0.2847	0.2847	0.2772	0.2997	0.3222	0.3372	0.3522 (22b)
Effective ac	0.5730	0.5702	0.5674	0.5543	0.5519	0.5405	0.5405	0.5384	0.5449	0.5519	0.5568	0.5620 (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			78.1000	0.1200	9.3720	84.0000	6560.4000 (28a)
Brick and Block	205.5000	31.6300	173.8700	0.2400	41.7288	42.2200	7340.7914 (29a)
Pitched Roof	78.1000		78.1000	0.1000	7.8100	9.1000	710.7100 (30)
Total net area of external elements Aum(A, m ²)			361.7000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	95.0329		(33)
GF Block			75.9400			75.0000	5695.5000 (32c)
GF Stud			27.3600			9.0000	246.2400 (32c)
First Floor Stud			172.3800			9.0000	1551.4200 (32c)
Internal Floor 1			78.1000			18.0000	1405.8000 (32d)
Internal Ceiling 1			78.1000			18.0000	1405.8000 (32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		24916.6614 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							159.5177 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.9152 (36)
Total fabric heat loss					(33) + (36) =		100.9480 (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	74.7280	74.3582	73.9958	72.2934	71.9749	70.4922	70.4922	70.2176	71.0633	71.9749	72.6192	73.2928 (38)
Heat transfer coeff	175.6760	175.3062	174.9438	173.2414	172.9229	171.4402	171.4402	171.1656	172.0113	172.9229	173.5673	174.2409 (39)
Average = Sum(39)m / 12 =												173.2399 (39)
HLP	1.1247	1.1223	1.1200	1.1091	1.1071	1.0976	1.0976	1.0958	1.1012	1.1071	1.1112	1.1155 (40)
HLP (average)												1.1091 (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												2.9435 (42)
Average daily hot water use (litres/day)												104.1079 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	114.5187	110.3543	106.1900	102.0257	97.8614	93.6971	93.6971	97.8614	102.0257	106.1900	110.3543	114.5187 (44)
Energy content (annual)	169.8279	148.5325	153.2723	133.6265	128.2178	110.6422	102.5263	117.6504	119.0555	138.7477	151.4540	164.4692 (45)
										Total = Sum(45)m =		1638.0221 (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	25.4742	22.2799	22.9908	20.0440	19.2327	16.5963	15.3789	17.6476	17.8583	20.8122	22.7181	24.6704 (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												
222.0505 195.7013 205.4949 184.1645 180.4404 161.1802 154.7489 169.8730 169.5935 190.9703 201.9920 216.6918 (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	222.0505	195.7013	205.4949	184.1645	180.4404	161.1802	154.7489	169.8730	169.5935	190.9703	201.9920	216.6918 (64)
Total per year (kWh/year) = Sum(64)m =												2252.9011 (64)
Heat gains from water heating, kWh/month												
98.2458 87.1221 92.7411 84.8612 84.4105 77.2189 75.8681 80.8968 80.0164 87.9117 90.7888 96.4641 (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	176.6093	176.6093	176.6093	176.6093	176.6093	176.6093	176.6093	176.6093	176.6093	176.6093	176.6093	176.6093	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	73.9458	65.6780	53.4130	40.4371	30.2272	25.5191	27.5742	35.8420	48.1071	61.0830	71.2929	76.0010	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	488.3415	493.4090	480.6392	453.4537	419.1370	386.8840	365.3371	360.2697	373.0395	400.2249	434.5417	466.7946	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.6044	55.6044	55.6044	55.6044	55.6044	55.6044	55.6044	55.6044	55.6044	55.6044	55.6044	55.6044	(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)	-117.7396	-117.7396	-117.7396	-117.7396	-117.7396	-117.7396	-117.7396	-117.7396	-117.7396	-117.7396	-117.7396	-117.7396	(71)
Water heating gains (Table 5)	132.0509	129.6460	124.6520	117.8628	113.4550	107.2485	101.9732	108.7323	111.1338	118.1609	126.0956	129.6560	(72)
Total internal gains	811.8124	806.2072	776.1784	729.2278	680.2933	637.1258	612.3588	622.3182	649.7546	696.9431	749.4044	789.9259	(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	2.1700	19.6403	0.6300	0.7000	0.7700	13.0250 (76)
South	16.8400	46.7521	0.6300	0.7000	0.7700	240.6106 (78)
West	0.9600	19.6403	0.6300	0.7000	0.7700	5.7622 (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	1102.2124	1296.2639	1439.3383	1546.5332	1597.4981	1550.0062	1491.3990	1425.4598	1365.5480	1236.1064	1096.2807	1039.1302 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	39.3981	39.4812	39.5630	39.9517	40.0253	40.3715	40.3715	40.4362	40.2374	40.0253	39.8767	39.7226
alpha	3.6265	3.6321	3.6375	3.6634	3.6684	3.6914	3.6914	3.6957	3.6825	3.6684	3.6584	3.6482
util living area	0.9819	0.9671	0.9406	0.8864	0.7884	0.6359	0.4847	0.5230	0.7282	0.9044	0.9688	0.9851 (86)
MIT	19.7484	19.9276	20.1729	20.4633	20.7037	20.8554	20.9067	20.9001	20.8035	20.4917	20.0645	19.7129 (87)
Th 2	19.9807	19.9826	19.9845	19.9934	19.9951	20.0028	20.0028	20.0043	19.9998	19.9951	19.9917	19.9882 (88)
util rest of house												
	0.9780	0.9603	0.9281	0.8617	0.7416	0.5581	0.3836	0.4215	0.6580	0.8783	0.9611	0.9820 (89)
MIT 2	18.3103	18.5699	18.9219	19.3345	19.6537	19.8383	19.8851	19.8820	19.7834	19.3830	18.7773	18.2645 (90)
Living area fraction												
MIT	18.5692	18.8143	19.1471	19.5377	19.8427	20.0214	20.0690	20.0653	19.9671	19.5826	19.0090	18.5252 (91)
Temperature adjustment												0.0000
adjusted MIT	18.5692	18.8143	19.1471	19.5377	19.8427	20.0214	20.0690	20.0653	19.9671	19.5826	19.0090	18.5252 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9709	0.9502	0.9153	0.8485	0.7337	0.5597	0.3906	0.4280	0.6554	0.8653	0.9513	0.9757	(94)
Useful gains	1070.1215	1231.6827	1317.4657	1312.2685	1172.0491	867.4836	582.5582	610.0918	895.0045	1069.5737	1042.9095	1013.9023	(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													
	2506.7546	2439.2682	2212.5283	1842.8978	1408.0600	929.4415	594.7290	627.3766	1009.1999	1553.3043	2067.0133	2496.0380	(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	1068.8550	811.4974	665.9266	382.0531	175.5921	0.0000	0.0000	0.0000	0.0000	359.8956	737.3548	1102.7090	(98)
Space heating												5303.8836	(98)
Space heating per m2												(98) / (4) =	33.9557 (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																5860.6449	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
Space heating requirement	1068.8550	811.4974	665.9266	382.0531	175.5921	0.0000	0.0000	0.0000	0.0000	359.8956	737.3548	1102.7090	(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)	1181.0553	896.6823	735.8305	422.1582	194.0244	0.0000	0.0000	0.0000	0.0000	397.6747	814.7566	1218.4629	(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	222.0505	195.7013	205.4949	184.1645	180.4404	161.1802	154.7489	169.8730	169.5935	190.9703	201.9920	216.6918	(64)				
Efficiency of water heater (217)m	88.4597	88.2021	87.7262	86.7181	84.7414	79.8000	79.8000	79.8000	79.8000	86.4801	87.9637	88.5500	(216)				
Fuel for water heating, kWh/month	251.0186	221.8784	234.2458	212.3715	212.9307	201.9802	193.9209	212.8734	212.5232	220.8258	229.6309	244.7113	(219)				
Water heating fuel used												2648.9107	(219)				
Annual totals kWh/year																	
Space heating fuel - main system												5860.6449	(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)												522.3627	(232)				
Energy saving/generation technologies (Appendices M ,N and Q)																	
PV Unit 0 (0.80 + 1.15 + 1068 + 1.00) =										-982.6248		-982.6248	(233)				
Total delivered energy for all uses												8124.2935	(238)				

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	5860.6449	3.4800	203.9504 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2648.9107	3.4800	92.1821 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	522.3627	13.1900	68.8996 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-982.6248	13.1900	-129.6082 (252)
Total energy cost			365.3165 (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] =	0.7626 (257)
SAP value		89.3619
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	5860.6449	0.2160	1265.8993 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2648.9107	0.2160	572.1647 (264)
Space and water heating			1838.0640 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	522.3627	0.5190	271.1063 (268)
Energy saving/generation technologies			
PV Unit	-982.6248	0.5190	-509.9823 (269)
Total kg/year			1638.1130 (272)
CO2 emissions per m2			10.4900 (273)
EI value			89.0901
EI rating			89 (274)
EI band			B

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Calculation Type: New Build (As Built)



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Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.25) / 0.9050 = 4.124$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.25) / 0.9050 = 0.2560$, stars = 4
Water heating energy efficiency	$3.48 / 0.8484 = 4.102$, stars = 4
Water heating environmental impact	$0.216 / 0.8484 = 0.2546$, 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	78.1000 (1b)	x 2.3900 (2b)	= 186.6590 (1b) - (3b)
First floor	78.1000 (1c)	x 2.6700 (2c)	= 208.5270 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	156.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 395.1860 (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) = 0.1265 (8)
Pressure test					Yes
Measured/design AP50					3.9500
Infiltration rate					0.3240 (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) =	0.2997 (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	0.3522	0.3297	0.3297	0.2997	0.3072	0.2922	0.2922	0.2847	0.2847	0.3072	0.2997	0.3072 (22b)
Effective ac	0.5620	0.5543	0.5543	0.5449	0.5472	0.5427	0.5427	0.5405	0.5405	0.5472	0.5449	0.5472 (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			78.1000	0.1200	9.3720	84.0000	6560.4000 (28a)
Brick and Block	205.5000	31.6300	173.8700	0.2400	41.7288	42.2200	7340.7914 (29a)
Pitched Roof	78.1000		78.1000	0.1000	7.8100	9.1000	710.7100 (30)
Total net area of external elements Aum(A, m ²)			361.7000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	95.0329		(33)
GF Block			75.9400			75.0000	5695.5000 (32c)
GF Stud			27.3600			9.0000	246.2400 (32c)
First Floor Stud			172.3800			9.0000	1551.4200 (32c)
Internal Floor 1			78.1000			18.0000	1405.8000 (32d)
Internal Ceiling 1			78.1000			18.0000	1405.8000 (32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		24916.6614 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							159.5177 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.9152 (36)
Total fabric heat loss						(33) + (36) =	100.9480 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	73.2928	72.2934	72.2934	71.0633	71.3598	70.7741	70.7741	70.4922	70.4922	71.3598	71.0633	71.3598 (38)
Heat transfer coeff	174.2409	173.2414	173.2414	172.0113	172.3079	171.7221	171.7221	171.4402	171.4402	172.3079	172.0113	172.3079 (39)
Average = Sum(39)m / 12 =												172.3329 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1.1155	1.1091	1.1091	1.1012	1.1031	1.0994	1.0994	1.0976	1.0976	1.1031	1.1012	1.1031 (40)
HLP (average)												1.1033 (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												2.9435 (42)
Average daily hot water use (litres/day)												104.1079 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	114.5187	110.3543	106.1900	102.0257	97.8614	93.6971	93.6971	97.8614	102.0257	106.1900	110.3543	114.5187 (44)
Energy conte	169.8279	148.5325	153.2723	133.6265	128.2178	110.6422	102.5263	117.6504	119.0555	138.7477	151.4540	164.4692 (45)
Energy content (annual)										Total = Sum(45)m =		1638.0221 (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	25.4742	22.2799	22.9908	20.0440	19.2327	16.5963	15.3789	17.6476	17.8583	20.8122	22.7181	24.6704 (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												
222.0505 195.7013 205.4949 184.1645 180.4404 161.1802 154.7489 169.8730 169.5935 190.9703 201.9920 216.6918 (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	222.0505	195.7013	205.4949	184.1645	180.4404	161.1802	154.7489	169.8730	169.5935	190.9703	201.9920	216.6918 (64)
Total per year (kWh/year) = Sum(64)m =												2252.9011 (64)
Heat gains from water heating, kWh/month												
98.2458 87.1221 92.7411 84.8612 84.4105 77.2189 75.8681 80.8968 80.0164 87.9117 90.7888 96.4641 (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	176.6093	176.6093	176.6093	176.6093	176.6093	176.6093	176.6093	176.6093	176.6093	176.6093	176.6093	176.6093 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
73.9458 65.6780 53.4130 40.4371 30.2272 25.5191 27.5742 35.8420 48.1071 61.0830 71.2929 76.0010 (67)												
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
488.3415 493.4090 480.6392 453.4537 419.1370 386.8840 365.3371 360.2697 373.0395 400.2249 434.5417 466.7946 (68)												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
55.6044 55.6044 55.6044 55.6044 55.6044 55.6044 55.6044 55.6044 55.6044 55.6044 55.6044 55.6044 (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)												
-117.7396 -117.7396 -117.7396 -117.7396 -117.7396 -117.7396 -117.7396 -117.7396 -117.7396 -117.7396 -117.7396 -117.7396 (71)												
Water heating gains (Table 5)												
132.0509 129.6460 124.6520 117.8628 113.4550 107.2485 101.9732 108.7323 111.1338 118.1609 126.0956 129.6560 (72)												
Total internal gains	811.8124	806.2072	776.1784	729.2278	680.2933	637.1258	612.3588	622.3182	649.7546	696.9431	749.4044	789.9259 (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	2.1700	25.1733	0.6300	0.7000	0.7700	16.6944 (76)
South	16.8400	56.5862	0.6300	0.7000	0.7700	291.2223 (78)
West	0.9600	25.1733	0.6300	0.7000	0.7700	7.3855 (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	1166.3825	1315.4045	1479.5970	1606.0062	1613.2068	1668.0712	1564.7570	1524.5574	1446.5213	1301.7796	1171.4740	1078.0363 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec												
tau	39.7226	39.9517	39.9517	40.2374	40.1682	40.3052	40.3052	40.3715	40.3715	40.1682	40.2374	40.1682
alpha	3.6482	3.6634	3.6634	3.6825	3.6779	3.6870	3.6870	3.6914	3.6914	3.6779	3.6825	3.6779
util living area	0.9724	0.9575	0.9206	0.8427	0.7151	0.5007	0.3566	0.3545	0.6061	0.8455	0.9472	0.9776 (86)
MIT	19.9387	20.0714	20.3140	20.5931	20.7938	20.9007	20.9212	20.9216	20.8735	20.6498	20.2721	19.9149 (87)
Th 2	19.9882	19.9934	19.9934	19.9998	19.9983	20.0013	20.0013	20.0028	20.0028	19.9983	19.9998	19.9983 (88)
util rest of house												
0.9662 0.9483 0.9035 0.8088 0.6539 0.4119 0.2514 0.2466 0.5174 0.8033 0.9337 0.9725 (89)												
MIT 2	18.5917	18.7852	19.1280	19.5140	19.7654	19.8779	19.8923	19.8941	19.8575	19.5956	19.0800	18.5655 (90)
Living area fraction												
MIT	18.8342	19.0167	19.3415	19.7083	19.9506	20.0620	20.0775	20.0791	20.0404	19.7854	19.2946	18.8084 (91)
Temperature adjustment												0.0000
adjusted MIT	18.8342	19.0167	19.3415	19.7083	19.9506	20.0620	20.0775	20.0791	20.0404	19.7854	19.2946	18.8084 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.9571 0.9371 0.8902 0.7976 0.6507 0.4175 0.2596 0.2550 0.5210 0.7929 0.9216 0.9645 (94)												
Useful gains	1116.3191	1232.6216	1317.0771	1280.9010	1049.6969	696.4174	406.1424	388.8140	753.6257	1032.1868	1079.6249	1039.7226 (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												
2305.9352 2255.0359 2034.1086 1652.7346 1180.4066 714.7109 408.2760 390.7255 795.5547 1324.2525 1839.5976 2258.6794 (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	885.0743	687.0624	533.4714	267.7202	97.2480	0.0000	0.0000	0.0000	0.0000	217.2969	547.1803	906.9039 (98)
Space heating												4141.9576 (98)
Space heating per m2												(98) / (4) = 26.5170 (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													4576.7487 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	885.0743	687.0624	533.4714	267.7202	97.2480	0.0000	0.0000	0.0000	0.0000	217.2969	547.1803	906.9039	(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)	977.9827	759.1850	589.4712	295.8235	107.4564	0.0000	0.0000	0.0000	0.0000	240.1071	604.6192	1002.1037	(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	222.0505	195.7013	205.4949	184.1645	180.4404	161.1802	154.7489	169.8730	169.5935	190.9703	201.9920	216.6918	(64)
Efficiency of water heater (217)m	88.1299	87.8875	87.2468	85.8108	83.2469	79.8000	79.8000	79.8000	79.8000	85.1589	87.3424	88.2187	(216)
Fuel for water heating, kWh/month	251.9580	222.6726	235.5328	214.6170	216.7533	201.9802	193.9209	212.8734	212.5232	224.2518	231.2645	245.6301	(219)
Water heating fuel used												2663.9777	(219)
Annual totals kWh/year													
Space heating fuel - main system												4576.7487	(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)												522.3627	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.15 * 1184 * 1.00) =										-1089.2036		-1089.2036	(233)
Total delivered energy for all uses												6748.8856	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4576.7487	3.6300	166.1360 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2663.9777	3.6300	96.7024 (247)
Pumps and fans for heating	75.0000	19.4400	14.5800 (249)
Energy for lighting	522.3627	19.4400	101.5473 (250)
Additional standing charges			95.0000 (251)
Energy saving/generation technologies			
PV Unit	-1089.2036	19.4400	-211.7412 (252)
Total energy cost			262.2245 (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	4576.7487	0.2160	988.5777 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2663.9777	0.2160	575.4192 (264)
Space and water heating			1563.9969 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	522.3627	0.5190	271.1063 (268)
Energy saving/generation technologies			
PV Unit	-1089.2036	0.5190	-565.2967 (269)
Total kg/year			1308.7315 (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	4576.7487	1.2200	5583.6334 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2663.9777	1.2200	3250.0528 (264)
Space and water heating			8833.6862 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	522.3627	3.0700	1603.6536 (268)
Energy saving/generation technologies			

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PV Unit -1089.2036 3.0700 -3343.8550 (269)
Primary energy kWh/year 7323.7348 (272)
Primary energy kWh/m2/year 46.8869 (273)

SAP 2012 EPC IMPROVEMENTS

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

(For testing purposes):

A	Not considered
B	Not considered
C	Not considered
D	Not considered
E Low energy lighting	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 (20.9%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£41 1.75 kg/m²	B 91	B 91
Total Savings	£41 1.75 kg/m²		
Potential energy efficiency rating:		B 91	
Potential environmental impact rating:			B 91

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	£358	£308	£50
Space heating	£276	£277	-£2
Water heating	£97	£55	£42
Lighting	£102	£102	£0
Generated (PV)	-£212	-£212	£0
Total cost of fuels	£262	£222	£40
Total cost of uses	£263	£222	£40
Delivered energy	43 kWh/m²	35 kWh/m²	9 kWh/m²
Carbon dioxide emissions	1.3 tonnes	1.0 tonnes	0.3 tonnes
CO2 emissions per m²	8 kg/m²	7 kg/m²	2 kg/m²
Primary energy	47 kWh/m²	37 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	78.1000 (1b)	x 2.3900 (2b)	= 186.6590 (1b) - (3b)
First floor	78.1000 (1c)	x 2.6700 (2c)	= 208.5270 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	156.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 395.1860 (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) = 0.1265 (8)
Pressure test					Yes
Measured/design AP50					3.9500
Infiltration rate					0.3240 (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) =	0.2997 (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	0.3821	0.3747	0.3672	0.3297	0.3222	0.2847	0.2847	0.2772	0.2997	0.3222	0.3372	0.3522 (22b)
Effective ac	0.5730	0.5702	0.5674	0.5543	0.5519	0.5405	0.5405	0.5384	0.5449	0.5519	0.5568	0.5620 (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			78.1000	0.1200	9.3720	84.0000	6560.4000 (28a)
Brick and Block	205.5000	31.6300	173.8700	0.2400	41.7288	42.2200	7340.7914 (29a)
Pitched Roof	78.1000		78.1000	0.1000	7.8100	9.1000	710.7100 (30)
Total net area of external elements Aum(A, m ²)			361.7000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	95.0329		(33)
GF Block			75.9400			75.0000	5695.5000 (32c)
GF Stud			27.3600			9.0000	246.2400 (32c)
First Floor Stud			172.3800			9.0000	1551.4200 (32c)
Internal Floor 1			78.1000			18.0000	1405.8000 (32d)
Internal Ceiling 1			78.1000			18.0000	1405.8000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 24916.6614 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 159.5177 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.9152 (36)
Total fabric heat loss (33) + (36) = 100.9480 (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	74.7280	74.3582	73.9958	72.2934	71.9749	70.4922	70.4922	70.2176	71.0633	71.9749	72.6192	73.2928 (38)
Heat transfer coeff	175.6760	175.3062	174.9438	173.2414	172.9229	171.4402	171.4402	171.1656	172.0113	172.9229	173.5673	174.2409 (39)
Average = Sum(39)m / 12 =												173.2399 (39)
HLP	1.1247	1.1223	1.1200	1.1091	1.1071	1.0976	1.0976	1.0958	1.1012	1.1071	1.1112	1.1155 (40)
HLP (average)												1.1091 (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												2.9435 (42)
Average daily hot water use (litres/day)												104.1079 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	114.5187	110.3543	106.1900	102.0257	97.8614	93.6971	93.6971	97.8614	102.0257	106.1900	110.3543	114.5187 (44)
Energy content (annual)	169.8279	148.5325	153.2723	133.6265	128.2178	110.6422	102.5263	117.6504	119.0555	138.7477	151.4540	164.4692 (45)
										Total = Sum(45)m =		1638.0221 (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	25.4742	22.2799	22.9908	20.0440	19.2327	16.5963	15.3789	17.6476	17.8583	20.8122	22.7181	24.6704 (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												
211.9481 186.5766 193.9967 167.6344 157.5437 138.7970 131.6195 147.6741 154.4141 179.4722 192.2155 206.5894 (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												1.1072 (H8)
Utilisation factor												0.5947 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												117.0000 (H13)
Daily hot water demand												104.1079 (H14)
Volume ratio Veff/V												1.1238 (H15)
Solar storage volume factor												1.0000 (H16)
Solar input												-948.3995 (H17)
Solar input	-27.5017	-45.8924	-78.1600	-104.7499	-129.4096	-127.2303	-125.5489	-109.6927	-85.9114	-58.6674	-32.6210	-23.0142 (63)
Solar input (sum of months) = Sum (63)m =												-948.3995 (63)
Output from w/h												
184.4464 140.6842 115.8367 62.8845 28.1340 11.5667 6.0706 37.9814 68.5027 120.8048 159.5945 183.5752 (64)												
Total per year (kWh/year) = Sum (64)m =												1120.0817 (64)
Heat gains from water heating, kWh/month												
90.1639 79.8223 83.5426 71.6371 66.0931 59.3123 57.3646 63.1378 67.8728 78.7132 82.9676 88.3822 (65)												

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

Metabolic gains (Table 5), Watts												
(66)m	176.6093	176.6093	176.6093	176.6093	176.6093	176.6093	176.6093	176.6093	176.6093	176.6093	176.6093	176.6093 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
73.9458 65.6780 53.4130 40.4371 30.2272 25.5191 27.5742 35.8420 48.1071 61.0830 71.2929 76.0010 (67)												
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
488.3415 493.4090 480.6392 453.4537 419.1370 386.8840 365.3371 360.2697 373.0395 400.2249 434.5417 466.7946 (68)												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
55.6044 55.6044 55.6044 55.6044 55.6044 55.6044 55.6044 55.6044 55.6044 55.6044 55.6044 55.6044 (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)												
-117.7396 -117.7396 -117.7396 -117.7396 -117.7396 -117.7396 -117.7396 -117.7396 -117.7396 -117.7396 -117.7396 -117.7396 (71)												
Water heating gains (Table 5)												
121.1881 118.7832 112.2884 99.4960 88.8348 82.3783 77.1029 84.8626 94.2678 105.7973 115.2328 118.7932 (72)												
Total internal gains												
800.9497 795.3444 763.8148 710.8610 655.6732 612.2556 587.4885 598.4485 632.8886 684.5795 738.5416 779.0631 (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						2.1700	19.6403	0.6300	0.7000	0.7700		13.0250 (76)
South						16.8400	46.7521	0.6300	0.7000	0.7700		240.6106 (78)
West						0.9600	19.6403	0.6300	0.7000	0.7700		5.7622 (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	1091.3497	1285.4011	1426.9747	1528.1665	1572.8780	1525.1360	1466.5288	1401.5901	1348.6820	1223.7428	1085.4179	1028.2674 (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	39.3981	39.4812	39.5630	39.9517	40.0253	40.3715	40.3715	40.4362	40.2374	40.0253	39.8767	39.7226
alpha	3.6265	3.6321	3.6375	3.6634	3.6684	3.6914	3.6914	3.6957	3.6825	3.6684	3.6584	3.6482
util living area												
0.9824 0.9679 0.9420 0.8896 0.7944 0.6433 0.4919 0.5305 0.7336 0.9067 0.9697 0.9856 (86)												
MIT	19.7420	19.9216	20.1667	20.4560	20.6973	20.8525	20.9057	20.8988	20.8003	20.4864	20.0584	19.7064 (87)
Th 2	19.9807	19.9826	19.9845	19.9934	19.9951	20.0028	20.0028	20.0043	19.9998	19.9951	19.9917	19.9882 (88)
util rest of house												
0.9787 0.9612 0.9297 0.8653 0.7482 0.5655 0.3897 0.4280 0.6637 0.8811 0.9622 0.9825 (89)												
MIT 2	18.3011	18.5613	18.9133	19.3249	19.6463	19.8358	19.8845	19.8813	19.7802	19.3761	18.7686	18.2551 (90)
Living area fraction												
MIT	18.5605	18.8062	19.1389	19.5285	19.8355	20.0188	20.0684	20.0644	19.9638	19.5760	19.0008	18.5163 (92)
Temperature adjustment												0.0000

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CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

adjusted MIT 18.5605 18.8062 19.1389 19.5285 19.8355 20.0188 20.0684 20.0644 19.9638 19.5760 19.0008 18.5163 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9717	0.9512	0.9170	0.8521	0.7400	0.5668	0.3967	0.4345	0.6609	0.8680	0.9526	0.9764	(94)
Useful gains	1060.4347	1222.7324	1308.5482	1302.1092	1163.8634	864.4387	581.8099	609.0593	891.2954	1062.2630	1033.9251	1004.0376	(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	2505.2221	2437.8430	2211.1038	1841.2992	1406.8140	928.9997	594.6191	627.2259	1008.6483	1552.1507	2065.5933	2494.4907	(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	1074.9218	816.5543	671.5014	388.2167	180.7553	0.0000	0.0000	0.0000	0.0000	364.4764	742.8011	1108.8971	(98)
Space heating													(98)
Space heating per m2													(98) / (4) = 34.2390 (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													5909.5294 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1074.9218	816.5543	671.5014	388.2167	180.7553	0.0000	0.0000	0.0000	0.0000	364.4764	742.8011	1108.8971	(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)	1187.7589	902.2699	741.9905	428.9688	199.7296	0.0000	0.0000	0.0000	0.0000	402.7364	820.7747	1225.3006	(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	184.4464	140.6842	115.8367	62.8845	28.1340	11.5667	6.0706	37.9814	68.5027	120.8048	159.5945	183.5752	(64)
Efficiency of water heater (217)m	88.7570	88.7510	88.7492	88.8394	88.8946	79.8000	79.8000	79.8000	79.8000	87.5768	88.4036	88.8087	(216)
Fuel for water heating, kWh/month	207.8105	158.5155	130.5213	70.7844	31.6487	14.4946	7.6073	47.5958	85.8430	137.9416	180.5294	206.7086	(219)
Water heating fuel used													(219)
Annual totals kWh/year													
Space heating fuel - main system													5909.5294 (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)													522.3627 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.15 * 1068 * 1.00) =										-982.6248		-982.6248	(233)
Total delivered energy for all uses													6854.2681 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	5909.5294	3.4800	205.6516	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1280.0009	3.4800	44.5440	(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	522.3627	13.1900	68.8996	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	-982.6248	13.1900	-129.6082	(252)
Total energy cost			325.9746	(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] =	0.6805	(257)
SAP value		90.5075	
SAP rating (Section 12)		91	(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	5909.5294	0.2160	1276.4583 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1280.0009	0.2160	276.4802 (264)
Space and water heating			1552.9385 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	522.3627	0.5190	271.1063 (268)
Energy saving/generation technologies			
PV Unit	-982.6248	0.5190	-509.9823 (269)
Total kg/year			1378.9375 (272)
CO2 emissions per m2			8.8300 (273)
EI value			90.8162
EI rating			91 (274)
EI band			B

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	78.1000 (1b)	x 2.3900 (2b)	= 186.6590 (1b) - (3b)
First floor	78.1000 (1c)	x 2.6700 (2c)	= 208.5270 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	156.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 395.1860 (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) = 0.1265 (8)
Pressure test					Yes
Measured/design AP50					3.9500
Infiltration rate					0.3240 (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) =	0.2997 (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	0.3522	0.3297	0.3297	0.2997	0.3072	0.2922	0.2922	0.2847	0.2847	0.3072	0.2997	0.3072 (22b)
Effective ac	0.5620	0.5543	0.5543	0.5449	0.5472	0.5427	0.5427	0.5405	0.5405	0.5472	0.5449	0.5472 (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			78.1000	0.1200	9.3720	84.0000	6560.4000 (28a)
Brick and Block	205.5000	31.6300	173.8700	0.2400	41.7288	42.2200	7340.7914 (29a)
Pitched Roof	78.1000		78.1000	0.1000	7.8100	9.1000	710.7100 (30)
Total net area of external elements Aum(A, m ²)			361.7000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	95.0329		(33)
GF Block			75.9400			75.0000	5695.5000 (32c)
GF Stud			27.3600			9.0000	246.2400 (32c)
First Floor Stud			172.3800			9.0000	1551.4200 (32c)
Internal Floor 1			78.1000			18.0000	1405.8000 (32d)
Internal Ceiling 1			78.1000			18.0000	1405.8000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 24916.6614 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 159.5177 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.9152 (36)
Total fabric heat loss (33) + (36) = 100.9480 (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	73.2928	72.2934	72.2934	71.0633	71.3598	70.7741	70.7741	70.4922	70.4922	71.3598	71.0633	71.3598 (38)
Heat transfer coeff	174.2409	173.2414	173.2414	172.0113	172.3079	171.7221	171.7221	171.4402	171.4402	172.3079	172.0113	172.3079 (39)
Average = Sum(39)m / 12 =												172.3329 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1155	1.1091	1.1091	1.1012	1.1031	1.0994	1.0994	1.0976	1.0976	1.1031	1.1012	1.1031 (40)
HLP (average)												1.1033 (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												2.9435 (42)
Average daily hot water use (litres/day)												104.1079 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	114.5187	110.3543	106.1900	102.0257	97.8614	93.6971	93.6971	97.8614	102.0257	106.1900	110.3543	114.5187 (44)
Energy conte	169.8279	148.5325	153.2723	133.6265	128.2178	110.6422	102.5263	117.6504	119.0555	138.7477	151.4540	164.4692 (45)
Energy content (annual)										Total = Sum(45)m =		1638.0221 (45)

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Calculation Type: New Build (As Built)

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

Distribution loss (46)m = 0.15 x (45)m	25.4742	22.2799	22.9908	20.0440	19.2327	16.5963	15.3789	17.6476	17.8583	20.8122	22.7181	24.6704 (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 18.8578 18.2495 18.8578 18.2495 18.8578 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												
211.9481 186.5766 193.9967 167.6344 157.5437 138.7970 131.6195 147.6741 154.4141 179.4722 192.2155 206.5894 (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												1.2369 (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												104.1079 (H14)
Volume ratio Veff/V												1.1238 (H15)
Solar storage volume factor												1.0000 (H16)
Solar input												-987.7842 (H17)
Solar input	-32.2327	-45.8385	-79.5415	-106.9968	-124.3375	-135.2431	-128.2311	-116.9343	-91.5242	-63.2583	-38.1239	-25.5223 (63)
Solar input (sum of months) = Sum (63)m =												-987.7842 (63)
Output from w/h												
179.7154 140.7381 114.4552 60.6376 33.2062 3.5539 3.3884 30.7398 62.8899 116.2139 154.0916 181.0671 (64)												
Total per year (kWh/year) = Sum (64)m =												1080.6970 (64)
Heat gains from water heating, kWh/month												
90.1639 79.8223 83.5426 71.6371 66.0931 59.3123 57.3646 63.1378 67.8728 78.7132 82.9676 88.3822 (65)												

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

Metabolic gains (Table 5), Watts												
(66)m	176.6093	176.6093	176.6093	176.6093	176.6093	176.6093	176.6093	176.6093	176.6093	176.6093	176.6093	176.6093 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
73.9458 65.6780 53.4130 40.4371 30.2272 25.5191 27.5742 35.8420 48.1071 61.0830 71.2929 76.0010 (67)												
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
488.3415 493.4090 480.6392 453.4537 419.1370 386.8840 365.3371 360.2697 373.0395 400.2249 434.5417 466.7946 (68)												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
55.6044 55.6044 55.6044 55.6044 55.6044 55.6044 55.6044 55.6044 55.6044 55.6044 55.6044 55.6044 (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)												
-117.7396 -117.7396 -117.7396 -117.7396 -117.7396 -117.7396 -117.7396 -117.7396 -117.7396 -117.7396 -117.7396 -117.7396 (71)												
Water heating gains (Table 5)												
121.1881 118.7832 112.2884 99.4960 88.8348 82.3783 77.1029 84.8626 94.2678 105.7973 115.2328 118.7932 (72)												
Total internal gains												
800.9497 795.3444 763.8148 710.8610 655.6732 612.2556 587.4885 598.4485 632.8886 684.5795 738.5416 779.0631 (73)												

6. Solar gains

[Jan]												Gains
	Area				Solar flux		g	FF	Access		W	
	m2				Table 6a		Specific data	Specific data	factor			
					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	2.1700				25.1733		0.6300	0.7000	0.7700		16.6944 (76)	
South	16.8400				56.5862		0.6300	0.7000	0.7700		291.2223 (78)	
West	0.9600				25.1733		0.6300	0.7000	0.7700		7.3855 (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	1155.5197	1304.5417	1467.2334	1587.6394	1588.5867	1643.2009	1539.8868	1500.6877	1429.6553	1289.4160	1160.6112	1067.1735 (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	39.7226	39.9517	39.9517	40.2374	40.1682	40.3052	40.3052	40.3715	40.3715	40.1682	40.2374	40.1682
alpha	3.6482	3.6634	3.6634	3.6825	3.6779	3.6870	3.6870	3.6914	3.6914	3.6779	3.6825	3.6779
util living area												
0.9731 0.9584 0.9223 0.8465 0.7218 0.5072 0.3621 0.3599 0.6116 0.8486 0.9485 0.9783 (86)												
MIT	19.9325	20.0656	20.3083	20.5870	20.7894	20.8996	20.9209	20.9213	20.8719	20.6457	20.2665	19.9086 (87)
Th 2	19.9882	19.9934	19.9934	19.9998	19.9983	20.0013	20.0013	20.0028	20.0028	19.9983	19.9998	19.9983 (88)
util rest of house												
0.9672 0.9495 0.9055 0.8131 0.6609 0.4176 0.2554 0.2505 0.5226 0.8069 0.9353 0.9733 (89)												
MIT 2	18.5829	18.7770	19.1202	19.5064	19.7608	19.8771	19.8922	19.8940	19.8563	19.5906	19.0723	18.5564 (90)
Living area fraction												
18.8258 19.0090 19.3341 19.7010 19.9460 20.0612 20.0774 20.0790 20.0391 19.7806 19.2873 18.7998 (92)												
Temperature adjustment												0.0000

adjusted MIT	18.8258	19.0090	19.3341	19.7010	19.9460	20.0612	20.0774	20.0790	20.0391	19.7806	19.2873	18.7998 (93)
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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	522.3627	0.5190	271.1063 (268)
Energy saving/generation technologies			
PV Unit	-1089.2036	0.5190	-565.2967 (269)
Total kg/year			1035.8121 (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	4618.8463	1.2200	5634.9925 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1238.2255	1.2200	1510.6351 (264)
Space and water heating			7145.6276 (265)
Pumps and fans	125.0000	3.0700	383.7500 (267)
Energy for lighting	522.3627	3.0700	1603.6536 (268)
Energy saving/generation technologies			
PV Unit	-1089.2036	3.0700	-3343.8550 (269)
Primary energy kWh/year			5789.1762 (272)
Primary energy kWh/m2/year			37.0626 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Plot 18	Issued on Date	08/08/2022
Assessment Reference	As Built	Prop Type Ref	Fh
Project	2 Robert Place, West End, SOUTHAMPTON, SO30 3JY		
Calculation Type	New Build (As Built)		

SAP Rating	89 B	DER	11.80	TER	15.38
Environmental	89 B	% DER<TER	23.27		
CO ₂ Emissions (t/year)	1.31	DFEE	43.38	TREE	54.80
General Requirements Compliance	Pass	% DFEE<TFEE	20.85		

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 18	Issued on Date	08/08/2022
Assessment Reference	As Built	Prop Type Ref	Fh
Project	2 Robert Place, West End, SOUTHAMPTON, SO30 3JY		
Calculation Type	New Build (As Built)		

SAP Rating	89 B	DER	11.80	TER	15.38
Environmental	89 B	% DER<TER	23.27		
CO ₂ Emissions (t/year)	1.31	DFEE	43.38	TFEE	54.80
General Requirements Compliance	Pass	% DFEE<TFEE	20.85		

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 18	Issued on Date	08/08/2022
Assessment Reference	As Built	Prop Type Ref	Fh
Project	2 Robert Place, West End, SOUTHAMPTON, SO30 3JY		
Calculation Type	New Build (As Built)		

SAP Rating	89 B	DER	11.80	TER	15.38
Environmental	89 B	% DER<TER	23.27		
CO ₂ Emissions (t/year)	1.31	DFEE	43.38	TFEE	54.80
General Requirements Compliance	Pass	% DFEE<TFEE	20.85		

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

Building Elements

Floor 000003 - Worst Case Slab

Floor Type: Slab On Ground Floor

Area = 35.11 m², Perimeter = 16.79 m, Wall thickness = 275.00 mm, Soil: Unknown

Horizontal edge insulation: none

Vertical edge insulation: none

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	Concrete, medium density						
	Main construction	100	1.3500	0.0741	100.00		
Layer 2	Polythene, 1000 gauge						
	Main construction	0.5	0.0000	0.0000	100.00		
Layer 3	Celotex XR4000						
	Main construction	150	0.0220	6.8182	100.00		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 4	Polythene, 500 gauge						
	Main construction	0.5	0.0000	0.0000	100.00		
Layer 5	Screed						
	Main construction	70	1.1500	0.0609	100.00	1200	1000
Int surface				0.1700			

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

Total correction = 0.0096 m² K/W

U-value (unrounded) = 0.12 W/m² K

Unheated space: None

Total thickness: 321 mm

U-value: 0.12 W/m² K

Kappa: 84.00 kJ/m² K

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Plot 18	Issued on Date	08/08/2022
Assessment Reference	As Built	Prop Type Ref	Fh
Property	2 Robert Place, West End, SOUTHAMPTON, SO30 3JY		
SAP Rating	89 B	DER	11.80
Environmental	89 B	TER	15.38
CO ₂ Emissions (t/year)	1.31	% DER<TER	23.27
General Requirements Compliance	Pass	DFEE	43.38
		TFEE	54.80
		% DFEE<TFEE	20.85
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:	40.57 m	78.10 m ²	2.39 m
	1st Storey:	40.65 m	78.10 m ²	2.67 m

7.0 Living Area	28.12	m ²
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8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	159.52	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	205.50	173.87

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	75.94
GF Stud	Plasterboard on timber frame		9.00	27.36
First Floor Stud	Plasterboard on timber frame		9.00	172.38

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	78.10	78.10

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

10.2 Internal Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Ceiling 1	Plasterboard ceiling, carpeted chipboard floor	9.00	78.10

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)
Ground Floor	Ground Floor - Solid	Other	0.12	84.00	78.10

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	78.10

12.0 Opening Types

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

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
Front Door	Solid Door	[1] Brick and Block	North							2.12	
Front Shaded	Window	[1] Brick and Block	North	None	1.18	Yes				1.92	
Front Elevation	Window	[1] Brick and Block	North	None	0.00					7.62	
Side Elevation	Window	[1] Brick and Block	East	None	0.00					2.17	
Rear Elevation	Window	[1] Brick and Block	South	None	0.00					16.84	
Side Elevation	Window	[1] Brick and Block	West	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)	1.01	0.071	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	3.54	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	15.21	0.021	No	Knauf P5
Independently assessed	E4 Jamb	50.10	0.016	No	Knauf P6
Independently assessed	E5 Ground floor (normal)	40.57	0.022	No	Knauf P10
Independently assessed	E6 Intermediate floor within a dwelling	40.57	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	25.68	0.060	No	
Independently assessed	E12 Gable (insulation at ceiling level)	14.89	0.044	No	Knauf P21
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	0.016	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	3.95	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 and Underfloor	
Underfloor Heating	Yes - Pipes in thin screed	
Flow Temperature	Normal (> 45°C)	

25.0 Main Heating 2

None

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Community Heating	None			
28.0 Water Heating	HWP From main heating 1			
Water Heating	Main Heating 1			
Flue Gas Heat Recovery System	No			
Waste Water Heat Recovery Instantaneous System 1	No			
Waste Water Heat Recovery Instantaneous System 2	No			
Waste Water Heat Recovery Storage System	No			
Solar Panel	No			
Water use <= 125 litres/person/day	Yes			
SAP Code	901			
29.0 Hot Water Cylinder	Hot Water Cylinder			
Cylinder Stat	Yes			
Cylinder In Heated Space	Yes			
Independent Time Control	Yes			
Insulation Type	Measured Loss			
Cylinder Volume	215.00	L		
Loss	1.73	kWh/day		
Pipes insulation	Fully insulated primary pipework			
31.0 Thermal Store	None			
32.0 Photovoltaic Unit	One Dwelling			
PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
1.15	South	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 91	