



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 4 Starling Road
BOTLEY, SO32 2DN

Contact: Tobias Whiting
Abacus Energy (UK) Ltd
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Report Issue Date: 17/06/2025

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0906 Plot 6	Issued on Date	17/06/2025
Assessment Reference	As Built	Prop Type Ref	Type G
Property	4 Starling Road, BOTLEY, SO32 2DN		
SAP Rating	90 B	DER	11.24
Environmental	89 B	TER	15.21
CO ₂ Emissions (t/year)	1.46	% DER<TER	26.08
General Requirements Compliance	Pass	DfEE	44.19
		TfEE	55.79
		% DfEE<TfEE	20.79
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)	15.21	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	11.24	kgCO ₂ /m ²	Pass
	-3.97 (-26.1%)	kgCO ₂ /m ²	

1b TfEE and DfEE

Target Fabric Energy Efficiency (TfEE)	55.79	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DfEE)	44.19	kWh/m ² /yr	
	-11.6 (-20.8%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.26 (measured in this dwelling)	m ³ /(h.m ²) @ 50 Pa	
Maximum	10.0	m ³ /(h.m ²) @ 50 Pa	Pass

Limiting System Efficiencies

4 Heating efficiency

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

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Main heating system

Boiler system with radiators or underfloor - Mains gas
Data from database
Worcester Greenstar 4000 GR4700iW 18 S NG

Efficiency: 89.5% SEDBUK2009
Minimum: 88.0%

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

Measured cylinder loss: 1.87 kWh/day
Permitted by DBSCG 2.24

Pass

Primary pipework insulated

Yes

Pass

6 Controls

Space heating controls

Time and temperature zone control

Pass

Hot water controls

Cylinderstat

Pass

Independent timer for DHW

Pass

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100 %

Minimum

75 %

Pass

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Southern England)

Slight

Pass

Based on:

Overshading

Average

Windows facing North

20.15 m², No overhang

Windows facing East

3.82 m², No overhang

Windows facing South

11.04 m², Overhang twice as wide as window, ratio 0.57

Windows facing West

1.44 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

4.26 (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	0.022	W/m ² K
Photovoltaic array	1.21	kW

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THERMAL BRIDGING

Calculation Type: New Build (As Built)

Property Reference	SAP 0906 Plot 6	Issued on Date	17/06/2025
Assessment Reference	As Built	Prop Type Ref	Type G
Property	4 Starling Road, BOTLEY, SO32 2DN		

SAP Rating	90 B	DER	11.24	TER	15.21
Environmental	89 B	% DER<TER	26.08		
CO ₂ Emissions (t/year)	1.46	DFEE	44.19	TFEE	55.79
General Requirements Compliance	Pass	% DFEE<TFEE	20.79		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com	Assessor ID	E477-0001
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Client	Foreman Homes, FORE
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	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.077	1.37	0.11	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.071	5.46	0.39	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	0.061	16.51	1.01	Birtley Supatherm
External wall	E3 Sill	Independently assessed	0.021	17.82	0.37	Knauf P5
External wall	E4 Jamb	Independently assessed	0.016	49.50	0.79	Knauf P6
External wall	E5 Ground floor (normal)	Independently assessed	0.062	39.22	2.43	Knauf BE-E5-23902
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	39.22	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Independently assessed	0.071	21.20	1.51	Knauf P16
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.044	18.02	0.79	Knauf P21
External wall	E16 Corner (normal)	Independently assessed	0.039	29.99	1.17	Knauf P23
External wall	E17 Corner (inverted – internal area greater than external area)	Independently assessed	-0.091	10.00	-0.91	Knauf P24

Total: **7.90** W/mK:
Y-Value: **0.022** W/m²K:

FULL SAP CALCULATION PRINTOUT

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General Requirements Compliance	Pass	% DFEE<TFEE	20.79			
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FULL SAP CALCULATION PRINTOUT

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

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

DWELLING AS BUILT

Detached House, total floor area 168 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) 15.21 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 11.24 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)55.8 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)44.2 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:	4.26 (measured in this dwelling)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas

Data from database

Worcester Greenstar 4000 GR4700iW 18 S NG

Efficiency: 89.5% SEDBUK2009

Minimum: 88.0% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage	Measured cylinder loss: 1.87 kWh/day	
Permitted by DBSCG 2.24	OK	
Primary pipework insulated:	Yes	OK

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls: Cylinderstat OK
Independent timer for DHW OK

Boiler interlock Yes OK

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Southern England): Slight OK

Based on:

Overshading:	Average
Windows facing North:	20.15 m ² , No overhang
Windows facing East:	3.82 m ² , No overhang
Windows facing South:	11.04 m ² , Overhang twice as wide as window, ratio 0.57
Windows facing West:	1.44 m ² , No overhang
Air change rate:	4.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Party wall U-value	0.00 W/m ² K
Roof U-value	0.10 W/m ² K
Floor U-value	0.12 W/m ² K
Door U-value	1.10 W/m ² K
Thermal bridging y-value	0.022 W/m ² K
Photovoltaic array	1.21 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	83.7500 (1b)	x 2.3900 (2b)	= 200.1625 (1b) - (3b)
First floor	83.7500 (1c)	x 2.6100 (2c)	= 218.5875 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	167.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 418.7500 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					5 * 10 = 50.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					50.0000 / (5) = 0.1194 (8)
Pressure test					Yes
Measured/design AP50					4.2600
Infiltration rate					0.3324 (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) =	0.2825 (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	0.3602	0.3532	0.3461	0.3108	0.3037	0.2684	0.2684	0.2614	0.2825	0.3037	0.3179	0.3320 (22b)
Effective ac	0.5649	0.5624	0.5599	0.5483	0.5461	0.5360	0.5360	0.5342	0.5399	0.5461	0.5505	0.5551 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			36.4500	1.1450	41.7366		(27)
Ground Floor			83.7500	0.1200	10.0500	84.0000	7035.0000 (28a)
Brick and Block	177.0600	36.6600	140.4000	0.2400	33.6960	42.2200	5927.6880 (29a)
Tile Clad	19.0400	1.9100	17.1300	0.2400	4.1112	42.2200	723.2286 (29a)
Pitched Roof	83.7500		83.7500	0.1000	8.3750	9.1000	762.1250 (30)
Total net area of external elements Aum(A, m ²)			363.6000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	100.3008		(33)
Ground Floor Block			51.8000			75.0000	3885.0000 (32c)
Ground Floor Stud			60.3900			9.0000	543.5100 (32c)
First Floor Stud			190.3000			9.0000	1712.7000 (32c)
Internal Floor 1			83.7500			18.0000	1507.5000 (32d)
Internal Ceiling 1			83.7500			18.0000	1507.5000 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 23604.2516 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							140.9209 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.8952 (36)
Total fabric heat loss							(33) + (36) = 108.1960 (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	78.0603	77.7121	77.3709	75.7678	75.4679	74.0717	74.0717	73.8132	74.6095	75.4679	76.0747	76.7090 (38)
Heat transfer coeff	186.2563	185.9082	185.5669	183.9638	183.6639	182.2677	182.2677	182.0092	182.8055	183.6639	184.2707	184.9050 (39)
Average = Sum(39)m / 12 =												183.9624 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1120	1.1099	1.1079	1.0983	1.0965	1.0882	1.0882	1.0866	1.0914	1.0965	1.1001	1.1039 (40)
HLP (average)												1.0983 (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												2.9592 (42)
Average daily hot water use (litres/day)												104.4813 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	114.9294	110.7502	106.5709	102.3917	98.2124	94.0332	94.0332	98.2124	102.3917	106.5709	110.7502	114.9294 (44)
Energy conte	170.4370	149.0653	153.8221	134.1058	128.6777	111.0391	102.8940	118.0724	119.4826	139.2454	151.9972	165.0592 (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 = 1643.8977 (45)
Distribution loss (46)m = 0.15 x (45)m												
25.5656	22.3598	23.0733	20.1159	19.3017	16.6559	15.4341	17.7109	17.9224	20.8868	22.7996	24.7589	(46)
Water storage loss:												
Store volume												200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8700 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0098 (55)
Total storage loss												
31.3038	28.2744	31.3038	30.2940	31.3038	30.2940	31.3038	31.3038	30.2940	31.3038	30.2940	31.3038	(56)
If cylinder contains dedicated solar storage												
31.3038	28.2744	31.3038	30.2940	31.3038	30.2940	31.3038	31.3038	30.2940	31.3038	30.2940	31.3038	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month												
225.0032	198.3509	208.3883	186.9118	183.2439	163.8451	157.4602	172.6386	172.2886	193.8116	204.8032	219.6254	(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												
225.0032	198.3509	208.3883	186.9118	183.2439	163.8451	157.4602	172.6386	172.2886	193.8116	204.8032	219.6254	(64)
Heat gains from water heating, kWh/month												
100.3233	86.9927	94.7988	86.8350	86.4383	79.1653	77.8652	82.9120	81.9727	89.9521	92.7839	98.5351	(65)

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

Metabolic gains (Table 5), Watts												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.9606	147.9606	147.9606	147.9606	147.9606	147.9606	147.9606	147.9606	147.9606	147.9606	147.9606	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
30.2438	26.8623	21.8459	16.5387	12.3629	10.4373	11.2778	14.6594	19.6758	24.9829	29.1588	31.0844	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
338.9913	342.5089	333.6445	314.7732	290.9516	268.5627	253.6055	250.0878	258.9522	277.8235	301.6451	324.0341	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
37.7961	37.7961	37.7961	37.7961	37.7961	37.7961	37.7961	37.7961	37.7961	37.7961	37.7961	37.7961	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	(71)
Water heating gains (Table 5)												
134.8431	132.4296	127.4177	120.6041	116.1805	109.9518	104.6576	111.4409	113.8510	120.9033	128.8665	132.4397	(72)
Total internal gains	574.4664	572.1890	553.2963	522.3043	489.8832	459.3400	439.9291	446.5763	462.8672	494.0979	530.0586	557.9463 (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					20.1500	10.6334		0.6300	0.7000	0.7700		65.4815 (74)
East					3.8200	19.6403		0.6300	0.7000	0.7700		22.9289 (76)
South					11.0400	46.7521		0.6300	0.7000	0.7700		157.7399 (78)
West					1.4400	19.6403		0.6300	0.7000	0.7700		8.6433 (80)

Solar gains	254.7937	445.2378	643.4300	861.8257	1029.4776	1051.6468	1001.4732	870.9495	717.7186	500.8879	307.1223	216.8539 (83)
Total gains	829.2600	1017.4269	1196.7264	1384.1300	1519.3608	1510.9867	1441.4023	1317.5258	1180.5858	994.9858	837.1809	774.8002 (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	35.2028	35.2687	35.3336	35.6414	35.6996	35.9731	35.9731	36.0242	35.8673	35.6996	35.5821	35.4600
alpha	3.3469	3.3512	3.3556	3.3761	3.3800	3.3982	3.3982	3.4016	3.3912	3.3800	3.3721	3.3640
util living area	0.9912	0.9821	0.9623	0.9131	0.8146	0.6645	0.5200	0.5781	0.7971	0.9439	0.9844	0.9930 (86)
MIT	19.0203	19.2741	19.6670	20.1645	20.5913	20.8585	20.9543	20.9342	20.7213	20.1564	19.4921	18.9737 (87)
Th 2	19.9911	19.9928	19.9944	20.0022	20.0037	20.0105	20.0105	20.0118	20.0079	20.0037	20.0007	19.9976 (88)
util rest of house	0.9894	0.9785	0.9543	0.8940	0.7731	0.5899	0.4168	0.4743	0.7367	0.9278	0.9806	0.9915 (89)
MIT 2	17.3277	17.6977	18.2667	18.9784	19.5578	19.8895	19.9840	19.9703	19.7400	18.9806	18.0223	17.2638 (90)
Living area fraction												
MIT	17.5691	17.9225	18.4664	19.1476	19.7052	20.0277	20.1224	20.1078	19.8800	19.1483	18.2319	17.5076 (92)
Temperature adjustment												0.0000
adjusted MIT	17.5691	17.9225	18.4664	19.1476	19.7052	20.0277	20.1224	20.1078	19.8800	19.1483	18.2319	17.5076 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9827	0.9675	0.9379	0.8737	0.7589	0.5913	0.4291	0.4851	0.7277	0.9093	0.9706	0.9859 (94)
Useful gains	814.8831	984.3793	1122.3655	1209.2531	1152.9710	893.4218	618.5448	639.1627	859.1058	904.7507	812.5599	763.8477 (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	2471.4494	2420.9908	2220.5711	1885.1816	1470.2631	989.2957	642.0138	674.8556	1056.6086	1570.0199	2051.2911	2460.6499 (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	1232.4853	965.4029	817.0650	486.6685	236.0653	0.0000	0.0000	0.0000	0.0000	494.9602	891.8864	1262.4208 (98)
Space heating												6386.9545 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Space heating per m2 (98) / (4) = 38.1311 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													7057.4083 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1232.4853	965.4029	817.0650	486.6685	236.0653	0.0000	0.0000	0.0000	0.0000	494.9602	891.8864	1262.4208	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	1361.8622	1066.7436	902.8343	537.7552	260.8456	0.0000	0.0000	0.0000	0.0000	546.9174	985.5099	1394.9401	(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	225.0032	198.3509	208.3883	186.9118	183.2439	163.8451	157.4602	172.6386	172.2886	193.8116	204.8032	219.6254	(64)
Efficiency of water heater (217)m	88.6647	88.4780	88.0994	87.2535	85.4905	79.8000	79.8000	79.8000	79.8000	87.2096	88.2892	79.8000	(216)
Fuel for water heating, kWh/month	253.7688	224.1811	236.5375	214.2169	214.3442	205.3196	197.3186	216.3391	215.9004	222.2366	231.9685	247.5020	(219)
Water heating fuel used												2679.6333	(219)
Annual totals kWh/year													
Space heating fuel - main system												7057.4083	(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)												534.1151	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.21 * 1068 * 1.00) =									-1033.8922			-1033.8922	(233)
Total delivered energy for all uses												9312.2645	(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	7057.4083	0.2160	1524.4002 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2679.6333	0.2160	578.8008 (264)
Space and water heating			2103.2010 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	534.1151	0.5190	277.2057 (268)
Energy saving/generation technologies			
PV Unit	-1033.8922	0.5190	-536.5901 (269)
Total CO2, kg/year			1882.7417 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			11.2400 (273)

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

DER			11.2400 ZC1
Total Floor Area		TFA	167.5000
Assumed number of occupants		N	2.9592
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			11.9928 ZC2
CO2 emissions from cooking, equation (L16)			1.1345 ZC3
Total CO2 emissions			24.3672 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			24.3672 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	83.7500 (1b)	x 2.3900 (2b)	= 200.1625 (1b) - (3b)
First floor	83.7500 (1c)	x 2.6100 (2c)	= 218.5875 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	167.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 418.7500 (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) = 0.0955 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3455 (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) =	0.2937 (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	0.3745	0.3671	0.3598	0.3231	0.3157	0.2790	0.2790	0.2717	0.2937	0.3157	0.3304	0.3451 (22b)
Effective ac	0.5701	0.5674	0.5647	0.5522	0.5498	0.5389	0.5389	0.5369	0.5431	0.5498	0.5546	0.5595 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.40)			36.4500	1.3258	48.3239		(27)
Ground Floor			83.7500	0.1300	10.8875		(28a)
Brick and Block	177.0600	36.6600	140.4000	0.1800	25.2720		(29a)
Tile Clad	19.0400	1.9100	17.1300	0.1800	3.0834		(29a)
Pitched Roof	83.7500		83.7500	0.1300	10.8875		(30)
Total net area of external elements Aum(A, m ²)			363.6000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	100.5743		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.1475 (36)
Total fabric heat loss						(33) + (36) =	115.7218 (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	78.7821	78.4059	78.0371	76.3051	75.9810	74.4724	74.4724	74.1931	75.0535	75.9810	76.6366	77.3219 (38)
Heat transfer coeff	194.5039	194.1276	193.7589	192.0268	191.7028	190.1942	190.1942	189.9148	190.7753	191.7028	192.3583	193.0437 (39)
Average = Sum(39)m / 12 =												192.0253 (39)
HLP	1.1612	1.1590	1.1568	1.1464	1.1445	1.1355	1.1355	1.1338	1.1390	1.1445	1.1484	1.1525 (40)
HLP (average)												1.1464 (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												2.9592 (42)
Average daily hot water use (litres/day)												104.4813 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	114.9294	110.7502	106.5709	102.3917	98.2124	94.0332	94.0332	98.2124	102.3917	106.5709	110.7502	114.9294 (44)
Energy content (annual)	170.4370	149.0653	153.8221	134.1058	128.6777	111.0391	102.8940	118.0724	119.4826	139.2454	151.9972	165.0592 (45)
Distribution loss (46)m = 0.15 x (45)m	25.5656	22.3598	23.0733	20.1159	19.3017	16.6559	15.4341	17.7109	17.9224	20.8868	22.7996	24.7589 (46)
Water storage loss:												200.0000 (47)
Store volume												1.6525 (48)
a) If manufacturer declared loss factor is known (kWh/day):												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8924 (55)
Total storage loss	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637 (56)
If cylinder contains dedicated solar storage	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	221.3631	195.0631	204.7481	183.3891	179.6038	160.3224	153.8201	168.9985	168.7659	190.1715	201.2805	215.9852 (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	221.3631	195.0631	204.7481	183.3891	179.6038	160.3224	153.8201	168.9985	168.7659	190.1715	201.2805	215.9852 (64)
Heat gains from water heating, kWh/month	97.4112	86.3624	91.8867	84.0168	83.5262	76.3471	74.9531	79.9999	79.1546	87.0400	89.9657	95.6230 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.9606	147.9606	147.9606	147.9606	147.9606	147.9606	147.9606	147.9606	147.9606	147.9606	147.9606	147.9606	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.2438	26.8623	21.8459	16.5387	12.3629	10.4373	11.2778	14.6594	19.6758	24.9829	29.1588	31.0844	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	338.9913	342.5089	333.6445	314.7732	290.9516	268.5627	253.6055	250.0878	258.9522	277.8235	301.6451	324.0341	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.7961	37.7961	37.7961	37.7961	37.7961	37.7961	37.7961	37.7961	37.7961	37.7961	37.7961	37.7961	(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)	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	(71)
Water heating gains (Table 5)	130.9290	128.5155	123.5036	116.6900	112.2664	106.0377	100.7434	107.5268	109.9369	116.9892	124.9524	128.5256	(72)
Total internal gains	570.5523	568.2749	549.3822	518.3902	485.9691	455.4258	436.0150	442.6622	458.9531	490.1838	526.1445	554.0322	(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					20.1500	10.6334	0.6300	0.7000	0.7700	65.4815 (74)		
East					3.8200	19.6403	0.6300	0.7000	0.7700	22.9289 (76)		
South					11.0400	46.7521	0.6300	0.7000	0.7700	157.7399 (78)		
West					1.4400	19.6403	0.6300	0.7000	0.7700	8.6433 (80)		
Solar gains	254.7937	445.2378	643.4300	861.8257	1029.4776	1051.6468	1001.4732	870.9495	717.7186	500.8879	307.1223	216.8539 (83)
Total gains	825.3459	1013.5127	1192.8122	1380.2159	1515.4467	1507.0726	1437.4882	1313.6117	1176.6717	991.0717	833.2668	770.8861 (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	59.8032	59.9191	60.0331	60.5746	60.6770	61.1583	61.1583	61.2482	60.9720	60.6770	60.4702	60.2555
alpha	4.9869	4.9946	5.0022	5.0383	5.0451	5.0772	5.0772	5.0832	5.0648	5.0451	5.0313	5.0170
util living area	0.9992	0.9976	0.9920	0.9692	0.8944	0.7354	0.5660	0.6345	0.8782	0.9850	0.9980	0.9994 (86)
MIT	19.6439	19.8164	20.0893	20.4469	20.7601	20.9388	20.9869	20.9774	20.8410	20.4289	19.9668	19.6142 (87)
Th 2	19.9512	19.9530	19.9547	19.9631	19.9647	19.9720	19.9720	19.9733	19.9691	19.9647	19.9615	19.9582 (88)
util rest of house	0.9989	0.9967	0.9890	0.9569	0.8526	0.6444	0.4420	0.5078	0.8137	0.9770	0.9972	0.9992 (89)
MIT 2	18.1320	18.3853	18.7841	19.3027	19.7243	19.9304	19.9671	19.9637	19.8357	19.2849	18.6118	18.0935 (90)
Living area fraction	18.3476	18.5894	18.9703	19.4659	19.8721	20.0742	20.1125	20.1083	19.9791	19.4480	18.8051	18.3104 (91)
MIT	18.3476	18.5894	18.9703	19.4659	19.8721	20.0742	20.1125	20.1083	19.9791	19.4480	18.8051	18.3104 (92)
Temperature adjustment												0.0000
adjusted MIT	18.3476	18.5894	18.9703	19.4659	19.8721	20.0742	20.1125	20.1083	19.9791	19.4480	18.8051	18.3104 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	823.8732	1008.4119	1174.8721	1310.0148	1285.2753	986.1200	660.6838	690.2068	958.3530	962.5805	829.7259	769.9035	(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	2732.3142	2657.4991	2416.2261	2028.9361	1566.6082	1041.1633	668.0609	704.2623	1121.5774	1696.1949	2251.5649	2723.9168	(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	1419.8801	1108.1866	923.5674	517.6233	209.3117	0.0000	0.0000	0.0000	0.0000	545.8091	1023.7241	1453.7859	(98)
Space heating												7201.8881	(98)
Space heating per m2												(98) / (4) =	42.9963 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													7702.5541 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1419.8801	1108.1866	923.5674	517.6233	209.3117	0.0000	0.0000	0.0000	0.0000	545.8091	1023.7241	1453.7859	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	1518.5883	1185.2263	987.7726	553.6079	223.8627	0.0000	0.0000	0.0000	0.0000	583.7530	1094.8921	1554.8512	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	221.3631	195.0631	204.7481	183.3891	179.6038	160.3224	153.8201	168.9985	168.7659	190.1715	201.2805	215.9852	(64)
Efficiency of water heater (217)m	88.8924	88.7195	88.3503	87.4331	85.2229	79.8000	79.8000	79.8000	79.8000	87.4695	88.5491	79.8000	(216)
Fuel for water heating, kWh/month	249.0237	219.8650	231.7458	209.7480	210.7460	200.9052	192.7570	211.7775	211.4860	217.4146	227.3095	242.7970	(219)
Water heating fuel used												2625.5753	(219)
Annual totals kWh/year													
Space heating fuel - main system												7702.5541	(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)												534.1151	(232)
Total delivered energy for all uses												10937.2445	(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	7702.5541	0.2160	1663.7517	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2625.5753	0.2160	567.1243	(264)
Space and water heating			2230.8759	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	534.1151	0.5190	277.2057	(268)
Total CO2, kg/m2/year			2547.0067	(272)
Emissions per m2 for space and water heating			13.3187	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			1.6550	(272b)
Emissions per m2 for pumps and fans			0.2324	(272c)
Target Carbon Dioxide Emission Rate (TER) = (13.3187 * 1.00) + 1.6550 + 0.2324, rounded to 2 d.p.			15.2100	(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	83.7500 (1b)	x 2.3900 (2b)	= 200.1625 (1b) - (3b)
First floor	83.7500 (1c)	x 2.6100 (2c)	= 218.5875 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	167.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 418.7500 (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) =	0.0955 (8)
Pressure test					Yes
Measured/design AP50					4.2600
Infiltration rate					0.3085 (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) =		0.2622 (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	0.3344	0.3278	0.3212	0.2885	0.2819	0.2491	0.2491	0.2426	0.2622	0.2819	0.2950	0.3081 (22b)
Effective ac	0.5559	0.5537	0.5516	0.5416	0.5397	0.5310	0.5310	0.5294	0.5344	0.5397	0.5435	0.5475 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			36.4500	1.1450	41.7366		(27)
Ground Floor			83.7500	0.1200	10.0500	84.0000	7035.0000 (28a)
Brick and Block	177.0600	36.6600	140.4000	0.2400	33.6960	42.2200	5927.6880 (29a)
Tile Clad	19.0400	1.9100	17.1300	0.2400	4.1112	42.2200	723.2286 (29a)
Pitched Roof	83.7500		83.7500	0.1000	8.3750	9.1000	762.1250 (30)
Total net area of external elements Aum(A, m ²)			363.6000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		100.3008		(33)
Ground Floor Block			51.8000			75.0000	3885.0000 (32c)
Ground Floor Stud			60.3900			9.0000	543.5100 (32c)
First Floor Stud			190.3000			9.0000	1712.7000 (32c)
Internal Floor 1			83.7500			18.0000	1507.5000 (32d)
Internal Ceiling 1			83.7500			9.0000	753.7500 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 22850.5016 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							136.4209 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.8952 (36)
Total fabric heat loss						(33) + (36) =	108.1960 (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	76.8182	76.5183	76.2243	74.8433	74.5849	73.3822	73.3822	73.1594	73.8455	74.5849	75.1076	75.6541 (38)
Heat transfer coeff	185.0143	184.7143	184.4203	183.0393	182.7810	181.5782	181.5782	181.3554	182.0415	182.7810	183.3036	183.8501 (39)
Average = Sum(39)m / 12 =												183.0381 (39)
HLP	1.1046	1.1028	1.1010	1.0928	1.0912	1.0840	1.0840	1.0827	1.0868	1.0912	1.0944	1.0976 (40)
HLP (average)												1.0928 (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												2.9592 (42)
Average daily hot water use (litres/day)												104.4813 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	114.9294	110.7502	106.5709	102.3917	98.2124	94.0332	94.0332	98.2124	102.3917	106.5709	110.7502	114.9294 (44)
	170.4370	149.0653	153.8221	134.1058	128.6777	111.0391	102.8940	118.0724	119.4826	139.2454	151.9972	165.0592 (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 = 1643.8977 (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	36.2179	31.6764	32.6872	28.4975	27.3440	23.5958	21.8650	25.0904	25.3900	29.5896	32.2994	35.0751 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.9606	147.9606	147.9606	147.9606	147.9606	147.9606	147.9606	147.9606	147.9606	147.9606	147.9606	147.9606	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.2438	26.8623	21.8459	16.5387	12.3629	10.4373	11.2778	14.6594	19.6758	24.9829	29.1588	31.0844	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	338.9913	342.5089	333.6445	314.7732	290.9516	268.5627	253.6055	250.0878	258.9522	277.8235	301.6451	324.0341	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.7961	37.7961	37.7961	37.7961	37.7961	37.7961	37.7961	37.7961	37.7961	37.7961	37.7961	37.7961	(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)	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	(71)
Water heating gains (Table 5)	48.6799	47.1375	43.9344	39.5798	36.7527	32.7719	29.3884	33.7236	35.2639	39.7710	44.8603	47.1439	(72)
Total internal gains	485.3032	483.8969	466.8130	438.2800	407.4554	379.1601	361.6599	365.8590	381.2802	409.9657	443.0524	469.6506	(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						20.1500	10.6334	0.6300	0.7000	0.7700		65.4815 (74)
East						3.8200	19.6403	0.6300	0.7000	0.7700		22.9289 (76)
South						11.0400	46.7521	0.6300	0.7000	0.7700		157.7399 (78)
West						1.4400	19.6403	0.6300	0.7000	0.7700		8.6433 (80)
Solar gains	254.7937	445.2378	643.4300	861.8257	1029.4776	1051.6468	1001.4732	870.9495	717.7186	500.8879	307.1223	216.8539 (83)
Total gains	740.0969	929.1347	1110.2430	1300.1057	1436.9330	1430.8069	1363.1332	1236.8085	1098.9987	910.8536	750.1747	686.5045 (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	34.3074	34.3631	34.4179	34.6776	34.7266	34.9566	34.9566	34.9996	34.8677	34.7266	34.6276	34.5247	
alpha	3.2872	3.2909	3.2945	3.3118	3.3151	3.3304	3.3304	3.3333	3.3245	3.3151	3.3085	3.3016	
util living area	0.9931	0.9849	0.9669	0.9213	0.8282	0.6837	0.5407	0.6023	0.8172	0.9526	0.9876	0.9946	(86)
MIT	18.9128	19.1742	19.5799	20.0955	20.5464	20.8361	20.9448	20.9204	20.6811	20.0806	19.3935	18.8632	(87)
Th 2	19.9971	19.9986	20.0000	20.0067	20.0080	20.0139	20.0139	20.0150	20.0116	20.0080	20.0055	20.0028	(88)
util rest of house	0.9916	0.9819	0.9600	0.9040	0.7890	0.6104	0.4362	0.4980	0.7606	0.9388	0.9846	0.9935	(89)
MIT 2	18.0734	18.3344	18.7367	19.2440	19.6656	19.9160	19.9913	19.9796	19.7976	19.2388	18.5591	18.0281	(90)
Living area fraction	18.1931	18.4542	18.8569	19.3654	19.7912	20.0473	20.1273	20.1138	19.9236	19.3589	18.6781	18.1472	(91)
Temperature adjustment	18.1931	18.4542	18.8569	19.3654	19.7912	20.0473	20.1273	20.1138	19.9236	19.3589	18.6781	18.1472	(92)
adjusted MIT	18.1931	18.4542	18.8569	19.3654	19.7912	20.0473	20.1273	20.1138	19.9236	19.3589	18.6781	18.1472	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	731.2563	906.4273	1054.4280	1157.5803	1119.6507	877.1941	611.9541	629.9310	829.4511	844.4973	734.4557	679.9993	(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	2570.4308	2503.6457	2278.8701	1915.5824	1478.9233	989.1032	640.4781	673.5116	1060.1358	1600.9573	2122.3074	2564.2010	(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	(98)
Space heating kWh	1368.3458	1073.3308	910.9849	545.7615	267.2989	0.0000	0.0000	0.0000	0.0000	562.8062	999.2532	1401.8460	(98)
Space heating												7129.6274	(98)
Space heating per m2												42.5649	(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													

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	1706.8349	1343.6785	1378.3014	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.7899	0.8539	0.8180	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1348.1456	1147.3370	1127.4183	0.0000	0.0000	0.0000	0.0000 (102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1803.8012	1721.5506	1576.5291	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	328.0720	427.2149	334.1385	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									FC = cooled area / (4) =			1089.4254 (104)
Intermittency factor (Table 10b)												1.0000 (105)
Space cooling kWh	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	0.0000	0.0000	0.0000	0.0000	0.0000	82.0180	106.8037	83.5346	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling per m2												272.3563 (107)
Energy for space heating												1.6260 (108)
Energy for space cooling												42.5649 (99)
Total												1.6260 (108)
Dwelling Fabric Energy Efficiency (DFEE)												44.1909 (109)
												44.2 (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	83.7500 (1b)	x 2.3900 (2b)	= 200.1625 (1b) - (3b)
First floor	83.7500 (1c)	x 2.6100 (2c)	= 218.5875 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	167.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 418.7500 (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) = 0.0955 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3455 (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) =	0.2937 (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	0.3745	0.3671	0.3598	0.3231	0.3157	0.2790	0.2790	0.2717	0.2937	0.3157	0.3304	0.3451 (22b)
Effective ac	0.5701	0.5674	0.5647	0.5522	0.5498	0.5389	0.5389	0.5369	0.5431	0.5498	0.5546	0.5595 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.40)			36.4500	1.3258	48.3239		(27)
Ground Floor			83.7500	0.1300	10.8875		(28a)
Brick and Block	177.0600	36.6600	140.4000	0.1800	25.2720		(29a)
Tile Clad	19.0400	1.9100	17.1300	0.1800	3.0834		(29a)
Pitched Roof	83.7500		83.7500	0.1300	10.8875		(30)
Total net area of external elements Aum(A, m ²)			363.6000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	100.5743		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.1475 (36)
Total fabric heat loss						(33) + (36) =	115.7218 (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	78.7821	78.4059	78.0371	76.3051	75.9810	74.4724	74.4724	74.1931	75.0535	75.9810	76.6366	77.3219 (38)
Heat transfer coeff	194.5039	194.1276	193.7589	192.0268	191.7028	190.1942	190.1942	189.9148	190.7753	191.7028	192.3583	193.0437 (39)
Average = Sum(39)m / 12 =												192.0253 (39)
HLP	1.1612	1.1590	1.1568	1.1464	1.1445	1.1355	1.1355	1.1338	1.1390	1.1445	1.1484	1.1525 (40)
HLP (average)												1.1464 (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												2.9592 (42)
Average daily hot water use (litres/day)												104.4813 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	114.9294	110.7502	106.5709	102.3917	98.2124	94.0332	94.0332	98.2124	102.3917	106.5709	110.7502	114.9294 (44)
Energy content (annual)	170.4370	149.0653	153.8221	134.1058	128.6777	111.0391	102.8940	118.0724	119.4826	139.2454	151.9972	165.0592 (45)
Distribution loss (46)m = 0.15 x (45)m												1643.8977 (45)
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	36.2179	31.6764	32.6872	28.4975	27.3440	23.5958	21.8650	25.0904	25.3900	29.5896	32.2994	35.0751 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.9606	147.9606	147.9606	147.9606	147.9606	147.9606	147.9606	147.9606	147.9606	147.9606	147.9606	147.9606	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.2438	26.8623	21.8459	16.5387	12.3629	10.4373	11.2778	14.6594	19.6758	24.9829	29.1588	31.0844	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	338.9913	342.5089	333.6445	314.7732	290.9516	268.5627	253.6055	250.0878	258.9522	277.8235	301.6451	324.0341	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.7961	37.7961	37.7961	37.7961	37.7961	37.7961	37.7961	37.7961	37.7961	37.7961	37.7961	37.7961	(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)	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	(71)
Water heating gains (Table 5)	48.6799	47.1375	43.9344	39.5798	36.7527	32.7719	29.3884	33.7236	35.2639	39.7710	44.8603	47.1439	(72)
Total internal gains	485.3032	483.8969	466.8130	438.2800	407.4554	379.1601	361.6599	365.8590	381.2802	409.9657	443.0524	469.6506	(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				20.1500	10.6334	0.6300		0.7000		0.7700		65.4815 (74)	
East				3.8200	19.6403	0.6300		0.7000		0.7700		22.9289 (76)	
South				11.0400	46.7521	0.6300		0.7000		0.7700		157.7399 (78)	
West				1.4400	19.6403	0.6300		0.7000		0.7700		8.6433 (80)	
Solar gains	254.7937	445.2378	643.4300	861.8257	1029.4776	1051.6468	1001.4732	870.9495	717.7186	500.8879	307.1223	216.8539	(83)
Total gains	740.0969	929.1347	1110.2430	1300.1057	1436.9330	1430.8069	1363.1332	1236.8085	1098.9987	910.8536	750.1747	686.5045	(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	59.8032	59.9191	60.0331	60.5746	60.6770	61.1583	61.1583	61.2482	60.9720	60.6770	60.4702	60.2555	
alpha	4.9869	4.9946	5.0022	5.0383	5.0451	5.0772	5.0772	5.0832	5.0648	5.0451	5.0313	5.0170	
util living area	0.9995	0.9984	0.9942	0.9756	0.9103	0.7614	0.5929	0.6661	0.9005	0.9895	0.9988	0.9997	(86)
MIT	19.5964	19.7697	20.0448	20.4080	20.7335	20.9281	20.9839	20.9720	20.8165	20.3869	19.9206	19.5670	(87)
Th 2	19.9512	19.9530	19.9547	19.9631	19.9647	19.9720	19.9720	19.9733	19.9691	19.9647	19.9615	19.9582	(88)
util rest of house	0.9993	0.9978	0.9919	0.9655	0.8725	0.6717	0.4650	0.5367	0.8428	0.9837	0.9983	0.9996	(89)
MIT 2	18.6616	18.8361	19.1115	19.4755	19.7791	19.9378	19.9678	19.9649	19.8605	19.4599	18.9939	18.6379	(90)
Living area fraction									fLA = Living area / (4) =			0.1426	(91)
MIT	18.7949	18.9693	19.2447	19.6085	19.9152	20.0791	20.1127	20.1086	19.9968	19.5922	19.1261	18.7704	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7949	18.9693	19.2447	19.6085	19.9152	20.0791	20.1127	20.1086	19.9968	19.5922	19.1261	18.7704	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9991	0.9970	0.9898	0.9610	0.8703	0.6820	0.4833	0.5550	0.8447	0.9807	0.9977	0.9994	(94)
Ext temp.	739.4042	926.3209	1098.9433	1249.4650	1250.6327	975.8206	658.8548	686.4024	928.3339	893.2909	748.4179	686.0656	(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	2819.3214	2731.2365	2469.3892	2056.3159	1574.8813	1042.0899	668.0938	704.3132	1124.9657	1723.8203	2313.3236	2812.7280	(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	1547.4584	1212.9033	1019.6117	580.9326	241.2409	0.0000	0.0000	0.0000	0.0000	617.9139	1126.7321	1582.2369	(98)
												7929.0298	(98)
												47.3375	(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	1787.8255	1407.4371	1443.3528	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8391	0.9071	0.8702	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1500.2440	1276.6510	1255.9577	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1803.8012	1721.5506	1576.5291	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													

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	218.5612	331.0053	238.5052	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction												788.0716 (104)
Intermittency factor (Table 10b)									fC = cooled area / (4) =			1.0000 (105)
Space cooling kWh	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	0.0000	0.0000	0.0000	0.0000	0.0000	54.6403	82.7513	59.6263	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling per m2												197.0179 (107)
Energy for space heating												1.1762 (108)
Energy for space cooling												47.3375 (99)
Total												1.1762 (108)
Target Fabric Energy Efficiency (TFEE)												48.5137 (109)
												55.8 (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	83.7500 (1b)	x 2.3900 (2b)	= 200.1625 (1b) - (3b)
First floor	83.7500 (1c)	x 2.6100 (2c)	= 218.5875 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	167.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 418.7500 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					5 * 10 = 50.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					50.0000 / (5) = 0.1194 (8)
Pressure test					Yes
Measured/design AP50					4.2600
Infiltration rate					0.3324 (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)	=	0.2825 (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	0.2967	0.2755	0.2825	0.2684	0.2684	0.2614	0.2543	0.2472	0.2402	0.2614	0.2472	0.2614 (22b)
Effective ac	0.5440	0.5379	0.5399	0.5360	0.5360	0.5342	0.5323	0.5306	0.5288	0.5342	0.5306	0.5342 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			36.4500	1.1450	41.7366		(27)
Ground Floor			83.7500	0.1200	10.0500	84.0000	7035.0000 (28a)
Brick and Block	177.0600	36.6600	140.4000	0.2400	33.6960	42.2200	5927.6880 (29a)
Tile Clad	19.0400	1.9100	17.1300	0.2400	4.1112	42.2200	723.2286 (29a)
Pitched Roof	83.7500		83.7500	0.1000	8.3750	9.1000	762.1250 (30)
Total net area of external elements Aum(A, m ²)			363.6000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		100.3008		(33)
Ground Floor Block			51.8000			75.0000	3885.0000 (32c)
Ground Floor Stud			60.3900			9.0000	543.5100 (32c)
First Floor Stud			190.3000			9.0000	1712.7000 (32c)
Internal Floor 1			83.7500			18.0000	1507.5000 (32d)
Internal Ceiling 1			83.7500			18.0000	1507.5000 (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) = 23604.2516 (34)
140.9209 (35)
7.8952 (36)
(33) + (36) = 108.1960 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	75.1749	74.3372	74.6095	74.0717	74.0717	73.8132	73.5615	73.3168	73.0789	73.8132	73.3168	73.8132 (38)
Heat transfer coeff	183.3709	182.5332	182.8055	182.2677	182.2677	182.0092	181.7575	181.5128	181.2749	182.0092	181.5128	182.0092 (39)
Average = Sum(39)m / 12 =												182.1109 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0948	1.0898	1.0914	1.0882	1.0882	1.0866	1.0851	1.0837	1.0822	1.0866	1.0837	1.0866 (40)
HLP (average)												1.0872 (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												2.9592 (42)
Average daily hot water use (litres/day)												104.4813 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	114.9294	110.7502	106.5709	102.3917	98.2124	94.0332	94.0332	98.2124	102.3917	106.5709	110.7502	114.9294 (44)
Energy conte	170.4370	149.0653	153.8221	134.1058	128.6777	111.0391	102.8940	118.0724	119.4826	139.2454	151.9972	165.0592 (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 = 1643.8977 (45)											
Distribution loss (46)m = 0.15 x (45)m												
25.5656	22.3598	23.0733	20.1159	19.3017	16.6559	15.4341	17.7109	17.9224	20.8868	22.7996	24.7589	(46)
Water storage loss:												
Store volume	200.0000 (47)											
a) If manufacturer declared loss factor is known (kWh/day):	1.8700 (48)											
Temperature factor from Table 2b	0.5400 (49)											
Enter (49) or (54) in (55)	1.0098 (55)											
Total storage loss												
31.3038	28.2744	31.3038	30.2940	31.3038	30.2940	31.3038	31.3038	30.2940	31.3038	30.2940	31.3038	(56)
If cylinder contains dedicated solar storage												
31.3038	28.2744	31.3038	30.2940	31.3038	30.2940	31.3038	31.3038	30.2940	31.3038	30.2940	31.3038	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month												
225.0032	198.3509	208.3883	186.9118	183.2439	163.8451	157.4602	172.6386	172.2886	193.8116	204.8032	219.6254	(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												
225.0032	198.3509	208.3883	186.9118	183.2439	163.8451	157.4602	172.6386	172.2886	193.8116	204.8032	219.6254	(64)
Total per year (kWh/year) = Sum(64)m =	2286.3707 (64)											
RHI water heating demand	2286 (64)											
Heat gains from water heating, kWh/month												
100.3233	86.9927	94.7988	86.8350	86.4383	79.1653	77.8652	82.9120	81.9727	89.9521	92.7839	98.5351	(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	177.5528	177.5528	177.5528	177.5528	177.5528	177.5528	177.5528	177.5528	177.5528	177.5528	177.5528	177.5528	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	75.6095	67.1557	54.6147	41.3468	30.9072	26.0932	28.1946	36.6484	49.1894	62.4573	72.8969	77.7109	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	505.9571	511.2074	497.9769	469.8108	434.2562	400.8398	378.5157	373.2654	386.4959	414.6620	450.2166	483.6329	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.7145	55.7145	55.7145	55.7145	55.7145	55.7145	55.7145	55.7145	55.7145	55.7145	55.7145	55.7145	(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)	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	(71)
Water heating gains (Table 5)	134.8431	132.4296	127.4177	120.6041	116.1805	109.9518	104.6576	111.4409	113.8510	120.9033	128.8665	132.4397	(72)
Total internal gains	834.3085	828.6914	797.9081	749.6605	699.2427	654.7836	629.2666	639.2535	667.4351	715.9213	769.8788	811.6823	(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					20.1500	13.4839		0.6300	0.7000	0.7700		83.0352 (74)	
East					3.8200	25.1925		0.6300	0.7000	0.7700		29.4108 (76)	
South					11.0400	56.7559		0.6300	0.7000	0.7700		191.4924 (78)	
West					1.4400	25.1925		0.6300	0.7000	0.7700		11.0868 (80)	
Solar gains	315.0252	469.9979	689.4549	937.2784	1069.8866	1189.2233	1122.8551	996.8008	815.1456	571.7586	378.7743	263.3999 (83)	
Total gains	1149.3337	1298.6893	1487.3630	1686.9389	1769.1293	1844.0069	1752.1217	1636.0542	1482.5807	1287.6799	1148.6530	1075.0823 (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	35.7567	35.9208	35.8673	35.9731	35.9731	36.0242	36.0741	36.1227	36.1701	36.0242	36.1227	36.0242
alpha	3.3838	3.3947	3.3912	3.3982	3.3982	3.4016	3.4049	3.4082	3.4113	3.4016	3.4082	3.4016
util living area	0.9745	0.9616	0.9268	0.8483	0.7189	0.5248	0.3933	0.4182	0.6641	0.8740	0.9549	0.9785 (86)
MIT	19.4073	19.5924	19.9725	20.4208	20.7584	20.9393	20.9828	20.9793	20.8626	20.4582	19.8830	19.3792 (87)
Th 2	20.0051	20.0092	20.0079	20.0105	20.0105	20.0118	20.0130	20.0142	20.0154	20.0118	20.0142	20.0118 (88)
util rest of house	0.9695	0.9543	0.9126	0.8191	0.6655	0.4460	0.2986	0.3186	0.5884	0.8421	0.9446	0.9742 (89)
MIT 2	17.8973	18.1661	18.7073	19.3293	19.7662	19.9669	20.0049	20.0044	19.8989	19.3953	18.5916	17.8616 (90)
Living area fraction												
MIT	18.1127	18.3695	18.8877	19.4850	19.9077	20.1056	20.1444	20.1434	20.0363	19.5469	18.7758	18.0780 (91)
Temperature adjustment												
adjusted MIT	18.1127	18.3695	18.8877	19.4850	19.9077	20.1056	20.1444	20.1434	20.0363	19.5469	18.7758	18.0780 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9562	0.9379	0.8924	0.8010	0.6594	0.4538	0.3115	0.3321	0.5902	0.8240	0.9273	0.9621	(94)
Useful gains	1098.9794	1218.0280	1327.3445	1351.2693	1166.6373	836.8819	545.8205	543.3045	874.9553	1061.0189	1065.1239	1034.3803	(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	2422.8245	2385.6154	2173.1428	1819.9475	1350.1861	874.6663	553.3451	552.4235	967.3401	1482.8113	1974.0937	2380.3216	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	984.9408	784.6187	629.2739	337.4483	136.5603	0.0000	0.0000	0.0000	0.0000	313.8135	654.4583	1001.3804	(98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF HEAT DEMAND 09 Jan 2014

Space heating	4842.4943 (98)
RHI space heating demand	4842 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	83.7500 (1b)	x 2.3900 (2b)	= 200.1625 (1b) - (3b)
First floor	83.7500 (1c)	x 2.6100 (2c)	= 218.5875 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	167.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 418.7500 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					5 * 10 = 50.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					50.0000 / (5) = 0.1194 (8)
Pressure test					Yes
Measured/design AP50					4.2600
Infiltration rate					0.3324 (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) =	0.2825 (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	0.3602	0.3532	0.3461	0.3108	0.3037	0.2684	0.2684	0.2614	0.2825	0.3037	0.3179	0.3320 (22b)
Effective ac	0.5649	0.5624	0.5599	0.5483	0.5461	0.5360	0.5360	0.5342	0.5399	0.5461	0.5505	0.5551 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			36.4500	1.1450	41.7366		(27)
Ground Floor			83.7500	0.1200	10.0500	84.0000	7035.0000 (28a)
Brick and Block	177.0600	36.6600	140.4000	0.2400	33.6960	42.2200	5927.6880 (29a)
Tile Clad	19.0400	1.9100	17.1300	0.2400	4.1112	42.2200	723.2286 (29a)
Pitched Roof	83.7500		83.7500	0.1000	8.3750	9.1000	762.1250 (30)
Total net area of external elements Aum(A, m ²)			363.6000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	100.3008		(33)
Ground Floor Block			51.8000			75.0000	3885.0000 (32c)
Ground Floor Stud			60.3900			9.0000	543.5100 (32c)
First Floor Stud			190.3000			9.0000	1712.7000 (32c)
Internal Floor 1			83.7500			18.0000	1507.5000 (32d)
Internal Ceiling 1			83.7500			18.0000	1507.5000 (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) = 23604.2516 (34)
140.9209 (35)
7.8952 (36)
(33) + (36) = 108.1960 (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	78.0603	77.7121	77.3709	75.7678	75.4679	74.0717	74.0717	73.8132	74.6095	75.4679	76.0747	76.7090 (38)
Heat transfer coeff	186.2563	185.9082	185.5669	183.9638	183.6639	182.2677	182.2677	182.0092	182.8055	183.6639	184.2707	184.9050 (39)
Average = Sum(39)m / 12 =												183.9624 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1120	1.1099	1.1079	1.0983	1.0965	1.0882	1.0882	1.0866	1.0914	1.0965	1.1001	1.1039 (40)
HLP (average)												1.0983 (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)
2.9592 (42)
104.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	114.9294	110.7502	106.5709	102.3917	98.2124	94.0332	94.0332	98.2124	102.3917	106.5709	110.7502	114.9294 (44)
Energy conte	170.4370	149.0653	153.8221	134.1058	128.6777	111.0391	102.8940	118.0724	119.4826	139.2454	151.9972	165.0592 (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 = 1643.8977 (45)										
Distribution loss (46)m = 0.15 x (45)m											
25.5656	22.3598	23.0733	20.1159	19.3017	16.6559	15.4341	17.7109	17.9224	20.8868	22.7996	24.7589 (46)
Water storage loss:											
Store volume	200.0000 (47)										
a) If manufacturer declared loss factor is known (kWh/day):	1.8700 (48)										
Temperature factor from Table 2b	0.5400 (49)										
Enter (49) or (54) in (55)	1.0098 (55)										
Total storage loss											
31.3038	28.2744	31.3038	30.2940	31.3038	30.2940	31.3038	31.3038	30.2940	31.3038	30.2940	31.3038 (56)
If cylinder contains dedicated solar storage											
31.3038	28.2744	31.3038	30.2940	31.3038	30.2940	31.3038	31.3038	30.2940	31.3038	30.2940	31.3038 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month											
225.0032	198.3509	208.3883	186.9118	183.2439	163.8451	157.4602	172.6386	172.2886	193.8116	204.8032	219.6254 (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											
225.0032	198.3509	208.3883	186.9118	183.2439	163.8451	157.4602	172.6386	172.2886	193.8116	204.8032	219.6254 (64)
Heat gains from water heating, kWh/month											
100.3233	86.9927	94.7988	86.8350	86.4383	79.1653	77.8652	82.9120	81.9727	89.9521	92.7839	98.5351 (65)
Total per year (kWh/year) = Sum(64)m =	2286.3707 (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	177.5528	177.5528	177.5528	177.5528	177.5528	177.5528	177.5528	177.5528	177.5528	177.5528	177.5528	177.5528 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	75.6095	67.1557	54.6147	41.3468	30.9072	26.0932	28.1946	36.6484	49.1894	62.4573	72.8969	77.7109 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	505.9571	511.2074	497.9769	469.8108	434.2562	400.8398	378.5157	373.2654	386.4959	414.6620	450.2166	483.6329 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.7145	55.7145	55.7145	55.7145	55.7145	55.7145	55.7145	55.7145	55.7145	55.7145	55.7145	55.7145 (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)	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685 (71)
Water heating gains (Table 5)	134.8431	132.4296	127.4177	120.6041	116.1805	109.9518	104.6576	111.4409	113.8510	120.9033	128.8665	132.4397 (72)
Total internal gains	834.3085	828.6914	797.9081	749.6605	699.2427	654.7836	629.2666	639.2535	667.4351	715.9213	769.8788	811.6823 (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						20.1500	10.6334	0.6300	0.7000	0.7700		65.4815 (74)
East						3.8200	19.6403	0.6300	0.7000	0.7700		22.9289 (76)
South						11.0400	46.7521	0.6300	0.7000	0.7700		157.7399 (78)
West						1.4400	19.6403	0.6300	0.7000	0.7700		8.6433 (80)
Solar gains	254.7937	445.2378	643.4300	861.8257	1029.4776	1051.6468	1001.4732	870.9495	717.7186	500.8879	307.1223	216.8539 (83)
Total gains	1089.1021	1273.9293	1441.3381	1611.4862	1728.7203	1706.4303	1630.7398	1510.2030	1385.1537	1216.8092	1077.0011	1028.5362 (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	35.2028	35.2687	35.3336	35.6414	35.6996	35.9731	35.9731	36.0242	35.8673	35.6996	35.5821	35.4600
alpha	3.3469	3.3512	3.3556	3.3761	3.3800	3.3982	3.3982	3.4016	3.3912	3.3800	3.3721	3.3640
util living area	0.9804	0.9664	0.9388	0.8774	0.7670	0.6105	0.4683	0.5185	0.7349	0.9082	0.9681	0.9836 (86)
MIT	19.2329	19.4748	19.8416	20.2948	20.6680	20.8914	20.9667	20.9528	20.7882	20.3006	19.6818	19.1838 (87)
Th 2	19.9911	19.9928	19.9944	20.0022	20.0037	20.0105	20.0105	20.0118	20.0079	20.0037	20.0007	19.9976 (88)
util rest of house	0.9766	0.9600	0.9269	0.8531	0.7212	0.5363	0.3722	0.4204	0.6686	0.8847	0.9609	0.9805 (89)
MIT 2	17.6358	17.9860	18.5127	19.1531	19.6494	19.9200	19.9917	19.9831	19.8117	19.1757	18.2943	17.5688 (90)
Living area fraction	fLA = Living area / (4) = 0.1426 (91)											
MIT	17.8636	18.1984	18.7022	19.3160	19.7947	20.0586	20.1308	20.1214	19.9510	19.3362	18.4922	17.7991 (92)
Temperature adjustment	0.0000											
adjusted MIT	17.8636	18.1984	18.7022	19.3160	19.7947	20.0586	20.1308	20.1214	19.9510	19.3362	18.4922	17.7991 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9651	0.9444	0.9072	0.8332	0.7104	0.5402	0.3843	0.4318	0.6643	0.8649	0.9458	0.9702 (94)
Useful gains	1051.0433	1203.0375	1307.5686	1342.7102	1228.1187	921.7758	626.7324	652.1641	920.1778	1052.4139	1018.5983	997.8735 (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	2526.3031	2472.2737	2264.3239	1916.1594	1486.7016	994.9193	643.5486	677.3230	1069.5928	1604.5169	2099.2428	2514.5492 (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	1097.5933	852.9267	711.8259	412.8834	192.3856	0.0000	0.0000	0.0000	0.0000	410.7646	778.0640	1128.4067 (98)
Space heating	5584.8504 (98)											

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Space heating per m2

(98) / (4) = 33.3424 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													6171.1055 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1097.5933	852.9267	711.8259	412.8834	192.3856	0.0000	0.0000	0.0000	0.0000	410.7646	778.0640	1128.4067	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	1212.8103	942.4605	786.5480	456.2248	212.5808	0.0000	0.0000	0.0000	0.0000	453.8836	859.7393	1246.8583	(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	225.0032	198.3509	208.3883	186.9118	183.2439	163.8451	157.4602	172.6386	172.2886	193.8116	204.8032	219.6254	(64)
Efficiency of water heater (217)m	88.4817	88.2670	87.8330	86.8702	84.9437	79.8000	79.8000	79.8000	79.8000	86.7702	88.0402	79.8000	(216)
Fuel for water heating, kWh/month	254.2936	224.7170	237.2551	215.1622	215.7238	205.3196	197.3186	216.3391	215.9004	223.3618	232.6247	247.9814	(219)
Water heating fuel used												2685.9976	(219)
Annual totals kWh/year													
Space heating fuel - main system												6171.1055	(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)												534.1151	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.21 * 1068 * 1.00) =										-1033.8922		-1033.8922	(233)
Total delivered energy for all uses												8432.3259	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	6171.1055	3.4800	214.7545 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2685.9976	3.4800	93.4727 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	534.1151	13.1900	70.4498 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-1033.8922	13.1900	-136.3704 (252)
Total energy cost			372.1991 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7356 (257)
SAP value		89.7378
SAP rating (Section 12)		90 (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	6171.1055	0.2160	1332.9588 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2685.9976	0.2160	580.1755 (264)
Space and water heating			1913.1343 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	534.1151	0.5190	277.2057 (268)
Energy saving/generation technologies			
PV Unit	-1033.8922	0.5190	-536.5901 (269)
Total kg/year			1692.6749 (272)
CO2 emissions per m2			10.1100 (273)
EI value			89.3262
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	$3.48 \times (1 + 0.29 \times 0.00) / 0.9050 = 3.845$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9050 = 0.2387$, stars = 4
Water heating energy efficiency	$3.48 / 0.8491 = 4.098$, stars = 4
Water heating environmental impact	$0.216 / 0.8491 = 0.2544$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	83.7500 (1b)	x 2.3900 (2b)	= 200.1625 (1b) - (3b)
First floor	83.7500 (1c)	x 2.6100 (2c)	= 218.5875 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	167.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 418.7500 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					5 * 10 = 50.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					50.0000 / (5) = 0.1194 (8)
Pressure test					Yes
Measured/design AP50					4.2600
Infiltration rate					0.3324 (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) =	0.2825 (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	0.2967	0.2755	0.2825	0.2684	0.2684	0.2614	0.2543	0.2472	0.2402	0.2614	0.2472	0.2614 (22b)
	0.5440	0.5379	0.5399	0.5360	0.5360	0.5342	0.5323	0.5306	0.5288	0.5342	0.5306	0.5342 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			36.4500	1.1450	41.7366		(27)
Ground Floor			83.7500	0.1200	10.0500	84.0000	7035.0000 (28a)
Brick and Block	177.0600	36.6600	140.4000	0.2400	33.6960	42.2200	5927.6880 (29a)
Tile Clad	19.0400	1.9100	17.1300	0.2400	4.1112	42.2200	723.2286 (29a)
Pitched Roof	83.7500		83.7500	0.1000	8.3750	9.1000	762.1250 (30)
Total net area of external elements Aum(A, m ²)			363.6000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	100.3008		(33)
Ground Floor Block			51.8000			75.0000	3885.0000 (32c)
Ground Floor Stud			60.3900			9.0000	543.5100 (32c)
First Floor Stud			190.3000			9.0000	1712.7000 (32c)
Internal Floor 1			83.7500			18.0000	1507.5000 (32d)
Internal Ceiling 1			83.7500			18.0000	1507.5000 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 23604.2516 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							140.9209 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.8952 (36)
Total fabric heat loss							(33) + (36) = 108.1960 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	75.1749	74.3372	74.6095	74.0717	74.0717	73.8132	73.5615	73.3168	73.0789	73.8132	73.3168	73.8132 (38)
Heat transfer coeff	183.3709	182.5332	182.8055	182.2677	182.2677	182.0092	181.7575	181.5128	181.2749	182.0092	181.5128	182.0092 (39)
Average = Sum(39)m / 12 =												182.1109 (39)
HLP	1.0948	1.0898	1.0914	1.0882	1.0882	1.0866	1.0851	1.0837	1.0822	1.0866	1.0837	1.0866 (40)
HLP (average)												1.0872 (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												2.9592 (42)
Average daily hot water use (litres/day)												104.4813 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	114.9294	110.7502	106.5709	102.3917	98.2124	94.0332	94.0332	98.2124	102.3917	106.5709	110.7502	114.9294 (44)
	170.4370	149.0653	153.8221	134.1058	128.6777	111.0391	102.8940	118.0724	119.4826	139.2454	151.9972	165.0592 (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 = 1643.8977 (45)
Distribution loss (46)m = 0.15 x (45)m												
25.5656	22.3598	23.0733	20.1159	19.3017	16.6559	15.4341	17.7109	17.9224	20.8868	22.7996	24.7589	(46)
Water storage loss:												
Store volume												200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8700 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0098 (55)
Total storage loss												
31.3038	28.2744	31.3038	30.2940	31.3038	30.2940	31.3038	31.3038	30.2940	31.3038	30.2940	31.3038	(56)
If cylinder contains dedicated solar storage												
31.3038	28.2744	31.3038	30.2940	31.3038	30.2940	31.3038	31.3038	30.2940	31.3038	30.2940	31.3038	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month												
225.0032	198.3509	208.3883	186.9118	183.2439	163.8451	157.4602	172.6386	172.2886	193.8116	204.8032	219.6254	(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												
225.0032	198.3509	208.3883	186.9118	183.2439	163.8451	157.4602	172.6386	172.2886	193.8116	204.8032	219.6254	(64)
Total per year (kWh/year) = Sum(64)m =												2286.3707 (64)
Heat gains from water heating, kWh/month												
100.3233	86.9927	94.7988	86.8350	86.4383	79.1653	77.8652	82.9120	81.9727	89.9521	92.7839	98.5351	(65)

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

Metabolic gains (Table 5), Watts												
(66)m	177.5528	177.5528	177.5528	177.5528	177.5528	177.5528	177.5528	177.5528	177.5528	177.5528	177.5528	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
75.6095	67.1557	54.6147	41.3468	30.9072	26.0932	28.1946	36.6484	49.1894	62.4573	72.8969	77.7109	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
505.9571	511.2074	497.9769	469.8108	434.2562	400.8398	378.5157	373.2654	386.4959	414.6620	450.2166	483.6329	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
55.7145	55.7145	55.7145	55.7145	55.7145	55.7145	55.7145	55.7145	55.7145	55.7145	55.7145	55.7145	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	(71)
Water heating gains (Table 5)												
134.8431	132.4296	127.4177	120.6041	116.1805	109.9518	104.6576	111.4409	113.8510	120.9033	128.8665	132.4397	(72)
Total internal gains	834.3085	828.6914	797.9081	749.6605	699.2427	654.7836	629.2666	639.2535	667.4351	715.9213	769.8788	811.6823 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g		FF		Access		Gains
						Specific data or Table 6b		Specific data or Table 6c		factor Table 6d		W
North				20.1500	13.4839	0.6300		0.7000		0.7700		83.0352 (74)
East				3.8200	25.1925	0.6300		0.7000		0.7700		29.4108 (76)
South				11.0400	56.7559	0.6300		0.7000		0.7700		191.4924 (78)
West				1.4400	25.1925	0.6300		0.7000		0.7700		11.0868 (80)
Solar gains	315.0252	469.9979	689.4549	937.2784	1069.8866	1189.2233	1122.8551	996.8008	815.1456	571.7586	378.7743	263.3999 (83)
Total gains	1149.3337	1298.6893	1487.3630	1686.9389	1769.1293	1844.0069	1752.1217	1636.0542	1482.5807	1287.6799	1148.6530	1075.0823 (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	35.7567	35.9208	35.8673	35.9731	35.9731	36.0242	36.0741	36.1227	36.1701	36.0242	36.1227	36.0242
alpha	3.3838	3.3947	3.3912	3.3982	3.3982	3.4016	3.4049	3.4082	3.4113	3.4016	3.4082	3.4016
util living area	0.9745	0.9616	0.9268	0.8483	0.7189	0.5248	0.3933	0.4182	0.6641	0.8740	0.9549	0.9785 (86)
MIT	19.4073	19.5924	19.9725	20.4208	20.7584	20.9393	20.9828	20.9793	20.8626	20.4582	19.8830	19.3792 (87)
Th 2	20.0051	20.0092	20.0079	20.0105	20.0105	20.0118	20.0130	20.0142	20.0154	20.0118	20.0142	20.0118 (88)
util rest of house	0.9695	0.9543	0.9126	0.8191	0.6655	0.4460	0.2986	0.3186	0.5884	0.8421	0.9446	0.9742 (89)
MIT 2	17.8973	18.1661	18.7073	19.3293	19.7662	19.9669	20.0049	20.0044	19.8989	19.3953	18.5916	17.8616 (90)
Living area fraction												
MIT	18.1127	18.3695	18.8877	19.4850	19.9077	20.1056	20.1444	20.1434	20.0363	19.5469	18.7758	18.0780 (92)
Temperature adjustment												0.0000
adjusted MIT	18.1127	18.3695	18.8877	19.4850	19.9077	20.1056	20.1444	20.1434	20.0363	19.5469	18.7758	18.0780 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9562	0.9379	0.8924	0.8010	0.6594	0.4538	0.3115	0.3321	0.5902	0.8240	0.9273	0.9621	(94)
Useful gains	1098.9794	1218.0280	1327.3445	1351.2693	1166.6373	836.8819	545.8205	543.3045	874.9553	1061.0189	1065.1239	1034.3803	(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	2422.8245	2385.6154	2173.1428	1819.9475	1350.1861	874.6663	553.3451	552.4235	967.3401	1482.8113	1974.0937	2380.3216	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	984.9408	784.6187	629.2739	337.4483	136.5603	0.0000	0.0000	0.0000	0.0000	313.8135	654.4583	1001.3804	(98)
Space heating												4842.4943	(98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Space heating per m2 (98) / (4) = 28.9104 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													5350.8225 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	984.9408	784.6187	629.2739	337.4483	136.5603	0.0000	0.0000	0.0000	0.0000	313.8135	654.4583	1001.3804	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	1088.3324	866.9820	695.3303	372.8711	150.8954	0.0000	0.0000	0.0000	0.0000	346.7553	723.1583	1106.4977	(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	225.0032	198.3509	208.3883	186.9118	183.2439	163.8451	157.4602	172.6386	172.2886	193.8116	204.8032	219.6254	(64)
Efficiency of water heater (217)m	88.2983	88.1159	87.5787	86.3718	84.0430	79.8000	79.8000	79.8000	79.8000	86.0926	87.6973	79.8000	(216)
Fuel for water heating, kWh/month	254.8217	225.1024	237.9441	216.4037	218.0358	205.3196	197.3186	216.3391	215.9004	225.1199	233.5343	248.5330	(219)
Water heating fuel used												2694.3726	(219)
Annual totals kWh/year													
Space heating fuel - main system												5350.8225	(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)												534.1151	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.21 * 1187 * 1.00) =										-1148.5689		-1148.5689	(233)
Total delivered energy for all uses												7505.7413	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	5350.8225	5.7300	306.6021	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	2694.3726	5.7300	154.3876	(247)
Pumps and fans for heating	75.0000	24.1800	18.1350	(249)
Energy for lighting	534.1151	24.1800	129.1490	(250)
Additional standing charges			114.0000	(251)
Energy saving/generation technologies				
PV Unit	-1148.5689	24.1800	-277.7240	(252)
Total energy cost			444.5498	(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	5350.8225	0.2160	1155.7777	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2694.3726	0.2160	581.9845	(264)
Space and water heating			1737.7621	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	534.1151	0.5190	277.2057	(268)
Energy saving/generation technologies				
PV Unit	-1148.5689	0.5190	-596.1072	(269)
Total kg/year			1457.7856	(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	5350.8225	1.2200	6528.0034	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2694.3726	1.2200	3287.1346	(264)
Space and water heating			9815.1380	(265)
Pumps and fans	75.0000	3.0700	230.2500	(267)
Energy for lighting	534.1151	3.0700	1639.7334	(268)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Energy saving/generation technologies			
PV Unit	-1148.5689	3.0700	-3526.1064 (269)
Primary energy kWh/year			8159.0150 (272)
Primary energy kWh/m2/year			48.7105 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	B 90
Current environmental impact rating:	B 89

(For testing purposes):

A	Not considered
B	Not considered
C	Not considered
D	Not considered
E Low energy lighting	Already installed
F	Not considered
G	Not considered
H	Not considered
I	Not considered
J	Not considered
K	Not considered
M	Not considered
N Solar water heating	Recommended
O	Not considered
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U Solar photovoltaic panels	Already installed
A2	Not considered
A3	Not considered
T2	Not considered
W	Not considered
X	Not considered
Y	Not considered
J2	Not considered
Q2	Not considered
Z1	Not considered
Z2	Not considered
Z3	Not considered
Z4	Not considered
Z5	Not considered
V2 Wind turbine	Not applicable
L2	Not considered
Q3	Not considered
O3	Not considered

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.1	-£ 68	-277 kg (19.0%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£68 1.65 kg/m²	B 91	B 91
Total Savings	£68 1.65 kg/m²		

Potential energy efficiency rating:	B 91
Potential environmental impact rating:	B 91

Fuel prices for cost data on this page from database revision number 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	£147	£159	-£12
Mains gas	£575	£495	£80
Space heating	£439	£441	-£3
Water heating	£154	£84	£71
Lighting	£129	£129	£0
Generated (PV)	-£278	-£278	£0
Total cost of fuels	£444	£376	£68
Total cost of uses	£444	£376	£68
Delivered energy	45 kWh/m²	37 kWh/m²	8 kWh/m²
Carbon dioxide emissions	1.5 tonnes	1.2 tonnes	0.3 tonnes
CO2 emissions per m²	9 kg/m²	7 kg/m²	2 kg/m²
Primary energy	49 kWh/m²	39 kWh/m²	9 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	83.7500 (1b)	x 2.3900 (2b)	= 200.1625 (1b) - (3b)
First floor	83.7500 (1c)	x 2.6100 (2c)	= 218.5875 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	167.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 418.7500 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					5 * 10 = 50.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					50.0000 / (5) = 0.1194 (8)
Pressure test					Yes
Measured/design AP50					4.2600
Infiltration rate					0.3324 (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) =	0.2825 (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	0.3602	0.3532	0.3461	0.3108	0.3037	0.2684	0.2684	0.2614	0.2825	0.3037	0.3179	0.3320 (22b)
Effective ac	0.5649	0.5624	0.5599	0.5483	0.5461	0.5360	0.5360	0.5342	0.5399	0.5461	0.5505	0.5551 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			36.4500	1.1450	41.7366		(27)
Ground Floor			83.7500	0.1200	10.0500	84.0000	7035.0000 (28a)
Brick and Block	177.0600	36.6600	140.4000	0.2400	33.6960	42.2200	5927.6880 (29a)
Tile Clad	19.0400	1.9100	17.1300	0.2400	4.1112	42.2200	723.2286 (29a)
Pitched Roof	83.7500		83.7500	0.1000	8.3750	9.1000	762.1250 (30)
Total net area of external elements Aum(A, m ²)			363.6000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	100.3008		(33)
Ground Floor Block			51.8000			75.0000	3885.0000 (32c)
Ground Floor Stud			60.3900			9.0000	543.5100 (32c)
First Floor Stud			190.3000			9.0000	1712.7000 (32c)
Internal Floor 1			83.7500			18.0000	1507.5000 (32d)
Internal Ceiling 1			83.7500			18.0000	1507.5000 (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) = 23604.2516 (34)
140.9209 (35)
7.8952 (36)
(33) + (36) = 108.1960 (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	78.0603	77.7121	77.3709	75.7678	75.4679	74.0717	74.0717	73.8132	74.6095	75.4679	76.0747	76.7090 (38)
Heat transfer coeff	186.2563	185.9082	185.5669	183.9638	183.6639	182.2677	182.2677	182.0092	182.8055	183.6639	184.2707	184.9050 (39)
Average = Sum(39)m / 12 =												183.9624 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1120	1.1099	1.1079	1.0983	1.0965	1.0882	1.0882	1.0866	1.0914	1.0965	1.1001	1.1039 (40)
HLP (average)												1.0983 (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)
2.9592 (42)
104.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	114.9294	110.7502	106.5709	102.3917	98.2124	94.0332	94.0332	98.2124	102.3917	106.5709	110.7502	114.9294 (44)
Energy conte	170.4370	149.0653	153.8221	134.1058	128.6777	111.0391	102.8940	118.0724	119.4826	139.2454	151.9972	165.0592 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Energy content (annual)												Total = Sum(45)m =	1643.8977 (45)
Distribution loss (46)m = 0.15 x (45)m													
25.5656	22.3598	23.0733	20.1159	19.3017	16.6559	15.4341	17.7109	17.9224	20.8868	22.7996	24.7589		(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8700	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.0098	(55)
Total storage loss													
31.3038	28.2744	31.3038	30.2940	31.3038	30.2940	31.3038	31.3038	30.2940	31.3038	30.2940	31.3038		(56)
If cylinder contains dedicated solar storage													
19.5649	17.6715	19.5649	18.9338	19.5649	18.9338	19.5649	19.5649	18.9338	19.5649	18.9338	19.5649		(57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
213.2643	187.7480	195.2536	168.7979	158.7107	139.8781	132.6944	148.8032	155.5254	180.6769	193.4430	207.8864		(62)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.7000	(H2)
Collector heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0050	(H3a)
Collector effective heat loss coefficient												1.8063	(H3b)
Collector performance ratio												2.5804	(H4)
Annual solar radiation per m2												1079.5246	(H5)
Overshading factor												0.8000	(H6)
Solar energy available												1813.6014	(H7)
Adjustment factor for showers												1.0000	(H7a)
Solar-to-load ratio												1.1032	(H8)
Utilisation factor												0.5960	(H9)
Collector performance factor												0.8793	(H10)
Dedicated solar storage volume												75.0000	(H11)
Effective solar volume												112.5000	(H13)
Daily hot water demand												104.4813	(H14)
Volume ratio Veff/V												1.0767	(H15)
Solar storage volume factor												1.0000	(H16)
Solar input												-950.4899	(H17)
Solar input	-27.5623	-45.9936	-78.3323	-104.9808	-129.6949	-127.5107	-125.8256	-109.9345	-86.1007	-58.7967	-32.6929	-23.0649	(63)
Solar input (sum of months) = Sum(63)m =												-950.4899	(63)
Output from w/h													
185.7020	141.7544	116.9213	63.8172	29.0158	12.3674	6.8687	38.8687	69.4247	121.8803	160.7501	184.8215		(64)
Total per year (kWh/year) = Sum(64)m =												1132.1921	(64)
Heat gains from water heating, kWh/month													
90.9321	80.5104	84.2911	72.3439	66.8117	59.9917	58.0525	63.8437	68.5622	79.4443	83.6957	89.1440		(65)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	177.5528	177.5528	177.5528	177.5528	177.5528	177.5528	177.5528	177.5528	177.5528	177.5528	177.5528	177.5528	(67)
75.6095	67.1557	54.6147	41.3468	30.9072	26.0932	28.1946	36.6484	49.1894	62.4573	72.8969	77.7109		(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	505.9571	511.2074	497.9769	469.8108	434.2562	400.8398	378.5157	373.2654	386.4959	414.6620	450.2166	483.6329	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.7145	55.7145	55.7145	55.7145	55.7145	55.7145	55.7145	55.7145	55.7145	55.7145	55.7145	55.7145	(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)	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	(71)
Water heating gains (Table 5)	122.2206	119.8071	113.2944	100.4776	89.8007	83.3218	78.0276	85.8115	95.2253	106.7800	116.2440	119.8172	(72)
Total internal gains	821.6860	816.0689	783.7848	729.5340	672.8628	628.1536	602.6366	613.6241	648.8094	701.7980	757.2563	799.0598	(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					20.1500	10.6334	0.6300	0.7000			0.7700			65.4815 (74)
East					3.8200	19.6403	0.6300	0.7000			0.7700			22.9289 (76)
South					11.0400	46.7521	0.6300	0.7000			0.7700			157.7399 (78)
West					1.4400	19.6403	0.6300	0.7000			0.7700			8.6433 (80)

Solar gains	254.7937	445.2378	643.4300	861.8257	1029.4776	1051.6468	1001.4732	870.9495	717.7186	500.8879	307.1223	216.8539	(83)	
Total gains	1076.4796	1261.3068	1427.2148	1591.3597	1702.3404	1679.8004	1604.1098	1484.5735	1366.5280	1202.6859	1064.3786	1015.9137	(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	35.2028	35.2687	35.3336	35.6414	35.6996	35.9731	35.9731	36.0242	35.8673	35.6996	35.5821	35.4600	
alpha	3.3469	3.3512	3.3556	3.3761	3.3800	3.3982	3.3982	3.4016	3.3912	3.3800	3.3721	3.3640	
util living area	0.9811	0.9673	0.9403	0.8807	0.7730	0.6175	0.4751	0.5259	0.7404	0.9107	0.9691	0.9842	(86)
MIT	19.2228	19.4653	19.8319	20.2841	20.6592	20.8875	20.9652	20.9507	20.7829	20.2920	19.6721	19.1736	(87)
Th 2	19.9911	19.9928	19.9944	20.0022	20.0037	20.0105	20.0105	20.0118	20.0079	20.0037	20.0007	19.9976	(88)
util rest of house	0.9774	0.9610	0.9286	0.8569	0.7276	0.5432	0.3779	0.4269	0.6745	0.8876	0.9621	0.9811	(89)
MIT 2	17.6212	17.9723	18.4992	19.1388	19.6391	19.9165	19.9908	19.9817	19.8062	19.1643	18.2805	17.5540	(90)
Living area fraction	17.8496	18.1853	18.6893	19.3022	19.7846	20.0550	20.1298	20.1199	19.9455	19.3252	18.4790	17.7850	(92)
MIT													

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Temperature adjustment
adjusted MIT 17.8496 18.1853 18.6893 19.3022 19.7846 20.0550 20.1298 20.1199 19.9455 19.3252 18.4790 0.0000
17.7850 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9660	0.9456	0.9091	0.8368	0.7164	0.5467	0.3901	0.4383	0.6698	0.8678	0.9472	0.9711	(94)
Useful gains	1039.9293	1192.7051	1297.4265	1331.7131	1219.5357	918.4255	625.7745	650.7378	915.3648	1043.7237	1008.2182	986.5598	(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	2523.7048	2469.8386	2261.9261	1913.6238	1484.8464	994.2616	643.3698	677.0542	1068.5861	1602.4961	2096.8139	2511.9265	(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	1103.9290	858.2337	717.5878	418.9757	197.3911	0.0000	0.0000	0.0000	0.0000	415.7267	783.7889	1134.8729	(98)
Space heating												5630.5057	(98)
Space heating per m2												33.6150	(99)

(98) / (4) =

8c. Space cooling requirement

Not applicable

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													6221.5532 (211)
Space heating requirement	1103.9290	858.2337	717.5878	418.9757	197.3911	0.0000	0.0000	0.0000	0.0000	415.7267	783.7889	1134.8729	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	1219.8110	948.3245	792.9146	462.9566	218.1118	0.0000	0.0000	0.0000	0.0000	459.3665	866.0650	1254.0032	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	185.7020	141.7544	116.9213	63.8172	29.0158	12.3674	6.8687	38.8687	69.4247	121.8803	160.7501	184.8215	(64)
Efficiency of water heater (217)m	88.7857	88.8119	88.8312	88.9239	88.9711	79.8000	79.8000	79.8000	79.8000	87.8301	88.4809	79.8000	(216)
Fuel for water heating, kWh/month	209.1574	159.6120	131.6219	71.7660	32.6126	15.4980	8.6074	48.7077	86.9984	138.7682	181.6778	208.0576	(219)
Water heating fuel used												1293.0850	(219)
Annual totals kWh/year													
Space heating fuel - main system												6221.5532	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
pump for solar water heating												50.0000	(230g)
Total electricity for the above, kWh/year												125.0000	(231)
Electricity for lighting (calculated in Appendix L)												534.1151	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.21 * 1068 * 1.00) =									-1033.8922			-1033.8922	(233)
Total delivered energy for all uses												7139.8611	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	6221.5532	3.4800	216.5101	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1293.0850	3.4800	44.9994	(247)
Pumps and fans for heating	75.0000	13.1900	9.8925	(249)
Pump for solar water heating	50.0000	13.1900	6.5950	(249)
Energy for lighting	534.1151	13.1900	70.4498	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	-1033.8922	13.1900	-136.3704	(252)
Total energy cost			332.0763	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):			0.4200 (256)
Energy cost factor (ECF)		[(255) x (256)] / [(4) + 45.0] =	0.6563 (257)
SAP value			90.8441
SAP rating (Section 12)			91 (258)
SAP band			B

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	6221.5532	0.2160	1343.8555 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1293.0850	0.2160	279.3064 (264)
Space and water heating			1623.1619 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	534.1151	0.5190	277.2057 (268)
Energy saving/generation technologies			
PV Unit	-1033.8922	0.5190	-536.5901 (269)
Total kg/year			1428.6525 (272)
CO2 emissions per m2			8.5300 (273)
EI value			90.9911
EI rating			91 (274)
EI band			B

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	83.7500 (1b)	x 2.3900 (2b)	= 200.1625 (1b) - (3b)
First floor	83.7500 (1c)	x 2.6100 (2c)	= 218.5875 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	167.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 418.7500 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					5 * 10 = 50.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					50.0000 / (5) = 0.1194 (8)
Pressure test					Yes
Measured/design AP50					4.2600
Infiltration rate					0.3324 (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)	=	0.2825 (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	0.2967	0.2755	0.2825	0.2684	0.2684	0.2614	0.2543	0.2472	0.2402	0.2614	0.2472	0.2614 (22b)
	0.5440	0.5379	0.5399	0.5360	0.5360	0.5342	0.5323	0.5306	0.5288	0.5342	0.5306	0.5342 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			36.4500	1.1450	41.7366		(27)
Ground Floor			83.7500	0.1200	10.0500	84.0000	7035.0000 (28a)
Brick and Block	177.0600	36.6600	140.4000	0.2400	33.6960	42.2200	5927.6880 (29a)
Tile Clad	19.0400	1.9100	17.1300	0.2400	4.1112	42.2200	723.2286 (29a)
Pitched Roof	83.7500		83.7500	0.1000	8.3750	9.1000	762.1250 (30)
Total net area of external elements Aum(A, m ²)			363.6000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		100.3008		(33)
Ground Floor Block			51.8000			75.0000	3885.0000 (32c)
Ground Floor Stud			60.3900			9.0000	543.5100 (32c)
First Floor Stud			190.3000			9.0000	1712.7000 (32c)
Internal Floor 1			83.7500			18.0000	1507.5000 (32d)
Internal Ceiling 1			83.7500			18.0000	1507.5000 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 23604.2516 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							140.9209 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.8952 (36)
Total fabric heat loss							(33) + (36) = 108.1960 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	75.1749	74.3372	74.6095	74.0717	74.0717	73.8132	73.5615	73.3168	73.0789	73.8132	73.3168	73.8132 (38)
Heat transfer coeff	183.3709	182.5332	182.8055	182.2677	182.2677	182.0092	181.7575	181.5128	181.2749	182.0092	181.5128	182.0092 (39)
Average = Sum(39)m / 12 =												182.1109 (39)
HLP	1.0948	1.0898	1.0914	1.0882	1.0882	1.0866	1.0851	1.0837	1.0822	1.0866	1.0837	1.0866 (40)
HLP (average)												1.0872 (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												2.9592 (42)
Average daily hot water use (litres/day)												104.4813 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	114.9294	110.7502	106.5709	102.3917	98.2124	94.0332	94.0332	98.2124	102.3917	106.5709	110.7502	114.9294 (44)
	170.4370	149.0653	153.8221	134.1058	128.6777	111.0391	102.8940	118.0724	119.4826	139.2454	151.9972	165.0592 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Energy content (annual)												Total = Sum (45)m =	1643.8977 (45)
Distribution loss (46)m = 0.15 x (45)m													
	25.5656	22.3598	23.0733	20.1159	19.3017	16.6559	15.4341	17.7109	17.9224	20.8868	22.7996	24.7589	(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8700	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.0098	(55)
Total storage loss													
	31.3038	28.2744	31.3038	30.2940	31.3038	30.2940	31.3038	31.3038	30.2940	31.3038	30.2940	31.3038	(56)
If cylinder contains dedicated solar storage													
	19.5649	17.6715	19.5649	18.9338	19.5649	18.9338	19.5649	19.5649	18.9338	19.5649	18.9338	19.5649	(57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	213.2643	187.7480	195.2536	168.7979	158.7107	139.8781	132.6944	148.8032	155.5254	180.6769	193.4430	207.8864	(62)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.7000	(H2)
Collector heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0050	(H3a)
Collector effective heat loss coefficient												1.8063	(H3b)
Collector performance ratio												2.5804	(H4)
Annual solar radiation per m2												1208.1510	(H5)
Overshading factor												0.8000	(H6)
Solar energy available												2029.6937	(H7)
Adjustment factor for showers												1.0000	(H7a)
Solar-to-load ratio												1.2347	(H8)
Utilisation factor												0.5551	(H9)
Collector performance factor												0.8793	(H10)
Dedicated solar storage volume												75.0000	(H11)
Effective solar volume												112.5000	(H13)
Daily hot water demand												104.4813	(H14)
Volume ratio Veff/V												1.0767	(H15)
Solar storage volume factor												1.0000	(H16)
Solar input												-990.6995	(H17)
Solar input	-32.3190	-45.9556	-78.9866	-106.5712	-125.1743	-133.7059	-130.8940	-117.1541	-91.7236	-63.4146	-38.2249	-26.5756	(63)
												-990.6995	(63)
Solar input (sum of months) = Sum (63)m =													
Output from w/h													
	180.9453	141.7924	116.2670	62.2267	33.5364	6.1722	1.8003	31.6491	63.8018	117.2624	155.2181	181.3108	(64)
Total per year (kWh/year) = Sum (64)m =												1091.9825	(64)
Heat gains from water heating, kWh/month													
	90.9321	80.5104	84.2911	72.3439	66.8117	59.9917	58.0525	63.8437	68.5622	79.4443	83.6957	89.1440	(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	177.5528	177.5528	177.5528	177.5528	177.5528	177.5528	177.5528	177.5528	177.5528	177.5528	177.5528	177.5528	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	75.6095	67.1557	54.6147	41.3468	30.9072	26.0932	28.1946	36.6484	49.1894	62.4573	72.8969	77.7109	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	505.9571	511.2074	497.9769	469.8108	434.2562	400.8398	378.5157	373.2654	386.4959	414.6620	450.2166	483.6329	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	55.7145	55.7145	55.7145	55.7145	55.7145	55.7145	55.7145	55.7145	55.7145	55.7145	55.7145	55.7145	(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)													
	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	-118.3685	(71)
Water heating gains (Table 5)													
	122.2206	119.8071	113.2944	100.4776	89.8007	83.3218	78.0276	85.8115	95.2253	106.7800	116.2440	119.8172	(72)
Total internal gains	821.6860	816.0689	783.7848	729.5340	672.8628	628.1536	602.6366	613.6241	648.8094	701.7980	757.2563	799.0598	(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				20.1500	13.4839	0.6300			0.7000		0.7700	83.0352 (74)	
East				3.8200	25.1925	0.6300			0.7000		0.7700	29.4108 (76)	
South				11.0400	56.7559	0.6300			0.7000		0.7700	191.4924 (78)	
West				1.4400	25.1925	0.6300			0.7000		0.7700	11.0868 (80)	
Solar gains	315.0252	469.9979	689.4549	937.2784	1069.8866	1189.2233	1122.8551	996.8008	815.1456	571.7586	378.7743	263.3999	(83)
Total gains	1136.7112	1286.0668	1473.2397	1666.8124	1742.7495	1817.3769	1725.4918	1610.4248	1463.9550	1273.5566	1136.0305	1062.4598	(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	35.7567	35.9208	35.8673	35.9731	35.9731	36.0242	36.0741	36.1227	36.1701	36.0242	36.1227	36.0242	
alpha	3.3838	3.3947	3.3912	3.3982	3.3982	3.4016	3.4049	3.4082	3.4113	3.4016	3.4082	3.4016	
util living area	0.9753	0.9626	0.9284	0.8520	0.7252	0.5311	0.3989	0.4242	0.6696	0.8769	0.9562	0.9792	(86)
MIT	19.3974	19.5830	19.9633	20.4113	20.7515	20.9371	20.9820	20.9784	20.8589	20.4507	19.8737	19.3691	(87)
Th 2	20.0051	20.0092	20.0079	20.0105	20.0105	20.0118	20.0130	20.0142	20.0154	20.0118	20.0142	20.0118	(88)
util rest of house	0.9705	0.9554	0.9145	0.8231	0.6721	0.4518	0.3030	0.3235	0.5940	0.8455	0.9462	0.9750	(89)
MIT 2	17.8831	18.1526	18.6945	19.3170	19.7585	19.9651	20.0046	20.0039	19.8954	19.3857	18.5786	17.8470	(90)
Living area fraction												0.1426	(91)
MIT	18.0991	18.3566	18.8755	19.4731	19.9001	20.1038	20.1440	20.1429	20.0328	19.5376	18.7634	18.0641	(92)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Temperature adjustment													0.0000
adjusted MIT	18.0991	18.3566	18.8755	19.4731	19.9001	20.1038	20.1440	20.1429	20.0328	19.5376	18.7634	18.0641	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9573	0.9393	0.8945	0.8049	0.6656	0.4595	0.3161	0.3370	0.5955	0.8273	0.9290	0.9632	(94)
Useful gains	1088.2182	1207.9452	1317.7499	1341.6170	1159.9894	835.1077	545.3967	542.7824	871.7813	1053.6049	1055.4149	1023.3944	(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	2420.3246	2383.2662	2170.9029	1817.7696	1348.7981	874.3298	553.2666	552.3268	966.7056	1481.1256	1971.8378	2377.7906	(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	991.0872	789.8158	634.7458	342.8298	140.4737	0.0000	0.0000	0.0000	0.0000	318.0754	659.8245	1007.6708	(98)
Space heating												4884.5230	(98)
Space heating per m2												29.1613	(99)

(98) / (4) = 29.1613 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													5397.2630 (211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	991.0872	789.8158	634.7458	342.8298	140.4737	0.0000	0.0000	0.0000	0.0000	318.0754	659.8245	1007.6708	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	1095.1240	872.7246	701.3766	378.8175	155.2196	0.0000	0.0000	0.0000	0.0000	351.4645	729.0879	1113.4484	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)

Water heating													
Water heating requirement	180.9453	141.7924	116.2670	62.2267	33.5364	6.1722	1.8003	31.6491	63.8018	117.2624	155.2181	181.3108	(64)
Efficiency of water heater (217)m	88.6646	88.6900	88.6596	88.6734	88.2202	79.8000	79.8000	79.8000	79.8000	87.3453	88.2466	79.8000	(216)
Fuel for water heating, kWh/month	204.0785	159.8742	131.1387	70.1752	38.0144	7.7346	2.2560	39.6605	79.9522	134.2514	175.8914	204.4398	(219)
Water heating fuel used												1247.4667	(219)
Annual totals kWh/year													
Space heating fuel - main system												5397.2630	(211)
Space heating fuel - secondary												0.0000	(215)

Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
pump for solar water heating												50.0000	(230g)
Total electricity for the above, kWh/year												125.0000	(231)
Electricity for lighting (calculated in Appendix L)												534.1151	(232)

Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.21 * 1187 * 1.00) =										-1148.5689		-1148.5689	(233)
Total delivered energy for all uses												6155.2760	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	5397.2630	5.7300	309.2632	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1247.4667	5.7300	71.4798	(247)
Pumps and fans for heating	75.0000	24.1800	18.1350	(249)
Pump for solar water heating	50.0000	24.1800	12.0900	(249)
Energy for lighting	534.1151	24.1800	129.1490	(250)
Additional standing charges			114.0000	(251)
Energy saving/generation technologies				
PV Unit	-1148.5689	24.1800	-277.7240	(252)
Total energy cost			376.3931	(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	5397.2630	0.2160	1165.8088	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1247.4667	0.2160	269.4528	(264)
Space and water heating			1435.2616	(265)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	534.1151	0.5190	277.2057 (268)
Energy saving/generation technologies			
PV Unit	-1148.5689	0.5190	-596.1072 (269)
Total kg/year			1181.2351 (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	5397.2630	1.2200	6584.6609 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1247.4667	1.2200	1521.9094 (264)
Space and water heating			8106.5703 (265)
Pumps and fans	125.0000	3.0700	383.7500 (267)
Energy for lighting	534.1151	3.0700	1639.7334 (268)
Energy saving/generation technologies			
PV Unit	-1148.5689	3.0700	-3526.1064 (269)
Primary energy kWh/year			6603.9473 (272)
Primary energy kWh/m2/year			39.4266 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0906 Plot 6	Issued on Date	17/06/2025
Assessment Reference	As Built	Prop Type Ref	Type G
Project	4 Starling Road, BOTLEY, SO32 2DN		
Calculation Type	New Build (As Built)		

SAP Rating	90 B	DER	11.24	TER	15.21
Environmental	89 B	% DER<TER	26.08		
CO ₂ Emissions (t/year)	1.46	DFEE	44.19	TFEE	55.79
General Requirements Compliance	Pass	% DFEE<TFEE	20.79		

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 6	Issued on Date	17/06/2025
Assessment Reference	As Built	Prop Type Ref	Type G
Project	4 Starling Road, BOTLEY, SO32 2DN		
Calculation Type	New Build (As Built)		

SAP Rating	90 B	DER	11.24	TER	15.21
Environmental	89 B	% DER<TER	26.08		
CO ₂ Emissions (t/year)	1.46	DFEE	44.19	TFEE	55.79
General Requirements Compliance	Pass	% DFEE<TFEE	20.79		

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 6	Issued on Date	17/06/2025
Assessment Reference	As Built	Prop Type Ref	Type G
Project	4 Starling Road, BOTLEY, SO32 2DN		
Calculation Type	New Build (As Built)		

SAP Rating	90 B	DER	11.24	TER	15.21
Environmental	89 B	% DER<TER	26.08		
CO ₂ Emissions (t/year)	1.46	DFEE	44.19	TFEE	55.79
General Requirements Compliance	Pass	% DFEE<TFEE	20.79		

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 000004

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				0.1300			
Layer 1	Tiling						
	Main construction	30	1.5000	0.0000	100.00		
Layer 2	Standard cavity						
	Main construction	25	0.0000	0.0000	90.50		
	Main construction	25	0.1300	0.0000	9.50		
	Corrections - Cavity Ventilated, Emissivity: Normal						
Layer 3	Blockwork, dense						
	Main construction	100	1.5900	0.0629	92.97		
	Main construction	100	0.8800	0.1136	7.03		
Layer 4	Supafil 34						
	Main construction	100	0.0340	2.9412	100.00		
	Corrections - Air Gap: Level 0, Fasteners: None or plastic						
Layer 5	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 6	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 7	Plasterboard, standard						
	Main construction	12.5	0.2100	0.0595	100.00	700	1000
Int surface				0.1300			

Total resistance:	Upper limit = 4.349 m ² K/W	Lower limit = 4.137 m ² K/W	Average = 4.243 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: 383 mm

U-value: 0.24 W/m² K

Kappa: 42.22 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0906 Plot 6	Issued on Date	17/06/2025
Assessment Reference	As Built	Prop Type Ref	Type G
Project	4 Starling Road, BOTLEY, SO32 2DN		
Calculation Type	New Build (As Built)		

SAP Rating	90 B	DER	11.24	TER	15.21
Environmental	89 B	% DER<TER	26.08		
CO ₂ Emissions (t/year)	1.46	DFEE	44.19	TFEE	55.79
General Requirements Compliance	Pass	% DFEE<TFEE	20.79		

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

Floor 000003 - Worst Case Slab

Floor Type: Slab On Ground Floor

Area = 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 6	Issued on Date	17/06/2025
Assessment Reference	As Built	Prop Type Ref	Type G
Property	4 Starling Road, BOTLEY, SO32 2DN		
SAP Rating	90 B	DER	11.24
Environmental	89 B	TER	15.21
CO ₂ Emissions (t/year)	1.46	% DER<TER	26.08
General Requirements Compliance	Pass	DfEE	44.19
		TFEE	55.79
		% DfEE<TFEE	20.79
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	South
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:	39.22 m	83.75 m ²	2.39 m
	1st Storey:	39.22 m	83.75 m ²	2.61 m

7.0 Living Area	23.89	m ²
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8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	140.92	kJ/m ² K

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	177.06	140.40
Tile Clad	Cavity Wall	Other	0.24	42.22	19.04	17.13

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	51.80
Ground Floor Stud	Plasterboard on timber frame		9.00	60.39
First Floor Stud	Plasterboard on timber frame		9.00	190.30

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	83.75	83.75

10.2 Internal Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Ceiling 1	Plasterboard ceiling, carpeted chipboard floor	9.00	83.75

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	83.75

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	83.75

12.0 Opening Types

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

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
Front Door	Solid Door	[1] Brick and Block	South							2.12	
Front Shaded	Window	[1] Brick and Block	South	None	0.57	Yes				1.26	
Front Brick	Window	[1] Brick and Block	South	None	0.00					7.87	
Front Tiled	Window	[2] Tile Clad	South	None	0.00					1.91	
Side Elevation	Window	[1] Brick and Block	West	None	0.00					1.44	
Rear Elevation	Window	[1] Brick and Block	North	None	0.00					20.15	
Side Elevation	Window	[1] Brick and Block	East	None	0.00					3.82	

14.0 Conservatory

None

15.0 Draught Proofing

100

%

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	1.37	0.077	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	5.46	0.071	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	3.74	0.064	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	16.51	0.061	No	Birtley Supatherm
Independently assessed	E3 Sill	17.82	0.021	No	Knauf P5
Independently assessed	E4 Jamb	49.50	0.016	No	Knauf P6
Independently assessed	E5 Ground floor (normal)	39.22	0.062	No	Knauf BE-E5-23902
Independently assessed	E6 Intermediate floor within a dwelling	39.22	0.000	No	CD0029
Independently assessed	E10 Eaves (insulation at ceiling level)	21.20	0.071	No	Knauf P16
Independently assessed	E12 Gable (insulation at ceiling level)	18.02	0.044	No	Knauf P21
Independently assessed	E16 Corner (normal)	29.99	0.039	No	Knauf P23
Independently assessed	E17 Corner (inverted – internal area greater than external area)	10.00	-0.091	No	Knauf P24

Y-value	0.022	W/m²K
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18.0 Pressure Testing

Yes

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Designed AP ₅₀	5.00	m ³ /(h.m ²) @ 50 Pa
Property Tested ?	Yes	
As Built AP ₅₀	4.26	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
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20.0 Fans, Open Fireplaces, Flues

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

21.0 Fixed Cooling System

No

22.0 Lighting

Internal

Total number of light fittings	28	
Total number of L.E.L. fittings	28	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	Yes
Light and motion sensor	Yes

23.0 Electricity Tariff

Standard

24.0 Main Heating 1

Description	Database	
Percentage of Heat	Mains Gas Combi	%
Database Ref. No.	100	
Fuel Type	18911	
Main Heating	Mains gas	
SAP Code	BGB	
In Winter	102	
In Summer	90.5	
Controls	79.8	
PCDF Controls	CBI Time and temperature zone control	
Delayed Start Stat	0	
Sap Code	No	
Flue Type	2110	
Fan Assisted Flue	Balanced	
Is MHS Pumped	Yes	
Heat Emitter	Pump in heated space	
Flow Temperature	Radiators	
	Normal (> 45°C)	

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

25.0 Main Heating 2

Community Heating

28.0 Water Heating

Water Heating

Flue Gas Heat Recovery System

Waste Water Heat Recovery Instantaneous System 1

Waste Water Heat Recovery Instantaneous System 2

Waste Water Heat Recovery Storage System

Solar Panel

Water use <= 125 litres/person/day

SAP Code

29.0 Hot Water Cylinder

Cylinder Stat

Cylinder In Heated Space

Independent Time Control

Insulation Type

Cylinder Volume L

Loss kWh/day

Pipes insulation

31.0 Thermal Store

32.0 Photovoltaic Unit

PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
1.21	South	45°	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar water heating	£4,000 - £6,000	£68	B 91	