



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 3, Redwing Close
Botley, SO32 2DL

Contact: Tobias Whiting
Abacus Energy (UK) Ltd
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Report Issue Date: 16/06/2025

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0906 Plot 3			Issued on Date	16/06/2025
Assessment Reference	As Built	Prop Type Ref	Type D		
Property	3, Redwing Close, Botley, SO32 2DL				
SAP Rating	89 B	DER	12.33	TER	15.41
Environmental	89 B	% DER<TER	19.98		
CO ₂ Emissions (t/year)	1.39	DFEE	42.77	TFEE	52.78
General Requirements Compliance	Pass	% DFEE<TFEE	18.96		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com			Assessor ID	E477-0001
Client	Foreman Homes, FORE				

SUMMARY FOR INPUT DATA FOR New Build (As Built)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	15.41	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	12.33	kgCO ₂ /m ²	Pass
	-3.08 (-20.0%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	52.78	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	42.77	kWh/m ² /yr	
	-10.0 (-18.9%)	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	4.14 (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 32CDi 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

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Southern England)

Slight

Pass

Based on:

Overshading

Average

Windows facing North

9.74 m², Overhang twice as wide as window, ratio 0.73

Windows facing East

0.72 m², No overhang

Windows facing South

15.87 m², No overhang

Windows facing South West

0.81 m², No overhang

Windows facing West

1.51 m², No overhang

Windows facing North West

0.81 m², No overhang

Air change rate

4.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

W/m²K

Pass

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

4.14 (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
Party wall U-value	0.00	W/m ² K
Roof U-value	0.10	W/m ² K
Floor U-value	0.12	W/m ² K
Door U-value	1.10	W/m ² K
Thermal bridging ψ -value	0.026	W/m ² K
Photovoltaic array	0.81	kW

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THERMAL BRIDGING

Calculation Type: New Build (As Built)

Property Reference	SAP 0906 Plot 3	Issued on Date	16/06/2025
Assessment Reference	As Built	Prop Type Ref	Type D
Property	3, Redwing Close, Botley, SO32 2DL		

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Environmental	89 B	% DER<TER	19.98		
CO ₂ Emissions (t/year)	1.39	DFEE	42.77	TFEE	52.78
General Requirements Compliance	Pass	% DFEE<TFEE	18.96		

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Client	Foreman Homes, FORE
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	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E1 Steel lintel with perforated steel base plate	Table K1 - Approved	0.500	2.14	1.07	
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.077	1.37	0.11	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.064	3.74	0.24	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.067	1.60	0.11	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.061	7.24	0.44	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.056	5.42	0.30	Birtley Supatherm
External wall	E3 Sill	Independently assessed	0.021	14.74	0.31	Knauf P5
External wall	E4 Jamb	Independently assessed	0.016	36.00	0.58	Knauf P6
External wall	E5 Ground floor (normal)	Independently assessed	0.062	37.28	2.31	Knauf BE-E5-23902
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	34.99	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Independently assessed	0.071	35.22	2.50	Knauf P16
External wall	E24 Eaves (insulation at ceiling level - inverted)	Independently assessed	0.107	2.42	0.26	Knauf P18
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.044	5.24	0.23	Knauf P21
External wall	E16 Corner (normal)	Independently assessed	0.039	34.53	1.35	Knauf P23
External wall	E17 Corner (inverted – internal area greater than external area)	Independently assessed	-0.091	14.54	-1.32	Knauf P24

Total: **8.48** W/mK:
Y-Value: **0.026** W/m²K:

FULL SAP CALCULATION PRINTOUT

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Calculation Type: New Build (As Built)

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

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DWELLING AS BUILT

Detached House, total floor area 147 m²

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

1a TER and DER

Fuel for main heating:Mains gas

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 15.41 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 12.33 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)52.8 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)42.8 kWh/m²/yrOK

2 Fabric U-values

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	4.14 (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 32CDi 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

Not applicable

9 Summertime temperature

Overheating risk (Southern England): Slight OK

Based on:

Overshading:

Average

Windows facing North: 9.74 m², Overhang twice as wide as window, ratio 0.73

Windows facing East: 0.72 m², No overhang

Windows facing South: 15.87 m², No overhang

Windows facing South West: 0.81 m², No overhang

Windows facing West: 1.51 m², No overhang

Windows facing North West: 0.81 m², No overhang

Air change rate: 4.00 ach

Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K

Party wall U-value 0.00 W/m²K

Roof U-value 0.10 W/m²K

Floor U-value 0.12 W/m²K

Door U-value 1.10 W/m²K

Thermal bridging y-value 0.026 W/m²K

Photovoltaic array 0.81 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	74.7800 (1b)	x 2.3900 (2b)	= 178.7242 (1b) - (3b)
First floor	72.2500 (1c)	x 2.6100 (2c)	= 188.5725 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	147.0300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	367.2967 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				40.0000 / (5) =	0.1089 (8)
Pressure test					Yes
Measured/design AP50					4.1400
Infiltration rate					0.3159 (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) =		0.2685 (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	0.3424	0.3356	0.3289	0.2954	0.2887	0.2551	0.2551	0.2484	0.2685	0.2887	0.3021	0.3155 (22b)
Effective ac	0.5586	0.5563	0.5541	0.5436	0.5417	0.5325	0.5325	0.5308	0.5361	0.5417	0.5456	0.5498 (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			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.20)			29.4600	1.1450	33.7328		(27)
Ground Floor			74.7800	0.1200	8.9736	84.0000	6281.5200 (28a)
Brick and Block	180.4200	31.6100	148.8100	0.2400	35.7144	42.2200	6282.7582 (29a)
Pitched Roof	74.7800		74.7800	0.1000	7.4780	9.1000	680.4980 (30)
Total net area of external elements Aum(A, m ²)			329.9800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	88.2638		(33)
Ground Floor Block			62.2000			75.0000	4665.0000 (32c)
Ground Floor Stud			57.6700			9.0000	519.0300 (32c)
First Floor Block			48.4600			75.0000	3634.5000 (32c)
First Floor Stud			110.7600			9.0000	996.8400 (32c)
Internal Floor 1			72.2500			18.0000	1300.5000 (32d)
Internal Ceiling 1			72.2500			18.0000	1300.5000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 25661.1462 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 174.5300 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.4778 (36)
Total fabric heat loss (33) + (36) = 96.7416 (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	67.7074	67.4316	67.1612	65.8913	65.6537	64.5476	64.5476	64.3428	64.9736	65.6537	66.1343	66.6368 (38)
Heat transfer coeff	164.4490	164.1731	163.9028	162.6328	162.3952	161.2892	161.2892	161.0843	161.7152	162.3952	162.8759	163.3784 (39)
Average = Sum(39)m / 12 =												162.6317 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1185	1.1166	1.1148	1.1061	1.1045	1.0970	1.0970	1.0956	1.0999	1.1045	1.1078	1.1112 (40)
HLP (average)												1.1061 (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 2.9294 (42)
Average daily hot water use (litres/day) 103.7743 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	114.1518	110.0008	105.8498	101.6988	97.5479	93.3969	93.3969	97.5479	101.6988	105.8498	110.0008	114.1518 (44)
Energy conte	169.2838	148.0567	152.7812	133.1984	127.8070	110.2877	102.1978	117.2735	118.6741	138.3032	150.9687	163.9423 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy content (annual)	Total = Sum(45)m = 1632.7742 (45)										
Distribution loss (46)m = 0.15 x (45)m											
25.3926	22.2085	22.9172	19.9798	19.1710	16.5432	15.3297	17.5910	17.8011	20.7455	22.6453	24.5913 (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	25.3236	22.8735	25.3090	24.4657	25.2504	24.3882	25.1715	25.2226	24.4270	25.2716	24.4881 (61)
Total heat required for water heating calculated for each month											
194.6074	170.9301	178.0902	157.6641	153.0574	134.6759	127.3693	142.4961	143.1010	163.5747	175.4569	189.2529 (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)
Solar input (sum of months) = Sum(63)m =	0.0000 (63)										
Output from w/h											
194.6074	170.9301	178.0902	157.6641	153.0574	134.6759	127.3693	142.4961	143.1010	163.5747	175.4569	189.2529 (64)
Heat gains from water heating, kWh/month											
62.6177	54.9472	57.1270	50.4049	48.8084	42.7677	40.2736	45.2991	45.5659	52.3037	56.3191	60.8385 (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	146.4723	146.4723	146.4723	146.4723	146.4723	146.4723	146.4723	146.4723	146.4723	146.4723	146.4723	146.4723	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.4790	25.2948	20.5711	15.5736	11.6415	9.8282	10.6197	13.8039	18.5276	23.5251	27.4572	29.2705	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	317.2731	320.5654	312.2689	294.6067	272.3112	251.3567	237.3577	234.0654	242.3619	260.0242	282.3196	303.2742	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6472	37.6472	37.6472	37.6472	37.6472	37.6472	37.6472	37.6472	37.6472	37.6472	37.6472	37.6472	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	(71)
Water heating gains (Table 5)	84.1636	81.7667	76.7836	70.0068	65.6027	59.3996	54.1312	60.8859	63.2859	70.3007	78.2210	81.7721	(72)
Total internal gains	499.8574	497.5685	479.5653	450.1288	419.4971	390.5262	372.0504	378.6969	394.1172	423.7916	457.9395	484.2585	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North				9.7400	10.6334	0.6300		0.7000		0.7700		31.6521 (74)
East				0.7200	19.6403	0.6300		0.7000		0.7700		4.3217 (76)
South				15.8700	46.7521	0.6300		0.7000		0.7700		226.7512 (78)
Southwest				0.8100	36.7938	0.6300		0.7000		0.7700		9.1082 (79)
West				1.5100	19.6403	0.6300		0.7000		0.7700		9.0635 (80)
Northwest				0.8100	11.2829	0.6300		0.7000		0.7700		2.7931 (81)
Solar gains	283.6897	479.2330	650.4247	805.7599	908.6855	906.5100	872.0191	793.4468	703.3533	527.7153	338.9380	243.4036 (83)
Total gains	783.5471	976.8015	1129.9899	1255.8887	1328.1826	1297.0362	1244.0695	1172.1437	1097.4705	951.5069	796.8776	727.6621 (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	43.3453	43.4182	43.4898	43.8294	43.8935	44.1945	44.1945	44.2507	44.0781	43.8935	43.7640	43.6294
alpha	3.8897	3.8945	3.8993	3.9220	3.9262	3.9463	3.9463	3.9500	3.9385	3.9262	3.9176	3.9086
util living area	0.9945	0.9868	0.9703	0.9302	0.8448	0.6984	0.5419	0.5898	0.8041	0.9512	0.9891	0.9959 (86)
MIT	19.3372	19.5798	19.9169	20.3220	20.6707	20.8925	20.9699	20.9578	20.8018	20.3352	19.7492	19.2893 (87)
Th 2	19.9858	19.9873	19.9888	19.9958	19.9972	20.0033	20.0033	20.0044	20.0009	19.9972	19.9945	19.9917 (88)
util rest of house	0.9932	0.9837	0.9629	0.9118	0.8027	0.6185	0.4313	0.4793	0.7383	0.9347	0.9859	0.9949 (89)
MIT 2	18.4631	18.7051	19.0388	19.4367	19.7586	19.9445	19.9928	19.9884	19.8787	19.4571	18.8804	18.4199 (90)
Living area fraction	18.5958	18.8380	19.1722	19.5712	19.8971	20.0885	20.1412	20.1356	20.0189	19.5905	19.0123	18.5520 (91)
MIT	18.5958	18.8380	19.1722	19.5712	19.8971	20.0885	20.1412	20.1356	20.0189	19.5905	19.0123	18.5520 (92)
Temperature adjustment												0.0000
adjusted MIT	18.5958	18.8380	19.1722	19.5712	19.8971	20.0885	20.1412	20.1356	20.0189	19.5905	19.0123	18.5520 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation	0.9907	0.9789	0.9553	0.9024	0.7979	0.6260	0.4473	0.4947	0.7397	0.9262	0.9817	0.9929	(94)	
Useful gains	776.2364	956.1455	1079.4373	1133.3378	1059.7552	811.8980	556.5329	579.9179	811.7863	881.2858	782.3159	722.4658	(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	2350.9337	2288.2372	2077.0049	1735.4855	1331.1675	885.2301	571.1546	601.7520	957.1735	1460.0111	1940.2331	2344.7990	(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	1171.5748	895.1657	742.1903	433.5463	201.9307	0.0000	0.0000	0.0000	0.0000	430.5717	833.7004	1207.0159	(98)	
Space heating												5915.6958	(98)	
Space heating per m2												(98) / (4) =	40.2346	(99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													6522.2666 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1171.5748	895.1657	742.1903	433.5463	201.9307	0.0000	0.0000	0.0000	0.0000	430.5717	833.7004	1207.0159	(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)	1291.7032	986.9522	818.2914	478.0004	222.6359	0.0000	0.0000	0.0000	0.0000	474.7207	919.1846	1330.7783	(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	194.6074	170.9301	178.0902	157.6641	153.0574	134.6759	127.3693	142.4961	143.1010	163.5747	175.4569	189.2529	(64)
Efficiency of water heater	90.1844	90.1200	90.0009	89.7394	89.1571	87.2000	87.2000	87.2000	87.2000	89.7087	90.0714	87.2000	(216)
Fuel for water heating, kWh/month	215.7883	189.6694	197.8760	175.6910	171.6716	154.4449	146.0657	163.4130	164.1067	182.3399	194.7975	209.7933	(219)
Water heating fuel used												2165.6572	(219)
Annual totals kWh/year													
Space heating fuel - main system												6522.2666	(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)												502.9472	(232)
Energy saving/generation technologies (Appendices M, N and Q)													
PV Unit 0 (0.80 * 0.81 * 1080 * 1.00) =													-699.5320
Total delivered energy for all uses													8566.3390 (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	6522.2666	0.2160	1408.8096 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2165.6572	0.2160	467.7819 (264)
Space and water heating			1876.5915 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	502.9472	0.5190	261.0296 (268)
Energy saving/generation technologies			
PV Unit	-699.5320	0.5190	-363.0571 (269)
Total CO2, kg/year			1813.4890 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			12.3300 (273)

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

DER			12.3300 ZC1
Total Floor Area		TFA	147.0300
Assumed number of occupants		N	2.9294
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			12.7871 ZC2
CO2 emissions from cooking, equation (L16)			1.2875 ZC3
Total CO2 emissions			26.4047 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			26.4047 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	74.7800 (1b)	x 2.3900 (2b)	= 178.7242 (1b) - (3b)
First floor	72.2500 (1c)	x 2.6100 (2c)	= 188.5725 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	147.0300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 367.2967 (5)

2. Ventilation rate

										main	secondary	other	total	m3 per hour			
										heating	heating						
Number of chimneys										0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues										0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans																4 * 10 =	40.0000 (7a)
Number of passive vents																0 * 10 =	0.0000 (7b)
Number of flueless gas fires																0 * 40 =	0.0000 (7c)
										Air changes per hour							
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000	/ (5) =	0.1089 (8)
Pressure test										Yes							
Measured/design AP50										5.0000							
Infiltration rate										0.3589 (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) =					0.3051 (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	0.3890	0.3813	0.3737	0.3356	0.3279	0.2898	0.2898	0.2822	0.3051	0.3279	0.3432	0.3585 (22b)					
Effective ac	0.5756	0.5727	0.5698	0.5563	0.5538	0.5420	0.5420	0.5398	0.5465	0.5538	0.5589	0.5642 (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			2.1500	1.0000	2.1500		(26)					
TER Opening Type (Uw = 1.40)			29.4600	1.3258	39.0568		(27)					
Ground Floor			74.7800	0.1300	9.7214		(28a)					
Brick and Block	180.4200	31.6100	148.8100	0.1800	26.7858		(29a)					
Pitched Roof	74.7800		74.7800	0.1300	9.7214		(30)					
Total net area of external elements Aum(A, m2)			329.9800				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	87.4354		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.3848 (36)					
Total fabric heat loss						(33) + (36) =	101.8202 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 69.7728	Feb 69.4168	Mar 69.0678	Apr 67.4286	May 67.1219	Jun 65.6942	Jul 65.6942	Aug 65.4299	Sep 66.2442	Oct 67.1219	Nov 67.7423	Dec 68.3910 (38)
Heat transfer coeff	171.5930	171.2370	170.8880	169.2488	168.9421	167.5145	167.5145	167.2501	168.0644	168.9421	169.5626	170.2112 (39)
Average = Sum(39)m / 12 =												169.2474 (39)
HLP	Jan 1.1671	Feb 1.1646	Mar 1.1623	Apr 1.1511	May 1.1490	Jun 1.1393	Jul 1.1393	Aug 1.1375	Sep 1.1431	Oct 1.1490	Nov 1.1533	Dec 1.1577 (40)
HLP (average)												1.1511 (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												2.9294 (42)
Average daily hot water use (litres/day)												103.7743 (43)
Daily hot water use	Jan 114.1518	Feb 110.0008	Mar 105.8498	Apr 101.6988	May 97.5479	Jun 93.3969	Jul 93.3969	Aug 97.5479	Sep 101.6988	Oct 105.8498	Nov 110.0008	Dec 114.1518 (44)
Energy conte	169.2838	148.0567	152.7812	133.1984	127.8070	110.2877	102.1978	117.2735	118.6741	138.3032	150.9687	163.9423 (45)
Energy content (annual)												Total = Sum(45)m = 1632.7742 (45)
Distribution loss (46)m = 0.15 x (45)m												
25.3926	22.2085	22.9172	19.9798	19.1710	16.5432	15.3297	17.5910	17.8011	20.7455	22.6453	24.5913	(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	50.9589	46.0274	50.9589	49.3151	49.7093	46.0587	47.5940	49.7093	49.3151	50.9589	49.3151	50.9589 (61)
Solar input	220.2427	194.0840	203.7401	182.5134	177.5163	156.3465	149.7918	166.9828	167.9891	189.2621	200.2838	214.9012 (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	220.2427	194.0840	203.7401	182.5134	177.5163	156.3465	149.7918	166.9828	167.9891	189.2621	200.2838	214.9012 (64)
	69.0266	60.7357	63.5395	56.6172	54.9232	48.1854	45.8793	51.4208	51.7879	58.7255	62.5259	67.2505 (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	146.4723	146.4723	146.4723	146.4723	146.4723	146.4723	146.4723	146.4723	146.4723	146.4723	146.4723	146.4723	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.4790	25.2948	20.5711	15.5736	11.6415	9.8282	10.6197	13.8039	18.5276	23.5251	27.4572	29.2705	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	317.2731	320.5654	312.2689	294.6067	272.3112	251.3567	237.3577	234.0654	242.3619	260.0242	282.3196	303.2742	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6472	37.6472	37.6472	37.6472	37.6472	37.6472	37.6472	37.6472	37.6472	37.6472	37.6472	37.6472	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	(71)
Water heating gains (Table 5)	92.7777	90.3805	85.4025	78.6350	73.8214	66.9241	61.6657	69.1139	71.9276	78.9322	86.8415	90.3905	(72)
Total internal gains	508.4714	506.1823	488.1842	458.7570	427.7158	398.0507	379.5848	386.9250	402.7589	432.4231	466.5600	492.8768	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g Specific data or Table 6c	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	9.7400	10.6334	0.6300	0.7000	0.7700	31.6521	(74)
East	0.7200	19.6403	0.6300	0.7000	0.7700	4.3217	(76)
South	15.8700	46.7521	0.6300	0.7000	0.7700	226.7512	(78)
Southwest	0.8100	36.7938	0.6300	0.7000	0.7700	9.1082	(79)
West	1.5100	19.6403	0.6300	0.7000	0.7700	9.0635	(80)
Northwest	0.8100	11.2829	0.6300	0.7000	0.7700	2.7931	(81)

Solar gains	283.6897	479.2330	650.4247	805.7599	908.6855	906.5100	872.0191	793.4468	703.3533	527.7153	338.9380	243.4036	(83)
Total gains	792.1611	985.4153	1138.6088	1264.5169	1336.4013	1304.5607	1251.6039	1180.3717	1106.1122	960.1384	805.4981	736.2804	(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	59.5037	59.6274	59.7492	60.3278	60.4374	60.9524	60.9524	61.0488	60.7530	60.4374	60.2162	59.9868		
alpha	4.9669	4.9752	4.9833	5.0219	5.0292	5.0635	5.0635	5.0699	5.0502	5.0292	5.0144	4.9991		
util living area	0.9988	0.9961	0.9887	0.9641	0.8937	0.7439	0.5716	0.6238	0.8538	0.9777	0.9970	0.9992	(86)	
MIT	19.6791	19.8690	20.1382	20.4707	20.7593	20.9349	20.9862	20.9788	20.8623	20.4772	20.0081	19.6452	(87)	
Th 2	19.9464	19.9484	19.9503	19.9593	19.9610	19.9688	19.9688	19.9703	19.9658	19.9610	19.9576	19.9540	(88)	
util rest of house	0.9984	0.9948	0.9845	0.9500	0.8517	0.6530	0.4465	0.4979	0.7832	0.9664	0.9957	0.9989	(89)	
MIT 2	18.1800	18.4587	18.8512	19.3322	19.7201	19.9244	19.9637	19.9614	19.8539	19.3494	18.6690	18.1359	(90)	
Living area fraction	18.4077	18.6729	19.0466	19.5051	19.8779	20.0778	20.1190	20.1159	20.0071	19.5207	18.8724	18.3651	(92)	
Temperature adjustment	18.4077	18.6729	19.0466	19.5051	19.8779	20.0778	20.1190	20.1159	20.0071	19.5207	18.8724	18.3651	(93)	
adjusted MIT	18.4077	18.6729	19.0466	19.5051	19.8779	20.0778	20.1190	20.1159	20.0071	19.5207	18.8724	18.3651	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains	0.9974	0.9924	0.9795	0.9421	0.8477	0.6635	0.4654	0.5167	0.7866	0.9598	0.9937	0.9982	(94)	
Ext temp.	790.0834	977.9089	1115.2886	1191.2771	1132.8607	865.6331	582.5138	609.8700	870.0177	921.4962	800.4027	734.9197	(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	2420.7833	2358.4322	2144.0688	1794.9005	1381.5970	917.6179	589.4755	621.4919	992.7656	1507.0834	1996.1590	2411.0662	(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 per m2	1213.2407	927.7117	765.4125	434.6088	185.0598	0.0000	0.0000	0.0000	0.0000	435.6769	860.9445	1247.0530	(98)	
												6069.7079	(98)	
													(98) / (4) =	41.2821 (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													6498.6166 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1213.2407	927.7117	765.4125	434.6088	185.0598	0.0000	0.0000	0.0000	0.0000	435.6769	860.9445	1247.0530	(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)	1298.9729	993.2673	819.4995	465.3200	198.1368	0.0000	0.0000	0.0000	0.0000	466.4635	921.7822	1335.1745	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	220.2427	194.0840	203.7401	182.5134	177.5163	156.3465	149.7918	166.9828	167.9891	189.2621	200.2838	214.9012	(64)
Efficiency of water heater (217)m	88.6862	88.4747	88.0712	87.1578	85.1560	80.3000	80.3000	80.3000	80.3000	87.0829	88.3038	88.7589	(216)
Fuel for water heating, kWh/month	248.3394	219.3668	231.3356	209.4057	208.4601	194.7029	186.5402	207.9487	209.2019	217.3356	226.8121	242.1178	(219)
Water heating fuel used												2601.5667	(219)
Annual totals kWh/year													
Space heating fuel - main system												6498.6166	(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)												502.9472	(232)
Total delivered energy for all uses												9678.1305	(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	6498.6166	0.2160	1403.7012 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2601.5667	0.2160	561.9384 (264)
Space and water heating			1965.6396 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	502.9472	0.5190	261.0296 (268)
Total CO2, kg/m2/year			2265.5942 (272)
Emissions per m2 for space and water heating			13.3690 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			1.7753 (272b)
Emissions per m2 for pumps and fans			0.2647 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.3690 * 1.00) + 1.7753 + 0.2647, rounded to 2 d.p.			15.4100 (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	74.7800 (1b)	x 2.3900 (2b)	= 178.7242 (1b) - (3b)
First floor	72.2500 (1c)	x 2.6100 (2c)	= 188.5725 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	147.0300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 367.2967 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) = 0.1089 (8)
Pressure test					Yes
Measured/design AP50					4.1400
Infiltration rate					0.3159 (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) =	0.2685 (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	0.3424	0.3356	0.3289	0.2954	0.2887	0.2551	0.2551	0.2484	0.2685	0.2887	0.3021	0.3155 (22b)
Effective ac	0.5586	0.5563	0.5541	0.5436	0.5417	0.5325	0.5325	0.5308	0.5361	0.5417	0.5456	0.5498 (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			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.20)			29.4600	1.1450	33.7328		(27)
Ground Floor			74.7800	0.1200	8.9736	84.0000	6281.5200 (28a)
Brick and Block	180.4200	31.6100	148.8100	0.2400	35.7144	42.2200	6282.7582 (29a)
Pitched Roof	74.7800		74.7800	0.1000	7.4780	9.1000	680.4980 (30)
Total net area of external elements Aum(A, m ²)			329.9800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	88.2638		(33)
Ground Floor Block			62.2000			75.0000	4665.0000 (32c)
Ground Floor Stud			57.6700			9.0000	519.0300 (32c)
First Floor Block			48.4600			75.0000	3634.5000 (32c)
First Floor Stud			110.7600			9.0000	996.8400 (32c)
Internal Floor 1			72.2500			18.0000	1300.5000 (32d)
Internal Ceiling 1			72.2500			9.0000	650.2500 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 25010.8962 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 170.1074 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.4778 (36)
Total fabric heat loss (33) + (36) = 96.7416 (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	67.7074	67.4316	67.1612	65.8913	65.6537	64.5476	64.5476	64.3428	64.9736	65.6537	66.1343	66.6368 (38)
Heat transfer coeff	164.4490	164.1731	163.9028	162.6328	162.3952	161.2892	161.2892	161.0843	161.7152	162.3952	162.8759	163.3784 (39)
Average = Sum(39)m / 12 =												162.6317 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1185	1.1166	1.1148	1.1061	1.1045	1.0970	1.0970	1.0956	1.0999	1.1045	1.1078	1.1112 (40)
HLP (average)												1.1061 (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 2.9294 (42)
Average daily hot water use (litres/day) 103.7743 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	114.1518	110.0008	105.8498	101.6988	97.5479	93.3969	93.3969	97.5479	101.6988	105.8498	110.0008	114.1518 (44)
Energy conte	169.2838	148.0567	152.7812	133.1984	127.8070	110.2877	102.1978	117.2735	118.6741	138.3032	150.9687	163.9423 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Energy content (annual)	Total = Sum(45)m = 1632.7742 (45)											
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	35.9728	31.4620	32.4660	28.3047	27.1590	23.4361	21.7170	24.9206	25.2182	29.3894	32.0809	34.8377 (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)
(66)m	146.4723	146.4723	146.4723	146.4723	146.4723	146.4723	146.4723	146.4723	146.4723	146.4723	146.4723	146.4723	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.4790	25.2948	20.5711	15.5736	11.6415	9.8282	10.6197	13.8039	18.5276	23.5251	27.4572	29.2705	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	317.2731	320.5654	312.2689	294.6067	272.3112	251.3567	237.3577	234.0654	242.3619	260.0242	282.3196	303.2742	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6472	37.6472	37.6472	37.6472	37.6472	37.6472	37.6472	37.6472	37.6472	37.6472	37.6472	37.6472	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	(71)
Water heating gains (Table 5)	48.3505	46.8185	43.6371	39.3120	36.5040	32.5502	29.1896	33.4954	35.0253	39.5019	44.5567	46.8249	(72)
Total internal gains	461.0443	459.6204	443.4188	416.4340	387.3984	360.6768	344.1087	348.3065	362.8566	389.9929	421.2753	446.3112	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d		Gains W	
North				9.7400	10.6334	0.6300	0.7000		0.7700		31.6521 (74)	
East				0.7200	19.6403	0.6300	0.7000		0.7700		4.3217 (76)	
South				15.8700	46.7521	0.6300	0.7000		0.7700		226.7512 (78)	
Southwest				0.8100	36.7938	0.6300	0.7000		0.7700		9.1082 (79)	
West				1.5100	19.6403	0.6300	0.7000		0.7700		9.0635 (80)	
Northwest				0.8100	11.2829	0.6300	0.7000		0.7700		2.7931 (81)	
Solar gains	283.6897	479.2330	650.4247	805.7599	908.6855	906.5100	872.0191	793.4468	703.3533	527.7153	338.9380	243.4036 (83)
Total gains	744.7340	938.8533	1093.8434	1222.1939	1296.0839	1267.1868	1216.1278	1141.7533	1066.2099	917.7082	760.2133	689.7149 (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	42.2470	42.3180	42.3878	42.7187	42.7812	43.0746	43.0746	43.1294	42.9611	42.7812	42.6550	42.5238	
alpha	3.8165	3.8212	3.8259	3.8479	3.8521	3.8716	3.8716	3.8753	3.8641	3.8521	3.8437	3.8349	
util living area	0.9950	0.9876	0.9716	0.9327	0.8498	0.7065	0.5510	0.6004	0.8121	0.9541	0.9899	0.9962	(86)
MIT	19.2729	19.5213	19.8674	20.2847	20.6466	20.8814	20.9657	20.9520	20.7837	20.2970	19.6948	19.2246	(87)
Th 2	19.9858	19.9873	19.9888	19.9958	19.9972	20.0033	20.0033	20.0044	20.0009	19.9972	19.9945	19.9917	(88)
util rest of house	0.9938	0.9846	0.9646	0.9151	0.8090	0.6276	0.4397	0.4896	0.7482	0.9386	0.9871	0.9953	(89)
MIT 2	18.4015	18.6495	18.9925	19.4031	19.7389	19.9373	19.9911	19.9858	19.8655	19.4227	18.8288	18.3579	(90)
Living area fraction	18.5338	18.7819	19.1253	19.5370	19.8767	20.0807	20.1391	20.1325	20.0050	19.5555	18.9604	18.4895	(92)
Temperature adjustment	18.5338	18.7819	19.1253	19.5370	19.8767	20.0807	20.1391	20.1325	20.0050	19.5555	18.9604	18.4895	(93)
adjusted MIT	18.5338	18.7819	19.1253	19.5370	19.8767	20.0807	20.1391	20.1325	20.0050	19.5555	18.9604	18.4895	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9913	0.9799	0.9569	0.9053	0.8034	0.6343	0.4557	0.5049	0.7485	0.9299	0.9830	0.9934	(94)
Useful gains	738.2877	919.9585	1046.6838	1106.5050	1041.2820	803.8095	554.1986	576.4501	798.0654	853.3426	747.2787	685.1751	(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	2340.7412	2279.0385	2069.3288	1729.9263	1327.8641	883.9814	570.8159	601.2484	954.9209	1454.3263	1931.7664	2334.6022	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	1192.2254	913.3017	760.8479	448.8633	213.2170	0.0000	0.0000	0.0000	0.0000	447.1319	852.8312	1227.1738	(98)
Space heating												6055.5922	(98)
Space heating per m2												41.1861	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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	1516.1182	1193.5398	1224.2410	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8169	0.8827	0.8581	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1238.5869	1053.4973	1050.5664	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1605.9321	1543.3423	1458.8570	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	264.4886	364.4447	303.7682	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling													
Cooled fraction									FC = cooled area / (4) =			932.7015	(104)
Intermittency factor (Table 10b)												1.0000	(105)
Intermittency factor	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	66.1221	91.1112	75.9421	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling													
Space cooling per m2												233.1754	(107)
Energy for space heating												1.5859	(108)
Energy for space cooling												41.1861	(99)
Total												1.5859	(108)
Dwelling Fabric Energy Efficiency (DFEE)												42.7720	(109)
												42.8	(109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	74.7800 (1b)	x 2.3900 (2b)	= 178.7242 (1b) - (3b)
First floor	72.2500 (1c)	x 2.6100 (2c)	= 188.5725 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	147.0300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 367.2967 (5)

2. Ventilation rate

										main	secondary	other	total	m3 per hour			
										heating	heating						
Number of chimneys										0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues										0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans																4 * 10 =	40.0000 (7a)
Number of passive vents																0 * 10 =	0.0000 (7b)
Number of flueless gas fires																0 * 40 =	0.0000 (7c)
										Air changes per hour							
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) =	0.1089 (8)	
Pressure test															Yes		
Measured/design AP50															5.0000		
Infiltration rate															0.3589 (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) =					0.3051 (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	0.3890	0.3813	0.3737	0.3356	0.3279	0.2898	0.2898	0.2822	0.3051	0.3279	0.3432	0.3585 (22b)					
Effective ac	0.5756	0.5727	0.5698	0.5563	0.5538	0.5420	0.5420	0.5398	0.5465	0.5538	0.5589	0.5642 (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			2.1500	1.0000	2.1500		(26)					
TER Opening Type (Uw = 1.40)			29.4600	1.3258	39.0568		(27)					
Ground Floor			74.7800	0.1300	9.7214		(28a)					
Brick and Block	180.4200	31.6100	148.8100	0.1800	26.7858		(29a)					
Pitched Roof	74.7800		74.7800	0.1300	9.7214		(30)					
Total net area of external elements Aum(A, m2)			329.9800				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	87.4354		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.3848 (36)					
Total fabric heat loss						(33) + (36) =	101.8202 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 69.7728	Feb 69.4168	Mar 69.0678	Apr 67.4286	May 67.1219	Jun 65.6942	Jul 65.6942	Aug 65.4299	Sep 66.2442	Oct 67.1219	Nov 67.7423	Dec 68.3910 (38)
Heat transfer coeff	171.5930	171.2370	170.8880	169.2488	168.9421	167.5145	167.5145	167.2501	168.0644	168.9421	169.5626	170.2112 (39)
Average = Sum(39)m / 12 =												169.2474 (39)
HLP	Jan 1.1671	Feb 1.1646	Mar 1.1623	Apr 1.1511	May 1.1490	Jun 1.1393	Jul 1.1393	Aug 1.1375	Sep 1.1431	Oct 1.1490	Nov 1.1533	Dec 1.1577 (40)
HLP (average)												1.1511 (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												2.9294 (42)
Average daily hot water use (litres/day)												103.7743 (43)
Daily hot water use	Jan 114.1518	Feb 110.0008	Mar 105.8498	Apr 101.6988	May 97.5479	Jun 93.3969	Jul 93.3969	Aug 97.5479	Sep 101.6988	Oct 105.8498	Nov 110.0008	Dec 114.1518 (44)
Energy conte	169.2838	148.0567	152.7812	133.1984	127.8070	110.2877	102.1978	117.2735	118.6741	138.3032	150.9687	163.9423 (45)
Energy content (annual)												Total = Sum(45)m = 1632.7742 (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												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
	35.9728	31.4620	32.4660	28.3047	27.1590	23.4361	21.7170	24.9206	25.2182	29.3894	32.0809	34.8377 (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	146.4723	146.4723	146.4723	146.4723	146.4723	146.4723	146.4723	146.4723	146.4723	146.4723	146.4723	146.4723 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.4790	25.2948	20.5711	15.5736	11.6415	9.8282	10.6197	13.8039	18.5276	23.5251	27.4572	29.2705 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	317.2731	320.5654	312.2689	294.6067	272.3112	251.3567	237.3577	234.0654	242.3619	260.0242	282.3196	303.2742 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6472	37.6472	37.6472	37.6472	37.6472	37.6472	37.6472	37.6472	37.6472	37.6472	37.6472	37.6472 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778 (71)
Water heating gains (Table 5)	48.3505	46.8185	43.6371	39.3120	36.5040	32.5502	29.1896	33.4954	35.0253	39.5019	44.5567	46.8249 (72)
Total internal gains	461.0443	459.6204	443.4188	416.4340	387.3984	360.6768	344.1087	348.3065	362.8566	389.9929	421.2753	446.3112 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	9.7400	10.6334	0.6300	0.7000	0.7700	31.6521 (74)
East	0.7200	19.6403	0.6300	0.7000	0.7700	4.3217 (76)
South	15.8700	46.7521	0.6300	0.7000	0.7700	226.7512 (78)
Southwest	0.8100	36.7938	0.6300	0.7000	0.7700	9.1082 (79)
West	1.5100	19.6403	0.6300	0.7000	0.7700	9.0635 (80)
Northwest	0.8100	11.2829	0.6300	0.7000	0.7700	2.7931 (81)

Solar gains	283.6897	479.2330	650.4247	805.7599	908.6855	906.5100	872.0191	793.4468	703.3533	527.7153	338.9380	243.4036 (83)
Total gains	744.7340	938.8533	1093.8434	1222.1939	1296.0839	1267.1868	1216.1278	1141.7533	1066.2099	917.7082	760.2133	689.7149 (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	59.5037	59.6274	59.7492	60.3278	60.4374	60.9524	60.9524	61.0488	60.7530	60.4374	60.2162	59.9868
alpha	4.9669	4.9752	4.9833	5.0219	5.0292	5.0635	5.0635	5.0699	5.0502	5.0292	5.0144	4.9991
util living area	0.9991	0.9969	0.9904	0.9684	0.9031	0.7584	0.5862	0.6412	0.8677	0.9814	0.9977	0.9994 (86)
MIT	19.6490	19.8399	20.1112	20.4480	20.7441	20.9289	20.9845	20.9761	20.8500	20.4529	19.9796	19.6157 (87)
Th 2	19.9464	19.9484	19.9503	19.9593	19.9610	19.9688	19.9688	19.9703	19.9658	19.9610	19.9576	19.9540 (88)
util rest of house	0.9988	0.9958	0.9869	0.9558	0.8634	0.6682	0.4589	0.5135	0.8004	0.9718	0.9967	0.9992 (89)
MIT 2	18.7105	18.9024	19.1734	19.5100	19.7843	19.9352	19.9648	19.9634	19.8811	19.5204	19.0495	18.6832 (90)
Living area fraction										fLA = Living area / (4) =		0.1519 (91)
MIT	18.8530	19.0448	19.3158	19.6524	19.9301	20.0861	20.1197	20.1172	20.0282	19.6620	19.1908	18.8248 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8530	19.0448	19.3158	19.6524	19.9301	20.0861	20.1197	20.1172	20.0282	19.6620	19.1908	18.8248 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9983	0.9945	0.9840	0.9511	0.8620	0.6795	0.4783	0.5328	0.8052	0.9680	0.9956	0.9988 (94)
Ext temp.	743.4497	933.6847	1076.3531	1162.3902	1117.2248	861.1138	581.7340	608.3725	858.5002	888.3367	756.8991	688.8994 (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	2497.1938	2422.1100	2190.0734	1819.8362	1390.4030	919.0040	589.6022	621.6959	996.3276	1530.9546	2050.1406	2489.3012 (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	1304.7856	1000.2218	828.6078	473.3611	203.2446	0.0000	0.0000	0.0000	0.0000	478.1077	931.1339	1339.4990 (98)
Space heating per m2												658.9615 (98)
										(98) / (4) =		44.6097 (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	1574.6359	1239.6070	1271.1006	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8432	0.9118	0.8870	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1327.7096	1130.2200	1127.5236	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1605.9321	1543.3423	1458.8570	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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	200.3202	307.3630	246.5121	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												754.1953 (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	50.0801	76.8407	61.6280	0.0000	0.0000	0.0000	0.0000 (107)	
Space cooling												188.5488 (107)
Space cooling per m2												1.2824 (108)
Energy for space heating												44.6097 (99)
Energy for space cooling												1.2824 (108)
Total												45.8921 (109)
Target Fabric Energy Efficiency (TFEE)												52.8 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	74.7800 (1b)	x 2.3900 (2b)	= 178.7242 (1b) - (3b)
First floor	72.2500 (1c)	x 2.6100 (2c)	= 188.5725 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	147.0300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 367.2967 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				40.0000 / (5) =	0.1089 (8)
Pressure test					Yes
Measured/design AP50					4.1400
Infiltration rate					0.3159 (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) =		0.2685 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	3.9000	4.0000	3.8000	3.8000	3.7000	3.6000	3.5000	3.4000	3.7000	3.5000	3.7000 (22)
Wind factor	1.0500	0.9750	1.0000	0.9500	0.9500	0.9250	0.9000	0.8750	0.8500	0.9250	0.8750	0.9250 (22a)
Adj infilt rate												
Effective ac	0.2819	0.2618	0.2685	0.2551	0.2551	0.2484	0.2417	0.2350	0.2282	0.2484	0.2350	0.2484 (22b)
	0.5397	0.5343	0.5361	0.5325	0.5325	0.5308	0.5292	0.5276	0.5260	0.5308	0.5276	0.5308 (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			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.20)			29.4600	1.1450	33.7328		(27)
Ground Floor			74.7800	0.1200	8.9736	84.0000	6281.5200 (28a)
Brick and Block	180.4200	31.6100	148.8100	0.2400	35.7144	42.2200	6282.7582 (29a)
Pitched Roof	74.7800		74.7800	0.1000	7.4780	9.1000	680.4980 (30)
Total net area of external elements Aum(A, m ²)			329.9800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	88.2638		(33)
Ground Floor Block			62.2000			75.0000	4665.0000 (32c)
Ground Floor Stud			57.6700			9.0000	519.0300 (32c)
First Floor Block			48.4600			75.0000	3634.5000 (32c)
First Floor Stud			110.7600			9.0000	996.8400 (32c)
Internal Floor 1			72.2500			18.0000	1300.5000 (32d)
Internal Ceiling 1			72.2500			18.0000	1300.5000 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 25661.1462 (34)
174.5300 (35)
8.4778 (36)
(33) + (36) = 96.7416 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	65.4215	64.7579	64.9736	64.5476	64.5476	64.3428	64.1434	63.9495	63.7610	64.3428	63.9495	64.3428 (38)
Heat transfer coeff	162.1631	161.4995	161.7152	161.2892	161.2892	161.0843	160.8850	160.6911	160.5026	161.0843	160.6911	161.0843 (39)
Average = Sum(39)m / 12 =												161.1649 (40)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1029	1.0984	1.0999	1.0970	1.0970	1.0956	1.0942	1.0929	1.0916	1.0956	1.0929	1.0956 (40)
HLP (average)												1.0961 (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
Average daily hot water use (litres/day)
2.9294 (42)
103.7743 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	114.1518	110.0008	105.8498	101.6988	97.5479	93.3969	93.3969	97.5479	101.6988	105.8498	110.0008	114.1518 (44)
Energy conte	169.2838	148.0567	152.7812	133.1984	127.8070	110.2877	102.1978	117.2735	118.6741	138.3032	150.9687	163.9423 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Energy content (annual)												Total = Sum(45)m =	1632.7742 (45)
Distribution loss (46)m = 0.15 x (45)m													
	25.3926	22.2085	22.9172	19.9798	19.1710	16.5432	15.3297	17.5910	17.8011	20.7455	22.6453	24.5913 (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	25.3236	22.8735	25.3090	24.4657	25.2504	24.3882	25.1715	25.2226	24.4270	25.2716	24.4881	25.3107 (61)	
Total heat required for water heating calculated for each month	194.6074	170.9301	178.0902	157.6641	153.0574	134.6759	127.3693	142.4961	143.1010	163.5747	175.4569	189.2529 (62)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)	
	Solar input (sum of months) = Sum(63)m =											0.0000 (63)	
Output from w/h	194.6074	170.9301	178.0902	157.6641	153.0574	134.6759	127.3693	142.4961	143.1010	163.5747	175.4569	189.2529 (64)	
	Total per year (kWh/year) = Sum(64)m =											1930.2761 (64)	
RHI water heating demand												1930 (64)	
Heat gains from water heating, kWh/month	62.6177	54.9472	57.1270	50.4049	48.8084	42.7677	40.2736	45.2991	45.5659	52.3037	56.3191	60.8385 (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	175.7667	175.7667	175.7667	175.7667	175.7667	175.7667	175.7667	175.7667	175.7667	175.7667	175.7667	175.7667	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.1974	63.2369	51.4277	38.9341	29.1037	24.5705	26.5493	34.5098	46.3190	58.8127	68.6431	73.1762	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	473.5420	478.4558	466.0730	439.7114	406.4347	375.1592	354.2653	349.3514	361.7342	388.0958	421.3726	452.6480	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.5061	55.5061	55.5061	55.5061	55.5061	55.5061	55.5061	55.5061	55.5061	55.5061	55.5061	55.5061	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	(71)
Water heating gains (Table 5)	84.1636	81.7667	76.7836	70.0068	65.6027	59.3996	54.1312	60.8859	63.2859	70.3007	78.2210	81.7721	(72)
Total internal gains	745.9980	740.5544	711.3793	665.7473	618.2361	576.2244	552.0409	561.8421	588.4342	634.3042	685.3317	724.6914	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W	
North	9.7400	13.4839	0.6300	0.7000	0.7700	40.1371	(74)
East	0.7200	25.1925	0.6300	0.7000	0.7700	5.5434	(76)
South	15.8700	56.7559	0.6300	0.7000	0.7700	275.2704	(78)
Southwest	0.8100	45.1778	0.6300	0.7000	0.7700	11.1836	(79)
West	1.5100	25.1925	0.6300	0.7000	0.7700	11.6257	(80)
Northwest	0.8100	14.6176	0.6300	0.7000	0.7700	3.6185	(81)

Solar gains	347.3788	499.4768	685.6820	861.7471	931.0799	1012.5691	964.9378	893.7735	785.3557	593.8449	413.6262	293.0555	(83)
Total gains	1093.3768	1240.0312	1397.0614	1527.4945	1549.3160	1588.7935	1516.9787	1455.6157	1373.7899	1228.1490	1098.9579	1017.7469	(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	43.9563	44.1370	44.0781	44.1945	44.1945	44.2507	44.3055	44.3590	44.4111	44.2507	44.3590	44.2507
alpha	3.9304	3.9425	3.9385	3.9463	3.9463	3.9500	3.9537	3.9573	3.9607	3.9500	3.9573	3.9500
util living area	0.9807	0.9686	0.9370	0.8671	0.7464	0.5480	0.4061	0.4217	0.6622	0.8783	0.9620	0.9844 (86)
MIT	19.6945	19.8665	20.1891	20.5494	20.8177	20.9596	20.9903	20.9890	20.9137	20.6024	20.1087	19.6608 (87)
Th 2	19.9984	20.0021	20.0009	20.0033	20.0033	20.0044	20.0055	20.0066	20.0077	20.0044	20.0066	20.0044 (88)
util rest of house	0.9763	0.9616	0.9226	0.8369	0.6897	0.4632	0.3061	0.3184	0.5810	0.8432	0.9518	0.9807 (89)
MIT 2	18.8266	18.9980	19.3102	19.6500	19.8829	19.9859	20.0029	20.0036	19.9619	19.7065	19.2415	18.7984 (90)
Living area fraction	18.9585	19.1299	19.4437	19.7866	20.0249	20.1337	20.1529	20.1533	20.1065	19.8426	19.3732	18.9293 (91)
MIT	18.9585	19.1299	19.4437	19.7866	20.0249	20.1337	20.1529	20.1533	20.1065	19.8426	19.3732	18.9293 (92)
Temperature adjustment	18.9585	19.1299	19.4437	19.7866	20.0249	20.1337	20.1529	20.1533	20.1065	19.8426	19.3732	18.9293 (93)
adjusted MIT	18.9585	19.1299	19.4437	19.7866	20.0249	20.1337	20.1529	20.1533	20.1065	19.8426	19.3732	18.9293 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	1060.8241	1182.6929	1275.5356	1266.8976	1070.5934	754.1893	487.3029	486.2150	810.0344	1027.3392	1036.8908	992.7607	(94)
Ext temp.	4.9000	5.3000	7.0000	9.5000	12.5000	15.3000	17.1000	17.1000	14.7000	11.4000	7.9000	5.0000	(96)
Heat loss rate W	2279.7630	2233.5279	2012.3300	1659.1206	1213.6800	778.6405	491.1630	490.6331	867.7505	1359.9629	1843.6454	2243.7997	(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	906.8905	706.1611	548.1750	282.4006	106.4564	0.0000	0.0000	0.0000	0.0000	247.4720	580.8634	930.7731	(98)
Space heating												4309.1920	(98)
RHI space heating demand												4309	(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	74.7800 (1b)	x 2.3900 (2b)	= 178.7242 (1b) - (3b)
First floor	72.2500 (1c)	x 2.6100 (2c)	= 188.5725 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	147.0300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 367.2967 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					40.0000 / (5) = 0.1089 (8)
Pressure test					Yes
Measured/design AP50					4.1400
Infiltration rate					0.3159 (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)	=	0.2685 (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	0.3424	0.3356	0.3289	0.2954	0.2887	0.2551	0.2551	0.2484	0.2685	0.2887	0.3021	0.3155 (22b)
Effective ac	0.5586	0.5563	0.5541	0.5436	0.5417	0.5325	0.5325	0.5308	0.5361	0.5417	0.5456	0.5498 (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			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.20)			29.4600	1.1450	33.7328		(27)
Ground Floor			74.7800	0.1200	8.9736	84.0000	6281.5200 (28a)
Brick and Block	180.4200	31.6100	148.8100	0.2400	35.7144	42.2200	6282.7582 (29a)
Pitched Roof	74.7800		74.7800	0.1000	7.4780	9.1000	680.4980 (30)
Total net area of external elements Aum(A, m ²)			329.9800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	88.2638		(33)
Ground Floor Block			62.2000			75.0000	4665.0000 (32c)
Ground Floor Stud			57.6700			9.0000	519.0300 (32c)
First Floor Block			48.4600			75.0000	3634.5000 (32c)
First Floor Stud			110.7600			9.0000	996.8400 (32c)
Internal Floor 1			72.2500			18.0000	1300.5000 (32d)
Internal Ceiling 1			72.2500			18.0000	1300.5000 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 25661.1462 (34)
174.5300 (35)
8.4778 (36)
(33) + (36) = 96.7416 (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	67.7074	67.4316	67.1612	65.8913	65.6537	64.5476	64.5476	64.3428	64.9736	65.6537	66.1343	66.6368 (38)
Heat transfer coeff	164.4490	164.1731	163.9028	162.6328	162.3952	161.2892	161.2892	161.0843	161.7152	162.3952	162.8759	163.3784 (39)
Average = Sum(39)m / 12 =												162.6317 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1185	1.1166	1.1148	1.1061	1.1045	1.0970	1.0970	1.0956	1.0999	1.1045	1.1078	1.1112 (40)
HLP (average)												1.1061 (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
Average daily hot water use (litres/day)
2.9294 (42)
103.7743 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	114.1518	110.0008	105.8498	101.6988	97.5479	93.3969	93.3969	97.5479	101.6988	105.8498	110.0008	114.1518 (44)
Energy conte	169.2838	148.0567	152.7812	133.1984	127.8070	110.2877	102.1978	117.2735	118.6741	138.3032	150.9687	163.9423 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Energy content (annual)												Total = Sum(45)m = 1632.7742 (45)
Distribution loss (46)m = 0.15 x (45)m												
	25.3926	22.2085	22.9172	19.9798	19.1710	16.5432	15.3297	17.5910	17.8011	20.7455	22.6453	24.5913 (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	25.3236	22.8735	25.3090	24.4657	25.2504	24.3882	25.1715	25.2226	24.4270	25.2716	24.4881	25.3107 (61)
Total heat required for water heating calculated for each month	194.6074	170.9301	178.0902	157.6641	153.0574	134.6759	127.3693	142.4961	143.1010	163.5747	175.4569	189.2529 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h	194.6074	170.9301	178.0902	157.6641	153.0574	134.6759	127.3693	142.4961	143.1010	163.5747	175.4569	189.2529 (64)
Heat gains from water heating, kWh/month	62.6177	54.9472	57.1270	50.4049	48.8084	42.7677	40.2736	45.2991	45.5659	52.3037	56.3191	60.8385 (65)
Total per year (kWh/year) = Sum(64)m =												1930.2761 (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	175.7667	175.7667	175.7667	175.7667	175.7667	175.7667	175.7667	175.7667	175.7667	175.7667	175.7667	175.7667	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.1974	63.2369	51.4277	38.9341	29.1037	24.5705	26.5493	34.5098	46.3190	58.8127	68.6431	73.1762	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	473.5420	478.4558	466.0730	439.7114	406.4347	375.1592	354.2653	349.3514	361.7342	388.0958	421.3726	452.6480	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.5061	55.5061	55.5061	55.5061	55.5061	55.5061	55.5061	55.5061	55.5061	55.5061	55.5061	55.5061	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	(71)
Water heating gains (Table 5)	84.1636	81.7667	76.7836	70.0068	65.6027	59.3996	54.1312	60.8859	63.2859	70.3007	78.2210	81.7721	(72)
Total internal gains	745.9980	740.5544	711.3793	665.7473	618.2361	576.2244	552.0409	561.8421	588.4342	634.3042	685.3317	724.6914	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d		Gains W	
North				9.7400	10.6334	0.6300	0.7000		0.7700		31.6521 (74)	
East				0.7200	19.6403	0.6300	0.7000		0.7700		4.3217 (76)	
South				15.8700	46.7521	0.6300	0.7000		0.7700		226.7512 (78)	
Southwest				0.8100	36.7938	0.6300	0.7000		0.7700		9.1082 (79)	
West				1.5100	19.6403	0.6300	0.7000		0.7700		9.0635 (80)	
Northwest				0.8100	11.2829	0.6300	0.7000		0.7700		2.7931 (81)	
Solar gains	283.6897	479.2330	650.4247	805.7599	908.6855	906.5100	872.0191	793.4468	703.3533	527.7153	338.9380	243.4036 (83)
Total gains	1029.6877	1219.7874	1361.8040	1471.5072	1526.9216	1482.7344	1424.0600	1355.2889	1291.7876	1162.0195	1024.2697	968.0950 (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	43.3453	43.4182	43.4898	43.8294	43.8935	44.1945	44.1945	44.2507	44.0781	43.8935	43.7640	43.6294	
alpha	3.8897	3.8945	3.8993	3.9220	3.9262	3.9463	3.9463	3.9500	3.9385	3.9262	3.9176	3.9086	
util living area	0.9861	0.9729	0.9479	0.8940	0.7926	0.6354	0.4818	0.5227	0.7354	0.9146	0.9750	0.9889 (86)	
MIT	19.5368	19.7682	20.0814	20.4469	20.7455	20.9234	20.9800	20.9723	20.8592	20.4689	19.9276	19.4864 (87)	
Th 2	19.9858	19.9873	19.9888	19.9958	19.9972	20.0033	20.0033	20.0044	20.0009	19.9972	19.9945	19.9917 (88)	
util rest of house	0.9829	0.9668	0.9360	0.8692	0.7444	0.5557	0.3799	0.4197	0.6632	0.8893	0.9683	0.9863 (89)	
MIT 2	18.6608	18.8898	19.1967	19.5502	19.8184	19.9629	19.9966	19.9944	19.9181	19.5792	19.0551	18.6155 (90)	
Living area fraction	18.7938	19.0232	19.3310	19.6864	19.9592	20.1088	20.1459	20.1429	20.0611	fLA = Living area / (4) =			0.1519 (91)
MIT	18.7938	19.0232	19.3310	19.6864	19.9592	20.1088	20.1459	20.1429	20.0611	19.7143	19.1876	18.7477 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.7938	19.0232	19.3310	19.6864	19.9592	20.1088	20.1459	20.1429	20.0611	19.7143	19.1876	18.7477 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	1006.9654	1170.2717	1261.7374	1265.8888	1133.5669	837.2402	562.4667	589.0193	862.9465	1023.3281	984.6870	950.7403	(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	2383.4934	2318.6578	2103.0409	1754.2211	1341.2536	888.5048	571.9207	602.9220	963.9938	1480.1260	1968.7807	2376.7862	(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	1024.1368	771.7155	625.9298	351.5993	154.5189	0.0000	0.0000	0.0000	0.0000	339.8577	708.5475	1060.9781	(98)
Space heating	1024.1368	771.7155	625.9298	351.5993	154.5189	0.0000	0.0000	0.0000	0.0000	339.8577	708.5475	1060.9781	(98)
Space heating per m2													(98) / (4) = 34.2602 (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													5553.7856 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1024.1368	771.7155	625.9298	351.5993	154.5189	0.0000	0.0000	0.0000	0.0000	339.8577	708.5475	1060.9781	(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)	1129.1476	850.8439	690.1100	387.6508	170.3626	0.0000	0.0000	0.0000	0.0000	374.7052	781.1990	1169.7664	(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	194.6074	170.9301	178.0902	157.6641	153.0574	134.6759	127.3693	142.4961	143.1010	163.5747	175.4569	189.2529	(64)
Efficiency of water heater (217)m	90.1224	90.0446	89.9007	89.5868	88.9239	87.2000	87.2000	87.2000	87.2000	89.5324	89.9831	87.2000	(216)
Fuel for water heating, kWh/month	215.9367	189.8282	198.0965	175.9904	172.1218	154.4449	146.0657	163.4130	164.1067	182.6990	194.9886	209.9259	(219)
Water heating fuel used												2167.6173	(219)
Annual totals kWh/year													
Space heating fuel - main system												5553.7856	(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)												502.9472	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.81 * 1080 * 1.00) =										-699.5320		-699.5320	(233)
Total delivered energy for all uses												7599.8181	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	5553.7856	3.4800	193.2717 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2167.6173	3.4800	75.4331 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	502.9472	13.1900	66.3387 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-699.5320	13.1900	-92.2683 (252)
Total energy cost			372.6678 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)		0.8151 (257)
SAP value	[(255) x (256)] / [(4) + 45.0] =	88.6296
SAP rating (Section 12)		89 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	5553.7856	0.2160	1199.6177 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2167.6173	0.2160	468.2053 (264)
Space and water heating			1667.8230 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	502.9472	0.5190	261.0296 (268)
Energy saving/generation technologies			
PV Unit	-699.5320	0.5190	-363.0571 (269)
Total kg/year			1604.7205 (272)
CO2 emissions per m2			10.9100 (273)
EI value			88.8021
EI rating			89 (274)
EI band			B

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9070 = 3.837$, 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	$3.48 / 0.8892 = 3.914$, stars = 4
Water heating environmental impact	$0.216 / 0.8892 = 0.2429$, 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	74.7800 (1b)	x 2.3900 (2b)	= 178.7242 (1b) - (3b)
First floor	72.2500 (1c)	x 2.6100 (2c)	= 188.5725 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	147.0300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 367.2967 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					40.0000 / (5) = 0.1089 (8)
Pressure test					Yes
Measured/design AP50					4.1400
Infiltration rate					0.3159 (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)	=	0.2685 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	3.9000	4.0000	3.8000	3.8000	3.7000	3.6000	3.5000	3.4000	3.7000	3.5000	3.7000 (22)
Wind factor	1.0500	0.9750	1.0000	0.9500	0.9500	0.9250	0.9000	0.8750	0.8500	0.9250	0.8750	0.9250 (22a)
Adj infilt rate												
Effective ac	0.2819	0.2618	0.2685	0.2551	0.2551	0.2484	0.2417	0.2350	0.2282	0.2484	0.2350	0.2484 (22b)
	0.5397	0.5343	0.5361	0.5325	0.5325	0.5308	0.5292	0.5276	0.5260	0.5308	0.5276	0.5308 (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			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.20)			29.4600	1.1450	33.7328		(27)
Ground Floor			74.7800	0.1200	8.9736	84.0000	6281.5200 (28a)
Brick and Block	180.4200	31.6100	148.8100	0.2400	35.7144	42.2200	6282.7582 (29a)
Pitched Roof	74.7800		74.7800	0.1000	7.4780	9.1000	680.4980 (30)
Total net area of external elements Aum(A, m ²)			329.9800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	88.2638		(33)
Ground Floor Block			62.2000			75.0000	4665.0000 (32c)
Ground Floor Stud			57.6700			9.0000	519.0300 (32c)
First Floor Block			48.4600			75.0000	3634.5000 (32c)
First Floor Stud			110.7600			9.0000	996.8400 (32c)
Internal Floor 1			72.2500			18.0000	1300.5000 (32d)
Internal Ceiling 1			72.2500			18.0000	1300.5000 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	65.4215	64.7579	64.9736	64.5476	64.5476	64.3428	64.1434	63.9495	63.7610	64.3428	63.9495	64.3428 (38)
Average = Sum(39)m / 12 =	162.1631	161.4995	161.7152	161.2892	161.2892	161.0843	160.8850	160.6911	160.5026	161.0843	160.6911	161.0843 (39)
												161.1649 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1029	1.0984	1.0999	1.0970	1.0970	1.0956	1.0942	1.0929	1.0916	1.0956	1.0929	1.0956 (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												2.9294 (42)
Average daily hot water use (litres/day)												103.7743 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	114.1518	110.0008	105.8498	101.6988	97.5479	93.3969	93.3969	97.5479	101.6988	105.8498	110.0008	114.1518 (44)
	169.2838	148.0567	152.7812	133.1984	127.8070	110.2877	102.1978	117.2735	118.6741	138.3032	150.9687	163.9423 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Energy content (annual)												Total = Sum (45)m = 1632.7742 (45)
Distribution loss (46)m = 0.15 x (45)m												
25.3926	22.2085	22.9172	19.9798	19.1710	16.5432	15.3297	17.5910	17.8011	20.7455	22.6453	24.5913	(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	25.3236	22.8735	25.3090	24.4657	25.2504	24.3882	25.1715	25.2226	24.4270	25.2716	24.4881	25.3107 (61)
Total heat required for water heating calculated for each month												
194.6074	170.9301	178.0902	157.6641	153.0574	134.6759	127.3693	142.4961	143.1010	163.5747	175.4569	189.2529	(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)
Solar input (sum of months) = Sum (63)m =												0.0000 (63)
Output from w/h												
194.6074	170.9301	178.0902	157.6641	153.0574	134.6759	127.3693	142.4961	143.1010	163.5747	175.4569	189.2529	(64)
Total per year (kWh/year) = Sum (64)m =												1930.2761 (64)
Heat gains from water heating, kWh/month												
62.6177	54.9472	57.1270	50.4049	48.8084	42.7677	40.2736	45.2991	45.5659	52.3037	56.3191	60.8385	(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	175.7667	175.7667	175.7667	175.7667	175.7667	175.7667	175.7667	175.7667	175.7667	175.7667	175.7667	175.7667 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.1974	63.2369	51.4277	38.9341	29.1037	24.5705	26.5493	34.5098	46.3190	58.8127	68.6431	73.1762 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	473.5420	478.4558	466.0730	439.7114	406.4347	375.1592	354.2653	349.3514	361.7342	388.0958	421.3726	452.6480 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.5061	55.5061	55.5061	55.5061	55.5061	55.5061	55.5061	55.5061	55.5061	55.5061	55.5061	55.5061 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778	-117.1778 (71)
Water heating gains (Table 5)	84.1636	81.7667	76.7836	70.0068	65.6027	59.3996	54.1312	60.8859	63.2859	70.3007	78.2210	81.7721 (72)
Total internal gains	745.9980	740.5544	711.3793	665.7473	618.2361	576.2244	552.0409	561.8421	588.4342	634.3042	685.3317	724.6914 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				9.7400	13.4839	0.6300	0.7000	0.7700	40.1371 (74)			
East				0.7200	25.1925	0.6300	0.7000	0.7700	5.5434 (76)			
South				15.8700	56.7559	0.6300	0.7000	0.7700	275.2704 (78)			
Southwest				0.8100	45.1778	0.6300	0.7000	0.7700	11.1836 (79)			
West				1.5100	25.1925	0.6300	0.7000	0.7700	11.6257 (80)			
Northwest				0.8100	14.6176	0.6300	0.7000	0.7700	3.6185 (81)			
Solar gains	347.3788	499.4768	685.6820	861.7471	931.0799	1012.5691	964.9378	893.7735	785.3557	593.8449	413.6262	293.0555 (83)
Total gains	1093.3768	1240.0312	1397.0614	1527.4945	1549.3160	1588.7935	1516.9787	1455.6157	1373.7899	1228.1490	1098.9579	1017.7469 (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	43.9563	44.1370	44.0781	44.1945	44.1945	44.2507	44.3055	44.3590	44.4111	44.2507	44.3590	44.2507
alpha	3.9304	3.9425	3.9385	3.9463	3.9463	3.9500	3.9537	3.9573	3.9607	3.9500	3.9573	3.9500
util living area	0.9807	0.9686	0.9370	0.8671	0.7464	0.5480	0.4061	0.4217	0.6622	0.8783	0.9620	0.9844 (86)
MIT	19.6945	19.8665	20.1891	20.5494	20.8177	20.9596	20.9903	20.9890	20.9137	20.6024	20.1087	19.6608 (87)
Th 2	19.9984	20.0021	20.0009	20.0033	20.0033	20.0044	20.0055	20.0066	20.0077	20.0044	20.0066	20.0044 (88)
util rest of house	0.9763	0.9616	0.9226	0.8369	0.6897	0.4632	0.3061	0.3184	0.5810	0.8432	0.9518	0.9807 (89)
MIT 2	18.8266	18.9980	19.3102	19.6500	19.8829	19.9859	20.0029	20.0036	19.9619	19.7065	19.2415	18.7984 (90)
Living area fraction												
MIT	18.9585	19.1299	19.4437	19.7866	20.0249	20.1337	20.1529	20.1533	20.1065	19.8426	19.3732	18.9293 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9585	19.1299	19.4437	19.7866	20.0249	20.1337	20.1529	20.1533	20.1065	19.8426	19.3732	18.9293 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation	0.9702	0.9538	0.9130	0.8294	0.6910	0.4747	0.3212	0.3340	0.5896	0.8365	0.9435	0.9754	(94)	
Useful gains	1060.8241	1182.6929	1275.5356	1266.8976	1070.5934	754.1893	487.3029	486.2150	810.0344	1027.3392	1036.8908	992.7607	(95)	
Ext temp.	4.9000	5.3000	7.0000	9.5000	12.5000	15.3000	17.1000	17.1000	14.7000	11.4000	7.9000	5.0000	(96)	
Heat loss rate W														
	2279.7630	2233.5279	2012.3300	1659.1206	1213.6800	778.6405	491.1630	490.6331	867.7505	1359.9629	1843.6454	2243.7997	(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	906.8905	706.1611	548.1750	282.4006	106.4564	0.0000	0.0000	0.0000	0.0000	247.4720	580.8634	930.7731	(98)	
Space heating												4309.1920	(98)	
Space heating per m2												(98) / (4) =	29.3083	(99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													4751.0386 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	906.8905	706.1611	548.1750	282.4006	106.4564	0.0000	0.0000	0.0000	0.0000	247.4720	580.8634	930.7731	(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)	999.8793	778.5679	604.3826	311.3568	117.3720	0.0000	0.0000	0.0000	0.0000	272.8467	640.4227	1026.2106	(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	194.6074	170.9301	178.0902	157.6641	153.0574	134.6759	127.3693	142.4961	143.1010	163.5747	175.4569	189.2529	(64)
Efficiency of water heater (217)m	90.0613	89.9960	89.8160	89.4142	88.6026	87.2000	87.2000	87.2000	87.2000	89.2741	89.8632	87.2000	(216)
Fuel for water heating, kWh/month	216.0831	189.9307	198.2834	176.3300	172.7460	154.4449	146.0657	163.4130	164.1067	183.2276	195.2488	210.0733	(219)
Water heating fuel used												2169.9532	(219)
Annual totals kWh/year													
Space heating fuel - main system												4751.0386	(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)												502.9472	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.81 * 1208 * 1.00) =												-782.8819	(233)
Total delivered energy for all uses												6716.0571	(238)

10a. Fuel costs - using BEDF prices (572)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4751.0386	5.7300	272.2345 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2169.9532	5.7300	124.3383 (247)
Pumps and fans for heating	75.0000	24.1800	18.1350 (249)
Energy for lighting	502.9472	24.1800	121.6126 (250)
Additional standing charges			114.0000 (251)
Energy saving/generation technologies			
PV Unit	-782.8819	24.1800	-189.3008 (252)
Total energy cost			461.0196 (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	4751.0386	0.2160	1026.2243 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2169.9532	0.2160	468.7099 (264)
Space and water heating			1494.9342 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	502.9472	0.5190	261.0296 (268)
Energy saving/generation technologies			
PV Unit	-782.8819	0.5190	-406.3157 (269)
Total kg/year			1388.5731 (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	4751.0386	1.2200	5796.2671 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2169.9532	1.2200	2647.3429 (264)
Space and water heating			8443.6100 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	502.9472	3.0700	1544.0479 (268)
Energy saving/generation technologies			
PV Unit	-782.8819	3.0700	-2403.4473 (269)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

7814.4605 (272)
53.1487 (273)

SAP 2012 EPC IMPROVEMENTS

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

(For testing purposes):

A	Not considered
B	Not considered
C	Not considered
D	Not considered
E Low energy lighting	Already installed
F	Not considered
G	Not considered
H	Not considered
I	Not considered
J	Not considered
K	Not considered
M	Not considered
N Solar water heating	SAP increase too small
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
(none)

Measures omitted - SAP change or cost saving too small:
N Solar water heating + 0.9 -£ 48 -200 kg (14.4%)

Recommended measures Typical annual savings Energy Environmental
(none) efficiency impact
Total Savings £0 0.00 kg/m²

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

Fuel prices for cost data on this page from database revision number 572 TEST (30 May 2025)
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	£140	£140	£0
Mains gas	£511	£511	£0
Space heating	£404	£404	£0
Water heating	£124	£124	£0
Lighting	£122	£122	£0
Generated (PV)	-£189	-£189	£0
Total cost of fuels	£462	£462	£0
Total cost of uses	£461	£461	£0
Delivered energy	46 kWh/m ²	46 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	1.4 tonnes	1.4 tonnes	0.0 tonnes
CO2 emissions per m ²	9 kg/m ²	9 kg/m ²	0 kg/m ²
Primary energy	53 kWh/m ²	53 kWh/m ²	0 kWh/m ²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

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

No improvements selected / applicable

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0906 Plot 3	Issued on Date	16/06/2025
Assessment Reference	As Built	Prop Type Ref	Type D
Project	3, Redwing Close, Botley, SO32 2DL		
Calculation Type	New Build (As Built)		

SAP Rating	89 B	DER	12.33	TER	15.41
Environmental	89 B	% DER<TER	19.98		
CO ₂ Emissions (t/year)	1.39	DFEE	42.77	TFEE	52.78
General Requirements Compliance	Pass	% DFEE<TFEE	18.96		

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

Building Elements

Roof 000002 - Mineral Wool between and above

Roof Type: Pitched Roof, insulated flat ceiling

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	Mineral wool batt						
	Main construction	350	0.0380	9.2105	100.00		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 2	Mineral wool batt						
	Main construction	100	0.0380	2.6316	87.50		
	Main construction	100	0.1300	0.7692	12.50		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 3	Plasterboard, standard						
	Main construction	12.5	0.2100	0.0595	100.00	700	1000
Int surface				0.1000			

Total resistance: Upper limit = 11.772 m² K/W Lower limit = 11.430 m² K/W Average = 11.601 m² K/W
Total correction = 0.0096 m² K/W U-value (unrounded) = 0.1 W/m² 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 0906 Plot 3	Issued on Date	16/06/2025
Assessment Reference	As Built	Prop Type Ref	Type D
Project	3, Redwing Close, Botley, SO32 2DL		
Calculation Type	New Build (As Built)		

SAP Rating	89 B	DER	12.33	TER	15.41
Environmental	89 B	% DER<TER	19.98		
CO ₂ Emissions (t/year)	1.39	DFEE	42.77	TFEE	52.78
General Requirements Compliance	Pass	% DFEE<TFEE	18.96		

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

Wall 000001

Wall Type: Standard Wall

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

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

Unheated space: None		
Total thickness: 330 mm	U-value: 0.24 W/m² K	Kappa: 42.22 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0906 Plot 3	Issued on Date	16/06/2025
Assessment Reference	As Built	Prop Type Ref	Type D
Project	3, Redwing Close, Botley, SO32 2DL		
Calculation Type	New Build (As Built)		

SAP Rating	89 B	DER	12.33	TER	15.41
Environmental	89 B	% DER<TER	19.98		
CO ₂ Emissions (t/year)	1.39	DFEE	42.77	TFEE	52.78
General Requirements Compliance	Pass	% DFEE<TFEE	18.96		

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

Building Elements

Floor 000003 - Worst Case Slab

Floor Type: Slab On Ground Floor

Area = 42.27 m², Perimeter = 18.36 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 0906 Plot 3			Issued on Date	16/06/2025
Assessment Reference	As Built	Prop Type Ref	Type D		
Property	3, Redwing Close, Botley, SO32 2DL				
SAP Rating	89 B	DER	12.33	TER	15.41
Environmental	89 B	% DER<TER	19.98		
CO ₂ Emissions (t/year)	1.39	DFEE	42.77	TFEE	52.78
General Requirements Compliance	Pass	% DFEE<TFEE	18.96		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com			Assessor ID	E477-0001
Client	Foreman Homes, FORE				

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

Orientation	North
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Urban
1.0 Property Type	House, Detached
2.0 Number of Storeys	2
3.0 Date Built	2022
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:	37.28 m	74.78 m ²	2.39 m
1st Storey:	34.99 m	72.25 m ²	2.61 m

7.0 Living Area	22.33	m ²
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8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	174.53	kJ/m²K

9.0 External Walls

Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Brick and Block	Cavity Wall	Other	0.24	42.22	180.42	148.81

9.1 Party Walls

Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)
		Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill		110.00	
		Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill		110.00	

9.2 Internal Walls

Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
Ground Floor Block	Dense block, plasterboard on dabs	75.00	62.20
Ground Floor Stud	Plasterboard on timber frame	9.00	57.67
First Floor Block	Dense block, plasterboard on dabs	75.00	48.46
First Floor Stud	Plasterboard on timber frame	9.00	110.76

10.0 External Roofs

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area (m²)	Nett Area (m²)
Pitched Roof	External Plane Roof	Other	0.10	9.10	74.78	74.78

10.2 Internal Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Ceiling 1	Plasterboard ceiling, carpeted chipboard floor	9.00	72.25

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	74.78

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	72.25

12.0 Opening Types

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

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
Front Door	Solid Door	[1] Brick and Block	North							2.15	
Front Shaded	Window	[1] Brick and Block	North	None	0.73	Yes				0.60	
Front Elevation	Window	[1] Brick and Block	North	None	0.00					9.14	
Side Elevation	Window	[1] Brick and Block	East	None	0.00					0.72	
South Elevation	Window	[1] Brick and Block	South	None	0.00					15.87	
West Bay	Window	[1] Brick and Block	West	None	0.00					1.51	
North West Bay	Window	[1] Brick and Block	North West	None	0.00					0.81	
North East Bay	Window	[1] Brick and Block	South West	None	0.00					0.81	

14.0 Conservatory

None

15.0 Draught Proofing

100

%

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported
Table K1 - Approved	E1 Steel lintel with perforated steel base plate	2.14	0.500	No
Independently assessed	E2 Other lintels (including other steel lintels)	1.37	0.077	No
Independently assessed	E2 Other lintels (including other steel lintels)	3.74	0.064	No
Independently assessed	E2 Other lintels (including other steel lintels)	1.60	0.067	No
Independently assessed	E2 Other lintels (including other steel lintels)	7.24	0.061	No
Independently assessed	E2 Other lintels (including other steel lintels)	5.42	0.056	No
Independently assessed	E3 Sill	14.74	0.021	No
Independently assessed	E4 Jamb	36.00	0.016	No
Independently assessed	E5 Ground floor (normal)	37.28	0.062	No
Independently assessed	E6 Intermediate floor within a dwelling	34.99	0.000	No
Independently assessed	E10 Eaves (insulation at ceiling level)	35.22	0.071	No
Independently assessed	E24 Eaves (insulation at ceiling level - inverted)	2.42	0.107	No
Independently assessed	E12 Gable (insulation at ceiling level)	5.24	0.044	No
Independently assessed	E16 Corner (normal)	34.53	0.039	No
Independently assessed	E17 Corner (inverted – internal area greater than external area)	14.54	-0.091	No

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Y-value	0.026	W/m ² K
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18.0 Pressure Testing	Yes	
Designed AP ₅₀	5.00	m ³ /(h.m ²) @ 50 Pa
Property Tested ?	Yes	
As Built AP ₅₀	4.14	m ³ /(h.m ²) @ 50 Pa

19.0 Mechanical Ventilation	
Summer Overheating	
Windows open in hot weather	Windows half open
Cross ventilation possible	Yes
Night Ventilation	Yes
Air change rate	4.00
Mechanical Ventilation	
Mechanical Ventilation System Present	No

20.0 Fans, Open Fireplaces, Flues				
	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				4
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System	No
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22.0 Lighting		
Internal		
Total number of light fittings	25	
Total number of L.E.L. fittings	25	
Percentage of L.E.L. fittings	100.00	%
External		
External lights fitted	Yes	
Light and motion sensor	Yes	

23.0 Electricity Tariff	Standard
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24.0 Main Heating 1	Database	
Description	Mains Gas Combi	
Percentage of Heat	100	%
Database Ref. No.	17513	
Fuel Type	Mains gas	
Main Heating	BGW	
SAP Code	104	
In Winter	90.7	
In Summer	87.2	
Controls	CBE Programmer, room thermostat and TRVs	
PCDF Controls	0	
Delayed Start Stat	No	
Sap Code	2106	
Flue Type	Balanced	
Fan Assisted Flue	Yes	

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Is MHS Pumped	Pump in heated space
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
0.81	South	30°	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None