



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 6 Haines Crescent, West End
Southampton, SO30 3LG

Contact: Tobias Whiting
Abacus Energy (UK) Ltd
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Report Issue Date: 29/03/2022

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Plot 81			Issued on Date	29/03/2022
Assessment Reference	As Built	Prop Type Ref	D (HA/AR)		
Property	6 Haines Crescent, West End, Southampton, SO30 3LG				
SAP Rating	87 B	DER	14.50	TER	18.86
Environmental	90 B	% DER<TER	23.12		
CO ₂ Emissions (t/year)	0.76	DFEE	43.73	TFEE	51.70
General Requirements Compliance	Pass	% DFEE<TFEE	15.42		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.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)	18.86	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.50	kgCO ₂ /m ²	Pass
	-4.36 (-23.1%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	51.70	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	43.73	kWh/m ² /yr	
	-8.0 (-15.5%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.11 (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 30Si Compact ErP
Combi boiler
Efficiency: 89.8% SEDBUK2009
Minimum: 88.0%

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Programmer, room thermostat and TRVs

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100 %

Minimum

75 %

Pass

8 Mechanical ventilation

Continuous extract system

Specific fan power

0.30

Maximum

0.7

Pass

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 East

3.43 m², No overhang

Windows facing South East

1.32 m², No overhang

Windows facing South West

7.49 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

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

4.11 (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
Photovoltaic array	0.64	kW

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THERMAL BRIDGING

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SAP Rating	87 B	DER	14.50
Environmental	90 B	TER	18.86
CO ₂ Emissions (t/year)	0.76	% DER<TER	23.12
General Requirements Compliance	Pass	DFEE	43.73
		TFEE	51.70
		% DFEE<TFEE	15.42
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com		Assessor ID
			E477-0001
Client	Foreman Homes, FORE		

	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.053	10.13	0.54	CD0025
External wall	E3 Sill	Independently assessed	0.034	7.61	0.26	CD0027
External wall	E4 Jamb	Independently assessed	0.039	27.30	1.06	CD0028
External wall	E5 Ground floor (normal)	Independently assessed	0.060	16.79	1.01	CBA0302
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	16.79	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	8.40	0.50	
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.054	8.50	0.46	CD0031
External wall	E16 Corner (normal)	Independently assessed	0.050	10.10	0.51	CD0035
External wall	E18 Party wall between dwellings	Table K1 - Approved	0.060	10.10	0.61	
Party wall	P1 Party wall - Ground floor	Table K1 - Default	0.160	8.50	1.36	
Party wall	P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	0.000	8.50	0.00	
Party wall	P4 Party wall - Roof (insulation at ceiling level)	Table K1 - Default	0.240	8.50	2.04	CD0020

Total: **8.34** W/mK:
Y-Value: **0.053** W/m²K:

FULL SAP CALCULATION PRINTOUT

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FULL SAP CALCULATION PRINTOUT

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

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DWELLING AS BUILT

Semi-Detached House, total floor area 71 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) 18.86 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 14.50 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)51.7 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)43.7 kWh/m²/yrOK

2 Fabric U-values

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 4.11 (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 30Si Compact ErP

Combi boiler

Efficiency: 89.8% SEDBUK2009

Minimum: 88.0% OK

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls:

No cylinder

Boiler interlock

Yes

OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Continuous extract system

Specific fan power: 0.30
Maximum 0.7 OK

9 Summertime temperature

Overheating risk (Southern England): Slight OK

Based on:

Overshading:

Average

Windows facing North East: 3.43 m², No overhang

Windows facing South East: 1.32 m², No overhang

Windows facing South West: 7.49 m², No overhang

Air change rate: 4.00 ach

Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K

Roof U-value 0.10 W/m²K

Floor U-value 0.12 W/m²K

Door U-value 1.10 W/m²K

Photovoltaic array 0.64 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	35.3600 (1b)	x 2.3900 (2b)	= 84.5104 (1b) - (3b)
First floor	35.3600 (1c)	x 2.6700 (2c)	= 94.4112 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.7200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 178.9216 (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					0 * 10 = 0.0000 (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)					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					4.1100
Infiltration rate					0.2055 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)]	=	0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20)	=	0.1747 (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	0.2227	0.2183	0.2140	0.1921	0.1878	0.1659	0.1659	0.1616	0.1747	0.1878	0.1965	0.2052 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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)			12.2400	1.1450	14.0153		(27)
Ground Floor			35.3600	0.1200	4.2432	84.0000	2970.2400 (28a)
Brick and Block	85.2100	14.3600	70.8500	0.2400	17.0040	42.2200	2991.2870 (29a)
Pitched Roof	35.3600		35.3600	0.1000	3.5360	9.1000	321.7760 (30)
Total net area of external elements Aum(A, m ²)			155.9300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	41.1305			(33)
Party Wall 1			42.9200	0.0000	0.0000	70.0000	3004.4000 (32)
GF Stud			59.8200			9.0000	538.3800 (32c)
First Floor			74.8600			9.0000	673.7400 (32c)
Internal Floor 1			35.3600			18.0000	636.4800 (32d)
Internal Ceiling 1			35.3600			18.0000	636.4800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	11772.7830 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							166.4703 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.3417 (36)
Total fabric heat loss						(33) + (36) =	49.4722 (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	29.5221	29.5221	29.5221	29.5221	29.5221	29.5221	29.5221	29.5221	29.5221	29.5221	29.5221	29.5221 (38)
Average = Sum(39)m / 12 =	78.9943	78.9943	78.9943	78.9943	78.9943	78.9943	78.9943	78.9943	78.9943	78.9943	78.9943	78.9943 (39)
HLP	1.1170	1.1170	1.1170	1.1170	1.1170	1.1170	1.1170	1.1170	1.1170	1.1170	1.1170	1.1170 (40)
HLP (average)												1.1170 (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												2.2635 (42)
Average daily hot water use (litres/day)												87.9576 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy conte	96.7533	93.2350	89.7167	86.1984	82.6801	79.1618	79.1618	82.6801	86.1984	89.7167	93.2350	96.7533 (44)
143.4824	125.4906	129.4951	112.8970	108.3273	93.4782	86.6213	99.3992	100.5864	117.2237	127.9589	138.9551 (45)	
Energy content (annual)												
Distribution loss (46)m = 0.15 x (45)m												1383.9153 (45)
21.5224	18.8236	19.4243	16.9345	16.2491	14.0217	12.9932	14.9099	15.0880	17.5836	19.1938	20.8433 (46)	
Water storage loss:												
Total storage loss												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)	
If cylinder contains dedicated solar storage												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)	
Combi loss	31.2139	28.1772	31.1708	30.1366	31.1203	30.0923	31.0804	31.1062	30.1164	31.1499	30.1784	31.2055 (61)
Total heat required for water heating calculated for each month												
174.6963	153.6679	160.6659	143.0336	139.4476	123.5705	117.7017	130.5055	130.7028	148.3736	158.1372	170.1606 (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 (63)	
Output from w/h												
174.6963	153.6679	160.6659	143.0336	139.4476	123.5705	117.7017	130.5055	130.7028	148.3736	158.1372	170.1606 (64)	
Heat gains from water heating, kWh/month												
55.5114	48.7699	50.8498	45.0724	43.7989	38.6046	36.5717	40.8268	40.9741	46.7644	50.0909	54.0039 (65)	

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
113.1739	113.1739	113.1739	113.1739	113.1739	113.1739	113.1739	113.1739	113.1739	113.1739	113.1739	113.1739	113.1739 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
18.2366	16.1976	13.1728	9.9726	7.4547	6.2935	6.8004	8.8394	11.8642	15.0644	17.5824	18.7435 (67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
198.9716	201.0363	195.8333	184.7568	170.7747	157.6334	148.8543	146.7896	151.9926	163.0691	177.0512	190.1925 (68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
34.3174	34.3174	34.3174	34.3174	34.3174	34.3174	34.3174	34.3174	34.3174	34.3174	34.3174	34.3174 (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 (70)	
Losses e.g. evaporation (negative values) (Table 5)												
-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391 (71)	
Water heating gains (Table 5)												
74.6121	72.5743	68.3465	62.6005	58.8695	53.6175	49.1555	54.8747	56.9084	62.8553	69.5707	72.5859 (72)	
Total internal gains												
351.7725	349.7604	337.3048	317.2821	297.0510	277.4966	264.7623	270.4559	280.7174	300.9410	324.1565	341.4740 (73)	

6. Solar gains

[Jan]												
	Area	Solar flux	g	Specific data	FF	Access	Gains					
	m2	Table 6a	W/m2	or Table 6b	Specific data	factor	W					
					or Table 6c	Table 6d						
Northeast	3.4300	11.2829	0.6300	0.7000	0.7700	11.8274 (75)						
Southeast	1.3200	36.7938	0.6300	0.7000	0.7700	14.8430 (77)						
Southwest	7.4900	36.7938	0.6300	0.7000	0.7700	84.2226 (79)						
Solar gains	110.8929	192.8203	274.2601	357.3122	416.1842	420.1968	357.1976	302.8529	215.9210	133.5396	94.4383 (83)	
Total gains	462.6654	542.5807	611.5650	674.5944	713.2351	697.6935	666.9545	627.6534	583.5703	516.8620	435.9124 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	41.3982	41.3982	41.3982	41.3982	41.3982	41.3982	41.3982	41.3982	41.3982	41.3982	41.3982	41.3982
alpha	3.7599	3.7599	3.7599	3.7599	3.7599	3.7599	3.7599	3.7599	3.7599	3.7599	3.7599	3.7599
util living area												
	0.9873	0.9763	0.9536	0.9020	0.8014	0.6488	0.4986	0.5452	0.7621	0.9270	0.9779	0.9897 (86)
MIT	19.4308	19.6497	19.9770	20.3679	20.7033	20.9038	20.9726	20.9615	20.8175	20.3770	19.8165	19.3703 (87)
Th 2	19.9870	19.9870	19.9870	19.9870	19.9870	19.9870	19.9870	19.9870	19.9870	19.9870	19.9870	19.9870 (88)
util rest of house												
	0.9844	0.9710	0.9431	0.8790	0.7548	0.5690	0.3933	0.4387	0.6925	0.9050	0.9721	0.9874 (89)
MIT 2	18.5610	18.7771	19.0979	19.4723	19.7754	19.9350	19.9774	19.9724	19.8762	19.4888	18.9443	18.5010 (90)
Living area fraction												
MIT	18.7519	18.9686	19.2908	19.6688	19.9790	20.1476	20.1959	20.1895	20.0828	19.6837	19.1357	18.6918 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7519	18.9686	19.2908	19.6688	19.9790	20.1476	20.1959	20.1895	20.0828	19.6837	19.1357	18.6918 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9798	0.9643	0.9342	0.8705	0.7544	0.5825	0.4158	0.4610	0.6999	0.8969	0.9657	0.9834 (94)
Useful gains	453.3177	523.2016	571.3267	587.2497	538.0537	406.3830	277.3507	289.3757	408.4203	463.5783	442.0186	428.6837 (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												
	1141.6138	1111.3416	1010.4026	850.6771	653.9968	438.2266	284.0518	299.3472	472.6043	717.5630	950.7512	1144.7699 (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												
	512.0923	395.2301	326.6725	189.6677	86.2617	0.0000	0.0000	0.0000	0.0000	188.9646	366.2875	532.7681 (98)
Space heating												2597.9445 (98)
Space heating per m2												36.7356 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)											
Fraction of space heat from main system(s)	1.0000 (202)											
Efficiency of main space heating system 1 (in %)	90.7000 (206)											
Efficiency of secondary/supplementary heating system, %	0.0000 (208)											
Space heating requirement	2864.3269 (211)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	512.0923	395.2301	326.6725	189.6677	86.2617	0.0000	0.0000	0.0000	0.0000	188.9646	366.2875	532.7681 (98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000 (210)
Space heating fuel (main heating system)	564.6001	435.7554	360.1682	209.1154	95.1066	0.0000	0.0000	0.0000	0.0000	208.3402	403.8451	587.3959 (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	174.6963	153.6679	160.6659	143.0336	139.4476	123.5705	117.7017	130.5055	130.7028	148.3736	158.1372	170.1606 (64)
Efficiency of water heater (217)m	89.7293	89.6328	89.4459	89.0714	88.3779	87.0000	87.0000	87.0000	87.0000	89.0345	89.5516	87.0000 (216)
Fuel for water heating, kWh/month	194.6925	171.4415	179.6236	160.5830	157.7856	142.0351	135.2893	150.0063	150.2331	166.6473	176.5879	189.5396 (219)
Water heating fuel used												1974.4649 (219)
Annual totals kWh/year												
Space heating fuel - main system												2864.3269 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.4200)												
mechanical ventilation fans (SFP = 0.4200)												91.6794 (230a)
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												166.6794 (231)
Electricity for lighting (calculated in Appendix L)												322.0645 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 0.64 * 1029 * 1.00) =										-526.9436		-526.9436 (233)
Total delivered energy for all uses												4800.5921 (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	2864.3269	0.2160	618.6946 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1974.4649	0.2160	426.4844 (264)
Space and water heating			1045.1790 (265)
Pumps and fans	166.6794	0.5190	86.5066 (267)
Energy for lighting	322.0645	0.5190	167.1515 (268)
Energy saving/generation technologies			
PV Unit	-526.9436	0.5190	-273.4837 (269)
Total CO2, kg/year			1025.3534 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			14.5000 (273)

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

DER			14.5000 ZC1
Total Floor Area		TFA	70.7200
Assumed number of occupants		N	2.2635
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			16.6723 ZC2
CO2 emissions from cooking, equation (L16)			2.4508 ZC3
Total CO2 emissions			33.6231 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			33.6231 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	35.3600 (1b)	x 2.3900 (2b)	= 84.5104 (1b) - (3b)
First floor	35.3600 (1c)	x 2.6700 (2c)	= 94.4112 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.7200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 178.9216 (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																3 * 10 =	30.0000 (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) =					30.0000	/ (5) =	0.1677 (8)
Pressure test										Yes							
Measured/design AP50										5.0000							
Infiltration rate										0.4177 (18)							
Number of sides sheltered										2 (19)							
Shelter factor										(20) = 1 - [0.075 x (19)] =					0.8500 (20)		
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =					0.3550 (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	0.4527	0.4438	0.4349	0.3905	0.3816	0.3373	0.3373	0.3284	0.3550	0.3816	0.3994	0.4171	(22b)				
Effective ac	0.6024	0.5985	0.5946	0.5763	0.5728	0.5569	0.5569	0.5539	0.5630	0.5728	0.5798	0.5870	(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)			12.2400	1.3258	16.2273		(27)					
Ground Floor			35.3600	0.1300	4.5968		(28a)					
Brick and Block	85.2100	14.3600	70.8500	0.1800	12.7530		(29a)					
Pitched Roof	35.3600		35.3600	0.1300	4.5968		(30)					
Total net area of external elements Aum(A, m2)			155.9300				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.2939		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.1674 (36)					
Total fabric heat loss						(33) + (36) =	49.4613 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 35.5709	Feb 35.3360	Mar 35.1058	Apr 34.0244	May 33.8221	Jun 32.8802	Jul 32.8802	Aug 32.7058	Sep 33.2430	Oct 33.8221	Nov 34.2314	Dec 34.6593 (38)
Heat transfer coeff	85.0322	84.7973	84.5671	83.4857	83.2834	82.3415	82.3415	82.1671	82.7043	83.2834	83.6927	84.1206 (39)
Average = Sum(39)m / 12 =												83.4847 (39)
HLP	Jan 1.2024	Feb 1.1991	Mar 1.1958	Apr 1.1805	May 1.1776	Jun 1.1643	Jul 1.1643	Aug 1.1619	Sep 1.1695	Oct 1.1776	Nov 1.1834	Dec 1.1895 (40)
HLP (average)												1.1805 (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												2.2635 (42)
Average daily hot water use (litres/day)												87.9576 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.7533	93.2350	89.7167	86.1984	82.6801	79.1618	79.1618	82.6801	86.1984	89.7167	93.2350	96.7533 (44)
Energy content (annual)	143.4824	125.4906	129.4951	112.8970	108.3273	93.4782	86.6213	99.3992	100.5864	117.2237	127.9589	138.9551 (45)
Distribution loss	Total = Sum(45)m = 1383.9153 (45)											
	$(46)m = 0.15 \times (45)m$											
	21.5224	18.8236	19.4243	16.9345	16.2491	14.0217	12.9932	14.9099	15.0880	17.5836	19.1938	20.8433 (46)
Water storage loss:												
Total storage loss												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Total heat required for water heating calculated for each month	49.3044	42.9137	45.7187	42.5088	42.1329	39.0387	40.3400	42.1329	42.5088	45.7187	45.9789	49.3044 (61)
Solar input	192.7869	168.4043	175.2138	155.4058	150.4602	132.5169	126.9613	141.5321	143.0952	162.9424	173.9378	188.2595 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	192.7869	168.4043	175.2138	155.4058	150.4602	132.5169	126.9613	141.5321	143.0952	162.9424	173.9378	188.2595 (64)
	60.0340	52.4541	54.4868	48.1654	46.5521	40.8412	38.8866	43.5835	44.0722	50.4066	54.0411	58.5287 (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	113.1739	113.1739	113.1739	113.1739	113.1739	113.1739	113.1739	113.1739	113.1739	113.1739	113.1739	113.1739	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.2366	16.1976	13.1728	9.9726	7.4547	6.2935	6.8004	8.8394	11.8642	15.0644	17.5824	18.7435	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.9716	201.0363	195.8333	184.7568	170.7747	157.6334	148.8543	146.7896	151.9926	163.0691	177.0512	190.1925	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3174	34.3174	34.3174	34.3174	34.3174	34.3174	34.3174	34.3174	34.3174	34.3174	34.3174	34.3174	(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)	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	(71)
Water heating gains (Table 5)	80.6909	78.0566	73.2349	66.8964	62.5700	56.7239	52.2669	58.5799	61.2114	67.7508	75.0570	78.6676	(72)
Total internal gains	357.8513	355.2427	342.1932	321.5781	300.7515	280.6030	267.8738	274.1611	285.0203	305.8364	329.6428	347.5557	(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
Northeast					3.4300	11.2829	0.6300	0.7000			0.7700			11.8274 (75)
Southeast					1.3200	36.7938	0.6300	0.7000			0.7700			14.8430 (77)
Southwest					7.4900	36.7938	0.6300	0.7000			0.7700			84.2226 (79)
Solar gains	110.8929	192.8203	274.2601	357.3122	416.1842	420.1968	402.1922	357.1976	302.8529	215.9210	133.5396	94.4383	(83)	
Total gains	468.7442	548.0630	616.4533	678.8903	716.9356	700.7999	670.0660	631.3586	587.8732	521.7574	463.1824	441.9940	(84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	57.7559	57.9159	58.0736	58.8258	58.9687	59.6432	59.6432	59.7698	59.3816	58.9687	58.6803	58.3818	
alpha	4.8504	4.8611	4.8716	4.9217	4.9312	4.9762	4.9762	4.9847	4.9588	4.9312	4.9120	4.8921	
util living area	0.9969	0.9929	0.9822	0.9487	0.8618	0.6968	0.5287	0.5791	0.8196	0.9656	0.9934	0.9977	(86)
MIT	19.7467	19.9193	20.1825	20.5165	20.7930	20.9488	20.9894	20.9837	20.8824	20.5213	20.0718	19.7181	(87)
Th 2	19.9181	19.9208	19.9234	19.9356	19.9379	19.9486	19.9486	19.9506	19.9445	19.9379	19.9333	19.9284	(88)
util rest of house	0.9958	0.9905	0.9760	0.9300	0.8126	0.6038	0.4086	0.4567	0.7418	0.9493	0.9908	0.9969	(89)
MIT 2	18.2588	18.5118	18.8942	19.3747	19.7376	19.9151	19.9448	19.9441	19.8529	19.3914	18.7441	18.2242	(90)
Living area fraction	18.5853	18.8207	19.1769	19.6253	19.9692	20.1419	20.1741	20.1722	20.0788	19.6393	19.0354	18.5521	(92)
MIT	18.5853	18.8207	19.1769	19.6253	19.9692	20.1419	20.1741	20.1722	20.0788	19.6393	19.0354	18.5521	(93)
Temperature adjustment													
adjusted MIT	18.5853	18.8207	19.1769	19.6253	19.9692	20.1419	20.1741	20.1722	20.0788	19.6393	19.0354	18.5521	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9939	0.9870	0.9702	0.9232	0.8143	0.6221	0.4351	0.4836	0.7530	0.9432	0.9876	0.9953	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1214.7112	1180.4339	1072.0525	895.4101	688.6895	456.3311	294.2939	309.9520	494.4732	752.8266	998.9094	1207.3035	(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	557.1207	429.7421	352.6530	193.4467	78.0567	0.0000	0.0000	0.0000	0.0000	193.9601	389.8696	570.9223	(98)
Space heating												2765.7712	(98)
Space heating per m2												39.1088	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2961.2111 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	557.1207	429.7421	352.6530	193.4467	78.0567	0.0000	0.0000	0.0000	0.0000	193.9601	389.8696	570.9223	(98)
Space heating efficiency (main heating system 1)	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000	(210)
Space heating fuel (main heating system)	596.4890	460.1094	377.5728	207.1164	83.5724	0.0000	0.0000	0.0000	0.0000	207.6660	417.4193	611.2658	(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	192.7869	168.4043	175.2138	155.4058	150.4602	132.5169	126.9613	141.5321	143.0952	162.9424	173.9378	188.2595	(64)
Efficiency of water heater (217)m	87.5685	87.3082	86.7771	85.6035	83.4861	80.3000	80.3000	80.3000	80.3000	85.4908	87.0232	80.3000	(216)
Fuel for water heating, kWh/month	220.1556	192.8848	201.9124	181.5413	180.2219	165.0273	158.1088	176.2542	178.2007	190.5964	199.8752	214.7470	(219)
Water heating fuel used												2259.5257	(219)
Annual totals kWh/year													
Space heating fuel - main system												2961.2111	(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)												322.0645	(232)
Total delivered energy for all uses												5617.8013	(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	2961.2111	0.2160	639.6216 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2259.5257	0.2160	488.0575 (264)
Space and water heating			1127.6791 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	322.0645	0.5190	167.1515 (268)
Total CO2, kg/m2/year			1333.7556 (272)
Emissions per m2 for space and water heating			15.9457 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3636 (272b)
Emissions per m2 for pumps and fans			0.5504 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.9457 * 1.00) + 2.3636 + 0.5504, rounded to 2 d.p.			18.8600 (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	35.3600 (1b)	x 2.3900 (2b)	= 84.5104 (1b) - (3b)
First floor	35.3600 (1c)	x 2.6700 (2c)	= 94.4112 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.7200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 178.9216 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (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)					30.0000 / (5) = 0.1677 (8)
Pressure test					Yes
Measured/design AP50					4.1100
Infiltration rate					0.3732 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3172 (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	0.4044	0.3965	0.3886	0.3489	0.3410	0.3013	0.3013	0.2934	0.3172	0.3410	0.3568	0.3727 (22b)
Effective ac	0.5818	0.5786	0.5755	0.5609	0.5581	0.5454	0.5454	0.5430	0.5503	0.5581	0.5637	0.5695 (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)			12.2400	1.1450	14.0153		(27)
Ground Floor			35.3600	0.1200	4.2432	84.0000	2970.2400 (28a)
Brick and Block	85.2100	14.3600	70.8500	0.2400	17.0040	42.2200	2991.2870 (29a)
Pitched Roof	35.3600		35.3600	0.1000	3.5360	9.1000	321.7760 (30)
Total net area of external elements Aum(A, m ²)			155.9300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.1305		(33)
Party Wall 1			42.9200	0.0000	0.0000	70.0000	3004.4000 (32)
GF Stud			59.8200			9.0000	538.3800 (32c)
First Floor			74.8600			9.0000	673.7400 (32c)
Internal Floor 1			35.3600			18.0000	636.4800 (32d)
Internal Ceiling 1			35.3600			9.0000	318.2400 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 11454.5430 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 161.9703 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.3417 (36)
Total fabric heat loss (33) + (36) = 49.4722 (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	34.3507	34.1632	33.9794	33.1161	32.9546	32.2028	32.2028	32.0635	32.4924	32.9546	33.2814	33.6229 (38)
Heat transfer coeff	83.8229	83.6354	83.4516	82.5883	82.4268	81.6750	81.6750	81.5357	81.9646	82.4268	82.7536	83.0951 (39)
Average = Sum(39)m / 12 =												82.5876 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1853	1.1826	1.1800	1.1678	1.1655	1.1549	1.1549	1.1529	1.1590	1.1655	1.1702	1.1750 (40)
HLP (average)												1.1678 (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												2.2635 (42)
Average daily hot water use (litres/day)												87.9576 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.7533	93.2350	89.7167	86.1984	82.6801	79.1618	79.1618	82.6801	86.1984	89.7167	93.2350	96.7533 (44)
Energy conte	143.4824	125.4906	129.4951	112.8970	108.3273	93.4782	86.6213	99.3992	100.5864	117.2237	127.9589	138.9551 (45)
Energy content (annual)										Total = Sum(45)m =		1383.9153 (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	30.4900	26.6668	27.5177	23.9906	23.0196	19.8641	18.4070	21.1223	21.3746	24.9100	27.1913	29.5279 (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	113.1739	113.1739	113.1739	113.1739	113.1739	113.1739	113.1739	113.1739	113.1739	113.1739	113.1739	113.1739	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.2366	16.1976	13.1728	9.9726	7.4547	6.2935	6.8004	8.8394	11.8642	15.0644	17.5824	18.7435	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.9716	201.0363	195.8333	184.7568	170.7747	157.6334	148.8543	146.7896	151.9926	163.0691	177.0512	190.1925	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3174	34.3174	34.3174	34.3174	34.3174	34.3174	34.3174	34.3174	34.3174	34.3174	34.3174	34.3174	(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)	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	(71)
Water heating gains (Table 5)	40.9812	39.6827	36.9862	33.3203	30.9403	27.5891	24.7406	28.3902	29.6870	33.4812	37.7656	39.6881	(72)
Total internal gains	315.1416	313.8688	302.9444	285.0019	266.1218	248.4682	237.3475	240.9714	250.4959	268.5669	289.3514	305.5762	(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

Northeast				3.4300	11.2829		0.6300		0.7000		0.7700	11.8274 (75)
Southeast				1.3200	36.7938		0.6300		0.7000		0.7700	14.8430 (77)
Southwest				7.4900	36.7938		0.6300		0.7000		0.7700	84.2226 (79)

Solar gains	110.8929	192.8203	274.2601	357.3122	416.1842	420.1968	402.1922	357.1976	302.8529	215.9210	133.5396	94.4383 (83)
Total gains	426.0346	506.6891	577.2046	642.3141	682.3059	668.6650	639.5397	598.1689	553.3488	484.4879	422.8910	400.0145 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	37.9588	38.0439	38.1277	38.5262	38.6017	38.9571	38.9571	39.0236	38.8194	38.6017	38.4493	38.2913	
alpha	3.5306	3.5363	3.5418	3.5684	3.5734	3.5971	3.5971	3.6016	3.5880	3.5734	3.5633	3.5528	
util living area	0.9895	0.9801	0.9606	0.9149	0.8244	0.6779	0.5286	0.5777	0.7905	0.9389	0.9819	0.9916	(86)
MIT	19.2156	19.4487	19.8027	20.2458	20.6259	20.8724	20.9608	20.9458	20.7647	20.2625	19.6542	19.1724	(87)
Th 2	19.9318	19.9339	19.9360	19.9458	19.9477	19.9562	19.9562	19.9578	19.9529	19.9477	19.9439	19.9401	(88)
util rest of house	0.9871	0.9756	0.9514	0.8941	0.7799	0.5969	0.4168	0.4658	0.7232	0.9196	0.9771	0.9896	(89)
MIT 2	18.3089	18.5412	18.8911	19.3266	19.6770	19.8858	19.9423	19.9368	19.8068	19.3520	18.7544	18.2722	(90)
Living area fraction	18.5079	18.7404	19.0912	19.5284	19.8852	20.1023	20.1658	20.1582	20.0170	19.5518	18.9519	18.4697	(91)
Temperature adjustment	18.5079	18.7404	19.0912	19.5284	19.8852	20.1023	20.1658	20.1582	20.0170	19.5518	18.9519	18.4697	(92)
adjusted MIT	18.5079	18.7404	19.0912	19.5284	19.8852	20.1023	20.1658	20.1582	20.0170	19.5518	18.9519	18.4697	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	418.7049	490.9763	543.8408	567.9252	530.1075	407.3454	281.6150	292.3455	402.7477	441.1590	410.6216	394.3930	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1190.9445	1157.5434	1050.7538	877.7779	674.6810	449.4008	291.2382	306.4302	484.9880	737.8709	980.7858	1185.7459	(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	574.5463	447.9331	377.1433	223.0939	107.5627	0.0000	0.0000	0.0000	0.0000	220.7536	410.5182	588.7666	(98)
Space heating												2950.3176	(98)
Space heating per m2												41.7183	(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	767.7446	604.3947	619.6715	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8269	0.8869	0.8638	0.0000	0.0000	0.0000	0.0000	(101)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	634.8391	536.0159	535.2843	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	865.8498	830.1209	783.1952	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	166.3277	218.8141	184.4457	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												569.5875 (104)
Cooled fraction									FC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	41.5819	54.7035	46.1114	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												142.3969 (107)
Space cooling per m2												2.0135 (108)
Energy for space heating												41.7183 (99)
Energy for space cooling												2.0135 (108)
Total												43.7318 (109)
Dwelling Fabric Energy Efficiency (DFEE)												43.7 (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	35.3600 (1b)	x 2.3900 (2b)	= 84.5104 (1b) - (3b)
First floor	35.3600 (1c)	x 2.6700 (2c)	= 94.4112 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.7200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 178.9216 (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																3 * 10 =	30.0000 (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) =					30.0000	/ (5) =	0.1677 (8)
Pressure test										Yes							
Measured/design AP50										5.0000							
Infiltration rate										0.4177 (18)							
Number of sides sheltered										2 (19)							
Shelter factor										(20) = 1 - [0.075 x (19)] =					0.8500 (20)		
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =					0.3550 (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	0.4527	0.4438	0.4349	0.3905	0.3816	0.3373	0.3373	0.3284	0.3550	0.3816	0.3994	0.4171	(22b)				
Effective ac	0.6024	0.5985	0.5946	0.5763	0.5728	0.5569	0.5569	0.5539	0.5630	0.5728	0.5798	0.5870	(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)			12.2400	1.3258	16.2273		(27)					
Ground Floor			35.3600	0.1300	4.5968		(28a)					
Brick and Block	85.2100	14.3600	70.8500	0.1800	12.7530		(29a)					
Pitched Roof	35.3600		35.3600	0.1300	4.5968		(30)					
Total net area of external elements Aum(A, m2)			155.9300				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.2939		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.1674 (36)					
Total fabric heat loss						(33) + (36) =	49.4613 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 35.5709	Feb 35.3360	Mar 35.1058	Apr 34.0244	May 33.8221	Jun 32.8802	Jul 32.8802	Aug 32.7058	Sep 33.2430	Oct 33.8221	Nov 34.2314	Dec 34.6593 (38)
Heat transfer coeff	85.0322	84.7973	84.5671	83.4857	83.2834	82.3415	82.3415	82.1671	82.7043	83.2834	83.6927	84.1206 (39)
Average = Sum(39)m / 12 =												83.4847 (39)
HLP	Jan 1.2024	Feb 1.1991	Mar 1.1958	Apr 1.1805	May 1.1776	Jun 1.1643	Jul 1.1643	Aug 1.1619	Sep 1.1695	Oct 1.1776	Nov 1.1834	Dec 1.1895 (40)
HLP (average)												1.1805 (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												2.2635 (42)
Average daily hot water use (litres/day)												87.9576 (43)
Daily hot water use	Jan 96.7533	Feb 93.2350	Mar 89.7167	Apr 86.1984	May 82.6801	Jun 79.1618	Jul 79.1618	Aug 82.6801	Sep 86.1984	Oct 89.7167	Nov 93.2350	Dec 96.7533 (44)
Energy conte	143.4824	125.4906	129.4951	112.8970	108.3273	93.4782	86.6213	99.3992	100.5864	117.2237	127.9589	138.9551 (45)
Energy content (annual)										Total = Sum(45)m =		1383.9153 (45)
Distribution loss (46)m = 0.15 x (45)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

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Calculation Type: New Build (As Built)

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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	0.0000 (57)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
	30.4900	26.6668	27.5177	23.9906	23.0196	19.8641	18.4070	21.1223	21.3746	24.9100	27.1913	29.5279	(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	113.1739	113.1739	113.1739	113.1739	113.1739	113.1739	113.1739	113.1739	113.1739	113.1739	113.1739	113.1739	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.2366	16.1976	13.1728	9.9726	7.4547	6.2935	6.8004	8.8394	11.8642	15.0644	17.5824	18.7435	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.9716	201.0363	195.8333	184.7568	170.7747	157.6334	148.8543	146.7896	151.9926	163.0691	177.0512	190.1925	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3174	34.3174	34.3174	34.3174	34.3174	34.3174	34.3174	34.3174	34.3174	34.3174	34.3174	34.3174	(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)	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	(71)
Water heating gains (Table 5)	40.9812	39.6827	36.9862	33.3203	30.9403	27.5891	24.7406	28.3902	29.6870	33.4812	37.7656	39.6881	(72)
Total internal gains	315.1416	313.8688	302.9444	285.0019	266.1218	248.4682	237.3475	240.9714	250.4959	268.5669	289.3514	305.5762	(73)

6. Solar gains													

[Jan]				Area	Solar flux		g	FF		Access		Gains	
				m2	Table 6a		Specific data	Specific data		factor		W	
					W/m2		or Table 6b	or Table 6c		Table 6d			
Northeast				3.4300	11.2829		0.6300	0.7000		0.7700		11.8274	(75)
Southeast				1.3200	36.7938		0.6300	0.7000		0.7700		14.8430	(77)
Southwest				7.4900	36.7938		0.6300	0.7000		0.7700		84.2226	(79)

Solar gains	110.8929	192.8203	274.2601	357.3122	416.1842	420.1968	402.1922	357.1976	302.8529	215.9210	133.5396	94.4383	(83)
Total gains	426.0346	506.6891	577.2046	642.3141	682.3059	668.6650	639.5397	598.1689	553.3488	484.4879	422.8910	400.0145	(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	57.7559	57.9159	58.0736	58.8258	58.9687	59.6432	59.6432	59.7698	59.3816	58.9687	58.6803	58.3818	
alpha	4.8504	4.8611	4.8716	4.9217	4.9312	4.9762	4.9762	4.9847	4.9588	4.9312	4.9120	4.8921	
util living area	0.9980	0.9949	0.9864	0.9579	0.8794	0.7208	0.5515	0.6067	0.8447	0.9741	0.9956	0.9985	(86)
MIT	19.6913	19.8665	20.1349	20.4785	20.7694	20.9404	20.9873	20.9800	20.8634	20.4791	20.0202	19.6633	(87)
Th 2	19.9181	19.9208	19.9234	19.9356	19.9379	19.9486	19.9486	19.9506	19.9445	19.9379	19.9333	19.9284	(88)
util rest of house	0.9973	0.9932	0.9814	0.9418	0.8337	0.6280	0.4274	0.4807	0.7714	0.9611	0.9937	0.9980	(89)
MIT 2	18.7300	18.9066	19.1744	19.5178	19.7830	19.9215	19.9455	19.9450	19.8697	19.5256	19.0703	18.7103	(90)
Living area fraction									fLA = Living area / (4) =			0.2195	(91)
MIT	18.9410	19.1173	19.3852	19.7286	19.9995	20.1451	20.1741	20.1722	20.0878	19.7348	19.2787	18.9194	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9410	19.1173	19.3852	19.7286	19.9995	20.1451	20.1741	20.1722	20.0878	19.7348	19.2787	18.9194	(93)

8. Space heating requirement													

Utilisation	0.9964	0.9914	0.9782	0.9380	0.8367	0.6467	0.4549	0.5086	0.7829	0.9579	0.9922	0.9973	(94)
Useful gains	424.4876	502.3170	564.6192	602.4691	570.9153	432.4246	290.9245	304.2002	433.2067	464.0732	419.5860	398.9367	(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	1244.9547	1205.5856	1089.6615	904.0357	691.2082	456.5907	294.2963	309.9475	495.2159	760.7807	1019.2713	1238.2062	(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	610.4275	472.5965	390.6315	217.1280	89.4979	0.0000	0.0000	0.0000	0.0000	220.7504	431.7734	624.4165	(98)
Space heating												3057.2217	(98)
Space heating per m2												43.2299	(99)

8c. Space cooling requirement													

Calculated for June, July and August. See Table 10b													
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	774.0100	609.3270	624.4698	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8757	0.9322	0.9117	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	677.7841	568.0320	569.3244	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	865.8498	830.1209	783.1952	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	135.4073	194.9941	159.1199	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												489.5213	(104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Cooled fraction											FC = cooled area / (4) =	1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	33.8518	48.7485	39.7800	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												122.3803 (107)
Space cooling per m2												1.7305 (108)
Energy for space heating												43.2299 (99)
Energy for space cooling												1.7305 (108)
Total												44.9604 (109)
Target Fabric Energy Efficiency (TFEE)												51.7 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	35.3600 (1b)	x 2.3900 (2b)	= 84.5104 (1b) - (3b)
First floor	35.3600 (1c)	x 2.6700 (2c)	= 94.4112 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.7200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 178.9216 (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					0 * 10 = 0.0000 (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) =					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					4.1100
Infiltration rate					0.2055 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.1747 (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	0.2052	0.1921	0.1921	0.1747	0.1790	0.1703	0.1703	0.1659	0.1659	0.1790	0.1747	0.1790 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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)			12.2400	1.1450	14.0153		(27)
Ground Floor			35.3600	0.1200	4.2432	84.0000	2970.2400 (28a)
Brick and Block	85.2100	14.3600	70.8500	0.2400	17.0040	42.2200	2991.2870 (29a)
Pitched Roof	35.3600		35.3600	0.1000	3.5360	9.1000	321.7760 (30)
Total net area of external elements Aum(A, m ²)			155.9300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	41.1305			(33)
Party Wall 1			42.9200	0.0000	0.0000	70.0000	3004.4000 (32)
GF Stud			59.8200			9.0000	538.3800 (32c)
First Floor			74.8600			9.0000	673.7400 (32c)
Internal Floor 1			35.3600			18.0000	636.4800 (32d)
Internal Ceiling 1			35.3600			18.0000	636.4800 (32e)
Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =	11772.7830			(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							166.4703 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.3417 (36)
Total fabric heat loss			(33) + (36) =	49.4722			(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	29.5221	29.5221	29.5221	29.5221	29.5221	29.5221	29.5221	29.5221	29.5221	29.5221	29.5221	29.5221 (38)
Average = Sum(39)m / 12 =	78.9943	78.9943	78.9943	78.9943	78.9943	78.9943	78.9943	78.9943	78.9943	78.9943	78.9943	78.9943 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1170	1.1170	1.1170	1.1170	1.1170	1.1170	1.1170	1.1170	1.1170	1.1170	1.1170	1.1170 (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												2.2635 (42)
Average daily hot water use (litres/day)												87.9576 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Energy conte	96.7533	93.2350	89.7167	86.1984	82.6801	79.1618	79.1618	82.6801	86.1984	89.7167	93.2350	96.7533 (44)
Energy content (annual)	143.4824	125.4906	129.4951	112.8970	108.3273	93.4782	86.6213	99.3992	100.5864	117.2237	127.9589	138.9551 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum (45)m =		1383.9153 (45)
	21.5224	18.8236	19.4243	16.9345	16.2491	14.0217	12.9932	14.9099	15.0880	17.5836	19.1938	20.8433 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	31.2139	28.1772	31.1708	30.1366	31.1203	30.0923	31.0804	31.1062	30.1164	31.1499	30.1784	31.2055 (61)
Total heat required for water heating calculated for each month	174.6963	153.6679	160.6659	143.0336	139.4476	123.5705	117.7017	130.5055	130.7028	148.3736	158.1372	170.1606 (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	174.6963	153.6679	160.6659	143.0336	139.4476	123.5705	117.7017	130.5055	130.7028	148.3736	158.1372	170.1606 (64)
RHI water heating demand												
Heat gains from water heating, kWh/month	55.5114	48.7699	50.8498	45.0724	43.7989	38.6046	36.5717	40.8268	40.9741	46.7644	50.0909	54.0039 (65)
												1751 (64)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	135.8086	135.8086	135.8086	135.8086	135.8086	135.8086	135.8086	135.8086	135.8086	135.8086	135.8086	135.8086 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	45.5916	40.4940	32.9320	24.9316	18.6367	15.7339	17.0010	22.0985	29.6606	37.6609	43.9559	46.8587 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	296.9726	300.0542	292.2886	275.7564	254.8876	235.2738	222.1706	219.0889	226.8546	243.3867	264.2556	283.8694 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.8443	50.8443	50.8443	50.8443	50.8443	50.8443	50.8443	50.8443	50.8443	50.8443	50.8443	50.8443 (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)	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391 (71)
Water heating gains (Table 5)	74.6121	72.5743	68.3465	62.6005	58.8695	53.6175	49.1555	54.8747	56.9084	62.8553	69.5707	72.5859 (72)
Total internal gains	516.2901	512.2364	492.6810	462.4025	431.5076	403.7390	387.4409	395.1761	412.5375	443.0169	476.8961	502.4279 (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	
Northeast				3.4300	14.6130	0.6300	0.7000	0.7700		15.3182 (75)	
Southeast				1.3200	45.0642	0.6300	0.7000	0.7700		18.1793 (77)	
Southwest				7.4900	45.0642	0.6300	0.7000	0.7700		103.1538 (79)	
Solar gains	136.6512	202.5767	294.5946	387.7825	427.1216	478.0792	439.3048	405.5472	245.1024	164.0832	110.1322 (83)
Total gains	652.9413	714.8132	787.2755	850.1850	858.6292	881.8182	826.7457	800.7233	688.1193	640.9793	612.5601 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	41.3982	41.3982	41.3982	41.3982	41.3982	41.3982	41.3982	41.3982	41.3982	41.3982	41.3982	41.3982
alpha	3.7599	3.7599	3.7599	3.7599	3.7599	3.7599	3.7599	3.7599	3.7599	3.7599	3.7599	3.7599
util living area	0.9529	0.9348	0.8886	0.7949	0.6502	0.4435	0.3125	0.3128	0.5513	0.7983	0.9191	0.9601 (86)
MIT	19.9186	20.0598	20.3469	20.6630	20.8803	20.9785	20.9957	20.9959	20.9513	20.7203	20.2896	19.8710 (87)
Th 2	19.9870	19.9870	19.9870	19.9870	19.9870	19.9870	19.9870	19.9870	19.9870	19.9870	19.9870	19.9870 (88)
util rest of house	0.9430	0.9215	0.8662	0.7552	0.5865	0.3608	0.2180	0.2152	0.4642	0.7490	0.8996	0.9514 (89)
MIT 2	19.0394	19.1751	19.4473	19.7341	19.9134	19.9784	19.9861	19.9862	19.9645	19.7911	19.3995	18.9939 (90)
Living area fraction									fLA = Living area / (4) =			0.2195 (91)
MIT	19.2323	19.3692	19.6447	19.9379	20.1256	20.1979	20.2077	20.2078	20.1811	19.9951	19.5948	19.1864 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2323	19.3692	19.6447	19.9379	20.1256	20.1979	20.2077	20.2078	20.1811	19.9951	19.5948	19.1864 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9339	0.9117	0.8575	0.7531	0.5957	0.3784	0.2388	0.2367	0.4817	0.7494	0.8906	0.9428 (94)
Ext temp.	609.7768	651.7276	675.0966	640.2408	511.4921	333.6762	197.3932	189.5479	363.1215	515.7014	570.8860	577.5459 (95)
Heat loss rate W	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)
Month fracti	1076.8768	1056.0917	951.4661	777.1406	554.9801	339.5078	198.0937	190.2006	377.6771	623.6641	868.5284	1065.3453 (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)
RHI space heating demand	347.5224	271.7327	205.6189	98.5678	32.3551	0.0000	0.0000	0.0000	0.0000	80.3242	214.3025	362.9228 (98)
												1613.3465 (98)
												1613 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	35.3600 (1b)	x 2.3900 (2b)	= 84.5104 (1b) - (3b)
First floor	35.3600 (1c)	x 2.6700 (2c)	= 94.4112 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.7200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 178.9216 (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					0 * 10 = 0.0000 (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)					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					4.1100
Infiltration rate					0.2055 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)]	=	0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20)	=	0.1747 (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	0.2227	0.2183	0.2140	0.1921	0.1878	0.1659	0.1659	0.1616	0.1747	0.1878	0.1965	0.2052 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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)			12.2400	1.1450	14.0153		(27)
Ground Floor			35.3600	0.1200	4.2432	84.0000	2970.2400 (28a)
Brick and Block	85.2100	14.3600	70.8500	0.2400	17.0040	42.2200	2991.2870 (29a)
Pitched Roof	35.3600		35.3600	0.1000	3.5360	9.1000	321.7760 (30)
Total net area of external elements Aum(A, m ²)			155.9300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	41.1305			(33)
Party Wall 1			42.9200	0.0000	0.0000	70.0000	3004.4000 (32)
GF Stud			59.8200			9.0000	538.3800 (32c)
First Floor			74.8600			9.0000	673.7400 (32c)
Internal Floor 1			35.3600			18.0000	636.4800 (32d)
Internal Ceiling 1			35.3600			18.0000	636.4800 (32e)
Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =	11772.7830			(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							166.4703 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.3417 (36)
Total fabric heat loss			(33) + (36) =	49.4722			(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	29.5221	29.5221	29.5221	29.5221	29.5221	29.5221	29.5221	29.5221	29.5221	29.5221	29.5221	29.5221 (38)
Heat transfer coeff	78.9943	78.9943	78.9943	78.9943	78.9943	78.9943	78.9943	78.9943	78.9943	78.9943	78.9943	78.9943 (39)
Average = Sum(39)m / 12 =												78.9943 (39)
HLP	1.1170	1.1170	1.1170	1.1170	1.1170	1.1170	1.1170	1.1170	1.1170	1.1170	1.1170	1.1170 (40)
HLP (average)												1.1170 (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	2.2635 (42)
Average daily hot water use (litres/day)	87.9576 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												

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Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Energy conte	96.7533	93.2350	89.7167	86.1984	82.6801	79.1618	79.1618	82.6801	86.1984	89.7167	93.2350	96.7533 (44)
143.4824	125.4906	129.4951	112.8970	108.3273	93.4782	86.6213	99.3992	100.5864	117.2237	127.9589	138.9551 (45)	138.9551 (45)
Energy content (annual)	Total = Sum (45)m = 1383.9153 (45)											
Distribution loss (46)m = 0.15 x (45)m	21.5224	18.8236	19.4243	16.9345	16.2491	14.0217	12.9932	14.9099	15.0880	17.5836	19.1938	20.8433 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	31.2139	28.1772	31.1708	30.1366	31.1203	30.0923	31.0804	31.1062	30.1164	31.1499	30.1784	31.2055 (61)
Total heat required for water heating calculated for each month	174.6963	153.6679	160.6659	143.0336	139.4476	123.5705	117.7017	130.5055	130.7028	148.3736	158.1372	170.1606 (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	174.6963	153.6679	160.6659	143.0336	139.4476	123.5705	117.7017	130.5055	130.7028	148.3736	158.1372	170.1606 (64)
Heat gains from water heating, kWh/month	55.5114	48.7699	50.8498	45.0724	43.7989	38.6046	36.5717	40.8268	40.9741	46.7644	50.0909	54.0039 (65)
Total per year (kWh/year) = Sum (64)m = 1750.6632 (64)												

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	135.8086	135.8086	135.8086	135.8086	135.8086	135.8086	135.8086	135.8086	135.8086	135.8086	135.8086	135.8086	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	45.5916	40.4940	32.9320	24.9316	18.6367	15.7339	17.0010	22.0985	29.6606	37.6609	43.9559	46.8587	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	296.9726	300.0542	292.2886	275.7564	254.8876	235.2738	222.1706	219.0889	226.8546	243.3867	264.2556	283.8694	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.8443	50.8443	50.8443	50.8443	50.8443	50.8443	50.8443	50.8443	50.8443	50.8443	50.8443	50.8443	(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)	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	(71)
Water heating gains (Table 5)	74.6121	72.5743	68.3465	62.6005	58.8695	53.6175	49.1555	54.8747	56.9084	62.8553	69.5707	72.5859	(72)
Total internal gains	516.2901	512.2364	492.6810	462.4025	431.5076	403.7390	387.4409	395.1761	412.5375	443.0169	476.8961	502.4279	(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			
Northeast				3.4300	11.2829	0.6300	0.7000	0.7700	11.8274 (75)			
Southeast				1.3200	36.7938	0.6300	0.7000	0.7700	14.8430 (77)			
Southwest				7.4900	36.7938	0.6300	0.7000	0.7700	84.2226 (79)			
Solar gains	110.8929	192.8203	274.2601	357.3122	416.1842	420.1968	357.1976	302.8529	215.9210	133.5396	94.4383 (83)	
Total gains	627.1830	705.0567	766.9411	819.7147	847.6918	823.9358	789.6332	752.3736	715.3904	658.9379	610.4357	596.8662 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	41.3982	41.3982	41.3982	41.3982	41.3982	41.3982	41.3982	41.3982	41.3982	41.3982	41.3982	41.3982	
alpha	3.7599	3.7599	3.7599	3.7599	3.7599	3.7599	3.7599	3.7599	3.7599	3.7599	3.7599	3.7599	
util living area	0.9670	0.9484	0.9141	0.8459	0.7301	0.5717	0.4287	0.4663	0.6720	0.8671	0.9480	0.9721	(86)
MIT	19.7032	19.9026	20.1915	20.5225	20.7893	20.9372	20.9835	20.9771	20.8830	20.5448	20.0550	19.6410	(87)
Th 2	19.9870	19.9870	19.9870	19.9870	19.9870	19.9870	19.9870	19.9870	19.9870	19.9870	19.9870	19.9870	(88)
util rest of house	0.9603	0.9382	0.8971	0.8152	0.6782	0.4947	0.3350	0.3706	0.5983	0.8338	0.9359	0.9663	(89)
MIT 2	18.8281	19.0220	19.3003	19.6093	19.8419	19.9544	19.9814	19.9787	19.9197	19.6375	19.1741	18.7673	(90)
Living area fraction	19.0201	19.2153	19.4959	19.8097	20.0498	20.1700	20.2013	20.1978	20.1311	19.8366	19.3675	18.9591	(91)
MIT	19.0201	19.2153	19.4959	19.8097	20.0498	20.1700	20.2013	20.1978	20.1311	19.8366	19.3675	18.9591	(92)
Temperature adjustment	19.0201	19.2153	19.4959	19.8097	20.0498	20.1700	20.2013	20.1978	20.1311	19.8366	19.3675	18.9591	(93)
adjusted MIT	19.0201	19.2153	19.4959	19.8097	20.0498	20.1700	20.2013	20.1978	20.1311	19.8366	19.3675	18.9591	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9523	0.9287	0.8874	0.8092	0.6817	0.5092	0.3553	0.3911	0.6096	0.8282	0.9268	0.9589	(94)
Ext temp.	597.2399	654.8200	680.5810	663.3270	577.8446	419.5850	280.5371	294.2476	436.0828	545.7048	565.7370	572.3544	(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	1162.8067	1130.8247	1026.5996	861.8055	659.5898	440.0015	284.4856	300.0067	476.4209	729.6389	969.0596	1165.8813	(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	420.7817	319.8752	257.4378	142.9045	60.8185	0.0000	0.0000	0.0000	0.0000	136.8470	290.3923	441.5841	(98)
Space heating per m2	(98) / (4) = 29.2794 (99)												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2282.9558 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	420.7817	319.8752	257.4378	142.9045	60.8185	0.0000	0.0000	0.0000	0.0000	136.8470	290.3923	441.5841	(98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)
Space heating fuel (main heating system)	463.9269	352.6738	283.8344	157.5574	67.0545	0.0000	0.0000	0.0000	0.0000	150.8787	320.1679	486.8622	(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	174.6963	153.6679	160.6659	143.0336	139.4476	123.5705	117.7017	130.5055	130.7028	148.3736	158.1372	170.1606	(64)
Efficiency of water heater	89.5823	89.4653	89.2416	88.8106	88.0913	87.0000	87.0000	87.0000	87.0000	88.7368	89.3601	89.6396	(216)
(217)m													(217)
Fuel for water heating, kWh/month	195.0120	171.7625	180.0349	161.0545	158.2989	142.0351	135.2893	150.0063	150.2331	167.2064	176.9663	189.8275	(219)
Water heating fuel used												1977.7268	(219)
Annual totals kWh/year													
Space heating fuel - main system												2282.9558	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.4200)													
mechanical ventilation fans (SFP = 0.4200)												91.6794	(230a)
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												166.6794	(231)
Electricity for lighting (calculated in Appendix L)												322.0645	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 + 0.64 * 1029 * 1.00) =										-526.9436		-526.9436	(233)
Total delivered energy for all uses												4222.4830	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2282.9558	3.4800	79.4469 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1977.7268	3.4800	68.8249 (247)
Mechanical ventilation fans	91.6794	13.1900	12.0925 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	322.0645	13.1900	42.4803 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-526.9436	13.1900	-69.5039 (252)
Total energy cost			263.2332 (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] =	0.9554 (257)
SAP value		86.6723
SAP rating (Section 12)		87
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	2282.9558	0.2160	493.1185 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1977.7268	0.2160	427.1890 (264)
Space and water heating			920.3075 (265)
Pumps and fans	166.6794	0.5190	86.5066 (267)
Energy for lighting	322.0645	0.5190	167.1515 (268)
Energy saving/generation technologies			
PV Unit	-526.9436	0.5190	-273.4837 (269)
Total kg/year			900.4818 (272)
CO2 emissions per m2			12.7300 (273)
EI value			89.5727
EI rating			90
EI band			B

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Calculation of stars for heating and DHW

Main heating energy efficiency $3.48 \times (1 + 0.29 \times 0.00) / 0.9070 = 3.837$, stars = 4
Main heating environmental impact $0.216 \times (1 + 0.29 \times 0.00) / 0.9070 = 0.2381$, stars = 4
Water heating energy efficiency $3.48 / 0.8841 = 3.936$, stars = 4
Water heating environmental impact $0.216 / 0.8841 = 0.2443$, 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	35.3600 (1b)	x 2.3900 (2b)	= 84.5104 (1b) - (3b)
First floor	35.3600 (1c)	x 2.6700 (2c)	= 94.4112 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.7200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 178.9216 (5)

2. Ventilation rate

					main heating	+	secondary heating	+	other	=	total	m3 per hour	
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)	
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)	
Number of intermittent fans											0 * 10 =	0.0000 (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) =												0.0000 / (5) =	0.0000 (8)
Pressure test											Yes		
Measured/design AP50												4.1100	
Infiltration rate												0.2055 (18)	
Number of sides sheltered												2 (19)	
Shelter factor									(20) = 1 - [0.075 x (19)] =			0.8500 (20)	
Infiltration rate adjusted to include shelter factor									(21) = (18) x (20) =			0.1747 (21)	
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	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)	
Adj infilt rate	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)	
	0.2052	0.1921	0.1921	0.1747	0.1790	0.1703	0.1703	0.1659	0.1659	0.1790	0.1747	0.1790 (22b)	
Mechanical extract ventilation - centralised													
If mechanical ventilation:												0.5000 (23a)	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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)			12.2400	1.1450	14.0153		(27)
Ground Floor			35.3600	0.1200	4.2432	84.0000	2970.2400 (28a)
Brick and Block	85.2100	14.3600	70.8500	0.2400	17.0040	42.2200	2991.2870 (29a)
Pitched Roof	35.3600		35.3600	0.1000	3.5360	9.1000	321.7760 (30)
Total net area of external elements Aum(A, m ²)			155.9300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	41.1305			(33)
Party Wall 1			42.9200	0.0000	0.0000	70.0000	3004.4000 (32)
GF Stud			59.8200			9.0000	538.3800 (32c)
First Floor			74.8600			9.0000	673.7400 (32c)
Internal Floor 1			35.3600			18.0000	636.4800 (32d)
Internal Ceiling 1			35.3600			18.0000	636.4800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	11772.7830 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							166.4703 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.3417 (36)
Total fabric heat loss						(33) + (36) =	49.4722 (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	29.5221	29.5221	29.5221	29.5221	29.5221	29.5221	29.5221	29.5221	29.5221	29.5221	29.5221	29.5221 (38)
Heat transfer coeff	78.9943	78.9943	78.9943	78.9943	78.9943	78.9943	78.9943	78.9943	78.9943	78.9943	78.9943	78.9943 (39)
Average = Sum(39)m / 12 =												78.9943 (39)
HLP	1.1170	1.1170	1.1170	1.1170	1.1170	1.1170	1.1170	1.1170	1.1170	1.1170	1.1170	1.1170 (40)
HLP (average)												1.1170 (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	2.2635 (42)
Average daily hot water use (litres/day)	87.9576 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												

Energy conte	96.7533	93.2350	89.7167	86.1984	82.6801	79.1618	79.1618	82.6801	86.1984	89.7167	93.2350	96.7533	(44)
Energy content (annual)	143.4824	125.4906	129.4951	112.8970	108.3273	93.4782	86.6213	99.3992	100.5864	117.2237	127.9589	138.9551	(45)
Distribution loss	(46)m	= 0.15 x (45)m								Total = Sum(45)m =		1383.9153	(45)
Water storage loss:	21.5224	18.8236	19.4243	16.9345	16.2491	14.0217	12.9932	14.9099	15.0880	17.5836	19.1938	20.8433	(46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	31.2139	28.1772	31.1708	30.1366	31.1203	30.0923	31.0804	31.1062	30.1164	31.1499	30.1784	31.2055	(61)
Total heat required for water heating calculated for each month	174.6963	153.6679	160.6659	143.0336	139.4476	123.5705	117.7017	130.5055	130.7028	148.3736	158.1372	170.1606	(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	174.6963	153.6679	160.6659	143.0336	139.4476	123.5705	117.7017	Solar input (sum of months) = Sum(63)m =					0.0000 (63)
Heat gains from water heating, kWh/month	55.5114	48.7699	50.8498	45.0724	43.7989	38.6046	36.5717	40.8268	40.9741	46.7644	50.0909	54.0039	(65)
								Total per year (kWh/year) = Sum(64)m =					1750.6632 (64)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	135.8086	135.8086	135.8086	135.8086	135.8086	135.8086	135.8086	135.8086	135.8086	135.8086	135.8086	135.8086 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	45.5916	40.4940	32.9320	24.9316	18.6367	15.7339	17.0010	22.0985	29.6606	37.6609	43.9559	46.8587 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	296.9726	300.0542	292.2886	275.7564	254.8876	235.2738	222.1706	219.0889	226.8546	243.3867	264.2556	283.8694 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.8443	50.8443	50.8443	50.8443	50.8443	50.8443	50.8443	50.8443	50.8443	50.8443	50.8443	50.8443 (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)	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391 (71)
Water heating gains (Table 5)	74.6121	72.5743	68.3465	62.6005	58.8695	53.6175	49.1555	54.8747	56.9084	62.8553	69.5707	72.5859 (72)
Total internal gains	516.2901	512.2364	492.6810	462.4025	431.5076	403.7390	387.4409	395.1761	412.5375	443.0169	476.8961	502.4279 (73)

[Jan	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	3.4300	14.6130	0.6300	0.7000	0.7700	15.3182 (75)
Southeast	1.3200	45.0642	0.6300	0.7000	0.7700	18.1793 (77)
Southwest	7.4900	45.0642	0.6300	0.7000	0.7700	103.1538 (79)

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Calculation Type: New Build (As Built)

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

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1778.7723 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	347.5224	271.7327	205.6189	98.5678	32.3551	0.0000	0.0000	0.0000	0.0000	80.3242	214.3025	362.9228	(98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)
Space heating fuel (main heating system)	383.1559	299.5950	226.7022	108.6746	35.6727	0.0000	0.0000	0.0000	0.0000	88.5603	236.2762	400.1354	(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	174.6963	153.6679	160.6659	143.0336	139.4476	123.5705	117.7017	130.5055	130.7028	148.3736	158.1372	170.1606	(64)
Efficiency of water heater	89.4277	89.3277	89.0390	88.4724	87.6736	87.0000	87.0000	87.0000	87.0000	88.2646	89.0912	89.4852	(216)
(217)m	89.4277	89.3277	89.0390	88.4724	87.6736	87.0000	87.0000	87.0000	87.0000	88.2646	89.0912	89.4852	(217)
Fuel for water heating, kWh/month	195.3491	172.0271	180.4444	161.6702	159.0532	142.0351	135.2893	150.0063	150.2331	168.1009	177.5004	190.1550	(219)
Water heating fuel used												1981.8641	(219)
Annual totals kWh/year													
Space heating fuel - main system												1778.7723	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.4200)													
mechanical ventilation fans (SFP = 0.4200)												91.6794	(230a)
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												166.6794	(231)
Electricity for lighting (calculated in Appendix L)												322.0645	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.64 * 1154 * 1.00) =										-591.0819		-591.0819	(233)
Total delivered energy for all uses												3658.2985	(238)

10a. Fuel costs - using BEDF prices (491)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1778.7723	3.6300	64.5694 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1981.8641	3.6300	71.9417 (247)
Mechanical ventilation fans	91.6794	19.4400	17.8225 (249)
Pumps and fans for heating	75.0000	19.4400	14.5800 (249)
Energy for lighting	322.0645	19.4400	62.6093 (250)
Additional standing charges			95.0000 (251)
Energy saving/generation technologies			
PV Unit	-591.0819	19.4400	-114.9063 (252)
Total energy cost			211.6166 (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	1778.7723	0.2160	384.2148 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1981.8641	0.2160	428.0827 (264)
Space and water heating			812.2975 (265)
Pumps and fans	166.6794	0.5190	86.5066 (267)
Energy for lighting	322.0645	0.5190	167.1515 (268)
Energy saving/generation technologies			
PV Unit	-591.0819	0.5190	-306.7715 (269)
Total kg/year			759.1841 (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	1778.7723	1.2200	2170.1023 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1981.8641	1.2200	2417.8742 (264)
Space and water heating			4587.9765 (265)
Pumps and fans	166.6794	3.0700	511.7058 (267)
Energy for lighting	322.0645	3.0700	988.7380 (268)

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Energy saving/generation technologies			
PV Unit	-591.0819	3.0700	-1814.6214 (269)
Primary energy kWh/year			4273.7990 (272)
Primary energy kWh/m2/year			60.4327 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	B 87
Current environmental impact rating:	B 90

(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	+ 1.3	-£ 26	-185 kg (24.3%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£26 2.61 kg/m²	B 88	A 92
Total Savings	£26 2.61 kg/m²		

Potential energy efficiency rating:	B 88
Potential environmental impact rating:	A 92

Fuel prices for cost data on this page from database revision number 491 TEST (28 Feb 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	£95	£105	-£10
Mains gas	£232	£196	£35
Space heating	£192	£192	£0
Water heating	£72	£46	£26
Lighting	£63	£63	£0
Generated (PV)	-£115	-£115	£0
Total cost of fuels	£212	£186	£25
Total cost of uses	£212	£186	£26
Delivered energy	52 kWh/m²	39 kWh/m²	13 kWh/m²
Carbon dioxide emissions	0.8 tonnes	0.6 tonnes	0.2 tonnes
CO2 emissions per m²	11 kg/m²	8 kg/m²	3 kg/m²
Primary energy	60 kWh/m²	46 kWh/m²	15 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	35.3600 (1b)	x 2.3900 (2b)	= 84.5104 (1b) - (3b)
First floor	35.3600 (1c)	x 2.6700 (2c)	= 94.4112 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.7200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 178.9216 (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					0 * 10 = 0.0000 (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)					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					4.1100
Infiltration rate					0.2055 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)]	=	0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20)	=	0.1747 (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	0.2227	0.2183	0.2140	0.1921	0.1878	0.1659	0.1659	0.1616	0.1747	0.1878	0.1965	0.2052 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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)			12.2400	1.1450	14.0153		(27)
Ground Floor			35.3600	0.1200	4.2432	84.0000	2970.2400 (28a)
Brick and Block	85.2100	14.3600	70.8500	0.2400	17.0040	42.2200	2991.2870 (29a)
Pitched Roof	35.3600		35.3600	0.1000	3.5360	9.1000	321.7760 (30)
Total net area of external elements Aum(A, m ²)			155.9300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	41.1305			(33)
Party Wall 1			42.9200	0.0000	0.0000	70.0000	3004.4000 (32)
GF Stud			59.8200			9.0000	538.3800 (32c)
First Floor			74.8600			9.0000	673.7400 (32c)
Internal Floor 1			35.3600			18.0000	636.4800 (32d)
Internal Ceiling 1			35.3600			18.0000	636.4800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	11772.7830 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							166.4703 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.3417 (36)
Total fabric heat loss						(33) + (36) =	49.4722 (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	29.5221	29.5221	29.5221	29.5221	29.5221	29.5221	29.5221	29.5221	29.5221	29.5221	29.5221	29.5221 (38)
Average = Sum(39)m / 12 =	78.9943	78.9943	78.9943	78.9943	78.9943	78.9943	78.9943	78.9943	78.9943	78.9943	78.9943	78.9943 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1170	1.1170	1.1170	1.1170	1.1170	1.1170	1.1170	1.1170	1.1170	1.1170	1.1170	1.1170 (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												2.2635 (42)
Average daily hot water use (litres/day)												87.9576 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Energy conte	96.7533	93.2350	89.7167	86.1984	82.6801	79.1618	79.1618	82.6801	86.1984	89.7167	93.2350	96.7533 (44)
Energy content (annual)	143.4824	125.4906	129.4951	112.8970	108.3273	93.4782	86.6213	99.3992	100.5864	117.2237	127.9589	138.9551 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum (45)m =		1383.9153 (45)
	21.5224	18.8236	19.4243	16.9345	16.2491	14.0217	12.9932	14.9099	15.0880	17.5836	19.1938	20.8433 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	31.2139	28.1772	31.1708	30.1366	31.1203	30.0923	31.0804	31.1062	30.1164	31.1499	30.1784	31.2055 (61)
Total heat required for water heating calculated for each month	174.6963	153.6679	160.6659	143.0336	139.4476	123.5705	117.7017	130.5055	130.7028	148.3736	158.1372	170.1606 (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												1.3105 (H8)
Utilisation factor												0.5338 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												87.9576 (H14)
Volume ratio Veff/V												0.8527 (H15)
Solar storage volume factor												0.9681 (H16)
Solar input	-23.8963	-39.8760	-67.9134	-91.0173	-112.4442	-110.5506	-109.0896	-95.3121	-74.6485	-50.9762	-28.3444	-824.0657 (H17)
Solar input (sum of months) = Sum (63)m =												-19.9971 (63)
												-824.0657 (63)
Output from w/h	150.8000	113.7919	92.7525	52.0162	27.0034	13.0200	8.6121	35.1933	56.0543	97.3975	129.7928	150.1635 (64)
Total per year (kWh/year) = Sum (64)m =												926.5975 (64)
Heat gains from water heating, kWh/month	55.5114	48.7699	50.8498	45.0724	43.7989	38.6046	36.5717	40.8268	40.9741	46.7644	50.0909	54.0039 (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	135.8086	135.8086	135.8086	135.8086	135.8086	135.8086	135.8086	135.8086	135.8086	135.8086	135.8086	135.8086	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	45.5916	40.4940	32.9320	24.9316	18.6367	15.7339	17.0010	22.0985	29.6606	37.6609	43.9559	46.8587	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	296.9726	300.0542	292.2886	275.7564	254.8876	235.2738	222.1706	219.0889	226.8546	243.3867	264.2556	283.8694	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.8443	50.8443	50.8443	50.8443	50.8443	50.8443	50.8443	50.8443	50.8443	50.8443	50.8443	50.8443	(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)	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	(71)
Water heating gains (Table 5)	74.6121	72.5743	68.3465	62.6005	58.8695	53.6175	49.1555	54.8747	56.9084	62.8553	69.5707	72.5859	(72)
Total internal gains	516.2901	512.2364	492.6810	462.4025	431.5076	403.7390	387.4409	395.1761	412.5375	443.0169	476.8961	502.4279	(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	
Northeast				3.4300	11.2829	0.6300		0.7000	0.7700			11.8274 (75)	
Southeast				1.3200	36.7938	0.6300		0.7000	0.7700			14.8430 (77)	
Southwest				7.4900	36.7938	0.6300		0.7000	0.7700			84.2226 (79)	
Solar gains	110.8929	192.8203	274.2601	357.3122	416.1842	420.1968	402.1922	357.1976	302.8529	215.9210	133.5396	94.4383 (83)	
Total gains	627.1830	705.0567	766.9411	819.7147	847.6918	823.9358	789.6332	752.3736	715.3904	658.9379	610.4357	596.8662 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	41.3982	41.3982	41.3982	41.3982	41.3982	41.3982	41.3982	41.3982	41.3982	41.3982	41.3982	41.3982	
alpha	3.7599	3.7599	3.7599	3.7599	3.7599	3.7599	3.7599	3.7599	3.7599	3.7599	3.7599	3.7599	
util living area	0.9670	0.9484	0.9141	0.8459	0.7301	0.5717	0.4287	0.4663	0.6720	0.8671	0.9480	0.9721	(86)
MIT	19.7032	19.9026	20.1915	20.5225	20.7893	20.9372	20.9835	20.9771	20.8830	20.5448	20.0550	19.6410	(87)
Th 2	19.9870	19.9870	19.9870	19.9870	19.9870	19.9870	19.9870	19.9870	19.9870	19.9870	19.9870	19.9870	(88)
util rest of house	0.9603	0.9382	0.8971	0.8152	0.6782	0.4947	0.3350	0.3706	0.5983	0.8338	0.9359	0.9663	(89)
MIT 2	18.8281	19.0220	19.3003	19.6093	19.8419	19.9544	19.9814	19.9787	19.9197	19.6375	19.1741	18.7673	(90)
Living area fraction									fLA = Living area / (4) =			0.2195	(91)
MIT	19.0201	19.2153	19.4959	19.8097	20.0498	20.1700	20.2013	20.1978	20.1311	19.8366	19.3675	18.9591	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0201	19.2153	19.4959	19.8097	20.0498	20.1700	20.2013	20.1978	20.1311	19.8366	19.3675	18.9591	(93)

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9523	0.9287	0.8874	0.8092	0.6817	0.5092	0.3553	0.3911	0.6096	0.8282	0.9268	0.9589	(94)
Useful gains	597.2399	654.8200	680.5810	663.3270	577.8446	419.5850	280.5371	294.2476	436.0828	545.7048	565.7370	572.3544	(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	1162.8067	1130.8247	1026.5996	861.8055	659.5898	440.0015	284.4856	300.0067	476.4209	729.6389	969.0596	1165.8813	(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	420.7817	319.8752	257.4378	142.9045	60.8185	0.0000	0.0000	0.0000	0.0000	136.8470	290.3923	441.5841	(98)
Space heating												2070.6409	(98)
Space heating per m2											(98) / (4) =	29.2794	(99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													90.7000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													2282.9558	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	420.7817	319.8752	257.4378	142.9045	60.8185	0.0000	0.0000	0.0000	0.0000	136.8470	290.3923	441.5841	(98)	
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)	
Space heating fuel (main heating system)	463.9269	352.6738	283.8344	157.5574	67.0545	0.0000	0.0000	0.0000	0.0000	150.8787	320.1679	486.8622	(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	150.8000	113.7919	92.7525	52.0162	27.0034	13.0200	8.6121	35.1933	56.0543	97.3975	129.7928	150.1635	(64)	
Efficiency of water heater	89.6936	89.6990	89.6897	89.6822	89.5293	87.0000	87.0000	87.0000	87.0000	89.1240	89.5239	89.7316	(216)	
(217)m	89.6936	89.6990	89.6897	89.6822	89.5293	87.0000	87.0000	87.0000	87.0000	89.1240	89.5239	89.7316	(217)	
Fuel for water heating, kWh/month	168.1279	126.8596	103.4149	58.0006	30.1615	14.9655	9.8990	40.4521	64.4302	109.2831	144.9812	167.3474	(219)	
Water heating fuel used												1037.9230	(219)	
Annual totals kWh/year														
Space heating fuel - main system												2282.9558	(211)	
Space heating fuel - secondary												0.0000	(215)	
Electricity for pumps and fans:														
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.4200)														
mechanical ventilation fans (SFP = 0.4200)													91.6794	(230a)
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													216.6794	(231)
Electricity for lighting (calculated in Appendix L)													322.0645	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.64 * 1029 * 1.00) =										-526.9436			-526.9436	(233)
Total delivered energy for all uses													3332.6792	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2282.9558	3.4800	79.4469	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1037.9230	3.4800	36.1197	(247)
Mechanical ventilation fans	91.6794	13.1900	12.0925	(249)
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	322.0645	13.1900	42.4803	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	-526.9436	13.1900	-69.5039	(252)
Total energy cost			237.1230	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200	(256)
Energy cost factor (ECF)		0.8606	(257)
SAP value	[(255) x (256)] / [(4) + 45.0] =	87.9943	
SAP rating (Section 12)		88	(258)
SAP band		B	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2282.9558	0.2160	493.1185	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1037.9230	0.2160	224.1914	(264)
Space and water heating			717.3098	(265)
Pumps and fans	216.6794	0.5190	112.4566	(267)
Energy for lighting	322.0645	0.5190	167.1515	(268)
Energy saving/generation technologies				
PV Unit	-526.9436	0.5190	-273.4837	(269)
Total kg/year			723.4342	(272)
CO2 emissions per m2			10.2300	(273)
EI value			91.6229	
EI rating			92	(274)
EI band			A	

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	35.3600 (1b)	x 2.3900 (2b)	= 84.5104 (1b) - (3b)
First floor	35.3600 (1c)	x 2.6700 (2c)	= 94.4112 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.7200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 178.9216 (5)

2. Ventilation rate

					main heating	secondary heating	other		total	m3 per hour		
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											0 * 10 =	0.0000 (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) =											0.0000 / (5) =	0.0000 (8)
Pressure test											Yes	
Measured/design AP50												4.1100
Infiltration rate												0.2055 (18)
Number of sides sheltered												2 (19)
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.1747 (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												
	0.2052	0.1921	0.1921	0.1747	0.1790	0.1703	0.1703	0.1659	0.1659	0.1790	0.1747	0.1790 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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)			12.2400	1.1450	14.0153		(27)
Ground Floor			35.3600	0.1200	4.2432	84.0000	2970.2400 (28a)
Brick and Block	85.2100	14.3600	70.8500	0.2400	17.0040	42.2200	2991.2870 (29a)
Pitched Roof	35.3600		35.3600	0.1000	3.5360	9.1000	321.7760 (30)
Total net area of external elements Aum(A, m ²)			155.9300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	41.1305			(33)
Party Wall 1			42.9200	0.0000	0.0000	70.0000	3004.4000 (32)
GF Stud			59.8200			9.0000	538.3800 (32c)
First Floor			74.8600			9.0000	673.7400 (32c)
Internal Floor 1			35.3600			18.0000	636.4800 (32d)
Internal Ceiling 1			35.3600			18.0000	636.4800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	11772.7830 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							166.4703 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.3417 (36)
Total fabric heat loss						(33) + (36) =	49.4722 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 29.5221	Feb 29.5221	Mar 29.5221	Apr 29.5221	May 29.5221	Jun 29.5221	Jul 29.5221	Aug 29.5221	Sep 29.5221	Oct 29.5221	Nov 29.5221	Dec 29.5221 (38)
Heat transfer coeff	78.9943	78.9943	78.9943	78.9943	78.9943	78.9943	78.9943	78.9943	78.9943	78.9943	78.9943	78.9943 (39)
Average = Sum(39)m / 12 =												78.9943 (39)
HLP	Jan 1.1170	Feb 1.1170	Mar 1.1170	Apr 1.1170	May 1.1170	Jun 1.1170	Jul 1.1170	Aug 1.1170	Sep 1.1170	Oct 1.1170	Nov 1.1170	Dec 1.1170 (40)
HLP (average)												1.1170 (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												2.2635 (42)
Average daily hot water use (litres/day)												87.9576 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use												

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 conte	96.7533	93.2350	89.7167	86.1984	82.6801	79.1618	79.1618	82.6801	86.1984	89.7167	93.2350	96.7533 (44)
Energy content (annual)	143.4824	125.4906	129.4951	112.8970	108.3273	93.4782	86.6213	99.3992	100.5864	117.2237	127.9589	138.9551 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum (45)m =		1383.9153 (45)
	21.5224	18.8236	19.4243	16.9345	16.2491	14.0217	12.9932	14.9099	15.0880	17.5836	19.1938	20.8433 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	31.2139	28.1772	31.1708	30.1366	31.1203	30.0923	31.0804	31.1062	30.1164	31.1499	30.1784	31.2055 (61)
Total heat required for water heating calculated for each month	174.6963	153.6679	160.6659	143.0336	139.4476	123.5705	117.7017	130.5055	130.7028	148.3736	158.1372	170.1606 (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												1.4640 (H8)
Utilisation factor												0.4949 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												87.9576 (H14)
Volume ratio Veff/V												0.8527 (H15)
Solar storage volume factor												0.9681 (H16)
Solar input	-27.8547	-39.6125	-68.7379	-92.4640	-107.4494	-116.8738	-110.8142	-101.0518	-79.0930	-54.6663	-32.9458	-853.6191 (H17)
Solar input (sum of months) = Sum (63)m =												-22.0558 (63)
Output from w/h	146.8416	114.0554	91.9281	50.5695	31.9981	6.6967	6.8875	29.4537	51.6098	93.7074	125.1915	148.1048 (64)
Total per year (kWh/year) = Sum (64)m =												897.0441 (64)
Heat gains from water heating, kWh/month	55.5114	48.7699	50.8498	45.0724	43.7989	38.6046	36.5717	40.8268	40.9741	46.7644	50.0909	54.0039 (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	135.8086	135.8086	135.8086	135.8086	135.8086	135.8086	135.8086	135.8086	135.8086	135.8086	135.8086	135.8086 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	45.5916	40.4940	32.9320	24.9316	18.6367	15.7339	17.0010	22.0985	29.6606	37.6609	43.9559	46.8587 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	296.9726	300.0542	292.2886	275.7564	254.8876	235.2738	222.1706	219.0889	226.8546	243.3867	264.2556	283.8694 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.8443	50.8443	50.8443	50.8443	50.8443	50.8443	50.8443	50.8443	50.8443	50.8443	50.8443	50.8443 (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)	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391	-90.5391 (71)
Water heating gains (Table 5)	74.6121	72.5743	68.3465	62.6005	58.8695	53.6175	49.1555	54.8747	56.9084	62.8553	69.5707	72.5859 (72)
Total internal gains	516.2901	512.2364	492.6810	462.4025	431.5076	403.7390	387.4409	395.1761	412.5375	443.0169	476.8961	502.4279 (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			
Northeast				3.4300	14.6130	0.6300	0.7000	0.7700	15.3182 (75)			
Southeast				1.3200	45.0642	0.6300	0.7000	0.7700	18.1793 (77)			
Southwest				7.4900	45.0642	0.6300	0.7000	0.7700	103.1538 (79)			
Solar gains	136.6512	202.5767	294.5946	387.7825	427.1216	478.0792	439.3048	405.5472	341.3738	245.1024	164.0832	110.1322 (83)
Total gains	652.9413	714.8132	787.2755	850.1850	858.6292	881.8182	826.7457	800.7233	753.9113	688.1193	640.9793	612.5601 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	41.3982	41.3982	41.3982	41.3982	41.3982	41.3982	41.3982	41.3982	41.3982	41.3982	41.3982	41.3982
alpha	3.7599	3.7599	3.7599	3.7599	3.7599	3.7599	3.7599	3.7599	3.7599	3.7599	3.7599	3.7599
util living area	0.9529	0.9348	0.8886	0.7949	0.6502	0.4435	0.3125	0.3128	0.5513	0.7983	0.9191	0.9601 (86)
MIT	19.9186	20.0598	20.3469	20.6630	20.8803	20.9785	20.9957	20.9959	20.9513	20.7203	20.2896	19.8710 (87)
Th 2	19.9870	19.9870	19.9870	19.9870	19.9870	19.9870	19.9870	19.9870	19.9870	19.9870	19.9870	19.9870 (88)
util rest of house	0.9430	0.9215	0.8662	0.7552	0.5865	0.3608	0.2180	0.2152	0.4642	0.7490	0.8996	0.9514 (89)
MIT 2	19.0394	19.1751	19.4473	19.7341	19.9134	19.9784	19.9861	19.9862	19.9645	19.7911	19.3995	18.9939 (90)
Living area fraction									fLA = Living area / (4) =			0.2195 (91)
MIT	19.2323	19.3692	19.6447	19.9379	20.1256	20.1979	20.2077	20.2078	20.1811	19.9951	19.5948	19.1864 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2323	19.3692	19.6447	19.9379	20.1256	20.1979	20.2077	20.2078	20.1811	19.9951	19.5948	19.1864 (93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9339	0.9117	0.8575	0.7531	0.5957	0.3784	0.2388	0.2367	0.4817	0.7494	0.8906	0.9428	(94)
Useful gains	609.7768	651.7276	675.0966	640.2408	511.4921	333.6762	197.3932	189.5479	363.1215	515.7014	570.8860	577.5459	(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													
	1076.8768	1056.0917	951.4661	777.1406	554.9801	339.5078	198.0937	190.2006	377.6771	623.6641	868.5284	1065.3453	(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													
	347.5224	271.7327	205.6189	98.5678	32.3551	0.0000	0.0000	0.0000	0.0000	80.3242	214.3025	362.9228	(98)
Space heating												1613.3465	(98)
Space heating per m2											(98) / (4) =	22.8132	(99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													90.7000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													1778.7723	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	347.5224	271.7327	205.6189	98.5678	32.3551	0.0000	0.0000	0.0000	0.0000	80.3242	214.3025	362.9228	(98)	
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)	
Space heating fuel (main heating system)	383.1559	299.5950	226.7022	108.6746	35.6727	0.0000	0.0000	0.0000	0.0000	88.5603	236.2762	400.1354	(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	146.8416	114.0554	91.9281	50.5695	31.9981	6.6967	6.8875	29.4537	51.6098	93.7074	125.1915	148.1048	(64)	
Efficiency of water heater	89.5685	89.5738	89.5237	89.4106	88.8217	87.0000	87.0000	87.0000	87.0000	88.6695	89.2995	89.5957	(216)	
(217)m	163.9433	127.3312	102.6857	56.5587	36.0251	7.6974	7.9167	33.8548	59.3216	105.6816	140.1928	165.3035	(219)	
Fuel for water heating, kWh/month												1006.5125	(219)	
Water heating fuel used														
Annual totals kWh/year														
Space heating fuel - main system												1778.7723	(211)	
Space heating fuel - secondary												0.0000	(215)	
Electricity for pumps and fans:														
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.4200)														
mechanical ventilation fans (SFP = 0.4200)													91.6794	(230a)
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													216.6794	(231)
Electricity for lighting (calculated in Appendix L)													322.0645	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.64 * 1154 * 1.00) =													-591.0819	(233)
Total delivered energy for all uses													2732.9468	(238)

10a. Fuel costs - using BEDF prices (491)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1778.7723	3.6300	64.5694	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1006.5125	3.6300	36.5364	(247)
Mechanical ventilation fans	91.6794	19.4400	17.8225	(249)
Pumps and fans for heating	75.0000	19.4400	14.5800	(249)
Pump for solar water heating	50.0000	19.4400	9.7200	(249)
Energy for lighting	322.0645	19.4400	62.6093	(250)
Additional standing charges			95.0000	(251)
Energy saving/generation technologies				
PV Unit	-591.0819	19.4400	-114.9063	(252)
Total energy cost			185.9313	(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	1778.7723	0.2160	384.2148	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1006.5125	0.2160	217.4067	(264)
Space and water heating			601.6215	(265)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Pumps and fans	216.6794	0.5190	112.4566 (267)
Energy for lighting	322.0645	0.5190	167.1515 (268)
Energy saving/generation technologies			
PV Unit	-591.0819	0.5190	-306.7715 (269)
Total kg/year			574.4581 (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	1778.7723	1.2200	2170.1023 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1006.5125	1.2200	1227.9452 (264)
Space and water heating			3398.0475 (265)
Pumps and fans	216.6794	3.0700	665.2058 (267)
Energy for lighting	322.0645	3.0700	988.7380 (268)
Energy saving/generation technologies			
PV Unit	-591.0819	3.0700	-1814.6214 (269)
Primary energy kWh/year			3237.3699 (272)
Primary energy kWh/m2/year			45.7773 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Plot 81	Issued on Date	29/03/2022
Assessment Reference	As Built	Prop Type Ref	D (HA/AR)
Project	6 Haines Crescent, West End, Southampton, SO30 3LG		
Calculation Type	New Build (As Built)		

SAP Rating	87 B	DER	14.50	TER	18.86
Environmental	90 B	% DER<TER	23.12		
CO ₂ Emissions (t/year)	0.76	DFEE	43.73	TFEE	51.70
General Requirements Compliance	Pass	% DFEE<TFEE	15.42		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.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 81	Issued on Date	29/03/2022
Assessment Reference	As Built	Prop Type Ref	D (HA/AR)
Project	6 Haines Crescent, West End, Southampton, SO30 3LG		
Calculation Type	New Build (As Built)		

SAP Rating	87 B	DER	14.50	TER	18.86
Environmental	90 B	% DER<TER	23.12		
CO ₂ Emissions (t/year)	0.76	DFEE	43.73	TFEE	51.70
General Requirements Compliance	Pass	% DFEE<TFEE	15.42		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.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 81	Issued on Date	29/03/2022
Assessment Reference	As Built	Prop Type Ref	D (HA/AR)
Project	6 Haines Crescent, West End, Southampton, SO30 3LG		
Calculation Type	New Build (As Built)		

SAP Rating	87 B	DER	14.50	TER	18.86
Environmental	90 B	% DER<TER	23.12		
CO ₂ Emissions (t/year)	0.76	DFEE	43.73	TFEE	51.70
General Requirements Compliance	Pass	% DFEE<TFEE	15.42		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com	Assessor ID	E477-0001
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Client	Foreman Homes, FORE
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Building Elements

Floor 000003 - Worst Case Slab

Floor Type: Slab On Ground Floor

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

Horizontal edge insulation: none

Vertical edge insulation: none

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

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

Total correction = 0.0096 m² K/W

U-value (unrounded) = 0.12 W/m² K

Unheated space: None

Total thickness: 321 mm

U-value: 0.12 W/m² K

Kappa: 84.00 kJ/m² K

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Plot 81	Issued on Date	29/03/2022
Assessment Reference	As Built	Prop Type Ref	D (HA/AR)
Property	6 Haines Crescent, West End, Southampton, SO30 3LG		
SAP Rating	87 B	DER	14.50
Environmental	90 B	TER	18.86
CO ₂ Emissions (t/year)	0.76	% DER<TER	23.12
General Requirements Compliance	Pass	DLEE	43.73
		TFEE	51.70
		% DLEE<TFEE	15.42
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com		Assessor ID
			E477-0001
Client	Foreman Homes, FORE		

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

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

6.0 Measurements		Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	Ground Floor:	16.84 m	35.36 m ²	2.39 m
	1st Storey:	16.84 m	35.36 m ²	2.67 m

7.0 Living Area	15.52	m ²
8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	166.47	kJ/m ² K

9.0 External Walls			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type	Construction				
Brick and Block	Cavity Wall	Other	0.24	42.22	85.21	70.85

9.1 Party Walls			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)
Description	Type	Construction			
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs on both sides, dense blocks, cavity or cavity fill	0.00	70.00	42.92

9.2 Internal Walls			Kappa (kJ/m ² K)	Area (m ²)
Description	Construction			
GF Stud	Plasterboard on timber frame		9.00	59.82
First Floor	Plasterboard on timber frame		9.00	74.86

10.0 External Roofs			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type	Construction				
Pitched Roof	External Plane Roof	Other	0.10	9.10	35.36	35.36

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	35.36

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	35.36

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	35.36

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 East							2.12	
Front Elevation	Window	[1] Brick and Block	North East	None	0.00					3.43	
Side Elevation	Window	[1] Brick and Block	South East	None	0.00					1.32	
Rear Elevation	Window	[1] Brick and Block	South West	None	0.00					7.49	

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)	10.13	0.053	No	CD0025
Independently assessed	E3 Sill	7.61	0.034	No	CD0027
Independently assessed	E4 Jamb	27.30	0.039	No	CD0028
Independently assessed	E5 Ground floor (normal)	16.79	0.060	No	CBA0302
Independently assessed	E6 Intermediate floor within a dwelling	16.79	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	8.40	0.060	No	
Independently assessed	E12 Gable (insulation at ceiling level)	8.50	0.054	No	CD0031
Independently assessed	E16 Corner (normal)	10.10	0.050	No	CD0035
Table K1 - Approved	E18 Party wall between dwellings	10.10	0.060	No	
Table K1 - Default	P1 Party wall - Ground floor	8.50	0.160	No	
Table K1 - Default	P2 Party wall - Intermediate floor within a dwelling	8.50	0.000	No	
Table K1 - Default	P4 Party wall - Roof (insulation at ceiling level)	8.50	0.240	No	CD0020

Y-value	0.053	W/m²K
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18.0 Pressure Testing

Designed AP ₅₀	5.00	m³/(h.m²) @ 50 Pa
Property Tested ?	Yes	
As Built AP ₅₀	4.11	m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

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	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - centralised
MV Reference Number	500233
Configuration	2
Manufacturer SFP	0.30
Duct Type	Rigid
Wet Rooms	2

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				0
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	13	
Total number of L.E.L. fittings	13	
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.	17503	
Fuel Type	Mains gas	
Main Heating	BGW	
SAP Code	104	
In Winter	90.7	
In Summer	87.0	
Controls	CBE Programmer, room thermostat and TRVs	
PCDF Controls	0	
Delayed Start Stat	No	
Sap Code	2106	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Heat Emitter	Radiators
Flow Temperature	Normal (> 45°C)
Combi boiler type	Standard Combi
Combi keep hot type	Gas/Oil, time clock
25.0 Main Heating 2	None

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	None
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32.0 Photovoltaic Unit	One Dwelling			
PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
0.64	South West	30°	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar water heating	£4,000 - £6,000	£26	B 88	