



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 30, Shaw Crescent
West End, Southampton, SO30 3LH

Contact: Tobias Whiting
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Report Issue Date: 28/05/2024

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0943 Plot 28	Issued on Date	28/05/2024
Assessment Reference	As Built	Prop Type Ref	Block J
Property	30, Shaw Crescent, West End, Southampton, SO30 3LH		
SAP Rating	84 B	DER	16.58
Environmental	88 B	% DER<TER	10.50
CO ₂ Emissions (t/year)	0.91	DFEE	38.02
General Requirements Compliance	Pass	% DFEE<TFEE	19.24
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 TFE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	18.52	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.58	kgCO ₂ /m ²	Pass
	-1.94 (-10.5%)	kgCO ₂ /m ²	

1b TFE and DFEE

Target Fabric Energy Efficiency (TFEE)	47.08	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	38.02	kWh/m ² /yr	
	-9.1 (-19.3%)	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)	0.25 (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	1.18 (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	3.65 (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

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Main heating system

Boiler system with radiators or underfloor - Mains gas
Data from database
Vaillant ecoFIT sustain 830 VUW 306/6-3 (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 North

3.00 m², No overhang

Windows facing East

2.17 m², No overhang

Windows facing South

3.34 m², No overhang

Air change rate

4.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

3.65 (measured in this dwelling)

m³/(h.m²) @ 50 Pa

Maximum

10.0

m³/(h.m²) @ 50 Pa

Pass

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BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

10 Key features

Party wall U-value	0.00	W/m ² K
Party wall U-value	0.00	W/m ² K
Roof U-value	0.10	W/m ² K
Floor U-value	0.12	W/m ² K
Door U-value	1.10	W/m ² K
Air permeability	3.7	m ³ /m ² h
Photovoltaic array	0.80	kWh/Year

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THERMAL BRIDGING

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SAP Rating	84 B	DER	16.58
Environmental	88 B	TER	18.52
CO ₂ Emissions (t/year)	0.91	% DER<TER	10.50
General Requirements Compliance	Pass	DFEE	38.02
		TFEE	47.08
		% DFEE<TFEE	19.24
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	0.077	0.69	0.05	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.071	1.02	0.07	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.064	4.99	0.32	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.061	1.81	0.11	Birtley Supatherm
External wall	E3 Sill	Independently assessed	0.021	7.49	0.16	Knauf P5
External wall	E4 Jamb	Independently assessed	0.016	17.70	0.28	Knauf P6
External wall	E5 Ground floor (normal)	Table K1 - Default	0.320	2.23	0.71	
External wall	E7 Party floor between dwellings (in blocks of flats)	Table K1 - Approved	0.070	22.03	1.54	
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	12.77	0.77	
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.044	11.80	0.52	Knauf P21
External wall	E16 Corner (normal)	Independently assessed	0.039	9.29	0.36	Knauf P23
External wall	E16 Corner (normal)	Independently assessed	0.048	2.82	0.14	Knauf P23
External wall	E18 Party wall between dwellings	Independently assessed	0.026	2.40	0.06	Knauf P25/3
External wall	E18 Party wall between dwellings	Independently assessed	0.040	2.40	0.10	Knauf P25 Halved
External wall	E25 Staggered party wall between dwellings	Independently assessed	0.062	7.54	0.47	Knauf P27 Halved
Party wall	P1 Party wall - Ground floor	Table K1 - Default	0.160	7.54	1.21	
Party wall	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	0.000	13.66	0.00	
Party wall	P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	0.035	8.78	0.31	Knauf P29 Halved

Total: **7.17** W/mK:
Y-Value: **0.055** W/m²K:

FULL SAP CALCULATION PRINTOUT

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Environmental	88 B	% DER<TER	10.50		
CO ₂ Emissions (t/year)	0.91	DFEE	38.02	TFEE	47.08
General Requirements Compliance	Pass	% DFEE<TFEE	19.24		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com			Assessor ID	E477-0001
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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

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DWELLING AS BUILT

Semi-Detached Maisonette, total floor area 68 m²

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

1a TER and DER

Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 18.52 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 16.58 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 47.1 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 38.0 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.25 (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	1.18 (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: 3.65 (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 830 VUW 306/6-3 (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 North: 3.00 m², No overhang
Windows facing East: 2.17 m², No overhang
Windows facing South: 3.34 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Party wall U-value 0.00 W/m²K
Roof U-value 0.10 W/m²K
Floor U-value 0.12 W/m²K
Door U-value 1.10 W/m²K
Air permeability 3.7 m³/m²h
Photovoltaic array 0.80 kWh/Year

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	4.0100 (1b)	x 2.8300 (2b)	= 11.3483 (1b) - (3b)
First floor	63.6400 (1c)	x 2.3200 (2c)	= 147.6448 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	67.6500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 158.9931 (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					3.6500
Infiltration rate					0.1825 (18)
Number of sides sheltered					1 (19)
Shelter factor			(20) = 1 - [0.075 x (19)]	=	0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20)	=	0.1688 (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	0.2152	0.2110	0.2068	0.1857	0.1815	0.1604	0.1604	0.1562	0.1688	0.1815	0.1899	0.1984 (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)			8.5100	1.1450	9.7443		(27)
Ground Floor			3.9000	0.1200	0.4680	84.0000	327.6000 (28a)
Brick and Block	6.3000	2.1500	4.1500	0.2500	1.0375	68.2600	283.2790 (29a)
First Floor	57.2600	8.5100	48.7500	0.2400	11.7000	42.2200	2058.2250 (29a)
Pitched Roof	63.6400		63.6400	0.1000	6.3640	9.1000	579.1240 (30)
Total net area of external elements Aum(A, m ²)			131.1000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.6788		(33)
Party Wall 1			21.2600	0.0000	0.0000	58.0600	1234.3556 (32)
Party Wall 2			20.3500	0.0000	0.0000	58.0600	1181.5210 (32)
Party Floor 1			59.7400			70.0000	4181.8000 (32d)
Stud partition			128.4600			9.0000	1156.1400 (32c)
Internal Floor 1			3.9000			70.0000	273.0000 (32d)
Internal Ceiling 1			3.9000			30.0000	117.0000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	11392.0446 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							168.3968 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.1742 (36)
Total fabric heat loss						(33) + (36) =	38.8529 (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	26.2339	26.2339	26.2339	26.2339	26.2339	26.2339	26.2339	26.2339	26.2339	26.2339	26.2339	26.2339 (38)
Average = Sum(39)m / 12 =	65.0868	65.0868	65.0868	65.0868	65.0868	65.0868	65.0868	65.0868	65.0868	65.0868	65.0868	65.0868 (39)
HLP	0.9621	0.9621	0.9621	0.9621	0.9621	0.9621	0.9621	0.9621	0.9621	0.9621	0.9621	0.9621 (40)
HLP (average)												0.9621 (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	2.1877 (42)
Average daily hot water use (litres/day)	86.1590 (43)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	94.7749	91.3286	87.8822	84.4358	80.9895	77.5431	77.5431	80.9895	84.4358	87.8822	91.3286	94.7749	(44)
Energy content (annual)	140.5485	122.9246	126.8472	110.5884	106.1122	91.5668	84.8501	97.3667	98.5296	114.8267	125.3424	136.1137	(45)
Distribution loss (46)m = 0.15 x (45)m	21.0823	18.4387	19.0271	16.5883	15.9168	13.7350	12.7275	14.6050	14.7794	17.2240	18.8014	20.4171	(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	1.5319	1.2911	1.2820	1.0738	0.9883	0.8165	0.7566	0.9069	0.9567	1.1605	1.3164	1.4835	(61)
Total heat required for water heating calculated for each month	142.0803	124.2156	128.1291	111.6623	107.1005	92.3833	85.6067	98.2736	99.4863	115.9872	126.6588	137.5972	(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	142.0803	124.2156	128.1291	111.6623	107.1005	92.3833	85.6067	98.2736	99.4863	115.9872	126.6588	137.5972	(64)
Heat gains from water heating, kWh/month	47.1153	41.1952	42.4972	37.0391	35.5294	30.6501	28.4018	32.6011	33.0003	38.4700	42.0054	45.6287	(65)
Total per year (kWh/year) = Sum(64)m =													1369.1810 (64)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	109.3874	109.3874	109.3874	109.3874	109.3874	109.3874	109.3874	109.3874	109.3874	109.3874	109.3874	109.3874	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.7772	16.6777	13.5633	10.2683	7.6756	6.4801	7.0020	9.1014	12.2159	15.5109	18.1035	19.2991	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	191.7513	193.7411	188.7269	178.0524	164.5776	151.9132	143.4527	141.4629	146.4771	157.1516	170.6264	183.2908	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.9387	33.9387	33.9387	33.9387	33.9387	33.9387	33.9387	33.9387	33.9387	33.9387	33.9387	33.9387	(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)	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	(71)
Water heating gains (Table 5)	63.3271	61.3024	57.1199	51.4432	47.7546	42.5696	38.1745	43.8187	45.8337	51.7070	58.3409	61.3289	(72)
Total internal gains	332.6718	330.5375	318.2263	298.5800	278.8240	259.7791	247.4453	253.1993	263.3429	283.1858	305.8871	322.7349	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				3.0000	10.6334	0.6300	0.7000	0.7700	9.7491 (74)			
East				2.1700	19.6403	0.6300	0.7000	0.7700	13.0250 (76)			
South				3.3400	46.7521	0.6300	0.7000	0.7700	47.7220 (78)			

Solar gains	70.4962	122.2672	173.1776	224.5718	260.7575	262.9518	251.8138	224.1773	190.8664	136.7107	84.8344	60.0747 (83)
Total gains	403.1680	452.8047	491.4039	523.1518	539.5815	522.7309	499.2592	477.3766	454.2093	419.8965	390.7214	382.8097 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	48.6190	48.6190	48.6190	48.6190	48.6190	48.6190	48.6190	48.6190	48.6190	48.6190	48.6190	48.6190	
alpha	4.2413	4.2413	4.2413	4.2413	4.2413	4.2413	4.2413	4.2413	4.2413	4.2413	4.2413	4.2413	
util living area	0.9906	0.9836	0.9689	0.9329	0.8526	0.7081	0.5491	0.5918	0.8046	0.9454	0.9837	0.9924	(86)
MIT	19.6513	19.8182	20.0827	20.4125	20.7151	20.9089	20.9760	20.9669	20.8359	20.4509	19.9793	19.6003	(87)
Th 2	20.1150	20.1150	20.1150	20.1150	20.1150	20.1150	20.1150	20.1150	20.1150	20.1150	20.1150	20.1150	(88)
util rest of house	0.9885	0.9800	0.9617	0.9164	0.8152	0.6359	0.4490	0.4921	0.7448	0.9287	0.9794	0.9907	(89)
MIT 2	18.8776	19.0430	19.3038	19.6236	19.9035	20.0630	20.1060	20.1016	20.0107	19.6652	19.2040	18.8271	(90)
Living area fraction	19.1529	19.3188	19.5809	19.9043	20.1923	20.3640	20.4156	20.4094	20.3043	19.9448	19.4799	19.1022	(91)
MIT	19.1529	19.3188	19.5809	19.9043	20.1923	20.3640	20.4156	20.4094	20.3043	19.9448	19.4799	19.1022	(92)
Temperature adjustment													0.0000
adjusted MIT	19.1529	19.3188	19.5809	19.9043	20.1923	20.3640	20.4156	20.4094	20.3043	19.9448	19.4799	19.1022	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9856	0.9759	0.9565	0.9119	0.8188	0.6575	0.4841	0.5267	0.7589	0.9249	0.9755	0.9882	(94)
Useful gains	397.3514	441.9140	470.0089	477.0554	441.8213	343.6896	241.7153	251.4269	344.6828	388.3672	381.1619	378.2822	(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	966.7276	938.4721	851.3957	716.2363	552.7345	375.1581	248.3421	260.9617	403.8178	608.2204	805.7652	969.9351	(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	423.6159	333.6870	283.7518	172.2102	82.5194	0.0000	0.0000	0.0000	0.0000	163.5708	305.7144	440.1898	(98)
Space heating													2205.2593 (98)
Space heating per m2													(98) / (4) = 32.5981 (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												2444.8551 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	423.6159	333.6870	283.7518	172.2102	82.5194	0.0000	0.0000	0.0000	0.0000	163.5708	305.7144	440.1898 (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)	469.6407	369.9413	314.5807	190.9205	91.4849	0.0000	0.0000	0.0000	0.0000	181.3424	338.9295	488.0153 (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	142.0803	124.2156	128.1291	111.6623	107.1005	92.3833	85.6067	98.2736	99.4863	115.9872	126.6588	137.5972 (64)
Efficiency of water heater (217)m	86.2213	85.9179	85.3234	84.1206	81.7198	76.2000	76.2000	76.2000	76.2000	83.8113	85.5933	76.2000 (216)
Fuel for water heating, kWh/month	164.7856	144.5748	150.1688	132.7406	131.0583	121.2380	112.3448	128.9679	130.5595	138.3909	147.9775	159.2213 (219)
Water heating fuel used												1662.0280 (219)
Annual totals kWh/year												
Space heating fuel - main system												2444.8551 (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)												46.1652 (230a)
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												121.1652 (231)
Electricity for lighting (calculated in Appendix L)												331.6114 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
Total delivered energy for all uses												4559.6597 (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	2444.8551	0.2160	528.0887 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1662.0280	0.2160	358.9980 (264)
Space and water heating			887.0867 (265)
Pumps and fans	121.1652	0.5190	62.8848 (267)
Energy for lighting	331.6114	0.5190	172.1063 (268)
Energy saving/generation technologies			
PV Unit	-0.8000	0.5190	-0.4152 (269)
Total CO2, kg/year			1121.6626 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			16.5800 (273)

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

DER		16.5800 ZC1
Total Floor Area	TFA	67.6500
Assumed number of occupants	N	2.1877
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.7964 ZC2
CO2 emissions from cooking, equation (L16)		2.5352 ZC3
Total CO2 emissions		35.9116 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		35.9116 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	4.0100 (1b)	x 2.8300 (2b)	= 11.3483 (1b) - (3b)
First floor	63.6400 (1c)	x 2.3200 (2c)	= 147.6448 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	67.6500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 158.9931 (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					2 * 10 = 20.0000 (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) =					20.0000 / (5) = 0.1258 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3758 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3476 (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	0.4432	0.4345	0.4258	0.3824	0.3737	0.3302	0.3302	0.3215	0.3476	0.3737	0.3911	0.4084 (22b)
Effective ac	0.5982	0.5944	0.5907	0.5731	0.5698	0.5545	0.5545	0.5517	0.5604	0.5698	0.5765	0.5834 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1500	1.0000	2.1500		(26)
TER Opening Type (Uw = 1.40)			8.5100	1.3258	11.2822		(27)
Ground Floor			3.9000	0.1300	0.5070		(28a)
Brick and Block	6.3000	2.1500	4.1500	0.1800	0.7470		(29a)
First Floor	57.2600	8.5100	48.7500	0.1800	8.7750		(29a)
Pitched Roof	63.6400		63.6400	0.1300	8.2732		(30)
Total net area of external elements Aum(A, m ²)			131.1000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.7344		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.5452 (36)
Total fabric heat loss						(33) + (36) =	40.2796 (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	31.3869	31.1868	30.9906	30.0694	29.8970	29.0947	29.0947	28.9461	29.4037	29.8970	30.2457	30.6102 (38)
Heat transfer coeff	71.6665	71.4664	71.2702	70.3490	70.1766	69.3743	69.3743	69.2257	69.6833	70.1766	70.5253	70.8898 (39)
Average = Sum(39)m / 12 =												70.3482 (39)
HLP	1.0594	1.0564	1.0535	1.0399	1.0373	1.0255	1.0255	1.0233	1.0301	1.0373	1.0425	1.0479 (40)
HLP (average)												1.0399 (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												2.1877 (42)
Average daily hot water use (litres/day)												86.1590 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	94.7749	91.3286	87.8822	84.4358	80.9895	77.5431	77.5431	80.9895	84.4358	87.8822	91.3286	94.7749 (44)
Energy content (annual)	140.5485	122.9246	126.8472	110.5884	106.1122	91.5668	84.8501	97.3667	98.5296	114.8267	125.3424	136.1137 (45)
Distribution loss (46)m = 0.15 x (45)m	21.0823	18.4387	19.0271	16.5883	15.9168	13.7350	12.7275	14.6050	14.7794	17.2240	18.8014	20.4171 (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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	48.2963	42.0362	44.7838	41.6396	41.2713	38.2404	39.5151	41.2713	41.6396	44.7838	45.0387	48.2963 (61)
Total heat required for water heating calculated for each month	188.8447	164.9607	171.6310	152.2280	147.3836	129.8072	124.3652	138.6381	140.1692	159.6105	170.3811	184.4099 (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	188.8447	164.9607	171.6310	152.2280	147.3836	129.8072	124.3652	138.6381	140.1692	159.6105	170.3811	184.4099 (64)
Heat gains from water heating, kWh/month	58.8064	51.3815	53.3726	47.1805	45.6002	40.0061	38.0914	42.6923	43.1710	49.3758	52.9360	57.3319 (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	109.3874	109.3874	109.3874	109.3874	109.3874	109.3874	109.3874	109.3874	109.3874	109.3874	109.3874	109.3874 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.7772	16.6777	13.5633	10.2683	7.6756	6.4801	7.0020	9.1014	12.2159	15.5109	18.1035	19.2991 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	191.7513	193.7411	188.7269	178.0524	164.5776	151.9132	143.4527	141.4629	146.4771	157.1516	170.6264	183.2908 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.9387	33.9387	33.9387	33.9387	33.9387	33.9387	33.9387	33.9387	33.9387	33.9387	33.9387	33.9387 (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)	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099 (71)
Water heating gains (Table 5)	79.0409	76.4605	71.7374	65.5285	61.2905	55.5640	51.1982	57.3821	59.9597	66.3654	73.5222	77.0590 (72)
Total internal gains	348.3857	345.6956	332.8438	312.6654	292.3600	272.7735	260.4690	266.7626	277.4689	297.8442	321.0684	338.4650 (73)

6. Solar gains

[Jan]												
				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d	Gains W
North				3.0000	10.6334		0.6300		0.7000		0.7700	9.7491 (74)
East				2.1700	19.6403		0.6300		0.7000		0.7700	13.0250 (76)
South				3.3400	46.7521		0.6300		0.7000		0.7700	47.7220 (78)
Solar gains	70.4962	122.2672	173.1776	224.5718	260.7575	262.9518	251.8138	224.1773	190.8664	136.7107	84.8344	60.0747 (83)
Total gains	418.8819	467.9628	506.0214	537.2372	553.1175	535.7253	512.2829	490.9399	468.3353	434.5549	405.9028	398.5398 (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	65.5525	65.7361	65.9170	66.7802	66.9442	67.7184	67.7184	67.8638	67.4181	66.9442	66.6132	66.2707
alpha	5.3702	5.3824	5.3945	5.4520	5.4629	5.5146	5.5146	5.5243	5.4945	5.4629	5.4409	5.4180
util living area	0.9977	0.9953	0.9890	0.9684	0.9060	0.7574	0.5815	0.6265	0.8569	0.9753	0.9951	0.9982 (86)
MIT	19.9005	20.0328	20.2469	20.5311	20.7852	20.9457	20.9896	20.9845	20.8872	20.5663	20.1839	19.8781 (87)
Th 2	20.0342	20.0366	20.0390	20.0502	20.0523	20.0621	20.0621	20.0640	20.0584	20.0523	20.0481	20.0436 (88)
util rest of house	0.9969	0.9937	0.9851	0.9562	0.8687	0.6731	0.4650	0.5101	0.7909	0.9634	0.9932	0.9976 (89)
MIT 2	18.5662	18.7608	19.0736	19.4885	19.8330	20.0240	20.0580	20.0572	19.9652	19.5444	18.9903	18.5404 (90)
Living area fraction	19.0410	19.2134	19.4911	19.8595	20.1718	20.3519	20.3895	20.3872	20.2933	19.9080	19.4150	19.0163 (92)
Temperature adjustment	19.0410	19.2134	19.4911	19.8595	20.1718	20.3519	20.3895	20.3872	20.2933	19.9080	19.4150	19.0163 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9958	0.9919	0.9822	0.9531	0.8741	0.7010	0.5068	0.5517	0.8094	0.9611	0.9914	0.9967 (94)
Ext temp.	417.1179	464.1648	497.0159	512.0618	483.4684	375.5251	259.6184	270.8757	379.0891	417.6453	402.4300	397.2398 (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	1056.4326	1022.9263	925.8771	770.9872	594.5225	399.0347	262.8923	276.0145	431.5675	653.2029	868.5189	1050.3280 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating per m2	475.6501	375.4877	319.0728	186.4263	82.6243	0.0000	0.0000	0.0000	0.0000	175.2549	335.5840	485.8976 (98)
Space heating per m2												2435.9977 (98)
												36.0088 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2608.1346 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	475.6501	375.4877	319.0728	186.4263	82.6243	0.0000	0.0000	0.0000	0.0000	175.2549	335.5840	485.8976	(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)	509.2614	402.0211	341.6196	199.5999	88.4628	0.0000	0.0000	0.0000	0.0000	187.6391	359.2977	520.2330	(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	188.8447	164.9607	171.6310	152.2280	147.3836	129.8072	124.3652	138.6381	140.1692	159.6105	170.3811	184.4099	(64)
Efficiency of water heater (217)m	87.2801	87.0577	86.5906	85.5624	83.6576	80.3000	80.3000	80.3000	80.3000	85.2870	86.7267	87.3765	(216)
Fuel for water heating, kWh/month	216.3662	189.4843	198.2096	177.9145	176.1749	161.6528	154.8757	172.6501	174.5569	187.1453	196.4575	211.0521	(219)
Water heating fuel used												2216.5400	(219)
Annual totals kWh/year													
Space heating fuel - main system												2608.1346	(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)												331.6114	(232)
Total delivered energy for all uses												5231.2859	(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	2608.1346	0.2160	563.3571 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2216.5400	0.2160	478.7726 (264)
Space and water heating			1042.1297 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	331.6114	0.5190	172.1063 (268)
Total CO2, kg/m2/year			1253.1610 (272)
Emissions per m2 for space and water heating			15.4047 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.5441 (272b)
Emissions per m2 for pumps and fans			0.5754 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.4047 * 1.00) + 2.5441 + 0.5754, rounded to 2 d.p.			18.5200 (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	4.0100 (1b)	x 2.8300 (2b)	= 11.3483 (1b) - (3b)
First floor	63.6400 (1c)	x 2.3200 (2c)	= 147.6448 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	67.6500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 158.9931 (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					2 * 10 = 20.0000 (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) =					20.0000 / (5) = 0.1258 (8)
Pressure test					Yes
Measured/design AP50					3.6500
Infiltration rate					0.3083 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.2852 (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	0.3636	0.3565	0.3493	0.3137	0.3066	0.2709	0.2709	0.2638	0.2852	0.3066	0.3208	0.3351 (22b)
Effective ac	0.5661	0.5635	0.5610	0.5492	0.5470	0.5367	0.5367	0.5348	0.5407	0.5470	0.5515	0.5561 (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)			8.5100	1.1450	9.7443		(27)
Ground Floor			3.9000	0.1200	0.4680	84.0000	327.6000 (28a)
Brick and Block	6.3000	2.1500	4.1500	0.2500	1.0375	68.2600	283.2790 (29a)
First Floor	57.2600	8.5100	48.7500	0.2400	11.7000	42.2200	2058.2250 (29a)
Pitched Roof	63.6400		63.6400	0.1000	6.3640	9.1000	579.1240 (30)
Total net area of external elements Aum(A, m ²)			131.1000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.6788		(33)
Party Wall 1			21.2600	0.0000	0.0000	58.0600	1234.3556 (32)
Party Wall 2			20.3500	0.0000	0.0000	58.0600	1181.5210 (32)
Party Floor 1			59.7400			70.0000	4181.8000 (32d)
Stud partition			128.4600			9.0000	1156.1400 (32c)
Internal Floor 1			3.9000			70.0000	273.0000 (32d)
Internal Ceiling 1			3.9000			30.0000	117.0000 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 11392.0446 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							168.3968 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.1742 (36)
Total fabric heat loss							(33) + (36) = 38.8529 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	29.7019	29.5673	29.4353	28.8153	28.6993	28.1592	28.1592	28.0592	28.3672	28.6993	28.9339	Dec 29.1793 (38)
Heat transfer coeff	68.5549	68.4202	68.2882	67.6682	67.5522	67.0122	67.0122	66.9122	67.2202	67.5522	67.7869	68.0322 (39)
Average = Sum(39)m / 12 =												67.6676 (39)
HLP	1.0134	1.0114	1.0094	1.0003	0.9986	0.9906	0.9906	0.9891	0.9936	0.9986	1.0020	Dec 1.0056 (40)
HLP (average)												1.0003 (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												2.1877 (42)
Average daily hot water use (litres/day)												86.1590 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	94.7749	91.3286	87.8822	84.4358	80.9895	77.5431	77.5431	80.9895	84.4358	87.8822	91.3286	94.7749 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Energy conte	140.5485	122.9246	126.8472	110.5884	106.1122	91.5668	84.8501	97.3667	98.5296	114.8267	125.3424	136.1137 (45)
Energy content (annual)	Total = Sum (45)m = 1355.6168 (45)											
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	29.8665	26.1215	26.9550	23.5000	22.5488	19.4579	18.0306	20.6904	20.9375	24.4007	26.6352	28.9242 (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	109.3874	109.3874	109.3874	109.3874	109.3874	109.3874	109.3874	109.3874	109.3874	109.3874	109.3874	109.3874 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.7772	16.6777	13.5633	10.2683	7.6756	6.4801	7.0020	9.1014	12.2159	15.5109	18.1035	19.2991 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	191.7513	193.7411	188.7269	178.0524	164.5776	151.9132	143.4527	141.4629	146.4771	157.1516	170.6264	183.2908 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.9387	33.9387	33.9387	33.9387	33.9387	33.9387	33.9387	33.9387	33.9387	33.9387	33.9387	33.9387 (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)	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099 (71)
Water heating gains (Table 5)	40.1432	38.8712	36.2299	32.6389	30.3076	27.0249	24.2347	27.8097	29.0799	32.7966	36.9934	38.8766 (72)
Total internal gains	306.4880	305.1063	294.3363	276.7758	258.3771	241.2345	230.5056	234.1902	243.5891	261.2754	281.5396	297.2826 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W

North	3.0000	10.6334	0.6300	0.7000	0.7700	9.7491 (74)
East	2.1700	19.6403	0.6300	0.7000	0.7700	13.0250 (76)
South	3.3400	46.7521	0.6300	0.7000	0.7700	47.7220 (78)

Solar gains	70.4962	122.2672	173.1776	224.5718	260.7575	262.9518	251.8138	224.1773	190.8664	136.7107	84.8344	60.0747 (83)
Total gains	376.9842	427.3735	467.5139	501.3476	519.1345	504.1863	482.3194	458.3676	434.4555	397.9861	366.3739	357.3574 (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	46.1595	46.2503	46.3397	46.7643	46.8446	47.2221	47.2221	47.2927	47.0760	46.8446	46.6825	46.5141
alpha	4.0773	4.0834	4.0893	4.1176	4.1230	4.1481	4.1481	4.1528	4.1384	4.1230	4.1122	4.1009
util living area	0.9927	0.9871	0.9749	0.9440	0.8732	0.7357	0.5778	0.6231	0.8308	0.9560	0.9873	0.9941 (86)
MIT	19.5081	19.6834	19.9644	20.3289	20.6600	20.8872	20.9685	20.9568	20.7998	20.3741	19.8729	19.4720 (87)
Th 2	20.0722	20.0739	20.0755	20.0831	20.0845	20.0912	20.0912	20.0924	20.0886	20.0845	20.0816	20.0786 (88)
util rest of house	0.9911	0.9841	0.9689	0.9295	0.8382	0.6633	0.4723	0.5191	0.7735	0.9417	0.9839	0.9928 (89)
MIT 2	18.7022	18.8776	19.1567	19.5183	19.8295	20.0259	20.0792	20.0747	19.9592	19.5678	19.0730	18.6713 (90)
Living area fraction	18.9889	19.1643	19.4441	19.8067	20.1250	20.3323	20.3957	20.3885	20.2583	19.8547	19.3576	18.9562 (92)
Temperature adjustment	18.9889	19.1643	19.4441	19.8067	20.1250	20.3323	20.3957	20.3885	20.2583	19.8547	19.3576	18.9562 (93)
adjusted MIT	18.9889	19.1643	19.4441	19.8067	20.1250	20.3323	20.3957	20.3885	20.2583	19.8547	19.3576	18.9562 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9885	0.9804	0.9638	0.9243	0.8399	0.6840	0.5091	0.5548	0.7855	0.9373	0.9804	0.9906 (94)
Ext temp.	372.6609	419.0021	450.5695	463.3874	436.0362	344.8434	245.5718	254.3092	341.2453	373.0499	359.2018	354.0106 (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	1006.9981	975.9650	883.9292	738.0382	569.1255	384.1352	254.3548	266.8799	413.9636	625.1736	830.9033	1003.8993 (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	471.9468	374.2791	322.4196	197.7485	99.0184	0.0000	0.0000	0.0000	0.0000	187.5800	339.6251	483.5171 (98)
Space heating per m2	(98) / (4) = 36.6021 (99)											

8c. Space cooling requirement

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	629.9145	495.8901	508.5325	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.8305	0.8949	0.8755	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	523.1719	443.7881	445.2341	0.0000	0.0000	0.0000	0.0000 (102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	671.3768	644.2452	617.7966	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	106.7075	149.1400	128.3865	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									FC = cooled area / (4) =			384.2340 (104)
Intermittency factor (Table 10b)												1.0000 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	26.6769	37.2850	32.0966	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling per m2												96.0585 (107)
Energy for space heating												1.4199 (108)
Energy for space cooling												36.6021 (99)
Total												1.4199 (108)
Dwelling Fabric Energy Efficiency (DFEE)												38.0221 (109)
												38.0 (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	4.0100 (1b)	x 2.8300 (2b)	= 11.3483 (1b) - (3b)
First floor	63.6400 (1c)	x 2.3200 (2c)	= 147.6448 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	67.6500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 158.9931 (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																2 * 10 =	20.0000 (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) =					20.0000	/ (5) =	0.1258 (8)
Pressure test										Yes							
Measured/design AP50										5.0000							
Infiltration rate										0.3758 (18)							
Number of sides sheltered										1 (19)							
Shelter factor										(20) = 1 - [0.075 x (19)] =					0.9250 (20)		
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =					0.3476 (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	0.4432	0.4345	0.4258	0.3824	0.3737	0.3302	0.3302	0.3215	0.3476	0.3737	0.3911	0.4084	(22b)				
Effective ac	0.5982	0.5944	0.5907	0.5731	0.5698	0.5545	0.5545	0.5517	0.5604	0.5698	0.5765	0.5834	(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)			8.5100	1.3258	11.2822			(27)					
Ground Floor			3.9000	0.1300	0.5070			(28a)					
Brick and Block	6.3000	2.1500	4.1500	0.1800	0.7470			(29a)					
First Floor	57.2600	8.5100	48.7500	0.1800	8.7750			(29a)					
Pitched Roof	63.6400		63.6400	0.1300	8.2732			(30)					
Total net area of external elements Aum(A, m2)			131.1000					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.7344			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								8.5452 (36)					
Total fabric heat loss						(33) + (36) =		40.2796 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 31.3869	Feb 31.1868	Mar 30.9906	Apr 30.0694	May 29.8970	Jun 29.0947	Jul 29.0947	Aug 28.9461	Sep 29.4037	Oct 29.8970	Nov 30.2457	Dec 30.6102	(38)
Heat transfer coeff	71.6665	71.4664	71.2702	70.3490	70.1766	69.3743	69.3743	69.2257	69.6833	70.1766	70.5253	70.8898	(39)
Average = Sum(39)m / 12 =												70.3482	(39)
HLP	Jan 1.0594	Feb 1.0564	Mar 1.0535	Apr 1.0399	May 1.0373	Jun 1.0255	Jul 1.0255	Aug 1.0233	Sep 1.0301	Oct 1.0373	Nov 1.0425	Dec 1.0479	(40)
HLP (average)												1.0399	(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												2.1877 (42)
Average daily hot water use (litres/day)												86.1590 (43)
Daily hot water use	Jan 94.7749	Feb 91.3286	Mar 87.8822	Apr 84.4358	May 80.9895	Jun 77.5431	Jul 77.5431	Aug 80.9895	Sep 84.4358	Oct 87.8822	Nov 91.3286	Dec 94.7749 (44)
Energy conte	140.5485	122.9246	126.8472	110.5884	106.1122	91.5668	84.8501	97.3667	98.5296	114.8267	125.3424	136.1137 (45)
Energy content (annual)										Total = Sum(45)m =		1355.6168 (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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	29.8665	26.1215	26.9550	23.5000	22.5488	19.4579	18.0306	20.6904	20.9375	24.4007	26.6352	28.9242 (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	109.3874	109.3874	109.3874	109.3874	109.3874	109.3874	109.3874	109.3874	109.3874	109.3874	109.3874	109.3874	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.7772	16.6777	13.5633	10.2683	7.6756	6.4801	7.0020	9.1014	12.2159	15.5109	18.1035	19.2991	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	191.7513	193.7411	188.7269	178.0524	164.5776	151.9132	143.4527	141.4629	146.4771	157.1516	170.6264	183.2908	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.9387	33.9387	33.9387	33.9387	33.9387	33.9387	33.9387	33.9387	33.9387	33.9387	33.9387	33.9387	(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)	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	(71)
Water heating gains (Table 5)	40.1432	38.8712	36.2299	32.6389	30.3076	27.0249	24.2347	27.8097	29.0799	32.7966	36.9934	38.8766	(72)
Total internal gains	306.4880	305.1063	294.3363	276.7758	258.3771	241.2345	230.5056	234.1902	243.5891	261.2754	281.5396	297.2826	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	3.0000	10.6334	0.6300	0.7000	0.7700	9.7491 (74)
East	2.1700	19.6403	0.6300	0.7000	0.7700	13.0250 (76)
South	3.3400	46.7521	0.6300	0.7000	0.7700	47.7220 (78)

Solar gains	70.4962	122.2672	173.1776	224.5718	260.7575	262.9518	251.8138	224.1773	190.8664	136.7107	84.8344	60.0747	(83)
Total gains	376.9842	427.3735	467.5139	501.3476	519.1345	504.1863	482.3194	458.3676	434.4555	397.9861	366.3739	357.3574	(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	65.5525	65.7361	65.9170	66.7802	66.9442	67.7184	67.7184	67.8638	67.4181	66.9442	66.6132	66.2707	
alpha	5.3702	5.3824	5.3945	5.4520	5.4629	5.5146	5.5146	5.5243	5.4945	5.4629	5.4409	5.4180	
util living area	0.9986	0.9970	0.9924	0.9763	0.9241	0.7880	0.6132	0.6635	0.8855	0.9831	0.9970	0.9990	(86)
MIT	19.8420	19.9767	20.1953	20.4875	20.7549	20.9337	20.9865	20.9796	20.8636	20.5201	20.1291	19.8203	(87)
Th 2	20.0342	20.0366	20.0390	20.0502	20.0523	20.0621	20.0621	20.0640	20.0584	20.0523	20.0481	20.0436	(88)
util rest of house	0.9981	0.9959	0.9896	0.9667	0.8917	0.7058	0.4926	0.5438	0.8262	0.9745	0.9958	0.9986	(89)
MIT 2	18.9736	19.1099	19.3292	19.6256	19.8776	20.0294	20.0584	20.0577	19.9785	19.6619	19.2716	18.9596	(90)
Living area fraction	19.2826	19.4183	19.6373	19.9322	20.1898	20.3511	20.3887	20.3857	20.2934	19.9672	19.5767	19.2659	(91)
MIT	19.2826	19.4183	19.6373	19.9322	20.1898	20.3511	20.3887	20.3857	20.2934	19.9672	19.5767	19.2659	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2826	19.4183	19.6373	19.9322	20.1898	20.3511	20.3887	20.3857	20.2934	19.9672	19.5767	19.2659	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9976	0.9950	0.9880	0.9652	0.8971	0.7333	0.5361	0.5869	0.8432	0.9735	0.9950	0.9982	(94)
Useful gains	376.0972	425.2434	461.9238	483.9224	465.7295	369.7026	258.5479	269.0115	366.3333	387.4492	364.5491	356.7258	(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	1073.7486	1037.5713	936.3014	776.1074	595.7849	398.9797	262.8358	275.9152	431.5795	657.3608	879.9266	1068.0172	(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	519.0526	411.4843	352.9369	210.3732	96.7613	0.0000	0.0000	0.0000	0.0000	200.8142	371.0718	529.2008	(98)
Space heating												2691.6952	(98)
Space heating per m2												39.7885	(99)
										(98) / (4) =			

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	652.1180	513.3695	526.1151	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8585	0.9248	0.9059	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	559.8707	474.7641	476.6134	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	671.3768	644.2452	617.7966	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	80.2844	126.0939	105.0403	0.0000	0.0000	0.0000	0.0000	(104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling												311.4185 (104)
Cooled fraction												1.0000 (105)
Intermittency factor (Table 10b)												
	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)	
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	20.0711	31.5235	26.2601	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												77.8546 (107)
Space cooling per m2												1.1508 (108)
Energy for space heating												39.7885 (99)
Energy for space cooling												1.1508 (108)
Total												40.9394 (109)
Target Fabric Energy Efficiency (TFEE)												47.1 (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	4.0100 (1b)	x 2.8300 (2b)	= 11.3483 (1b) - (3b)
First floor	63.6400 (1c)	x 2.3200 (2c)	= 147.6448 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	67.6500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 158.9931 (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					3.6500
Infiltration rate					0.1825 (18)
Number of sides sheltered					1 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.1688 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)
Adj infilt rate	0.1984	0.1857	0.1857	0.1688	0.1730	0.1646	0.1646	0.1604	0.1604	0.1730	0.1688	0.1730 (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)			8.5100	1.1450	9.7443		(27)
Ground Floor			3.9000	0.1200	0.4680	84.0000	327.6000 (28a)
Brick and Block	6.3000	2.1500	4.1500	0.2500	1.0375	68.2600	283.2790 (29a)
First Floor	57.2600	8.5100	48.7500	0.2400	11.7000	42.2200	2058.2250 (29a)
Pitched Roof	63.6400		63.6400	0.1000	6.3640	9.1000	579.1240 (30)
Total net area of external elements Aum(A, m ²)			131.1000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.6788		(33)
Party Wall 1			21.2600	0.0000	0.0000	58.0600	1234.3556 (32)
Party Wall 2			20.3500	0.0000	0.0000	58.0600	1181.5210 (32)
Party Floor 1			59.7400			70.0000	4181.8000 (32d)
Stud partition			128.4600			9.0000	1156.1400 (32c)
Internal Floor 1			3.9000			70.0000	273.0000 (32d)
Internal Ceiling 1			3.9000			30.0000	117.0000 (32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		11392.0446 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							168.3968 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.1742 (36)
Total fabric heat loss						(33) + (36) =	38.8529 (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	26.2339	26.2339	26.2339	26.2339	26.2339	26.2339	26.2339	26.2339	26.2339	26.2339	26.2339	26.2339 (38)
Average = Sum(39)m / 12 =	65.0868	65.0868	65.0868	65.0868	65.0868	65.0868	65.0868	65.0868	65.0868	65.0868	65.0868	65.0868 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9621	0.9621	0.9621	0.9621	0.9621	0.9621	0.9621	0.9621	0.9621	0.9621	0.9621	0.9621 (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	2.1877 (42)
Average daily hot water use (litres/day)	86.1590 (43)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	94.7749	91.3286	87.8822	84.4358	80.9895	77.5431	77.5431	80.9895	84.4358	87.8822	91.3286	94.7749	(44)
Energy content (annual)	140.5485	122.9246	126.8472	110.5884	106.1122	91.5668	84.8501	97.3667	98.5296	114.8267	125.3424	136.1137	(45)
Distribution loss (46)m = 0.15 x (45)m	21.0823	18.4387	19.0271	16.5883	15.9168	13.7350	12.7275	14.6050	14.7794	17.2240	18.8014	20.4171	(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	1.5319	1.2911	1.2820	1.0738	0.9883	0.8165	0.7566	0.9069	0.9567	1.1605	1.3164	1.4835	(61)
Total heat required for water heating calculated for each month	142.0803	124.2156	128.1291	111.6623	107.1005	92.3833	85.6067	98.2736	99.4863	115.9872	126.6588	137.5972	(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	142.0803	124.2156	128.1291	111.6623	107.1005	92.3833	85.6067	98.2736	99.4863	115.9872	126.6588	137.5972	(64)
RHI water heating demand	47.1153	41.1952	42.4972	37.0391	35.5294	30.6501	28.4018	32.6011	33.0003	38.4700	42.0054	45.6287	(65)
Heat gains from water heating, kWh/month													
	47.1153	41.1952	42.4972	37.0391	35.5294	30.6501	28.4018	32.6011	33.0003	38.4700	42.0054	45.6287	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	131.2649	131.2649	131.2649	131.2649	131.2649	131.2649	131.2649	131.2649	131.2649	131.2649	131.2649	131.2649	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	46.9430	41.6944	33.9081	25.6706	19.1891	16.2003	17.5049	22.7536	30.5398	38.7773	45.2589	48.2477	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	286.1960	289.1659	281.6820	265.7498	245.6382	226.7362	214.1084	211.1386	218.6225	234.5547	254.6663	273.5683	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.3142	50.3142	50.3142	50.3142	50.3142	50.3142	50.3142	50.3142	50.3142	50.3142	50.3142	50.3142	(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)	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	(71)
Water heating gains (Table 5)	63.3271	61.3024	57.1199	51.4432	47.7546	42.5696	38.1745	43.8187	45.8337	51.7070	58.3409	61.3289	(72)
Total internal gains	493.5353	489.2318	469.7792	439.9328	409.6511	382.5752	366.8571	374.7801	392.0652	422.1082	455.3352	480.2141	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North				3.0000	13.4684		0.6300		0.7000		0.7700		12.3484 (74)
East				2.1700	25.1733		0.6300		0.7000		0.7700		16.6944 (76)
South				3.3400	56.5862		0.6300		0.7000		0.7700		57.7602 (78)
Solar gains	86.8030	128.3335	185.8208	243.4860	267.4073	298.9831	274.8601	254.2952	214.9171	155.0319	104.1514		70.0064 (83)
Total gains	580.3383	617.5653	655.6000	683.4189	677.0584	681.5583	641.7171	629.0753	606.9823	577.1401	559.4866		550.2205 (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	48.6190	48.6190	48.6190	48.6190	48.6190	48.6190	48.6190	48.6190	48.6190	48.6190	48.6190	48.6190
alpha	4.2413	4.2413	4.2413	4.2413	4.2413	4.2413	4.2413	4.2413	4.2413	4.2413	4.2413	4.2413
util living area	0.9560	0.9421	0.9046	0.8240	0.6850	0.4749	0.3326	0.3290	0.5709	0.8107	0.9240	0.9622 (86)
MIT	20.1222	20.2261	20.4526	20.7130	20.9011	20.9838	20.9973	20.9975	20.9647	20.7815	20.4309	20.0851 (87)
Th 2	20.1150	20.1150	20.1150	20.1150	20.1150	20.1150	20.1150	20.1150	20.1150	20.1150	20.1150	20.1150 (88)
util rest of house	0.9471	0.9305	0.8856	0.7896	0.6271	0.3974	0.2445	0.2391	0.4913	0.7663	0.9064	0.9542 (89)
MIT 2	19.3400	19.4402	19.6561	19.8949	20.0522	20.1082	20.1144	20.1145	20.0981	19.9592	19.6397	19.3045 (90)
Living area fraction									fLA = Living area / (4) =			0.3558 (91)
MIT	19.6183	19.7198	19.9395	20.1860	20.3542	20.4197	20.4286	20.4287	20.4064	20.2518	19.9212	19.5822 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6183	19.7198	19.9395	20.1860	20.3542	20.4197	20.4286	20.4287	20.4064	20.2518	19.9212	19.5822 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9411	0.9245	0.8814	0.7926	0.6435	0.4246	0.2759	0.2712	0.5184	0.7737	0.9020	0.9485	(94)
Useful gains	546.1532	570.9584	577.8466	541.6652	435.6581	289.3788	177.0395	170.5932	314.6330	446.5413	504.6535	521.8638	(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	912.4046	892.9790	803.1390	656.4649	472.1557	294.1758	177.5928	171.0915	325.8517	530.5735	736.8604	903.5501	(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	272.4911	216.3979	167.6176	82.6558	27.1543	0.0000	0.0000	0.0000	0.0000	62.5200	167.1890	283.9746	(98)
Space heating												1280.0001	(98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF HEAT DEMAND 09 Jan 2014

RHI space heating demand

1280 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	4.0100 (1b)	x 2.8300 (2b)	= 11.3483 (1b) - (3b)
First floor	63.6400 (1c)	x 2.3200 (2c)	= 147.6448 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	67.6500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 158.9931 (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												3.6500
Infiltration rate												0.1825 (18)
Number of sides sheltered												1 (19)
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.1688 (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												
	0.2152	0.2110	0.2068	0.1857	0.1815	0.1604	0.1604	0.1562	0.1688	0.1815	0.1899	0.1984 (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 m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Front Door			2.1500	1.1000	2.3650		(26)					
Windows (Uw = 1.20)			8.5100	1.1450	9.7443		(27)					
Ground Floor			3.9000	0.1200	0.4680	84.0000	327.6000 (28a)					
Brick and Block	6.3000	2.1500	4.1500	0.2500	1.0375	68.2600	283.2790 (29a)					
First Floor	57.2600	8.5100	48.7500	0.2400	11.7000	42.2200	2058.2250 (29a)					
Pitched Roof	63.6400		63.6400	0.1000	6.3640	9.1000	579.1240 (30)					
Total net area of external elements Aum(A, m2)			131.1000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.6788		(33)					
Party Wall 1			21.2600	0.0000	0.0000	58.0600	1234.3556 (32)					
Party Wall 2			20.3500	0.0000	0.0000	58.0600	1181.5210 (32)					
Party Floor 1			59.7400			70.0000	4181.8000 (32d)					
Stud partition			128.4600			9.0000	1156.1400 (32c)					
Internal Floor 1			3.9000			70.0000	273.0000 (32d)					
Internal Ceiling 1			3.9000			30.0000	117.0000 (32e)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		11392.0446 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							168.3968 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.1742 (36)					
Total fabric heat loss						(33) + (36) =	38.8529 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 26.2339	Feb 26.2339	Mar 26.2339	Apr 26.2339	May 26.2339	Jun 26.2339	Jul 26.2339	Aug 26.2339	Sep 26.2339	Oct 26.2339	Nov 26.2339	Dec 26.2339 (38)
Heat transfer coeff	65.0868	65.0868	65.0868	65.0868	65.0868	65.0868	65.0868	65.0868	65.0868	65.0868	65.0868	65.0868 (39)
Average = Sum(39)m / 12 =												65.0868 (39)
HLP	Jan 0.9621	Feb 0.9621	Mar 0.9621	Apr 0.9621	May 0.9621	Jun 0.9621	Jul 0.9621	Aug 0.9621	Sep 0.9621	Oct 0.9621	Nov 0.9621	Dec 0.9621 (40)
HLP (average)												0.9621 (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	2.1877 (42)
Average daily hot water use (litres/day)	86.1590 (43)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	94.7749	91.3286	87.8822	84.4358	80.9895	77.5431	77.5431	80.9895	84.4358	87.8822	91.3286	94.7749	(44)
Energy content (annual)	140.5485	122.9246	126.8472	110.5884	106.1122	91.5668	84.8501	97.3667	98.5296	114.8267	125.3424	136.1137	(45)
Distribution loss (46)m = 0.15 x (45)m	21.0823	18.4387	19.0271	16.5883	15.9168	13.7350	12.7275	14.6050	14.7794	17.2240	18.8014	20.4171	(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	1.5319	1.2911	1.2820	1.0738	0.9883	0.8165	0.7566	0.9069	0.9567	1.1605	1.3164	1.4835	(61)
Total heat required for water heating calculated for each month	142.0803	124.2156	128.1291	111.6623	107.1005	92.3833	85.6067	98.2736	99.4863	115.9872	126.6588	137.5972	(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	142.0803	124.2156	128.1291	111.6623	107.1005	92.3833	85.6067	98.2736	99.4863	115.9872	126.6588	137.5972	(64)
Heat gains from water heating, kWh/month	47.1153	41.1952	42.4972	37.0391	35.5294	30.6501	28.4018	32.6011	33.0003	38.4700	42.0054	45.6287	(65)
Total per year (kWh/year) = Sum(64)m =													1369.1810 (64)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	131.2649	131.2649	131.2649	131.2649	131.2649	131.2649	131.2649	131.2649	131.2649	131.2649	131.2649	131.2649	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	46.9430	41.6944	33.9081	25.6706	19.1891	16.2003	17.5049	22.7536	30.5398	38.7773	45.2589	48.2477	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	286.1960	289.1659	281.6820	265.7498	245.6382	226.7362	214.1084	211.1386	218.6225	234.5547	254.6663	273.5683	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.3142	50.3142	50.3142	50.3142	50.3142	50.3142	50.3142	50.3142	50.3142	50.3142	50.3142	50.3142	(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)	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	(71)
Water heating gains (Table 5)	63.3271	61.3024	57.1199	51.4432	47.7546	42.5696	38.1745	43.8187	45.8337	51.7070	58.3409	61.3289	(72)
Total internal gains	493.5353	489.2318	469.7792	439.9328	409.6511	382.5752	366.8571	374.7801	392.0652	422.1082	455.3352	480.2141	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				3.0000	10.6334	0.6300	0.7000	0.7700	9.7491 (74)			
East				2.1700	19.6403	0.6300	0.7000	0.7700	13.0250 (76)			
South				3.3400	46.7521	0.6300	0.7000	0.7700	47.7220 (78)			
Solar gains	70.4962	122.2672	173.1776	224.5718	260.7575	262.9518	251.8138	224.1773	190.8664	136.7107	84.8344	60.0747 (83)
Total gains	564.0315	611.4990	642.9568	664.5046	670.4086	645.5270	618.6709	598.9575	582.9316	558.8189	540.1696	540.2888 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	48.6190	48.6190	48.6190	48.6190	48.6190	48.6190	48.6190	48.6190	48.6190	48.6190	48.6190	48.6190	
alpha	4.2413	4.2413	4.2413	4.2413	4.2413	4.2413	4.2413	4.2413	4.2413	4.2413	4.2413	4.2413	
util living area	0.9692	0.9549	0.9277	0.8711	0.7658	0.6056	0.4532	0.4863	0.6919	0.8779	0.9515	0.9739	(86)
MIT	19.9402	20.0899	20.3188	20.5906	20.8197	20.9497	20.9883	20.9841	20.9102	20.6346	20.2336	19.8873	(87)
Th 2	20.1150	20.1150	20.1150	20.1150	20.1150	20.1150	20.1150	20.1150	20.1150	20.1150	20.1150	20.1150	(88)
util rest of house	0.9632	0.9462	0.9135	0.8452	0.7199	0.5346	0.3663	0.3985	0.6251	0.8483	0.9406	0.9687	(89)
MIT 2	19.1615	19.3075	19.5289	19.7848	19.9873	20.0878	20.1108	20.1089	20.0618	19.8301	19.4501	19.1098	(90)
Living area fraction	19.4386	19.5859	19.8100	20.0715	20.2835	20.3945	20.4230	20.4203	20.3637	20.1164	19.7288	19.3864	(91)
MIT	19.4386	19.5859	19.8100	20.0715	20.2835	20.3945	20.4230	20.4203	20.3637	20.1164	19.7288	19.3864	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4386	19.5859	19.8100	20.0715	20.2835	20.3945	20.4230	20.4203	20.3637	20.1164	19.7288	19.3864	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9576	0.9401	0.9079	0.8438	0.7292	0.5578	0.3971	0.4294	0.6449	0.8484	0.9350	0.9635	(94)
Useful gains	540.1129	574.8423	583.7418	560.6915	488.8478	360.0770	245.6783	257.2156	375.9084	474.0967	505.0700	520.5539	(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	985.3231	955.8550	866.3026	727.1189	558.6714	377.1451	248.8295	261.6692	407.6826	619.3896	821.9708	988.4349	(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	331.2364	256.0405	210.2252	119.8277	51.9487	0.0000	0.0000	0.0000	0.0000	108.0979	228.1686	348.1035	(98)
Space heating												1653.6485	(98)
Space heating per m2												24.4442	(99)
(98) / (4) =													

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														1833.3132 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	331.2364	256.0405	210.2252	119.8277	51.9487	0.0000	0.0000	0.0000	0.0000	108.0979	228.1686	348.1035	(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)	367.2244	283.8586	233.0656	132.8467	57.5928	0.0000	0.0000	0.0000	0.0000	119.8425	252.9585	385.9240	(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	142.0803	124.2156	128.1291	111.6623	107.1005	92.3833	85.6067	98.2736	99.4863	115.9872	126.6588	137.5972	(64)	
Efficiency of water heater (217)m	85.4854	85.0930	84.3326	82.8570	80.2692	76.2000	76.2000	76.2000	76.2000	82.3671	84.6485	85.7374	(216)	
Fuel for water heating, kWh/month	166.2042	145.9763	151.9331	134.7651	133.4266	121.2380	112.3448	128.9679	130.5595	140.8174	149.6291	160.4867	(219)	
Water heating fuel used												1676.3488	(219)	
Annual totals kWh/year														
Space heating fuel - main system												1833.3132	(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)													46.1652	(230a)
central heating pump													30.0000	(230c)
main heating flue fan													45.0000	(230e)
Total electricity for the above, kWh/year													121.1652	(231)
Electricity for lighting (calculated in Appendix L)													331.6114	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
Total delivered energy for all uses													3962.4386	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1833.3132	3.4800	63.7993 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1676.3488	3.4800	58.3369 (247)
Mechanical ventilation fans	46.1652	13.1900	6.0892 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	331.6114	13.1900	43.7395 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	0.0000	13.1900	0.0000 (252)
Total energy cost			301.8575 (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] =	1.1254 (257)
SAP value			84.3002
SAP rating (Section 12)			84 (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	1833.3132	0.2160	395.9957 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1676.3488	0.2160	362.0913 (264)
Space and water heating			758.0870 (265)
Pumps and fans	121.1652	0.5190	62.8848 (267)
Energy for lighting	331.6114	0.5190	172.1063 (268)
Energy saving/generation technologies			
PV Unit	-0.8000	0.5190	-0.4152 (269)
Total kg/year			992.6628 (272)
CO2 emissions per m2			14.6700 (273)
EI value			88.1920
EI rating			88 (274)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

EI band

B

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	$3.48 / 0.8130 = 4.280$, stars = 4
Water heating environmental impact	$0.216 / 0.8130 = 0.2657$, 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	4.0100 (1b)	x 2.8300 (2b)	= 11.3483 (1b) - (3b)
First floor	63.6400 (1c)	x 2.3200 (2c)	= 147.6448 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	67.6500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 158.9931 (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											3.6500	
Infiltration rate											0.1825 (18)	
Number of sides sheltered											1 (19)	
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.1688 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)
Adj infilt rate	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)
	0.1984	0.1857	0.1857	0.1688	0.1730	0.1646	0.1646	0.1604	0.1604	0.1730	0.1688	0.1730 (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 m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Front Door			2.1500	1.1000	2.3650		(26)					
Windows (Uw = 1.20)			8.5100	1.1450	9.7443		(27)					
Ground Floor			3.9000	0.1200	0.4680	84.0000	327.6000 (28a)					
Brick and Block	6.3000	2.1500	4.1500	0.2500	1.0375	68.2600	283.2790 (29a)					
First Floor	57.2600	8.5100	48.7500	0.2400	11.7000	42.2200	2058.2250 (29a)					
Pitched Roof	63.6400		63.6400	0.1000	6.3640	9.1000	579.1240 (30)					
Total net area of external elements Aum(A, m2)			131.1000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.6788		(33)					
Party Wall 1			21.2600	0.0000	0.0000	58.0600	1234.3556 (32)					
Party Wall 2			20.3500	0.0000	0.0000	58.0600	1181.5210 (32)					
Party Floor 1			59.7400			70.0000	4181.8000 (32d)					
Stud partition			128.4600			9.0000	1156.1400 (32c)					
Internal Floor 1			3.9000			70.0000	273.0000 (32d)					
Internal Ceiling 1			3.9000			30.0000	117.0000 (32e)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		11392.0446 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							168.3968 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.1742 (36)					
Total fabric heat loss						(33) + (36) =	38.8529 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 26.2339	Feb 26.2339	Mar 26.2339	Apr 26.2339	May 26.2339	Jun 26.2339	Jul 26.2339	Aug 26.2339	Sep 26.2339	Oct 26.2339	Nov 26.2339	Dec 26.2339 (38)
Heat transfer coeff	65.0868	65.0868	65.0868	65.0868	65.0868	65.0868	65.0868	65.0868	65.0868	65.0868	65.0868	65.0868 (39)
Average = Sum(39)m / 12 =												65.0868 (39)
HLP	Jan 0.9621	Feb 0.9621	Mar 0.9621	Apr 0.9621	May 0.9621	Jun 0.9621	Jul 0.9621	Aug 0.9621	Sep 0.9621	Oct 0.9621	Nov 0.9621	Dec 0.9621 (40)
HLP (average)												0.9621 (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	2.1877 (42)
Average daily hot water use (litres/day)	86.1590 (43)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	94.7749	91.3286	87.8822	84.4358	80.9895	77.5431	77.5431	80.9895	84.4358	87.8822	91.3286	94.7749	(44)
Energy content (annual)	140.5485	122.9246	126.8472	110.5884	106.1122	91.5668	84.8501	97.3667	98.5296	114.8267	125.3424	136.1137	(45)
Distribution loss (46)m = 0.15 x (45)m	21.0823	18.4387	19.0271	16.5883	15.9168	13.7350	12.7275	14.6050	14.7794	17.2240	18.8014	20.4171	(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	1.5319	1.2911	1.2820	1.0738	0.9883	0.8165	0.7566	0.9069	0.9567	1.1605	1.3164	1.4835	(61)
Total heat required for water heating calculated for each month	142.0803	124.2156	128.1291	111.6623	107.1005	92.3833	85.6067	98.2736	99.4863	115.9872	126.6588	137.5972	(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	142.0803	124.2156	128.1291	111.6623	107.1005	92.3833	85.6067	98.2736	99.4863	115.9872	126.6588	137.5972	(64)
Heat gains from water heating, kWh/month	47.1153	41.1952	42.4972	37.0391	35.5294	30.6501	28.4018	32.6011	33.0003	38.4700	42.0054	45.6287	(65)
Total per year (kWh/year) = Sum(64)m =													1369.1810 (64)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	131.2649	131.2649	131.2649	131.2649	131.2649	131.2649	131.2649	131.2649	131.2649	131.2649	131.2649	131.2649	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	46.9430	41.6944	33.9081	25.6706	19.1891	16.2003	17.5049	22.7536	30.5398	38.7773	45.2589	48.2477	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	286.1960	289.1659	281.6820	265.7498	245.6382	226.7362	214.1084	211.1386	218.6225	234.5547	254.6663	273.5683	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.3142	50.3142	50.3142	50.3142	50.3142	50.3142	50.3142	50.3142	50.3142	50.3142	50.3142	50.3142	(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)	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	-87.5099	(71)
Water heating gains (Table 5)	63.3271	61.3024	57.1199	51.4432	47.7546	42.5696	38.1745	43.8187	45.8337	51.7070	58.3409	61.3289	(72)
Total internal gains	493.5353	489.2318	469.7792	439.9328	409.6511	382.5752	366.8571	374.7801	392.0652	422.1082	455.3352	480.2141	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d		Gains W	
North				3.0000	13.4684	0.6300	0.7000		0.7700		12.3484 (74)	
East				2.1700	25.1733	0.6300	0.7000		0.7700		16.6944 (76)	
South				3.3400	56.5862	0.6300	0.7000		0.7700		57.7602 (78)	
Solar gains	86.8030	128.3335	185.8208	243.4860	267.4073	298.9831	274.8601	254.2952	214.9171	155.0319	104.1514	70.0064 (83)
Total gains	580.3383	617.5653	655.6000	683.4189	677.0584	681.5583	641.7171	629.0753	606.9823	577.1401	559.4866	550.2205 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	48.6190	48.6190	48.6190	48.6190	48.6190	48.6190	48.6190	48.6190	48.6190	48.6190	48.6190	48.6190	
alpha	4.2413	4.2413	4.2413	4.2413	4.2413	4.2413	4.2413	4.2413	4.2413	4.2413	4.2413	4.2413	
util living area	0.9560	0.9421	0.9046	0.8240	0.6850	0.4749	0.3326	0.3290	0.5709	0.8107	0.9240	0.9622	(86)
MIT	20.1222	20.2261	20.4526	20.7130	20.9011	20.9838	20.9973	20.9975	20.9647	20.7815	20.4309	20.0851	(87)
Th 2	20.1150	20.1150	20.1150	20.1150	20.1150	20.1150	20.1150	20.1150	20.1150	20.1150	20.1150	20.1150	(88)
util rest of house	0.9471	0.9305	0.8856	0.7896	0.6271	0.3974	0.2445	0.2391	0.4913	0.7663	0.9064	0.9542	(89)
MIT 2	19.3400	19.4402	19.6561	19.8949	20.0522	20.1082	20.1144	20.1145	20.0981	19.9592	19.6397	19.3045	(90)
Living area fraction	19.6183	19.7198	19.9395	20.1860	20.3542	20.4197	20.4286	20.4287	20.4064	20.2518	19.9212	19.5822	(91)
MIT	19.6183	19.7198	19.9395	20.1860	20.3542	20.4197	20.4286	20.4287	20.4064	20.2518	19.9212	19.5822	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6183	19.7198	19.9395	20.1860	20.3542	20.4197	20.4286	20.4287	20.4064	20.2518	19.9212	19.5822	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9411	0.9245	0.8814	0.7926	0.6435	0.4246	0.2759	0.2712	0.5184	0.7737	0.9020	0.9485	(94)
Useful gains	546.1532	570.9584	577.8466	541.6652	435.6581	289.3788	177.0395	170.5932	314.6330	446.5413	504.6535	521.8638	(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	912.4046	892.9790	803.1390	656.4649	472.1557	294.1758	177.5928	171.0915	325.8517	530.5735	736.8604	903.5501	(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	272.4911	216.3979	167.6176	82.6558	27.1543	0.0000	0.0000	0.0000	0.0000	62.5200	167.1890	283.9746	(98)
Space heating												1280.0001	(98)
Space heating per m2												18.9209	(99)
(98) / (4) =													

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													1419.0688 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	272.4911	216.3979	167.6176	82.6558	27.1543	0.0000	0.0000	0.0000	0.0000	62.5200	167.1890	283.9746	(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)	302.0965	239.9090	185.8288	91.6361	30.1045	0.0000	0.0000	0.0000	0.0000	69.3126	185.3536	314.8277	(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	142.0803	124.2156	128.1291	111.6623	107.1005	92.3833	85.6067	98.2736	99.4863	115.9872	126.6588	137.5972	(64)
Efficiency of water heater (217)m	84.8569	84.5359	83.5496	81.5864	78.6697	76.2000	76.2000	76.2000	76.2000	80.5804	83.5810	85.0970	(216)
Fuel for water heating, kWh/month	167.4352	146.9383	153.3569	136.8638	136.1396	121.2380	112.3448	128.9679	130.5595	143.9397	151.5402	161.6945	(219)
Water heating fuel used												1691.0184	(219)
Annual totals kWh/year													
Space heating fuel - main system												1419.0688	(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)													46.1652 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													121.1652 (231)
Electricity for lighting (calculated in Appendix L)													331.6114 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses													3562.8638 (238)

10a. Fuel costs - using BEDF prices (542)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1419.0688	7.6100	107.9911 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1691.0184	7.6100	128.6865 (247)
Mechanical ventilation fans	46.1652	31.0800	14.3482 (249)
Pumps and fans for heating	75.0000	31.0800	23.3100 (249)
Energy for lighting	331.6114	31.0800	103.0648 (250)
Additional standing charges			105.0000 (251)
Energy saving/generation technologies			
PV Unit	0.0000	31.0800	0.0000 (252)
Total energy cost			482.4006 (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	1419.0688	0.2160	306.5189 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1691.0184	0.2160	365.2600 (264)
Space and water heating			671.7788 (265)
Pumps and fans	121.1652	0.5190	62.8848 (267)
Energy for lighting	331.6114	0.5190	172.1063 (268)
Energy saving/generation technologies			
PV Unit	-0.8000	0.5190	-0.4152 (269)
Total kg/year			906.3547 (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	1419.0688	1.2200	1731.2640 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1691.0184	1.2200	2063.0424 (264)
Space and water heating			3794.3064 (265)
Pumps and fans	121.1652	3.0700	371.9773 (267)
Energy for lighting	331.6114	3.0700	1018.0469 (268)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Energy saving/generation technologies			
PV Unit	-0.8000	3.0700	-2.4560 (269)
Primary energy kWh/year			5181.8745 (272)
Primary energy kWh/m ² /year			76.5983 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	B 84
Current environmental impact rating:	B 88

(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	Not applicable
O	Not considered
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U Solar photovoltaic panels	Not applicable
A2	Not considered
A3	Not considered
T2	Not considered
W	Not considered
X	Not considered
Y	Not considered
J2	Not considered
Q2	Not considered
Z1	Not considered
Z2	Not considered
Z3	Not considered
Z4	Not considered
Z5	Not considered
V2 Wind turbine	Not applicable
L2	Not considered
Q3	Not considered
O3	Not considered

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0		0.00 kg/m ²

Potential energy efficiency rating:	B 84
Potential environmental impact rating:	B 88

Fuel prices for cost data on this page from database revision number 542 TEST (30 Apr 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	£141	£141	£0
Mains gas	£342	£342	£0
Space heating	£251	£251	£0
Water heating	£129	£129	£0
Lighting	£103	£103	£0
Total cost of fuels	£483	£483	£0
Total cost of uses	£483	£483	£0
Delivered energy	53 kWh/m ²	53 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	0.9 tonnes	0.9 tonnes	0.0 tonnes
CO2 emissions per m ²	13 kg/m ²	13 kg/m ²	0 kg/m ²
Primary energy	77 kWh/m ²	77 kWh/m ²	0 kWh/m ²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

No improvements selected / applicable

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0943 Plot 28	Issued on Date	28/05/2024
Assessment Reference	As Built	Prop Type Ref	Block J
Project	30, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	84 B	DER	16.58	TER	18.52
Environmental	88 B	% DER<TER	10.50		
CO ₂ Emissions (t/year)	0.91	DFEE	38.02	TFEE	47.08
General Requirements Compliance	Pass	% DFEE<TFEE	19.24		

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 28	Issued on Date	28/05/2024
Assessment Reference	As Built	Prop Type Ref	Block J
Project	30, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	84 B	DER	16.58	TER	18.52
Environmental	88 B	% DER<TER	10.50		
CO ₂ Emissions (t/year)	0.91	DFEE	38.02	TFEE	47.08
General Requirements Compliance	Pass	% DFEE<TFEE	19.24		

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	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 4	Supabloc *7						
	Main construction	100	0.1900	0.5263	94.04	680	1000
	Main construction	100	0.8803	0.1136	5.96	680	1000
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 5	Plasterboard, standard						
	Main construction	12.5	0.2100	0.0595	100.00	700	1000
Int surface				0.1300			

Total resistance:	Upper limit = 3.968 m ² K/W	Lower limit = 3.901 m ² K/W	Average = 3.935 m ² K/W
	Total correction = 0.0001 m ² K/W	U-value (unrounded) = 0.25 W/m ² K	

Unheated space: None		
Total thickness: 330 mm	U-value: 0.25 W/m² K	Kappa: 68.26 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0943 Plot 28	Issued on Date	28/05/2024
Assessment Reference	As Built	Prop Type Ref	Block J
Project	30, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	84 B	DER	16.58	TER	18.52
Environmental	88 B	% DER<TER	10.50		
CO ₂ Emissions (t/year)	0.91	DFEE	38.02	TFEE	47.08
General Requirements Compliance	Pass	% DFEE<TFEE	19.24		

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

Wall 000004

Wall Type: Standard Wall

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.0400			
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 28	Issued on Date	28/05/2024
Assessment Reference	As Built	Prop Type Ref	Block J
Project	30, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	84 B	DER	16.58	TER	18.52
Environmental	88 B	% DER<TER	10.50		
CO ₂ Emissions (t/year)	0.91	DFEE	38.02	TFEE	47.08
General Requirements Compliance	Pass	% DFEE<TFEE	19.24		

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 28			Issued on Date	28/05/2024
Assessment Reference	As Built	Prop Type Ref	Block J		
Property	30, Shaw Crescent, West End, Southampton, SO30 3LH				
SAP Rating	84 B	DER	16.58	TER	18.52
Environmental	88 B	% DER<TER	10.50		
CO ₂ Emissions (t/year)	0.91	DFEE	38.02	TFEE	47.08
General Requirements Compliance	Pass	% DFEE<TFEE	19.24		
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	Maisonette, Semi-Detached
2.0 Number of Storeys	2
3.0 Date Built	2023
4.0 Sheltered Sides	1
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements		Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	Ground Floor:	2.25 m	4.01 m ²	2.83 m
	1st Storey:	24.65 m	63.64 m ²	2.32 m

7.0 Living Area	24.07	m ²
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8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	168.4	kJ/m ² K

9.0 External Walls			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type	Construction				
Brick and Block	Cavity Wall	Other	0.25	68.26	6.30	4.15
First Floor	Cavity Wall	Other	0.24	42.22	57.26	48.75

9.1 Party Walls			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)
Description	Type	Construction			
Party Wall 1	Filled Cavity with Edge Sealing	Other	0.00	58.06	21.26
Party Wall 2	Filled Cavity with Edge Sealing	Other	0.00	58.06	20.35

9.2 Internal Walls		Kappa (kJ/m ² K)	Area (m ²)
Description	Construction		
Stud partition	Plasterboard on timber frame	9.00	128.46

10.0 External Roofs

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area (m²)	Nett Area (m²)
Pitched Roof	External Plane Roof	Other	0.10	9.10	63.64	63.64

10.2 Internal Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Ceiling 1	Other	30.00	3.90

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	3.90

11.1 Party Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Precast concrete plank floor (screed laid on rubber), carpeted	70.00	59.74

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	Other	70.00	3.90

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	[2] First Floor	East	None	0.00					2.17	
Side Elevation	Window	[2] First Floor	South	None	0.00					3.34	
Rear Elevation	Window	[2] First Floor	North	None	0.00					3.00	

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

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Source Type	Bridge Type	Length	Psi	Imported	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	0.69	0.077	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.02	0.071	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	4.99	0.064	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.81	0.061	No	Birtley Supatherm
Independently assessed	E3 Sill	7.49	0.021	No	Knauf P5
Independently assessed	E4 Jamb	17.70	0.016	No	Knauf P6
Table K1 - Default	E5 Ground floor (normal)	2.23	0.320	No	
Table K1 - Approved	E7 Party floor between dwellings (in blocks of flats)	22.03	0.070	No	
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	12.77	0.060	No	
Independently assessed	E12 Gable (insulation at ceiling level)	11.80	0.044	No	Knauf P21
Independently assessed	E16 Corner (normal)	9.29	0.039	No	Knauf P23
Independently assessed	E16 Corner (normal)	2.82	0.048	No	Knauf P23
Independently assessed	E18 Party wall between dwellings	2.40	0.026	No	Knauf P25/3
Independently assessed	E18 Party wall between dwellings	2.40	0.040	No	Knauf P25 Halved
Independently assessed	E25 Staggered party wall between dwellings	7.54	0.062	No	Knauf P27 Halved
Table K1 - Default	P1 Party wall - Ground floor	7.54	0.160	No	
Table K1 - Default	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.66	0.000	No	
Independently assessed	P4 Party wall - Roof (insulation at ceiling level)	8.78	0.035	No	Knauf P29 Halved

Y-value	0.055	W/m ² K
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18.0 Pressure Testing	Yes	
Designed AP ₅₀	5.00	m ³ /(h.m ²) @ 50 Pa
Property Tested ?	Yes	
As Built AP ₅₀	3.65	m ³ /(h.m ²) @ 50 Pa

19.0 Mechanical Ventilation	
Summer Overheating	
Windows open in hot weather	Windows half open
Cross ventilation possible	Yes
Night Ventilation	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	1
Manufacturer SFP	0.17
Duct Type	Rigid
Wet Rooms	1

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
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22.0 Lighting

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Internal

Total number of light fittings	15	
Total number of L.E.L. fittings	15	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	Yes
Light and motion sensor	Yes

23.0 Electricity Tariff	Standard
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24.0 Main Heating 1	Database	
Description	Gas Combi	
Percentage of Heat	100	%
Database Ref. No.	17959	
Fuel Type	Mains gas	
Main Heating	BGW	
SAP Code	104	
In Winter	90.2	
In Summer	76.2	
Controls	CBE Programmer, room thermostat and TRVs	
PCDF Controls	0	
Delayed Start Stat	No	
Sap Code	2106	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heat Emitter	Radiators	
Flow Temperature	Normal (> 45°C)	
Combi boiler type	Standard Combi	
Combi keep hot type	None	

25.0 Main Heating 2	None
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Community Heating	None
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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	More Dwellings, One Block
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SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Apportioned kWh/Year

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None