



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 29 Shaw Crescent, West End
SOUTHAMPTON, SO30 3LH

Contact: Tobias Whiting
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Report Issue Date: 26/11/2024

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0943 Plot 14			Issued on Date	26/11/2024
Assessment Reference	As Built	Prop Type Ref	Type L		
Property	29 Shaw Crescent, West End, SOUTHAMPTON, SO30 3LH				
SAP Rating	89 B	DER	12.89	TER	17.25
Environmental	89 B	% DER<TER	25.26		
CO ₂ Emissions (t/year)	1.07	DFEE	49.45	TFEE	57.03
General Requirements Compliance	Pass	% DFEE<TFEE	13.29		
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)	17.25	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	12.89	kgCO ₂ /m ²	Pass
	-4.36 (-25.3%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	57.03	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	49.45	kWh/m ² /yr	
	-7.6 (-13.3%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.15 (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
Vaillant ecoFIT sustain 835 VUW 356/6-3 (H-GB)
Combi boiler
Efficiency: 89.3% SEDBUK2009
Minimum: 88.0%

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Programmer, room thermostat and TRVs

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100 %

Minimum

75 %

Pass

8 Mechanical ventilation

Continuous extract system

Specific fan power

0.17

Maximum

0.7

Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Southern England)

Slight

Pass

Based on:

Overshading

Average

Windows facing East

9.64 m², No overhang

Windows facing West

12.11 m², No overhang

Air change rate

4.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

3.15 (measured in this dwelling) m³/(h.m²) @ 50 Pa

Maximum

10.0 m³/(h.m²) @ 50 Pa

Pass

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BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

10 Key features

Party wall U-value	0.00	W/m ² K
Roof U-value	0.10	W/m ² K
Floor U-value	0.12	W/m ² K
Door U-value	1.10	W/m ² K
Air permeability	3.2	m ³ /m ² h
Photovoltaic array	1.09	kW

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THERMAL BRIDGING

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SAP Rating	89 B	DER	12.89
Environmental	89 B	TER	17.25
CO ₂ Emissions (t/year)	1.07	% DER<TER	25.26
General Requirements Compliance	Pass	DFEE	49.45
		TFEE	57.03
		% DFEE<TFEE	13.29
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com		Assessor ID
			E477-0001
Client	Foreman Homes, FORE		

	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.071	2.84	0.20	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.064	3.74	0.24	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.067	3.17	0.21	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.061	7.24	0.44	Birtley Supatherm
External wall	E3 Sill	Independently assessed	0.021	12.80	0.27	Knauf P5
External wall	E4 Jamb	Independently assessed	0.016	33.60	0.54	Knauf P6
External wall	E5 Ground floor (normal)	Table K1 - Default	0.320	33.67	10.77	
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	33.67	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	18.79	1.13	
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.044	14.88	0.65	Knauf P21
External wall	E16 Corner (normal)	Independently assessed	0.039	24.99	0.97	Knauf P23
External wall	E17 Corner (inverted – internal area greater than external area)	Independently assessed	-0.091	5.00	-0.46	Knauf P24

Total: **14.98** W/mK:
Y-Value: **0.052** W/m²K:

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 118 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) 17.25 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 12.89 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)57.0 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)49.4 kWh/m²/yrOK

2 Fabric U-values

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.15 (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
Vaillant ecoFIT sustain 835 VUW 356/6-3 (H-GB)
Combi boiler
Efficiency: 89.3% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls: No cylinder

Boiler interlock Yes OK

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system
Specific fan power: 0.17
Maximum 0.7 OK

9 Summertime temperature

Overheating risk (Southern England): Slight OK
Based on:
Overshading: Average
Windows facing East: 9.64 m², No overhang
Windows facing West: 12.11 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.10 W/m²K
Floor U-value 0.12 W/m²K
Door U-value 1.10 W/m²K
Air permeability 3.2 m³/m²h
Photovoltaic array 1.09 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	58.9800 (1b)	x 2.3900 (2b)	= 140.9622 (1b) - (3b)
First floor	58.9800 (1c)	x 2.6100 (2c)	= 153.9378 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	117.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 294.9000 (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					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.1500
Infiltration rate					0.1575 (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)	=	0.1339 (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	0.1707	0.1673	0.1640	0.1473	0.1439	0.1272	0.1272	0.1238	0.1339	0.1439	0.1506	0.1573 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.20)			21.7500	1.1450	24.9046		(27)
Ground Floor			58.9800	0.1200	7.0776	84.0000	4954.3200 (28a)
Brick and Block	168.3500	23.9000	144.4500	0.2400	34.6680	42.2200	6098.6790 (29a)
Pitched Roof	58.9800		58.9800	0.1000	5.8980	9.1000	536.7180 (30)
Total net area of external elements Aum(A, m ²)			286.3100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		74.9132		(33)
Ground Block			58.4300			75.0000	4382.2500 (32c)
Ground Floor Stud			36.3900			9.0000	327.5100 (32c)
First Floor Stud			125.9100			9.0000	1133.1900 (32c)
Internal Floor 1			58.9800			18.0000	1061.6400 (32d)
Internal Ceiling 1			58.9800			18.0000	1061.6400 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	19555.9470 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							165.7846 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.9776 (36)
Total fabric heat loss						(33) + (36) =	89.8907 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	48.6585	48.6585	48.6585	48.6585	48.6585	48.6585	48.6585	48.6585	48.6585	48.6585	48.6585	48.6585 (38)
Average = Sum(39)m / 12 =	138.5492	138.5492	138.5492	138.5492	138.5492	138.5492	138.5492	138.5492	138.5492	138.5492	138.5492	138.5492 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1745	1.1745	1.1745	1.1745	1.1745	1.1745	1.1745	1.1745	1.1745	1.1745	1.1745	1.1745 (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												2.8551 (42)
Average daily hot water use (litres/day)												102.0080 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy conte	112.2088	108.1285	104.0482	99.9679	95.8876	91.8072	91.8072	95.8876	99.9679	104.0482	108.1285	112.2088 (44)
Energy content (annual)	166.4025	145.5367	150.1808	130.9313	125.6317	108.4106	100.4583	115.2774	116.6542	135.9492	148.3992	161.1519 (45)
Distribution loss (46)m = 0.15 x (45)m	Total = Sum(45)m = 1604.9837 (45)											
	24.9604	21.8305	22.5271	19.6397	18.8448	16.2616	15.0688	17.2916	17.4981	20.3924	22.2599	24.1728 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.6689	0.6088	0.6527	0.5890	0.5421	0.4479	0.4150	0.4974	0.5248	0.5908	0.6207	0.6478 (61)
Total heat required for water heating calculated for each month	167.0714	146.1454	150.8335	131.5203	126.1738	108.8585	100.8734	115.7748	117.1790	136.5401	149.0199	161.7997 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	167.0714	146.1454	150.8335	131.5203	126.1738	108.8585	100.8734	Solar input (sum of months) = Sum(63)m =			0.0000 (63)	
Heat gains from water heating, kWh/month	55.4960	48.5431	50.0983	43.6819	41.9081	36.1585	33.5062	38.4541	38.9187	45.3508	49.4979	53.7450 (65)
	Total per year (kWh/year) = Sum(64)m = 1611.7896 (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	142.7538	142.7538	142.7538	142.7538	142.7538	142.7538	142.7538	142.7538	142.7538	142.7538	142.7538	142.7538 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	25.6305	22.7648	18.5136	14.0160	10.4771	8.8452	9.5576	12.4233	16.6745	21.1721	24.7110	26.3429 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	282.5331	285.4649	278.0769	262.3486	242.4944	223.8343	211.3681	208.4363	215.8244	231.5527	251.4069	270.0670 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.2754	37.2754	37.2754	37.2754	37.2754	37.2754	37.2754	37.2754	37.2754	37.2754	37.2754	37.2754 (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)	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030 (71)
Water heating gains (Table 5)	74.5915	72.2368	67.3364	60.6693	56.3280	50.2201	45.0352	51.6856	54.0538	60.9554	68.7471	72.2378 (72)
Total internal gains	451.5812	449.2927	432.7530	405.8600	378.1256	351.7257	334.7870	341.3714	355.3788	382.5064	413.6911	437.4739 (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
East			9.6400	19.6403		0.6300		0.7000		0.7700		57.8624 (76)
West			12.1100	19.6403		0.6300		0.7000		0.7700		72.6881 (80)

Solar gains	130.5505	255.3844	420.5817	613.3934	751.7366	769.5362	732.6298	629.3182	489.1539	303.0351	162.7811	107.3583 (83)
Total gains	582.1317	704.6771	853.3347	1019.2533	1129.8622	1121.2619	1067.4168	970.6895	844.5327	685.5415	576.4722	544.8322 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	39.2078	39.2078	39.2078	39.2078	39.2078	39.2078	39.2078	39.2078	39.2078	39.2078	39.2078	39.2078 (85)
alpha	3.6139	3.6139	3.6139	3.6139	3.6139	3.6139	3.6139	3.6139	3.6139	3.6139	3.6139	3.6139
util living area	0.9949	0.9893	0.9734	0.9278	0.8315	0.6837	0.5361	0.5990	0.8290	0.9630	0.9910	0.9960 (86)
MIT	19.1291	19.3460	19.7291	20.2118	20.6236	20.8705	20.9597	20.9397	20.7240	20.1579	19.5390	19.0748 (87)
Th 2	19.9404	19.9404	19.9404	19.9404	19.9404	19.9404	19.9404	19.9404	19.9404	19.9404	19.9404	19.9404 (88)
util rest of house	0.9937	0.9868	0.9668	0.9091	0.7873	0.6013	0.4213	0.4832	0.7662	0.9500	0.9884	0.9950 (89)
MIT 2	18.2271	18.4428	18.8218	19.2900	19.6685	19.8696	19.9263	19.9172	19.7656	19.2471	18.6362	18.1729 (90)
Living area fraction	18.3558	18.5717	18.9512	19.4215	19.8047	20.0124	20.0738	20.0631	19.9023	19.3770	18.7650	18.3016 (91)
MIT	18.3558	18.5717	18.9512	19.4215	19.8047	20.0124	20.0738	20.0631	19.9023	19.3770	18.7650	18.3016 (92)
Temperature adjustment	18.3558	18.5717	18.9512	19.4215	19.8047	20.0124	20.0738	20.0631	19.9023	19.3770	18.7650	18.3016 (93)
adjusted MIT	18.3558	18.5717	18.9512	19.4215	19.8047	20.0124	20.0738	20.0631	19.9023	19.3770	18.7650	18.3016 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9910	0.9822	0.9587	0.8979	0.7808	0.6074	0.4366	0.4976	0.7636	0.9408	0.9844	0.9928 (94)
Ext temp.	576.9173	692.1290	818.0831	915.1440	882.2375	681.0937	466.0439	483.0452	644.8471	644.9693	567.4566	540.9310 (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	1947.4162	1894.2021	1725.1082	1457.7471	1122.9063	749.8817	481.2871	507.5198	803.9089	1216.0502	1616.1750	1953.7674 (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	1019.6512	807.7931	674.8266	390.6742	179.0576	0.0000	0.0000	0.0000	0.0000	424.8842	755.0772	1051.1503 (98)
Space heating per m2	(98) / (4) = 44.9569 (99)											

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													5879.2844 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1019.6512	807.7931	674.8266	390.6742	179.0576	0.0000	0.0000	0.0000	0.0000	424.8842	755.0772	1051.1503	(98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)
Space heating fuel (main heating system)	1130.4337	895.5578	748.1448	433.1200	198.5117	0.0000	0.0000	0.0000	0.0000	471.0468	837.1144	1165.3551	(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	167.0714	146.1454	150.8335	131.5203	126.1738	108.8585	100.8734	115.7748	117.1790	136.5401	149.0199	161.7997	(64)
Efficiency of water heater (217)m	87.9631	87.7711	87.3187	86.2751	83.9330	76.4000	76.4000	76.4000	76.4000	86.4043	87.5922	76.4000	(216)
Fuel for water heating, kWh/month	189.9334	166.5074	172.7391	152.4430	150.3267	142.4849	132.0332	151.5377	153.3756	158.0246	170.1293	183.7009	(219)
Water heating fuel used												1923.2357	(219)
Annual totals kWh/year													
Space heating fuel - main system												5879.2844	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.2380)													
mechanical ventilation fans (SFP = 0.2380)													85.6272 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													160.6272 (231)
Electricity for lighting (calculated in Appendix L)													452.6428 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.09 * 1068 * 1.00) =													-931.3575 (233)
Total delivered energy for all uses													7484.4326 (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	5879.2844	0.2160	1269.9254 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1923.2357	0.2160	415.4189 (264)
Space and water heating			1685.3443 (265)
Pumps and fans	160.6272	0.5190	83.3655 (267)
Energy for lighting	452.6428	0.5190	234.9216 (268)
Energy saving/generation technologies			
PV Unit	-931.3575	0.5190	-483.3745 (269)
Total CO2, kg/year			1520.2569 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			12.8900 (273)

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

DER			12.8900 ZC1
Total Floor Area		TFA	117.9600
Assumed number of occupants		N	2.8551
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			14.1932 ZC2
CO2 emissions from cooking, equation (L16)			1.5897 ZC3
Total CO2 emissions			28.6729 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			28.6729 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	58.9800 (1b)	x 2.3900 (2b)	= 140.9622 (1b) - (3b)
First floor	58.9800 (1c)	x 2.6100 (2c)	= 153.9378 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	117.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 294.9000 (5)

2. Ventilation rate

										main	secondary	other	total	m3 per hour			
										heating	heating						
Number of chimneys										0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues										0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans																4 * 10 =	40.0000 (7a)
Number of passive vents																0 * 10 =	0.0000 (7b)
Number of flueless gas fires																0 * 40 =	0.0000 (7c)
										Air changes per hour							
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) =	0.1356 (8)	
Pressure test															Yes		
Measured/design AP50															5.0000		
Infiltration rate															0.3856 (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) =					0.3278 (21)		
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
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	0.4179	0.4097	0.4015	0.3606	0.3524	0.3114	0.3114	0.3032	0.3278	0.3524	0.3688	0.3852 (22b)					
Effective ac	0.5873	0.5839	0.5806	0.5650	0.5621	0.5485	0.5485	0.5460	0.5537	0.5621	0.5680	0.5742 (25)					

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			2.1500	1.0000	2.1500		(26)					
TER Opening Type (Uw = 1.40)			21.7500	1.3258	28.8352		(27)					
Ground Floor			58.9800	0.1300	7.6674		(28a)					
Brick and Block	168.3500	23.9000	144.4500	0.1800	26.0010		(29a)					
Pitched Roof	58.9800		58.9800	0.1300	7.6674		(30)					
Total net area of external elements Aum(A, m2)			286.3100				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	72.3210		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.3760 (36)					
Total fabric heat loss						(33) + (36) =	84.6970 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 57.1577	Feb 56.8277	Mar 56.5042	Apr 54.9847	May 54.7004	Jun 53.3770	Jul 53.3770	Aug 53.1319	Sep 53.8868	Oct 54.7004	Nov 55.2755	Dec 55.8768 (38)
Heat transfer coeff	141.8548	141.5247	141.2012	139.6817	139.3975	138.0741	138.0741	137.8290	138.5838	139.3975	139.9726	140.5738 (39)
Average = Sum(39)m / 12 =												139.6804 (39)
HLP	Jan 1.2026	Feb 1.1998	Mar 1.1970	Apr 1.1841	May 1.1817	Jun 1.1705	Jul 1.1705	Aug 1.1684	Sep 1.1748	Oct 1.1817	Nov 1.1866	Dec 1.1917 (40)
HLP (average)												1.1841 (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												2.8551 (42)
Average daily hot water use (litres/day)												102.0080 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	112.2088	108.1285	104.0482	99.9679	95.8876	91.8072	91.8072	95.8876	99.9679	104.0482	108.1285	112.2088 (44)
Energy conte	166.4025	145.5367	150.1808	130.9313	125.6317	108.4106	100.4583	115.2774	116.6542	135.9492	148.3992	161.1519 (45)
Energy content (annual)											Total = Sum(45)m =	1604.9837 (45)
Distribution loss	(46)m = 0.15 x (45)m											
	24.9604	21.8305	22.5271	19.6397	18.8448	16.2616	15.0688	17.2916	17.4981	20.3924	22.2599	24.1728 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Total heat required for water heating calculated for each month	50.9589	46.0274	50.9589	49.2992	48.8633	45.2748	46.7840	48.8633	49.2992	50.9589	49.3151	50.9589 (61)
Solar input	217.3614	191.5641	201.1397	180.2305	174.4949	153.6854	147.2423	164.1407	165.9534	186.9081	197.7143	212.1108 (62)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	217.3614	191.5641	201.1397	180.2305	174.4949	153.6854	147.2423	164.1407	165.9534	186.9081	197.7143	212.1108 (64)
Heat gains from water heating, kWh/month	68.0686	59.8978	62.6748	55.8595	53.9883	47.3652	45.0984	50.5456	51.1123	57.9428	61.6715	66.3227 (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	142.7538	142.7538	142.7538	142.7538	142.7538	142.7538	142.7538	142.7538	142.7538	142.7538	142.7538	142.7538	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	25.6305	22.7648	18.5136	14.0160	10.4771	8.8452	9.5576	12.4233	16.6745	21.1721	24.7110	26.3429	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	282.5331	285.4649	278.0769	262.3486	242.4944	223.8343	211.3681	208.4363	215.8244	231.5527	251.4069	270.0670	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.2754	37.2754	37.2754	37.2754	37.2754	37.2754	37.2754	37.2754	37.2754	37.2754	37.2754	37.2754	(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)	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	(71)
Water heating gains (Table 5)	91.4900	89.1336	84.2404	77.5826	72.5650	65.7850	60.6161	67.9376	70.9893	77.8802	85.6549	89.1435	(72)
Total internal gains	468.4798	466.1895	449.6570	422.7732	394.3626	367.2906	350.3679	357.6233	372.3144	399.4311	430.5989	454.3795	(73)

6. Solar gains

[Jan]	Area m2					Solar flux Table 6a W/m2		Specific data g or Table 6b		Specific data FF or Table 6c		Access factor Table 6d		Gains W	
East	9.6400					19.6403		0.6300		0.7000		0.7700		57.8624 (76)	
West	12.1100					19.6403		0.6300		0.7000		0.7700		72.6881 (80)	

Solar gains	130.5505	255.3844	420.5817	613.3934	751.7366	769.5362	732.6298	629.3182	489.1539	303.0351	162.7811	107.3583	(83)		
Total gains	599.0302	721.5739	870.2387	1036.1666	1146.0992	1136.8268	1082.9977	986.9415	861.4683	702.4662	593.3799	561.7378	(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	57.7469	57.8815	58.0141	58.6452	58.7648	59.3281	59.3281	59.4336	59.1098	58.7648	58.5234	58.2731	
alpha	4.8498	4.8588	4.8676	4.9097	4.9177	4.9552	4.9552	4.9622	4.9407	4.9177	4.9016	4.8849	
util living area	0.9991	0.9974	0.9910	0.9629	0.8778	0.7134	0.5465	0.6149	0.8719	0.9852	0.9979	0.9993	(86)
MIT	19.6037	19.7701	20.0645	20.4521	20.7702	20.9423	20.9875	20.9784	20.8374	20.4002	19.9296	19.5775	(87)
Th 2	19.9179	19.9202	19.9224	19.9327	19.9346	19.9437	19.9437	19.9453	19.9402	19.9346	19.9307	19.9266	(88)
util rest of house	0.9987	0.9965	0.9876	0.9484	0.8317	0.6201	0.4227	0.4874	0.8047	0.9772	0.9971	0.9991	(89)
MIT 2	18.0500	18.2946	18.7248	19.2856	19.7089	19.9054	19.9391	19.9364	19.8054	19.2219	18.5357	18.0176	(90)
Living area fraction									fLA = Living area / (4) =			0.1427	(91)
MIT	18.2717	18.5051	18.9160	19.4520	19.8603	20.0534	20.0887	20.0851	19.9526	19.3900	18.7345	18.2402	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2717	18.5051	18.9160	19.4520	19.8603	20.0534	20.0887	20.0851	19.9526	19.3900	18.7345	18.2402	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	597.7673	717.7311	855.5056	973.8537	948.8313	716.8494	476.8339	498.6119	694.0447	682.2824	590.6975	560.8699	(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	1981.9475	1925.4605	1753.1485	1473.9275	1137.5254	752.9684	481.7008	507.9144	811.0790	1225.3032	1628.5168	1973.6796	(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	1029.8301	811.5942	667.8463	360.0531	140.3884	0.0000	0.0000	0.0000	0.0000	404.0075	747.2299	1051.1304	(98)
Space heating												5212.0798	(98)
Space heating per m2												44.1851	(99)

8c. Space cooling requirement

Not applicable

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													5580.3852 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1029.8301	811.5942	667.8463	360.0531	140.3884	0.0000	0.0000	0.0000	0.0000	404.0075	747.2299	1051.1304	(98)
Space heating efficiency (main heating system 1)	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000	(210)
Space heating fuel (main heating system)	1102.6018	868.9445	715.0388	385.4959	150.3088	0.0000	0.0000	0.0000	0.0000	432.5562	800.0320	1125.4072	(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	217.3614	191.5641	201.1397	180.2305	174.4949	153.6854	147.2423	164.1407	165.9534	186.9081	197.7143	212.1108	(64)
Efficiency of water heater	88.4609	88.2796	87.8426	86.7598	84.5096	80.3000	80.3000	80.3000	80.3000	86.9411	88.0819	88.5303	(217)
Fuel for water heating, kWh/month	245.7147	216.9969	228.9774	207.7351	206.4794	191.3890	183.3653	204.4093	206.6668	214.9824	224.4663	239.5912	(219)
Water heating fuel used												2570.7738	(219)
Annual totals kWh/year													
Space heating fuel - main system												5580.3852	(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)												452.6428	(232)
Total delivered energy for all uses												8678.8018	(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	5580.3852	0.2160	1205.3632 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2570.7738	0.2160	555.2871 (264)
Space and water heating			1760.6504 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	452.6428	0.5190	234.9216 (268)
Total CO2, kg/m2/year			2034.4970 (272)
Emissions per m2 for space and water heating			14.9258 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			1.9915 (272b)
Emissions per m2 for pumps and fans			0.3300 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.9258 * 1.00) + 1.9915 + 0.3300, rounded to 2 d.p.			17.2500 (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	58.9800 (1b)	x 2.3900 (2b)	= 140.9622 (1b) - (3b)
First floor	58.9800 (1c)	x 2.6100 (2c)	= 153.9378 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	117.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 294.9000 (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) =	0.1356 (8)
Pressure test					Yes
Measured/design AP50					3.1500
Infiltration rate					0.2931 (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) =		0.2492 (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	0.3177	0.3115	0.3052	0.2741	0.2679	0.2367	0.2367	0.2305	0.2492	0.2679	0.2803	0.2928 (22b)
Effective ac	0.5505	0.5485	0.5466	0.5376	0.5359	0.5280	0.5280	0.5266	0.5310	0.5359	0.5393	0.5429 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.20)			21.7500	1.1450	24.9046		(27)
Ground Floor			58.9800	0.1200	7.0776	84.0000	4954.3200 (28a)
Brick and Block	168.3500	23.9000	144.4500	0.2400	34.6680	42.2200	6098.6790 (29a)
Pitched Roof	58.9800		58.9800	0.1000	5.8980	9.1000	536.7180 (30)
Total net area of external elements Aum(A, m ²)			286.3100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	74.9132		(33)
Ground Block			58.4300			75.0000	4382.2500 (32c)
Ground Floor Stud			36.3900			9.0000	327.5100 (32c)
First Floor Stud			125.9100			9.0000	1133.1900 (32c)
Internal Floor 1			58.9800			18.0000	1061.6400 (32d)
Internal Ceiling 1			58.9800			9.0000	530.8200 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 19025.1270 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 161.2846 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.9776 (36)
Total fabric heat loss (33) + (36) = 89.8907 (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	53.5694	53.3787	53.1918	52.3139	52.1496	51.3849	51.3849	51.2433	51.6795	52.1496	52.4819	52.8293 (38)
Heat transfer coeff	143.4602	143.2695	143.0826	142.2046	142.0403	141.2757	141.2757	141.1340	141.5702	142.0403	142.3726	142.7200 (39)
Average = Sum(39)m / 12 =												142.2038 (39)
HLP	1.2162	1.2146	1.2130	1.2055	1.2041	1.1977	1.1977	1.1965	1.2002	1.2041	1.2070	1.2099 (40)
HLP (average)												1.2055 (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												2.8551 (42)
Average daily hot water use (litres/day)												102.0080 (43)
Daily hot water use	112.2088	108.1285	104.0482	99.9679	95.8876	91.8072	91.8072	95.8876	99.9679	104.0482	108.1285	112.2088 (44)
Energy conte	166.4025	145.5367	150.1808	130.9313	125.6317	108.4106	100.4583	115.2774	116.6542	135.9492	148.3992	161.1519 (45)
Energy content (annual)										Total = Sum(45)m =		1604.9837 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	35.3605	30.9265	31.9134	27.8229	26.6967	23.0372	21.3474	24.4964	24.7890	28.8892	31.5348	34.2448 (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	142.7538	142.7538	142.7538	142.7538	142.7538	142.7538	142.7538	142.7538	142.7538	142.7538	142.7538	142.7538	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	25.6305	22.7648	18.5136	14.0160	10.4771	8.8452	9.5576	12.4233	16.6745	21.1721	24.7110	26.3429	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	282.5331	285.4649	278.0769	262.3486	242.4944	223.8343	211.3681	208.4363	215.8244	231.5527	251.4069	270.0670	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.2754	37.2754	37.2754	37.2754	37.2754	37.2754	37.2754	37.2754	37.2754	37.2754	37.2754	37.2754	(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)	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	(71)
Water heating gains (Table 5)	47.5276	46.0216	42.8944	38.6429	35.8827	31.9962	28.6927	32.9253	34.4292	38.8296	43.7984	46.0279	(72)
Total internal gains	421.5174	420.0775	405.3110	380.8336	354.6803	330.5018	315.4446	319.6111	332.7542	357.3805	385.7424	408.2639	(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			
East				9.6400	19.6403	0.6300	0.7000		57.8624 (76)			
West				12.1100	19.6403	0.6300	0.7000	0.7700	72.6881 (80)			
Solar gains	130.5505	255.3844	420.5817	613.3934	751.7366	769.5362	732.6298	629.3182	489.1539	303.0351	162.7811	107.3583 (83)
Total gains	552.0678	675.4619	825.8927	994.2269	1106.4169	1100.0379	1048.0744	948.9292	821.9082	660.4156	548.5234	515.6223 (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	36.8378	36.8868	36.9350	37.1631	37.2060	37.4074	37.4074	37.4450	37.3296	37.2060	37.1192	37.0288	
alpha	3.4559	3.4591	3.4623	3.4775	3.4804	3.4938	3.4938	3.4963	3.4886	3.4804	3.4746	3.4686	
util living area	0.9952	0.9899	0.9748	0.9314	0.8401	0.6960	0.5501	0.6141	0.8390	0.9655	0.9916	0.9962	(86)
MIT	18.9904	19.2165	19.6171	20.1329	20.5726	20.8485	20.9507	20.9273	20.6861	20.0835	19.4345	18.9463	(87)
Th 2	19.9071	19.9084	19.9096	19.9156	19.9167	19.9219	19.9219	19.9228	19.9199	19.9167	19.9144	19.9121	(88)
util rest of house	0.9940	0.9874	0.9685	0.9135	0.7971	0.6136	0.4324	0.4964	0.7782	0.9533	0.9892	0.9953	(89)
MIT 2	18.0675	18.2934	18.6910	19.1973	19.6053	19.8378	19.9043	19.8943	19.7184	19.1594	18.5161	18.0271	(90)
Living area fraction									fLA = Living area / (4) =			0.1427	(91)
MIT	18.1992	18.4251	18.8231	19.3308	19.7433	19.9820	20.0536	20.0416	19.8565	19.2912	18.6472	18.1582	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1992	18.4251	18.8231	19.3308	19.7433	19.9820	20.0536	20.0416	19.8565	19.2912	18.6472	18.1582	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	547.3340	663.8684	793.0037	896.3567	873.0677	680.5651	469.2727	484.4793	636.0745	623.3531	540.4001	512.0963	(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	1993.9770	1937.7310	1763.2228	1483.3050	1142.4798	760.3498	487.9080	513.9607	814.9496	1234.5028	1643.9995	1992.1195	(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	1076.3024	856.0357	721.8430	422.6028	200.4426	0.0000	0.0000	0.0000	0.0000	454.6954	794.5916	1101.1372	(98)
Space heating												5627.6506	(98)
Space heating per m2										(98) / (4) =		47.7081	(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	1327.9911	1045.4398	1072.6187	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7975	0.8619	0.8255	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1059.0238	901.0203	885.4686	0.0000	0.0000	0.0000	0.0000	(102)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1399.7351	1336.4691	1222.7363	0.0000	0.0000	0.0000	0.0000 (103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	245.3121	323.9739	250.9271	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												820.2131 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)												
Intermittency factor	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	61.3280	80.9935	62.7318	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												205.0533 (107)
Space cooling per m2												1.7383 (108)
Energy for space heating												47.7081 (99)
Energy for space cooling												1.7383 (108)
Total												49.4465 (109)
Dwelling Fabric Energy Efficiency (DFEE)												49.4 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	58.9800 (1b)	x 2.3900 (2b)	= 140.9622 (1b) - (3b)
First floor	58.9800 (1c)	x 2.6100 (2c)	= 153.9378 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	117.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 294.9000 (5)

2. Ventilation rate

	main heating	+	secondary heating	+	other	=	total	m3 per hour				
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							4 * 10 =	40.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						40.0000 / (5) =	0.1356 (8)				
Pressure test							Yes					
Measured/design AP50							5.0000					
Infiltration rate							0.3856	(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) =	0.3278 (21)				
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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	0.4179	0.4097	0.4015	0.3606	0.3524	0.3114	0.3114	0.3032	0.3278	0.3524	0.3688	0.3852 (22b)
Effective ac	0.5873	0.5839	0.5806	0.5650	0.5621	0.5485	0.5485	0.5460	0.5537	0.5621	0.5680	0.5742 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			2.1500	1.0000	2.1500		(26)					
TER Opening Type (Uw = 1.40)			21.7500	1.3258	28.8352		(27)					
Ground Floor			58.9800	0.1300	7.6674		(28a)					
Brick and Block	168.3500	23.9000	144.4500	0.1800	26.0010		(29a)					
Pitched Roof	58.9800		58.9800	0.1300	7.6674		(30)					
Total net area of external elements Aum(A, m2)			286.3100				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	72.3210		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.3760 (36)					
Total fabric heat loss						(33) + (36) =	84.6970 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 57.1577	Feb 56.8277	Mar 56.5042	Apr 54.9847	May 54.7004	Jun 53.3770	Jul 53.3770	Aug 53.1319	Sep 53.8868	Oct 54.7004	Nov 55.2755	Dec 55.8768 (38)
Heat transfer coeff	141.8548	141.5247	141.2012	139.6817	139.3975	138.0741	138.0741	137.8290	138.5838	139.3975	139.9726	140.5738 (39)
Average = Sum(39)m / 12 =												139.6804 (39)
HLP	Jan 1.2026	Feb 1.1998	Mar 1.1970	Apr 1.1841	May 1.1817	Jun 1.1705	Jul 1.1705	Aug 1.1684	Sep 1.1748	Oct 1.1817	Nov 1.1866	Dec 1.1917 (40)
HLP (average)												1.1841 (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												2.8551 (42)
Average daily hot water use (litres/day)												102.0080 (43)
Daily hot water use	Jan 112.2088	Feb 108.1285	Mar 104.0482	Apr 99.9679	May 95.8876	Jun 91.8072	Jul 91.8072	Aug 95.8876	Sep 99.9679	Oct 104.0482	Nov 108.1285	Dec 112.2088 (44)
Energy conte	166.4025	145.5367	150.1808	130.9313	125.6317	108.4106	100.4583	115.2774	116.6542	135.9492	148.3992	161.1519 (45)
Energy content (annual)												Total = Sum(45)m = 1604.9837 (45)
Distribution loss (46)m = 0.15 x (45)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
	35.3605	30.9265	31.9134	27.8229	26.6967	23.0372	21.3474	24.4964	24.7890	28.8892	31.5348	34.2448 (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	142.7538	142.7538	142.7538	142.7538	142.7538	142.7538	142.7538	142.7538	142.7538	142.7538	142.7538	142.7538	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	25.6305	22.7648	18.5136	14.0160	10.4771	8.8452	9.5576	12.4233	16.6745	21.1721	24.7110	26.3429	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	282.5331	285.4649	278.0769	262.3486	242.4944	223.8343	211.3681	208.4363	215.8244	231.5527	251.4069	270.0670	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.2754	37.2754	37.2754	37.2754	37.2754	37.2754	37.2754	37.2754	37.2754	37.2754	37.2754	37.2754	(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)	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	(71)
Water heating gains (Table 5)	47.5276	46.0216	42.8944	38.6429	35.8827	31.9962	28.6927	32.9253	34.4292	38.8296	43.7984	46.0279	(72)
Total internal gains	421.5174	420.0775	405.3110	380.8336	354.6803	330.5018	315.4446	319.6111	332.7542	357.3805	385.7424	408.2639	(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		
East				9.6400	19.6403	0.6300		0.7000		0.7700	57.8624 (76)		
West				12.1100	19.6403	0.6300		0.7000		0.7700	72.6881 (80)		

Solar gains	130.5505	255.3844	420.5817	613.3934	751.7366	769.5362	732.6298	629.3182	489.1539	303.0351	162.7811	107.3583	(83)
Total gains	552.0678	675.4619	825.8927	994.2269	1106.4169	1100.0379	1048.0744	948.9292	821.9082	660.4156	548.5234	515.6223	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	57.7469	57.8815	58.0141	58.6452	58.7648	59.3281	59.3281	59.4336	59.1098	58.7648	58.5234	58.2731	
alpha	4.8498	4.8588	4.8676	4.9097	4.9177	4.9552	4.9552	4.9622	4.9407	4.9177	4.9016	4.8849	
util living area	0.9993	0.9981	0.9928	0.9682	0.8895	0.7301	0.5627	0.6352	0.8879	0.9885	0.9986	0.9995	(86)
MIT	19.5669	19.7341	20.0310	20.4243	20.7528	20.9361	20.9859	20.9752	20.8205	20.3692	19.8944	19.5412	(87)
Th 2	19.9179	19.9202	19.9224	19.9327	19.9346	19.9437	19.9437	19.9453	19.9402	19.9346	19.9307	19.9266	(88)
util rest of house	0.9991	0.9974	0.9900	0.9554	0.8459	0.6371	0.4362	0.5055	0.8252	0.9821	0.9979	0.9994	(89)
MIT 2	18.6058	18.7745	19.0717	19.4649	19.7669	19.9143	19.9401	19.9382	19.8363	19.4180	18.9432	18.5869	(90)
Living area fraction									fLA = Living area / (4) =			0.1427	(91)
MIT	18.7429	18.9114	19.2086	19.6018	19.9075	20.0601	20.0893	20.0862	19.9767	19.5537	19.0790	18.7231	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7429	18.9114	19.2086	19.6018	19.9075	20.0601	20.0893	20.0862	19.9767	19.5537	19.0790	18.7231	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9987	0.9965	0.9875	0.9503	0.8446	0.6483	0.4544	0.5239	0.8278	0.9789	0.9972	0.9991	(94)
Ext temp.	551.3698	673.0795	815.5822	944.8294	934.5057	713.1219	476.1964	497.1648	680.4059	646.5021	546.9776	515.1581	(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	2048.7926	1982.9633	1794.4674	1494.8475	1144.1110	753.8968	481.7834	508.0602	814.4144	1248.1293	1676.7247	2041.5664	(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	1114.0825	880.2419	728.2905	396.0130	155.9463	0.0000	0.0000	0.0000	0.0000	447.6107	813.4179	1135.6478	(98)
Space heating per m2												5671.2507	(98)
												48.0777	(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	1297.8961	1021.7480	1047.5002	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8619	0.9220	0.8896	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1118.6248	942.0400	931.8316	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1399.7351	1336.4691	1222.7363	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	202.3994	293.4553	216.4331	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												712.2877	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	50.5999	73.3638	54.1083	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											178.0719 (107)
Space cooling per m2											1.5096 (108)
Energy for space heating											48.0777 (99)
Energy for space cooling											1.5096 (108)
Total											49.5873 (109)
Target Fabric Energy Efficiency (TFEE)											57.0 (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	58.9800 (1b)	x 2.3900 (2b)	= 140.9622 (1b) - (3b)
First floor	58.9800 (1c)	x 2.6100 (2c)	= 153.9378 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	117.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 294.9000 (5)

2. Ventilation rate

					main heating	secondary heating	other		total	m3 per hour		
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											0 * 10 =	0.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =											0.0000 / (5) =	0.0000 (8)
Pressure test											Yes	
Measured/design AP50												3.1500
Infiltration rate												0.1575 (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) =	0.1339 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)
Adj infilt rate												
	0.1573	0.1473	0.1473	0.1339	0.1372	0.1305	0.1305	0.1272	0.1272	0.1372	0.1339	0.1372 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.20)			21.7500	1.1450	24.9046		(27)
Ground Floor			58.9800	0.1200	7.0776	84.0000	4954.3200 (28a)
Brick and Block	168.3500	23.9000	144.4500	0.2400	34.6680	42.2200	6098.6790 (29a)
Pitched Roof	58.9800		58.9800	0.1000	5.8980	9.1000	536.7180 (30)
Total net area of external elements Aum(A, m ²)			286.3100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		74.9132		(33)
Ground Block			58.4300			75.0000	4382.2500 (32c)
Ground Floor Stud			36.3900			9.0000	327.5100 (32c)
First Floor Stud			125.9100			9.0000	1133.1900 (32c)
Internal Floor 1			58.9800			18.0000	1061.6400 (32d)
Internal Ceiling 1			58.9800			18.0000	1061.6400 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	19555.9470 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							165.7846 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.9776 (36)
Total fabric heat loss						(33) + (36) =	89.8907 (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	48.6585	48.6585	48.6585	48.6585	48.6585	48.6585	48.6585	48.6585	48.6585	48.6585	48.6585	48.6585 (38)
Heat transfer coeff	138.5492	138.5492	138.5492	138.5492	138.5492	138.5492	138.5492	138.5492	138.5492	138.5492	138.5492	138.5492 (39)
Average = Sum(39)m / 12 =												138.5492 (39)
HLP	1.1745	1.1745	1.1745	1.1745	1.1745	1.1745	1.1745	1.1745	1.1745	1.1745	1.1745	1.1745 (40)
HLP (average)												1.1745 (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 2.8551 (42)
Average daily hot water use (litres/day) 102.0080 (43)

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Energy conte	112.2088	108.1285	104.0482	99.9679	95.8876	91.8072	91.8072	95.8876	99.9679	104.0482	108.1285	112.2088 (44)
Energy content (annual)	166.4025	145.5367	150.1808	130.9313	125.6317	108.4106	100.4583	115.2774	116.6542	135.9492	148.3992	161.1519 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum (45)m =		1604.9837 (45)
Water storage loss:	24.9604	21.8305	22.5271	19.6397	18.8448	16.2616	15.0688	17.2916	17.4981	20.3924	22.2599	24.1728 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.6689	0.6088	0.6527	0.5890	0.5421	0.4479	0.4150	0.4974	0.5248	0.5908	0.6207	0.6478 (61)
Total heat required for water heating calculated for each month	167.0714	146.1454	150.8335	131.5203	126.1738	108.8585	100.8734	115.7748	117.1790	136.5401	149.0199	161.7997 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	167.0714	146.1454	150.8335	131.5203	126.1738	108.8585	100.8734	115.7748	117.1790	136.5401	149.0199	161.7997 (64)
RHI water heating demand										Total per year (kWh/year) = Sum (64)m =		1611.7896 (64)
Heat gains from water heating, kWh/month	55.4960	48.5431	50.0983	43.6819	41.9081	36.1585	33.5062	38.4541	38.9187	45.3508	49.4979	53.7450 (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	171.3045	171.3045	171.3045	171.3045	171.3045	171.3045	171.3045	171.3045	171.3045	171.3045	171.3045	171.3045 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	64.0763	56.9120	46.2839	35.0399	26.1927	22.1130	23.8939	31.0582	41.6862	52.9303	61.7774	65.8572 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	421.6912	426.0671	415.0401	391.5650	361.9319	334.0810	315.4748	311.0990	322.1260	345.6011	375.2342	403.0851 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.9855	54.9855	54.9855	54.9855	54.9855	54.9855	54.9855	54.9855	54.9855	54.9855	54.9855	54.9855 (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)	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030 (71)
Water heating gains (Table 5)	74.5915	72.2368	67.3364	60.6693	56.3280	50.2201	45.0352	51.6856	54.0538	60.9554	68.7471	72.2378 (72)
Total internal gains	675.4460	670.3029	643.7475	602.3613	559.5397	521.5012	499.4909	508.9298	532.9530	574.5738	620.8457	656.2671 (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	
East					9.6400	25.1733	0.6300		0.7000				0.7700			74.1632 (76)
West					12.1100	25.1733	0.6300		0.7000				0.7700			93.1655 (80)

Solar gains	167.3287	278.4474	465.3636	677.7819	778.5214	880.4579	805.8952	724.5259	565.4384	356.2068	207.9562			130.2466	(83)	
Total gains	842.7747	948.7503	1109.1111	1280.1431	1338.0612	1401.9590	1305.3861	1233.4558	1098.3914	930.7806	828.8020			786.5137	(84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	39.2078	39.2078	39.2078	39.2078	39.2078	39.2078	39.2078	39.2078	39.2078	39.2078	39.2078	39.2078	
alpha	3.6139	3.6139	3.6139	3.6139	3.6139	3.6139	3.6139	3.6139	3.6139	3.6139	3.6139	3.6139	
util living area	0.9786	0.9672	0.9310	0.8429	0.6988	0.4821	0.3451	0.3537	0.6325	0.8779	0.9615	0.9823 (86)	
MIT	19.5883	19.7482	20.1113	20.5349	20.8279	20.9668	20.9927	20.9923	20.9124	20.5514	20.0065	19.5470 (87)	
Th 2	19.9404	19.9404	19.9404	19.9404	19.9404	19.9404	19.9404	19.9404	19.9404	19.9404	19.9404	19.9404 (88)	
util rest of house	0.9735	0.9595	0.9149	0.8072	0.6337	0.3905	0.2368	0.2394	0.5374	0.8393	0.9506	0.9780 (89)	
MIT 2	18.6824	18.8391	19.1908	19.5845	19.8328	19.9271	19.9390	19.9390	19.8985	19.6114	19.0955	18.6421 (90)	
Living area fraction	18.8116	18.9688	19.3221	19.7201	19.9747	20.0754	20.0893	20.0893	fLA = Living area / (4) =				0.1427 (91)
MIT	18.8116	18.9688	19.3221	19.7201	19.9747	20.0754	20.0893	20.0893	20.0432	19.7455	19.2255	18.7712 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.8116	18.9688	19.3221	19.7201	19.9747	20.0754	20.0893	20.0893	20.0432	19.7455	19.2255	18.7712 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9663	0.9504	0.9035	0.7988	0.6360	0.4026	0.2523	0.2557	0.5473	0.8308	0.9410	0.9716 (94)	
Ext temp.	814.4123	901.7390	1002.0593	1022.5511	850.9755	564.3993	329.3016	315.4360	601.1826	773.3166	779.9276	764.1948 (95)	
Heat loss rate W	5.6000	6.0000	7.6000	10.1000	13.1000	15.9000	17.7000	17.8000	15.4000	12.1000	8.6000	5.7000 (96)	
Month fracti	1830.4618	1796.8145	1624.0941	1332.8546	952.4905	578.5023	331.0406	317.1799	643.3109	1059.2781	1472.1532	1811.0009 (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	755.9408	601.4907	462.7939	223.4185	75.5272	0.0000	0.0000	0.0000	0.0000	212.7554	498.4025	778.8237 (98)	
RHI space heating demand												3609.1527 (98)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	58.9800 (1b)	x 2.3900 (2b)	= 140.9622 (1b) - (3b)
First floor	58.9800 (1c)	x 2.6100 (2c)	= 153.9378 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	117.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 294.9000 (5)

2. Ventilation rate

					main heating	secondary heating	other		total	m3 per hour		
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											0 * 10 =	0.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =											0.0000 / (5) =	0.0000 (8)
Pressure test											Yes	
Measured/design AP50												3.1500
Infiltration rate												0.1575 (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) =	0.1339 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	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												
	0.1707	0.1673	0.1640	0.1473	0.1439	0.1272	0.1272	0.1238	0.1339	0.1439	0.1506	0.1573 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.20)			21.7500	1.1450	24.9046		(27)
Ground Floor			58.9800	0.1200	7.0776	84.0000	4954.3200 (28a)
Brick and Block	168.3500	23.9000	144.4500	0.2400	34.6680	42.2200	6098.6790 (29a)
Pitched Roof	58.9800		58.9800	0.1000	5.8980	9.1000	536.7180 (30)
Total net area of external elements Aum(A, m ²)			286.3100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		74.9132		(33)
Ground Block			58.4300			75.0000	4382.2500 (32c)
Ground Floor Stud			36.3900			9.0000	327.5100 (32c)
First Floor Stud			125.9100			9.0000	1133.1900 (32c)
Internal Floor 1			58.9800			18.0000	1061.6400 (32d)
Internal Ceiling 1			58.9800			18.0000	1061.6400 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	19555.9470 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							165.7846 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.9776 (36)
Total fabric heat loss						(33) + (36) =	89.8907 (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	48.6585	48.6585	48.6585	48.6585	48.6585	48.6585	48.6585	48.6585	48.6585	48.6585	48.6585	48.6585 (38)
Heat transfer coeff	138.5492	138.5492	138.5492	138.5492	138.5492	138.5492	138.5492	138.5492	138.5492	138.5492	138.5492	138.5492 (39)
Average = Sum(39)m / 12 =												138.5492 (39)
HLP	1.1745	1.1745	1.1745	1.1745	1.1745	1.1745	1.1745	1.1745	1.1745	1.1745	1.1745	1.1745 (40)
HLP (average)												1.1745 (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 2.8551 (42)
Average daily hot water use (litres/day) 102.0080 (43)

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Energy conte	112.2088	108.1285	104.0482	99.9679	95.8876	91.8072	91.8072	95.8876	99.9679	104.0482	108.1285	112.2088 (44)
Energy content (annual)	166.4025	145.5367	150.1808	130.9313	125.6317	108.4106	100.4583	115.2774	116.6542	135.9492	148.3992	161.1519 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum (45)m =		1604.9837 (45)
	24.9604	21.8305	22.5271	19.6397	18.8448	16.2616	15.0688	17.2916	17.4981	20.3924	22.2599	24.1728 (46)
Water storage loss:												
Total storage loss												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.6689	0.6088	0.6527	0.5890	0.5421	0.4479	0.4150	0.4974	0.5248	0.5908	0.6207	0.6478 (61)
Total heat required for water heating calculated for each month												
	167.0714	146.1454	150.8335	131.5203	126.1738	108.8585	100.8734	115.7748	117.1790	136.5401	149.0199	161.7997 (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												
	167.0714	146.1454	150.8335	131.5203	126.1738	108.8585	100.8734	115.7748	117.1790	136.5401	149.0199	161.7997 (64)
								Total per year (kWh/year) =	Sum (64)m =			1611.7896 (64)
Heat gains from water heating, kWh/month												
	55.4960	48.5431	50.0983	43.6819	41.9081	36.1585	33.5062	38.4541	38.9187	45.3508	49.4979	53.7450 (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	171.3045	171.3045	171.3045	171.3045	171.3045	171.3045	171.3045	171.3045	171.3045	171.3045	171.3045	171.3045 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	64.0763	56.9120	46.2839	35.0399	26.1927	22.1130	23.8939	31.0582	41.6862	52.9303	61.7774	65.8572 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	421.6912	426.0671	415.0401	391.5650	361.9319	334.0810	315.4748	311.0990	322.1260	345.6011	375.2342	403.0851 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.9855	54.9855	54.9855	54.9855	54.9855	54.9855	54.9855	54.9855	54.9855	54.9855	54.9855	54.9855 (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)	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030 (71)
Water heating gains (Table 5)	74.5915	72.2368	67.3364	60.6693	56.3280	50.2201	45.0352	51.6856	54.0538	60.9554	68.7471	72.2378 (72)
Total internal gains	675.4460	670.3029	643.7475	602.3613	559.5397	521.5012	499.4909	508.9298	532.9530	574.5738	620.8457	656.2671 (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		
East					9.6400	19.6403	0.6300	0.7000	0.7700	57.8624 (76)		
West					12.1100	19.6403	0.6300	0.7000	0.7700	72.6881 (80)		
Solar gains	130.5505	255.3844	420.5817	613.3934	751.7366	769.5362	732.6298	629.3182	489.1539	303.0351	162.7811	107.3583 (83)
Total gains	805.9965	925.6873	1064.3292	1215.7546	1311.2763	1291.0373	1232.1207	1138.2480	1022.1070	877.6089	783.6268	763.6255 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	39.2078	39.2078	39.2078	39.2078	39.2078	39.2078	39.2078	39.2078	39.2078	39.2078	39.2078	39.2078
alpha	3.6139	3.6139	3.6139	3.6139	3.6139	3.6139	3.6139	3.6139	3.6139	3.6139	3.6139	3.6139
util living area												
	0.9855	0.9752	0.9500	0.8887	0.7763	0.6196	0.4743	0.5274	0.7563	0.9275	0.9766	0.9880 (86)
MIT	19.3611	19.5678	19.9237	20.3571	20.7082	20.9064	20.9728	20.9601	20.8027	20.3238	19.7483	19.3032 (87)
Th 2	19.9404	19.9404	19.9404	19.9404	19.9404	19.9404	19.9404	19.9404	19.9404	19.9404	19.9404	19.9404 (88)
util rest of house												
	0.9822	0.9697	0.9386	0.8631	0.7261	0.5377	0.3687	0.4190	0.6842	0.9051	0.9704	0.9852 (89)
MIT 2	18.4570	18.6610	19.0094	19.4223	19.7359	19.8911	19.9313	19.9257	19.8219	19.4014	18.8418	18.3997 (90)
Living area fraction									fLA = Living area / (4) =			0.1427 (91)
MIT	18.5860	18.7904	19.1399	19.5557	19.8747	20.0359	20.0799	20.0733	19.9619	19.5330	18.9711	18.5286 (92)
Temperature adjustment												0.0000
adjusted MIT	18.5860	18.7904	19.1399	19.5557	19.8747	20.0359	20.0799	20.0733	19.9619	19.5330	18.9711	18.5286 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9766	0.9618	0.9279	0.8522	0.7226	0.5456	0.3832	0.4333	0.6858	0.8944	0.9629	0.9803 (94)
Useful gains	787.1119	890.3651	987.5825	1036.0174	947.5785	704.3356	472.1161	493.2060	701.0032	784.9271	754.5269	748.5652 (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												
	1979.3187	1924.4995	1751.2446	1476.3364	1132.5932	753.1442	482.1330	508.9350	812.1561	1237.6568	1644.7367	1985.2182 (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												
	887.0019	694.9383	568.1646	317.0296	137.6509	0.0000	0.0000	0.0000	0.0000	336.8309	640.9511	920.0698 (98)
Space heating												4502.6371 (98)
Space heating per m2												(98) / (4) = 38.1709 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												90.2000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												4991.8372	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	887.0019	694.9383	568.1646	317.0296	137.6509	0.0000	0.0000	0.0000	0.0000	336.8309	640.9511	920.0698	(98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)
Space heating fuel (main heating system)	983.3724	770.4416	629.8943	351.4741	152.6063	0.0000	0.0000	0.0000	0.0000	373.4267	710.5887	1020.0330	(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	167.0714	146.1454	150.8335	131.5203	126.1738	108.8585	100.8734	115.7748	117.1790	136.5401	149.0199	161.7997	(64)
Efficiency of water heater	87.6895	87.4552	86.9069	85.6631	83.0276	76.4000	76.4000	76.4000	76.4000	85.7332	87.2278	76.4000	(216)
(217)m	87.6895	87.4552	86.9069	85.6631	83.0276	76.4000	76.4000	76.4000	76.4000	85.7332	87.2278	87.8274	(217)
Fuel for water heating, kWh/month	190.5261	167.1090	173.5576	153.5320	151.9660	142.4849	132.0332	151.5377	153.3756	159.2615	170.8399	184.2245	(219)
Water heating fuel used												1930.4482	(219)
Annual totals kWh/year													
Space heating fuel - main system												4991.8372	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.2380)													
mechanical ventilation fans (SFP = 0.2380)												85.6272	(230a)
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												160.6272	(231)
Electricity for lighting (calculated in Appendix L)												452.6428	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.09 * 1068 * 1.00) =										-931.3575		-931.3575	(233)
Total delivered energy for all uses												6604.1979	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4991.8372	3.4800	173.7159 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1930.4482	3.4800	67.1796 (247)
Mechanical ventilation fans	85.6272	13.1900	11.2942 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	452.6428	13.1900	59.7036 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-931.3575	13.1900	-122.8460 (252)
Total energy cost			318.9398 (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] = 0.8220 (257)
SAP value	88.5330
SAP rating (Section 12)	89 (258)
SAP band	B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	4991.8372	0.2160	1078.2368 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1930.4482	0.2160	416.9768 (264)
Space and water heating			1495.2136 (265)
Pumps and fans	160.6272	0.5190	83.3655 (267)
Energy for lighting	452.6428	0.5190	234.9216 (268)
Energy saving/generation technologies			
PV Unit	-931.3575	0.5190	-483.3745 (269)
Total kg/year			1330.1262 (272)
CO2 emissions per m2			11.2800 (273)
EI value			89.0625
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	$3.48 \times (1 + 0.29 \times 0.00) / 0.9020 = 3.858$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9020 = 0.2395$, stars = 4
Water heating energy efficiency	$3.48 / 0.8309 = 4.188$, stars = 4
Water heating environmental impact	$0.216 / 0.8309 = 0.2599$, 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	58.9800 (1b)	x 2.3900 (2b)	= 140.9622 (1b) - (3b)
First floor	58.9800 (1c)	x 2.6100 (2c)	= 153.9378 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	117.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 294.9000 (5)

2. Ventilation rate

					main heating	secondary heating	other		total	m3 per hour		
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											0 * 10 =	0.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =											0.0000 / (5) =	0.0000 (8)
Pressure test											Yes	
Measured/design AP50												3.1500
Infiltration rate												0.1575 (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) =	0.1339 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)
Adj infilt rate	0.1573	0.1473	0.1473	0.1339	0.1372	0.1305	0.1305	0.1272	0.1272	0.1372	0.1339	0.1372 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.20)			21.7500	1.1450	24.9046		(27)
Ground Floor			58.9800	0.1200	7.0776	84.0000	4954.3200 (28a)
Brick and Block	168.3500	23.9000	144.4500	0.2400	34.6680	42.2200	6098.6790 (29a)
Pitched Roof	58.9800		58.9800	0.1000	5.8980	9.1000	536.7180 (30)
Total net area of external elements Aum(A, m ²)			286.3100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	74.9132		(33)
Ground Block			58.4300			75.0000	4382.2500 (32c)
Ground Floor Stud			36.3900			9.0000	327.5100 (32c)
First Floor Stud			125.9100			9.0000	1133.1900 (32c)
Internal Floor 1			58.9800			18.0000	1061.6400 (32d)
Internal Ceiling 1			58.9800			18.0000	1061.6400 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	19555.9470 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							165.7846 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.9776 (36)
Total fabric heat loss						(33) + (36) =	89.8907 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 48.6585	Feb 48.6585	Mar 48.6585	Apr 48.6585	May 48.6585	Jun 48.6585	Jul 48.6585	Aug 48.6585	Sep 48.6585	Oct 48.6585	Nov 48.6585	Dec 48.6585 (38)
Heat transfer coeff	138.5492	138.5492	138.5492	138.5492	138.5492	138.5492	138.5492	138.5492	138.5492	138.5492	138.5492	138.5492 (39)
Average = Sum(39)m / 12 =												138.5492 (39)
HLP	Jan 1.1745	Feb 1.1745	Mar 1.1745	Apr 1.1745	May 1.1745	Jun 1.1745	Jul 1.1745	Aug 1.1745	Sep 1.1745	Oct 1.1745	Nov 1.1745	Dec 1.1745 (40)
HLP (average)												1.1745 (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												2.8551 (42)
Average daily hot water use (litres/day)												102.0080 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Energy conte	112.2088	108.1285	104.0482	99.9679	95.8876	91.8072	91.8072	95.8876	99.9679	104.0482	108.1285	112.2088 (44)
Energy content (annual)	166.4025	145.5367	150.1808	130.9313	125.6317	108.4106	100.4583	115.2774	116.6542	135.9492	148.3992	161.1519 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum (45)m =		1604.9837 (45)
	24.9604	21.8305	22.5271	19.6397	18.8448	16.2616	15.0688	17.2916	17.4981	20.3924	22.2599	24.1728 (46)
Water storage loss:												
Total storage loss												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.6689	0.6088	0.6527	0.5890	0.5421	0.4479	0.4150	0.4974	0.5248	0.5908	0.6207	0.6478 (61)
Total heat required for water heating calculated for each month												
	167.0714	146.1454	150.8335	131.5203	126.1738	108.8585	100.8734	115.7748	117.1790	136.5401	149.0199	161.7997 (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												
	167.0714	146.1454	150.8335	131.5203	126.1738	108.8585	100.8734	115.7748	117.1790	136.5401	149.0199	161.7997 (64)
								Total per year (kWh/year) = Sum (64)m =				1611.7896 (64)
Heat gains from water heating, kWh/month												
	55.4960	48.5431	50.0983	43.6819	41.9081	36.1585	33.5062	38.4541	38.9187	45.3508	49.4979	53.7450 (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	171.3045	171.3045	171.3045	171.3045	171.3045	171.3045	171.3045	171.3045	171.3045	171.3045	171.3045	171.3045 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	64.0763	56.9120	46.2839	35.0399	26.1927	22.1130	23.8939	31.0582	41.6862	52.9303	61.7774	65.8572 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	421.6912	426.0671	415.0401	391.5650	361.9319	334.0810	315.4748	311.0990	322.1260	345.6011	375.2342	403.0851 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.9855	54.9855	54.9855	54.9855	54.9855	54.9855	54.9855	54.9855	54.9855	54.9855	54.9855	54.9855 (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)	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030 (71)
Water heating gains (Table 5)	74.5915	72.2368	67.3364	60.6693	56.3280	50.2201	45.0352	51.6856	54.0538	60.9554	68.7471	72.2378 (72)
Total internal gains	675.4460	670.3029	643.7475	602.3613	559.5397	521.5012	499.4909	508.9298	532.9530	574.5738	620.8457	656.2671 (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
East					9.6400	25.1733	0.6300		0.7000				74.1632 (76)
West					12.1100	25.1733	0.6300		0.7000				93.1655 (80)

Solar gains	167.3287	278.4474	465.3636	677.7819	778.5214	880.4579	805.8952	724.5259	565.4384	356.2068	207.9562	130.2466	(83)
Total gains	842.7747	948.7503	1109.1111	1280.1431	1338.0612	1401.9590	1305.3861	1233.4558	1098.3914	930.7806	828.8020	786.5137	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	39.2078	39.2078	39.2078	39.2078	39.2078	39.2078	39.2078	39.2078	39.2078	39.2078	39.2078	39.2078
alpha	3.6139	3.6139	3.6139	3.6139	3.6139	3.6139	3.6139	3.6139	3.6139	3.6139	3.6139	3.6139
util living area												
	0.9786	0.9672	0.9310	0.8429	0.6988	0.4821	0.3451	0.3537	0.6325	0.8779	0.9615	0.9823 (86)
MIT	19.5883	19.7482	20.1113	20.5349	20.8279	20.9668	20.9927	20.9923	20.9124	20.5514	20.0065	19.5470 (87)
Th 2	19.9404	19.9404	19.9404	19.9404	19.9404	19.9404	19.9404	19.9404	19.9404	19.9404	19.9404	19.9404 (88)
util rest of house												
	0.9735	0.9595	0.9149	0.8072	0.6337	0.3905	0.2368	0.2394	0.5374	0.8393	0.9506	0.9780 (89)
MIT 2	18.6824	18.8391	19.1908	19.5845	19.8328	19.9271	19.9390	19.9390	19.8985	19.6114	19.0955	18.6421 (90)
Living area fraction									fLA = Living area / (4) =			0.1427 (91)
MIT	18.8116	18.9688	19.3221	19.7201	19.9747	20.0754	20.0893	20.0893	20.0432	19.7455	19.2255	18.7712 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8116	18.9688	19.3221	19.7201	19.9747	20.0754	20.0893	20.0893	20.0432	19.7455	19.2255	18.7712 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9663	0.9504	0.9035	0.7988	0.6360	0.4026	0.2523	0.2557	0.5473	0.8308	0.9410	0.9716	(94)
Useful gains	814.4123	901.7390	1002.0593	1022.5511	850.9755	564.3993	329.3016	315.4360	601.1826	773.3166	779.9276	764.1948	(95)
Ext temp.	5.6000	6.0000	7.6000	10.1000	13.1000	15.9000	17.7000	17.8000	15.4000	12.1000	8.6000	5.7000	(96)
Heat loss rate W													
	1830.4618	1796.8145	1624.0941	1332.8546	952.4905	578.5023	331.0406	317.1799	643.3109	1059.2781	1472.1532	1811.0009	(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													
	755.9408	601.4907	462.7939	223.4185	75.5272	0.0000	0.0000	0.0000	0.0000	212.7554	498.4025	778.8237	(98)
Space heating													3609.1527 (98)
Space heating per m2													(98) / (4) = 30.5964 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													4001.2779 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	755.9408	601.4907	462.7939	223.4185	75.5272	0.0000	0.0000	0.0000	0.0000	212.7554	498.4025	778.8237	(98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)
Space heating fuel (main heating system)	838.0719	666.8412	513.0753	247.6923	83.7330	0.0000	0.0000	0.0000	0.0000	235.8707	552.5526	863.4409	(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	167.0714	146.1454	150.8335	131.5203	126.1738	108.8585	100.8734	115.7748	117.1790	136.5401	149.0199	161.7997	(64)
Efficiency of water heater	87.3443	87.1238	86.3654	84.5416	81.0428	76.4000	76.4000	76.4000	76.4000	84.2512	86.5995	76.4000	(216)
(217)m	87.3443	87.1238	86.3654	84.5416	81.0428	76.4000	76.4000	76.4000	76.4000	84.2512	86.5995	87.4819	(217)
Fuel for water heating, kWh/month	191.2791	167.7446	174.6457	155.5687	155.6878	142.4849	132.0332	151.5377	153.3756	162.0630	172.0794	184.9522	(219)
Water heating fuel used												1943.4519	(219)
Annual totals kWh/year													
Space heating fuel - main system												4001.2779	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.2380)													
mechanical ventilation fans (SFP = 0.2380)												85.6272	(230a)
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												160.6272	(231)
Electricity for lighting (calculated in Appendix L)												452.6428	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.09 * 1184 * 1.00) =										-1032.3756		-1032.3756	(233)
Total delivered energy for all uses												5525.6242	(238)

10a. Fuel costs - using BEDF prices (554)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4001.2779	5.9600	238.4762 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1943.4519	5.9600	115.8297 (247)
Mechanical ventilation fans	85.6272	25.0500	21.4496 (249)
Pumps and fans for heating	75.0000	25.0500	18.7875 (249)
Energy for lighting	452.6428	25.0500	113.3870 (250)
Additional standing charges			112.0000 (251)
Energy saving/generation technologies			
PV Unit	-1032.3756	25.0500	-258.6101 (252)
Total energy cost			361.3199 (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	4001.2779	0.2160	864.2760 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1943.4519	0.2160	419.7856 (264)
Space and water heating			1284.0616 (265)
Pumps and fans	160.6272	0.5190	83.3655 (267)
Energy for lighting	452.6428	0.5190	234.9216 (268)
Energy saving/generation technologies			
PV Unit	-1032.3756	0.5190	-535.8029 (269)
Total kg/year			1066.5458 (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	4001.2779	1.2200	4881.5590 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1943.4519	1.2200	2371.0114 (264)
Space and water heating			7252.5704 (265)
Pumps and fans	160.6272	3.0700	493.1254 (267)
Energy for lighting	452.6428	3.0700	1389.6135 (268)
Energy saving/generation technologies			

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

PV Unit	-1032.3756	3.0700	-3169.3930 (269)
Primary energy kWh/year			5965.9162 (272)
Primary energy kWh/m2/year			50.5758 (273)

SAP 2012 EPC IMPROVEMENTS

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

(For testing purposes):

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

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.1	-£ 53	-212 kg (19.9%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£53 1.80 kg/m²	B 90	B 91
Total Savings	£53 1.80 kg/m²		
Potential energy efficiency rating:		B 90	
Potential environmental impact rating:			B 91

Fuel prices for cost data on this page from database revision number 554 TEST (31 Oct 2024)
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	£154	£166	-£13
Mains gas	£466	£401	£66
Space heating	£391	£391	£0
Water heating	£116	£63	£53
Lighting	£113	£113	£0
Generated (PV)	-£259	-£259	£0
Total cost of fuels	£361	£308	£53
Total cost of uses	£361	£308	£53
Delivered energy	47 kWh/m²	38 kWh/m²	9 kWh/m²
Carbon dioxide emissions	1.1 tonnes	0.9 tonnes	0.2 tonnes
CO2 emissions per m²	9 kg/m²	7 kg/m²	2 kg/m²
Primary energy	51 kWh/m²	40 kWh/m²	10 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	58.9800 (1b)	x 2.3900 (2b)	= 140.9622 (1b) - (3b)
First floor	58.9800 (1c)	x 2.6100 (2c)	= 153.9378 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	117.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 294.9000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.1500
Infiltration rate					0.1575 (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)	=	0.1339 (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	0.1707	0.1673	0.1640	0.1473	0.1439	0.1272	0.1272	0.1238	0.1339	0.1439	0.1506	0.1573 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.20)			21.7500	1.1450	24.9046		(27)
Ground Floor			58.9800	0.1200	7.0776	84.0000	4954.3200 (28a)
Brick and Block	168.3500	23.9000	144.4500	0.2400	34.6680	42.2200	6098.6790 (29a)
Pitched Roof	58.9800		58.9800	0.1000	5.8980	9.1000	536.7180 (30)
Total net area of external elements Aum(A, m ²)			286.3100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		74.9132		(33)
Ground Block			58.4300			75.0000	4382.2500 (32c)
Ground Floor Stud			36.3900			9.0000	327.5100 (32c)
First Floor Stud			125.9100			9.0000	1133.1900 (32c)
Internal Floor 1			58.9800			18.0000	1061.6400 (32d)
Internal Ceiling 1			58.9800			18.0000	1061.6400 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	19555.9470 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							165.7846 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.9776 (36)
Total fabric heat loss						(33) + (36) =	89.8907 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	48.6585	48.6585	48.6585	48.6585	48.6585	48.6585	48.6585	48.6585	48.6585	48.6585	48.6585	48.6585 (38)
Average = Sum(39)m / 12 =	138.5492	138.5492	138.5492	138.5492	138.5492	138.5492	138.5492	138.5492	138.5492	138.5492	138.5492	138.5492 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1745	1.1745	1.1745	1.1745	1.1745	1.1745	1.1745	1.1745	1.1745	1.1745	1.1745	1.1745 (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												2.8551 (42)
Average daily hot water use (litres/day)												102.0080 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Energy conte	112.2088	108.1285	104.0482	99.9679	95.8876	91.8072	91.8072	95.8876	99.9679	104.0482	108.1285	112.2088 (44)
Energy content (annual)	166.4025	145.5367	150.1808	130.9313	125.6317	108.4106	100.4583	115.2774	116.6542	135.9492	148.3992	161.1519 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum (45)m =		1604.9837 (45)
	24.9604	21.8305	22.5271	19.6397	18.8448	16.2616	15.0688	17.2916	17.4981	20.3924	22.2599	24.1728 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.6689	0.6088	0.6527	0.5890	0.5421	0.4479	0.4150	0.4974	0.5248	0.5908	0.6207	0.6478 (61)
Total heat required for water heating calculated for each month	167.0714	146.1454	150.8335	131.5203	126.1738	108.8585	100.8734	115.7748	117.1790	136.5401	149.0199	161.7997 (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												1.1300 (H8)
Utilisation factor												0.5873 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												102.0080 (H14)
Volume ratio Veff/V												0.7352 (H15)
Solar storage volume factor												0.9385 (H16)
Solar input	-25.4867	-42.5299	-72.4333	-97.0749	-119.9278	-117.9081	-116.3499	-101.6555	-79.6167	-54.3688	-30.2308	-878.9104 (H17)
Solar input (sum of months) = Sum (63)m =												-21.3280 (63)
Output from w/h	141.5847	103.6155	78.4002	34.4454	6.2460	0.0000	0.0000	14.1193	37.5623	82.1712	118.7891	140.4717 (64)
Total per year (kWh/year) = Sum (64)m =												757.4055 (64)
Heat gains from water heating, kWh/month	55.4960	48.5431	50.0983	43.6819	41.9081	36.1585	33.5062	38.4541	38.9187	45.3508	49.4979	53.7450 (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	171.3045	171.3045	171.3045	171.3045	171.3045	171.3045	171.3045	171.3045	171.3045	171.3045	171.3045	171.3045	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	64.0763	56.9120	46.2839	35.0399	26.1927	22.1130	23.8939	31.0582	41.6862	52.9303	61.7774	65.8572	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	421.6912	426.0671	415.0401	391.5650	361.9319	334.0810	315.4748	311.0990	322.1260	345.6011	375.2342	403.0851	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.9855	54.9855	54.9855	54.9855	54.9855	54.9855	54.9855	54.9855	54.9855	54.9855	54.9855	54.9855	(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)	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	(71)
Water heating gains (Table 5)	74.5915	72.2368	67.3364	60.6693	56.3280	50.2201	45.0352	51.6856	54.0538	60.9554	68.7471	72.2378	(72)
Total internal gains	675.4460	670.3029	643.7475	602.3613	559.5397	521.5012	499.4909	508.9298	532.9530	574.5738	620.8457	656.2671	(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
East				9.6400	19.6403		0.6300		0.7000		0.7700		57.8624 (76)
West				12.1100	19.6403		0.6300		0.7000		0.7700		72.6881 (80)

Solar gains	130.5505	255.3844	420.5817	613.3934	751.7366	769.5362	732.6298	629.3182	489.1539	303.0351	162.7811		107.3583 (83)
Total gains	805.9965	925.6873	1064.3292	1215.7546	1311.2763	1291.0373	1232.1207	1138.2480	1022.1070	877.6089	783.6268		763.6255 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	39.2078	39.2078	39.2078	39.2078	39.2078	39.2078	39.2078	39.2078	39.2078	39.2078	39.2078	39.2078	
alpha	3.6139	3.6139	3.6139	3.6139	3.6139	3.6139	3.6139	3.6139	3.6139	3.6139	3.6139	3.6139	
util living area	0.9855	0.9752	0.9500	0.8887	0.7763	0.6196	0.4743	0.5274	0.7563	0.9275	0.9766	0.9880	(86)
MIT	19.3611	19.5678	19.9237	20.3571	20.7082	20.9064	20.9728	20.9601	20.8027	20.3238	19.7483	19.3032	(87)
Th 2	19.9404	19.9404	19.9404	19.9404	19.9404	19.9404	19.9404	19.9404	19.9404	19.9404	19.9404	19.9404	(88)
util rest of house	0.9822	0.9697	0.9386	0.8631	0.7261	0.5377	0.3687	0.4190	0.6842	0.9051	0.9704	0.9852	(89)
MIT 2	18.4570	18.6610	19.0094	19.4223	19.7359	19.8911	19.9313	19.9257	19.8219	19.4014	18.8418	18.3997	(90)
Living area fraction									fLA = Living area / (4) =			0.1427	(91)
MIT	18.5860	18.7904	19.1399	19.5557	19.8747	20.0359	20.0799	20.0733	19.9619	19.5330	18.9711	18.5286	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5860	18.7904	19.1399	19.5557	19.8747	20.0359	20.0799	20.0733	19.9619	19.5330	18.9711	18.5286	(93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9766	0.9618	0.9279	0.8522	0.7226	0.5456	0.3832	0.4333	0.6858	0.8944	0.9629	0.9803	(94)
Useful gains	787.1119	890.3651	987.5825	1036.0174	947.5785	704.3356	472.1161	493.2060	701.0032	784.9271	754.5269	748.5652	(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	1979.3187	1924.4995	1751.2446	1476.3364	1132.5932	753.1442	482.1330	508.9350	812.1561	1237.6568	1644.7367	1985.2182	(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	887.0019	694.9383	568.1646	317.0296	137.6509	0.0000	0.0000	0.0000	0.0000	336.8309	640.9511	920.0698	(98)
Space heating												4502.6371	(98)
Space heating per m2											(98) / (4) =	38.1709	(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 %)													90.2000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													4991.8372	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	887.0019	694.9383	568.1646	317.0296	137.6509	0.0000	0.0000	0.0000	0.0000	336.8309	640.9511	920.0698	(98)	
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)	
Space heating fuel (main heating system)	983.3724	770.4416	629.8943	351.4741	152.6063	0.0000	0.0000	0.0000	0.0000	373.4267	710.5887	1020.0330	(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	141.5847	103.6155	78.4002	34.4454	6.2460	0.0000	0.0000	14.1193	37.5623	82.1712	118.7891	140.4717	(64)	
Efficiency of water heater	88.0117	88.1344	88.2667	88.6311	89.4983	76.4000	76.4000	76.4000	76.4000	87.1141	87.7225	76.4000	(216)	
(217)m	88.0117	88.1344	88.2667	88.6311	89.4983	76.4000	76.4000	76.4000	76.4000	87.1141	87.7225	88.0924	(217)	
Fuel for water heating, kWh/month	160.8703	117.5654	88.8219	38.8638	6.9789	0.0000	0.0000	18.4808	49.1653	94.3260	135.4146	159.4595	(219)	
Water heating fuel used												869.9464	(219)	
Annual totals kWh/year												4991.8372	(211)	
Space heating fuel - main system												0.0000	(215)	
Space heating fuel - secondary														
Electricity for pumps and fans:														
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.2380)														
mechanical ventilation fans (SFP = 0.2380)													85.6272	(230a)
central heating pump													30.0000	(230c)
main heating flue fan													45.0000	(230e)
pump for solar water heating													50.0000	(230g)
Total electricity for the above, kWh/year													210.6272	(231)
Electricity for lighting (calculated in Appendix L)													452.6428	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 1.09 * 1068 * 1.00) =										-931.3575			-931.3575	(233)
Total delivered energy for all uses													5593.6961	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	4991.8372	3.4800	173.7159	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	869.9464	3.4800	30.2741	(247)
Mechanical ventilation fans	85.6272	13.1900	11.2942	(249)
Pumps and fans for heating	75.0000	13.1900	9.8925	(249)
Pump for solar water heating	50.0000	13.1900	6.5950	(249)
Energy for lighting	452.6428	13.1900	59.7036	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	-931.3575	13.1900	-122.8460	(252)
Total energy cost			288.6293	(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] =	0.7439	(257)
SAP value		89.6227	
SAP rating (Section 12)		90	(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	4991.8372	0.2160	1078.2368 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	869.9464	0.2160	187.9084 (264)
Space and water heating			1266.1453 (265)
Pumps and fans	210.6272	0.5190	109.3155 (267)
Energy for lighting	452.6428	0.5190	234.9216 (268)
Energy saving/generation technologies			
PV Unit	-931.3575	0.5190	-483.3745 (269)
Total kg/year			1127.0079 (272)
CO2 emissions per m2			9.5500 (273)
EI value			90.7328
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	58.9800 (1b)	x 2.3900 (2b)	= 140.9622 (1b) - (3b)
First floor	58.9800 (1c)	x 2.6100 (2c)	= 153.9378 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	117.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 294.9000 (5)

2. Ventilation rate

					main heating	secondary heating	other		total	m3 per hour		
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											0 * 10 =	0.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =											0.0000 / (5) =	0.0000 (8)
Pressure test											Yes	
Measured/design AP50												3.1500
Infiltration rate												0.1575 (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) =	0.1339 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)
Adj infilt rate	0.1573	0.1473	0.1473	0.1339	0.1372	0.1305	0.1305	0.1272	0.1272	0.1372	0.1339	0.1372 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.20)			21.7500	1.1450	24.9046		(27)
Ground Floor			58.9800	0.1200	7.0776	84.0000	4954.3200 (28a)
Brick and Block	168.3500	23.9000	144.4500	0.2400	34.6680	42.2200	6098.6790 (29a)
Pitched Roof	58.9800		58.9800	0.1000	5.8980	9.1000	536.7180 (30)
Total net area of external elements Aum(A, m ²)			286.3100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	74.9132			(33)
Ground Block			58.4300			75.0000	4382.2500 (32c)
Ground Floor Stud			36.3900			9.0000	327.5100 (32c)
First Floor Stud			125.9100			9.0000	1133.1900 (32c)
Internal Floor 1			58.9800			18.0000	1061.6400 (32d)
Internal Ceiling 1			58.9800			18.0000	1061.6400 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	19555.9470 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							165.7846 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.9776 (36)
Total fabric heat loss						(33) + (36) =	89.8907 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 48.6585	Feb 48.6585	Mar 48.6585	Apr 48.6585	May 48.6585	Jun 48.6585	Jul 48.6585	Aug 48.6585	Sep 48.6585	Oct 48.6585	Nov 48.6585	Dec 48.6585 (38)
Heat transfer coeff	138.5492	138.5492	138.5492	138.5492	138.5492	138.5492	138.5492	138.5492	138.5492	138.5492	138.5492	138.5492 (39)
Average = Sum(39)m / 12 =												138.5492 (39)
HLP	Jan 1.1745	Feb 1.1745	Mar 1.1745	Apr 1.1745	May 1.1745	Jun 1.1745	Jul 1.1745	Aug 1.1745	Sep 1.1745	Oct 1.1745	Nov 1.1745	Dec 1.1745 (40)
HLP (average)												1.1745 (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												2.8551 (42)
Average daily hot water use (litres/day)												102.0080 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Energy conte	112.2088	108.1285	104.0482	99.9679	95.8876	91.8072	91.8072	95.8876	99.9679	104.0482	108.1285	112.2088 (44)
Energy content (annual)	166.4025	145.5367	150.1808	130.9313	125.6317	108.4106	100.4583	115.2774	116.6542	135.9492	148.3992	161.1519 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum (45)m =		1604.9837 (45)
	24.9604	21.8305	22.5271	19.6397	18.8448	16.2616	15.0688	17.2916	17.4981	20.3924	22.2599	24.1728 (46)
Water storage loss:												
Total storage loss												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.6689	0.6088	0.6527	0.5890	0.5421	0.4479	0.4150	0.4974	0.5248	0.5908	0.6207	0.6478 (61)
Total heat required for water heating calculated for each month												
	167.0714	146.1454	150.8335	131.5203	126.1738	108.8585	100.8734	115.7748	117.1790	136.5401	149.0199	161.7997 (62)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.7000 (H2)
Collector heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0050 (H3a)
Collector effective heat loss coefficient												1.8063 (H3b)
Collector performance ratio												2.5804 (H4)
Annual solar radiation per m2												1206.0102 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												2026.0972 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.2624 (H8)
Utilisation factor												0.5471 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												102.0080 (H14)
Volume ratio Veff/V												0.7352 (H15)
Solar storage volume factor												0.9385 (H16)
Solar input												-914.7763 (H17)
Solar input	-29.8503	-42.4505	-73.6625	-99.0886	-115.1476	-125.2472	-118.7534	-108.2916	-84.7596	-58.5828	-35.3061	-23.6359 (63)
								Solar input (sum of months) =	Sum (63)m =			-914.7763 (63)
Output from w/h												
	137.2210	103.6949	77.1710	32.4317	11.0262	0.0000	0.0000	7.4832	32.4194	77.9573	113.7138	138.1637 (64)
								Total per year (kWh/year) =	Sum (64)m =			731.2821 (64)
Heat gains from water heating, kWh/month												
	55.4960	48.5431	50.0983	43.6819	41.9081	36.1585	33.5062	38.4541	38.9187	45.3508	49.4979	53.7450 (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	171.3045	171.3045	171.3045	171.3045	171.3045	171.3045	171.3045	171.3045	171.3045	171.3045	171.3045	171.3045	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	64.0763	56.9120	46.2839	35.0399	26.1927	22.1130	23.8939	31.0582	41.6862	52.9303	61.7774	65.8572	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	421.6912	426.0671	415.0401	391.5650	361.9319	334.0810	315.4748	311.0990	322.1260	345.6011	375.2342	403.0851	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.9855	54.9855	54.9855	54.9855	54.9855	54.9855	54.9855	54.9855	54.9855	54.9855	54.9855	54.9855	(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)	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	-114.2030	(71)
Water heating gains (Table 5)	74.5915	72.2368	67.3364	60.6693	56.3280	50.2201	45.0352	51.6856	54.0538	60.9554	68.7471	72.2378	(72)
Total internal gains	675.4460	670.3029	643.7475	602.3613	559.5397	521.5012	499.4909	508.9298	532.9530	574.5738	620.8457	656.2671	(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	
East				9.6400	25.1733	0.6300		0.7000	0.7700		74.1632 (76)	
West				12.1100	25.1733	0.6300		0.7000	0.7700		93.1655 (80)	

Solar gains	167.3287	278.4474	465.3636	677.7819	778.5214	880.4579	805.8952	724.5259	565.4384	356.2068	207.9562	130.2466 (83)
Total gains	842.7747	948.7503	1109.1111	1280.1431	1338.0612	1401.9590	1305.3861	1233.4558	1098.3914	930.7806	828.8020	786.5137 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	39.2078	39.2078	39.2078	39.2078	39.2078	39.2078	39.2078	39.2078	39.2078	39.2078	39.2078	39.2078	
alpha	3.6139	3.6139	3.6139	3.6139	3.6139	3.6139	3.6139	3.6139	3.6139	3.6139	3.6139	3.6139	
util living area	0.9786	0.9672	0.9310	0.8429	0.6988	0.4821	0.3451	0.3537	0.6325	0.8779	0.9615	0.9823	(86)
MIT	19.5883	19.7482	20.1113	20.5349	20.8279	20.9668	20.9927	20.9923	20.9124	20.5514	20.0065	19.5470	(87)
Th 2	19.9404	19.9404	19.9404	19.9404	19.9404	19.9404	19.9404	19.9404	19.9404	19.9404	19.9404	19.9404	(88)
util rest of house	0.9735	0.9595	0.9149	0.8072	0.6337	0.3905	0.2368	0.2394	0.5374	0.8393	0.9506	0.9780	(89)
MIT 2	18.6824	18.8391	19.1908	19.5845	19.8328	19.9271	19.9390	19.9390	19.8985	19.6114	19.0955	18.6421	(90)
Living area fraction									fLA = Living area / (4) =			0.1427	(91)
MIT	18.8116	18.9688	19.3221	19.7201	19.9747	20.0754	20.0893	20.0893	20.0432	19.7455	19.2255	18.7712	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8116	18.9688	19.3221	19.7201	19.9747	20.0754	20.0893	20.0893	20.0432	19.7455	19.2255	18.7712	(93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9663	0.9504	0.9035	0.7988	0.6360	0.4026	0.2523	0.2557	0.5473	0.8308	0.9410	0.9716	(94)
Useful gains	814.4123	901.7390	1002.0593	1022.5511	850.9755	564.3993	329.3016	315.4360	601.1826	773.3166	779.9276	764.1948	(95)
Ext temp.	5.6000	6.0000	7.6000	10.1000	13.1000	15.9000	17.7000	17.8000	15.4000	12.1000	8.6000	5.7000	(96)
Heat loss rate W	1830.4618	1796.8145	1624.0941	1332.8546	952.4905	578.5023	331.0406	317.1799	643.3109	1059.2781	1472.1532	1811.0009	(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	755.9408	601.4907	462.7939	223.4185	75.5272	0.0000	0.0000	0.0000	0.0000	212.7554	498.4025	778.8237	(98)
Space heating												3609.1527	(98)
Space heating per m2												30.5964	(99)
											(98) / (4) =		

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 %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													4001.2779 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	755.9408	601.4907	462.7939	223.4185	75.5272	0.0000	0.0000	0.0000	0.0000	212.7554	498.4025	778.8237	(98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)
Space heating fuel (main heating system)	838.0719	666.8412	513.0753	247.6923	83.7330	0.0000	0.0000	0.0000	0.0000	235.8707	552.5526	863.4409	(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	137.2210	103.6949	77.1710	32.4317	11.0262	0.0000	0.0000	7.4832	32.4194	77.9573	113.7138	138.1637	(64)
Efficiency of water heater	87.7645	87.8662	87.9301	88.1810	88.1711	76.4000	76.4000	76.4000	76.4000	86.0328	87.2716	76.4000	(216)
(217)m	87.7645	87.8662	87.9301	88.1810	88.1711	76.4000	76.4000	76.4000	76.4000	86.0328	87.2716	76.4000	(217)
Fuel for water heating, kWh/month	156.3515	118.0146	87.7640	36.7786	12.5054	0.0000	0.0000	9.7948	42.4337	90.6134	130.2988	157.3436	(219)
Water heating fuel used												841.8983	(219)
Annual totals kWh/year												4001.2779	(211)
Space heating fuel - main system												0.0000	(215)
Space heating fuel - secondary													
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.2380)													
mechanical ventilation fans (SFP = 0.2380)													85.6272 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
pump for solar water heating													50.0000 (230g)
Total electricity for the above, kWh/year													210.6272 (231)
Electricity for lighting (calculated in Appendix L)													452.6428 (232)
Energy saving/generation technologies (Appendices M, N and Q)													
PV Unit 0 (0.80 * 1.09 * 1184 * 1.00) =										-1032.3756		-1032.3756	(233)
Total delivered energy for all uses												4474.0706	(238)

10a. Fuel costs - using BEDF prices (554)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	4001.2779	5.9600	238.4762	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	841.8983	5.9600	50.1771	(247)
Mechanical ventilation fans	85.6272	25.0500	21.4496	(249)
Pumps and fans for heating	75.0000	25.0500	18.7875	(249)
Pump for solar water heating	50.0000	25.0500	12.5250	(249)
Energy for lighting	452.6428	25.0500	113.3870	(250)
Additional standing charges			112.0000	(251)
Energy saving/generation technologies				
PV Unit	-1032.3756	25.0500	-258.6101	(252)
Total energy cost			308.1924	(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	4001.2779	0.2160	864.2760	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	841.8983	0.2160	181.8500	(264)
Space and water heating			1046.1261	(265)
Pumps and fans	210.6272	0.5190	109.3155	(267)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Energy for lighting	452.6428	0.5190	234.9216 (268)
Energy saving/generation technologies			
PV Unit	-1032.3756	0.5190	-535.8029 (269)
Total kg/year			854.5603 (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	4001.2779	1.2200	4881.5590 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	841.8983	1.2200	1027.1160 (264)
Space and water heating			5908.6750 (265)
Pumps and fans	210.6272	3.0700	646.6254 (267)
Energy for lighting	452.6428	3.0700	1389.6135 (268)
Energy saving/generation technologies			
PV Unit	-1032.3756	3.0700	-3169.3930 (269)
Primary energy kWh/year			4775.5209 (272)
Primary energy kWh/m2/year			40.4842 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0943 Plot 14	Issued on Date	26/11/2024
Assessment Reference	As Built	Prop Type Ref	Type L
Project	29 Shaw Crescent, West End, SOUTHAMPTON, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	89 B	DER	12.89	TER	17.25
Environmental	89 B	% DER<TER	25.26		
CO ₂ Emissions (t/year)	1.07	DFEE	49.45	TFEE	57.03
General Requirements Compliance	Pass	% DFEE<TFEE	13.29		

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 0943 Plot 14	Issued on Date	26/11/2024
Assessment Reference	As Built	Prop Type Ref	Type L
Project	29 Shaw Crescent, West End, SOUTHAMPTON, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	89 B	DER	12.89	TER	17.25
Environmental	89 B	% DER<TER	25.26		
CO ₂ Emissions (t/year)	1.07	DFEE	49.45	TFEE	57.03
General Requirements Compliance	Pass	% DFEE<TFEE	13.29		

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 0943 Plot 14	Issued on Date	26/11/2024
Assessment Reference	As Built	Prop Type Ref	Type L
Project	29 Shaw Crescent, West End, SOUTHAMPTON, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	89 B	DER	12.89	TER	17.25
Environmental	89 B	% DER<TER	25.26		
CO ₂ Emissions (t/year)	1.07	DFEE	49.45	TFEE	57.03
General Requirements Compliance	Pass	% DFEE<TFEE	13.29		

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 = 34.96 m², Perimeter = 16.87 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 0943 Plot 14			Issued on Date	26/11/2024
Assessment Reference	As Built	Prop Type Ref	Type L		
Property	29 Shaw Crescent, West End, SOUTHAMPTON, SO30 3LH				
SAP Rating	89 B	DER	12.89	TER	17.25
Environmental	89 B	% DER<TER	25.26		
CO ₂ Emissions (t/year)	1.07	DFEE	49.45	TFEE	57.03
General Requirements Compliance	Pass	% DFEE<TFEE	13.29		
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	East
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	House, Detached
2.0 Number of Storeys	2
3.0 Date Built	2023
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:	33.67 m	58.98 m ²	2.39 m
	1st Storey:	33.67 m	58.98 m ²	2.61 m

7.0 Living Area	16.83	m ²
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8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	165.78	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	168.35	144.45

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	

9.2 Internal Walls				
Description	Construction		Kappa (kJ/m ² K)	Area (m ²)
Ground Block	Dense block, plasterboard on dabs		75.00	58.43
Ground Floor Stud	Plasterboard on timber frame		9.00	36.39
First Floor Stud	Plasterboard on timber frame		9.00	125.91

10.0 External Roofs						
Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Pitched Roof	External Plane Roof	Other	0.10	9.10	58.98	58.98

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

10.2 Internal Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Ceiling 1	Plasterboard ceiling, carpeted chipboard floor	9.00	58.98

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	58.98

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	58.98

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	East							2.15	
Front Elevation	Window	[1] Brick and Block	East	None	0.00					9.64	
Rear Elevation	Window	[1] Brick and Block	West	None	0.00					12.11	

14.0 Conservatory

None

15.0 Draught Proofing

100 %

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	2.84	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)	3.17	0.067	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	7.24	0.061	No	Birtley Supatherm
Independently assessed	E3 Sill	12.80	0.021	No	Knauf P5
Independently assessed	E4 Jamb	33.60	0.016	No	Knauf P6
Table K1 - Default	E5 Ground floor (normal)	33.67	0.320	No	
Independently assessed	E6 Intermediate floor within a dwelling	33.67	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	18.79	0.060	No	
Independently assessed	E12 Gable (insulation at ceiling level)	14.88	0.044	No	Knauf P21
Independently assessed	E16 Corner (normal)	24.99	0.039	No	Knauf P23
Independently assessed	E17 Corner (inverted – internal area greater than external area)	5.00	-0.091	No	Knauf P24

Y-value 0.052 W/m²K

18.0 Pressure Testing

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

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather Windows half open

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Cross ventilation possible	Yes
Night Ventilation	No
Air change rate	4.00

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - centralised
MV Reference Number	500107
Configuration	3
Manufacturer SFP	0.17
Duct Type	Rigid
Wet Rooms	3

20.0 Fans, Open Fireplaces, Flues

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

21.0 Fixed Cooling System

No

22.0 Lighting

Internal

Total number of light fittings	23	
Total number of L.E.L. fittings	23	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	Yes
Light and motion sensor	Yes

23.0 Electricity Tariff

Standard

24.0 Main Heating 1

	Database	
Description	Gas Combi	
Percentage of Heat	100	%
Database Ref. No.	17960	
Fuel Type	Mains gas	
Main Heating	BGW	
SAP Code	104	
In Winter	90.2	
In Summer	76.4	
Controls	CBE Programmer, room thermostat and TRVs	
PCDF Controls	0	
Delayed Start Stat	No	
Sap Code	2106	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heat Emitter	Radiators	

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Flow Temperature	Normal (> 45°C)
Combi boiler type	Standard Combi
Combi keep hot type	None
25.0 Main Heating 2	None

Community Heating	None
28.0 Water Heating	HWP From main heating 1
Water Heating	Main Heating 1
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
SAP Code	901

29.0 Hot Water Cylinder	None
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32.0 Photovoltaic Unit		One Dwelling		
PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
1.09	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	£53	B 90	