



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 2, Shaw Crescent
West End, Southampton, SO30 3LH

Contact: Tobias Whiting
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Report Issue Date: 11/07/2024

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0943 Plot 29	Issued on Date	11/07/2024
Assessment Reference	As Built	Prop Type Ref	Type F
Property	2, Shaw Crescent, West End, Southampton, SO30 3LH		
SAP Rating	88 B	DER	13.42
Environmental	90 B	TER	18.25
CO ₂ Emissions (t/year)	0.80	% DER<TER	26.48
General Requirements Compliance	Pass	DFEE	45.55
		TFEE	52.66
		% DFEE<TFEE	13.50
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com		Assessor ID
			E477-0001
Client	Foreman Homes, FORE		

SUMMARY FOR INPUT DATA FOR New Build (As Built)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	18.25	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	13.42	kgCO ₂ /m ²	Pass
	-4.83 (-26.5%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	52.66	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	45.55	kWh/m ² /yr	
	-7.1 (-13.5%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.84 (measured in this dwelling)	m ³ /(h.m ²) @ 50 Pa	
Maximum	10.0	m ³ /(h.m ²) @ 50 Pa	Pass

Limiting System Efficiencies

4 Heating efficiency

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

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Main heating system

Boiler system with radiators or underfloor - Mains gas
Data from database
Vaillant ecoFIT sustain 835 VUW 356/6-3 (H-GB)
Combi boiler
Efficiency: 89.3% SEDBUK2009
Minimum: 88.0%

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Programmer, room thermostat and TRVs

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100 %

Minimum

75 %

Pass

8 Mechanical ventilation

Continuous extract system

Specific fan power

0.17

Maximum

0.7

Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Southern England)

Slight

Pass

Based on:

Overshading

Average

Windows facing North

7.82 m², No overhang

Windows facing East

1.91 m², No overhang

Windows facing South

5.80 m², No overhang

Air change rate

4.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

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

Maximum

10.0 m³/(h.m²) @ 50 Pa

Pass

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BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

10 Key features

Party wall U-value	0.00	W/m ² K
Roof U-value	0.10	W/m ² K
Floor U-value	0.12	W/m ² K
Door U-value	1.10	W/m ² K
Air permeability	3.8	m ³ /m ² h
Photovoltaic array	0.74	kW

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THERMAL BRIDGING

Calculation Type: New Build (As Built)

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SAP Rating	88 B	DER	13.42	TER	18.25
Environmental	90 B	% DER<TER	26.48		
CO ₂ Emissions (t/year)	0.80	DFEE	45.55	TFEE	52.66
General Requirements Compliance	Pass	% DFEE<TFEE	13.50		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com	Assessor ID	E477-0001
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Client	Foreman Homes, FORE
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	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.071	2.84	0.20	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.064	8.74	0.56	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.067	1.59	0.11	Birtley Supatherm
External wall	E3 Sill	Independently assessed	0.021	10.55	0.22	Knauf P5
External wall	E4 Jamb	Independently assessed	0.016	29.10	0.47	Knauf P6
External wall	E5 Ground floor (normal)	Table K1 - Default	0.320	20.06	6.42	
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	20.06	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	14.10	0.85	
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.044	6.02	0.26	Knauf P21
External wall	E16 Corner (normal)	Independently assessed	0.039	10.00	0.39	Knauf P23
External wall	E18 Party wall between dwellings	Independently assessed	0.036	10.00	0.36	Knauf P25 Halved
Party wall	P1 Party wall - Ground floor	Table K1 - Default	0.160	6.02	0.96	
Party wall	P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	0.000	6.02	0.00	
Party wall	P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	0.035	6.02	0.21	Knauf P29 Halved

Total: **11.01** W/mK:
Y-Value: **0.060** W/m²K:

FULL SAP CALCULATION PRINTOUT

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

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

DWELLING AS BUILT

Semi-Detached House, total floor area 84 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) 18.25 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 13.42 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 52.7 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 45.6 kWh/m²/yrOK

2 Fabric U-values

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.84 (measured in this dwelling)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from database
Vaillant ecoFIT sustain 835 VUW 356/6-3 (H-GB)
Combi boiler
Efficiency: 89.3% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls: No cylinder

Boiler interlock Yes OK

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system
Specific fan power: 0.17
Maximum 0.7 OK

9 Summertime temperature

Overheating risk (Southern England): Slight OK

Based on:

Overshading: Average
Windows facing North: 7.82 m², No overhang
Windows facing East: 1.91 m², No overhang
Windows facing South: 5.80 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.10 W/m²K
Floor U-value 0.12 W/m²K
Door U-value 1.10 W/m²K
Air permeability 3.8 m³/m²h
Photovoltaic array 0.74 kW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.1800 (1b)	x 2.3900 (2b)	= 100.8102 (1b) - (3b)
First floor	42.1800 (1c)	x 2.6100 (2c)	= 110.0898 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.3600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 210.9000 (5)

2. Ventilation rate

										main	secondary	other	total	m3 per hour			
										heating	heating						
Number of chimneys										0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues										0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans																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																3.8400	
Infiltration rate																0.1920 (18)	
Number of sides sheltered																2 (19)	
Shelter factor										(20) = 1 - [0.075 x (19)] =						0.8500 (20)	
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =						0.1632 (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																	
	0.2081	0.2040	0.1999	0.1795	0.1754	0.1550	0.1550	0.1510	0.1632	0.1754	0.1836	0.1918 (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)			15.5300	1.1450	17.7824		(27)					
Ground Floor			42.1800	0.1200	5.0616	84.0000	3543.1200 (28a)					
Brick and Block	100.3000	17.6800	82.6200	0.2400	19.8288	42.2200	3488.2164 (29a)					
Pitched Roof	42.1800		42.1800	0.1000	4.2180	9.1000	383.8380 (30)					
Total net area of external elements Aum(A, m2)			184.6600				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	49.2558		(33)					
Party Wall 1			29.8900	0.0000	0.0000	110.0000	3287.9000 (32)					
Ground Floor Block			28.5200			75.0000	2139.0000 (32c)					
Ground Floor Stud			47.8900			9.0000	431.0100 (32c)					
First Floor Stud			102.7200			9.0000	924.4800 (32c)					
Internal Floor 1			42.1800			18.0000	759.2400 (32d)					
Internal Ceiling 1			42.1800			18.0000	759.2400 (32e)					
Heat capacity Cm = Sum(A x k)						(28) ... (30) + (32) + (32a) ... (32e) =	15716.0444 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							186.2973 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.0087 (36)					
Total fabric heat loss						(33) + (36) =	60.2645 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 34.7985	Feb 34.7985	Mar 34.7985	Apr 34.7985	May 34.7985	Jun 34.7985	Jul 34.7985	Aug 34.7985	Sep 34.7985	Oct 34.7985	Nov 34.7985	Dec 34.7985 (38)
Heat transfer coeff	95.0630	95.0630	95.0630	95.0630	95.0630	95.0630	95.0630	95.0630	95.0630	95.0630	95.0630	95.0630 (39)
Average = Sum(39)m / 12 =												95.0630 (39)
HLP	Jan 1.1269	Feb 1.1269	Mar 1.1269	Apr 1.1269	May 1.1269	Jun 1.1269	Jul 1.1269	Aug 1.1269	Sep 1.1269	Oct 1.1269	Nov 1.1269	Dec 1.1269 (40)
HLP (average)												1.1269 (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												2.5404 (42)
Average daily hot water use (litres/day)												94.5346 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Daily hot water use	103.9880	100.2066	96.4253	92.6439	88.8625	85.0811	85.0811	88.8625	92.6439	96.4253	100.2066	103.9880 (44)
Energy conte	154.2112	134.8741	139.1780	121.3388	116.4274	100.4680	93.0984	106.8318	108.1077	125.9891	137.5269	149.3454 (45)
Energy content (annual)										Total = Sum (45)m =		1487.3969 (45)
Distribution loss (46)m = 0.15 x (45)m	23.1317	20.2311	20.8767	18.2008	17.4641	15.0702	13.9648	16.0248	16.2162	18.8984	20.6290	22.4018 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.6706	0.6069	0.6039	0.5059	0.4656	0.3847	0.3564	0.4272	0.4507	0.5467	0.6188	0.6494 (61)
Total heat required for water heating calculated for each month	154.8818	135.4810	139.7819	121.8446	116.8930	100.8527	93.4548	107.2590	108.5584	126.5358	138.1458	149.9948 (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	154.8818	135.4810	139.7819	121.8446	116.8930	100.8527	93.4548	107.2590	108.5584	126.5358	138.1458	149.9948 (64)
Heat gains from water heating, kWh/month	51.4429	44.9974	46.4277	40.4716	38.8285	33.5018	31.0443	35.6284	36.0585	42.0280	45.8824	49.8197 (65)
										Total per year (kWh/year) = Sum (64)m =		1493.6837 (64)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.7166	18.4003	14.9641	11.3288	8.4684	7.1494	7.7252	10.0415	13.4776	17.1130	19.9733	21.2924 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.3113	230.6804	224.7102	212.0004	195.9565	180.8775	170.8038	168.4346	174.4048	187.1147	203.1586	218.2376 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020 (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)	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161 (71)
Water heating gains (Table 5)	69.1437	66.9604	62.4028	56.2106	52.1889	46.5303	41.7262	47.8876	50.0812	56.4893	63.7256	66.9619 (72)
Total internal gains	382.2776	380.1471	366.1832	343.6458	320.7198	298.6632	284.3613	290.4697	302.0697	324.8230	350.9635	370.5979 (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				7.8200	10.6334	0.6300	0.7000		0.7700	25.4127 (74)		
East				1.9100	19.6403	0.6300	0.7000		0.7700	11.4644 (76)		
South				5.8000	46.7521	0.6300	0.7000		0.7700	82.8706 (78)		
Solar gains	119.7477	206.7125	292.3417	381.8166	448.1925	454.6863	434.2629	382.7881	322.7737	230.8091	143.8746	102.2209 (83)
Total gains	502.0253	586.8597	658.5248	725.4624	768.9124	753.3495	718.6241	673.2578	624.8434	555.6321	494.8381	472.8188 (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	45.9229	45.9229	45.9229	45.9229	45.9229	45.9229	45.9229	45.9229	45.9229	45.9229	45.9229	45.9229
alpha	4.0615	4.0615	4.0615	4.0615	4.0615	4.0615	4.0615	4.0615	4.0615	4.0615	4.0615	4.0615
util living area	0.9936	0.9873	0.9734	0.9371	0.8541	0.7089	0.5532	0.6051	0.8214	0.9554	0.9883	0.9950 (86)
MIT	19.4741	19.6671	19.9665	20.3407	20.6814	20.8958	20.9709	20.9581	20.8000	20.3584	19.8335	19.4211 (87)
Th 2	19.9789	19.9789	19.9789	19.9789	19.9789	19.9789	19.9789	19.9789	19.9789	19.9789	19.9789	19.9789 (88)
util rest of house	0.9920	0.9841	0.9663	0.9193	0.8117	0.6262	0.4374	0.4892	0.7553	0.9392	0.9848	0.9937 (89)
MIT 2	18.5880	18.7794	19.0750	19.4376	19.7506	19.9234	19.9693	19.9637	19.8571	19.4608	18.9461	18.5352 (90)
Living area fraction									fLA = Living area / (4) =			0.2288 (91)
MIT	18.7907	18.9825	19.2789	19.6442	19.9636	20.1459	20.1985	20.1912	20.0729	19.6662	19.1491	18.7379 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7907	18.9825	19.2789	19.6442	19.9636	20.1459	20.1985	20.1912	20.0729	19.6662	19.1491	18.7379 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	496.7037	575.1092	632.2649	661.8154	623.5332	482.7788	333.0788	346.5849	476.3015	518.4012	485.4059	468.8118 (94)
Ext temp.	4.3000	4.9000	6.5000	8.1000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1377.5315	1338.7226	1214.8028	1021.3757	785.5580	527.2084	342.0816	360.4031	567.7977	861.8555	1145.4231	1382.0120 (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	655.3358	513.1482	433.4082	258.8834	120.5464	0.0000	0.0000	0.0000	0.0000	255.5300	475.2124	679.4209 (98)
Space heating												3391.4854 (98)
Space heating per m2												(98) / (4) = 40.2025 (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												3759.9617 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	655.3358	513.1482	433.4082	258.8834	120.5464	0.0000	0.0000	0.0000	0.0000	255.5300	475.2124	679.4209 (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)	726.5364	568.9005	480.4969	287.0104	133.6435	0.0000	0.0000	0.0000	0.0000	283.2927	526.8430	753.2383 (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	154.8818	135.4810	139.7819	121.8446	116.8930	100.8527	93.4548	107.2590	108.5584	126.5358	138.1458	149.9948 (64)
Efficiency of water heater (217)m	87.1894	86.9206	86.3944	85.2708	82.8340	76.4000	76.4000	76.4000	76.4000	85.1086	86.6739	76.4000 (216)
Fuel for water heating, kWh/month	177.6383	155.8675	161.7951	142.8914	141.1172	132.0061	122.3231	140.3913	142.0921	148.6756	159.3857	171.7233 (219)
Water heating fuel used												1795.9069 (219)
Annual totals kWh/year												
Space heating fuel - main system												3759.9617 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
(MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.2380)												
mechanical ventilation fans (SFP = 0.2380)												61.2369 (230a)
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												136.2369 (231)
Electricity for lighting (calculated in Appendix L)												365.8614 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 0.74 * 1068 * 1.00) =											-632.2977	-632.2977 (233)
Total delivered energy for all uses											5425.6692	5425.6692 (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	3759.9617	0.2160	812.1517 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1795.9069	0.2160	387.9159 (264)
Space and water heating			1200.0676 (265)
Pumps and fans	136.2369	0.5190	70.7070 (267)
Energy for lighting	365.8614	0.5190	189.8821 (268)
Energy saving/generation technologies			
PV Unit	-632.2977	0.5190	-328.1625 (269)
Total CO2, kg/year			1132.4941 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			13.4200 (273)

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

DER		13.4200 ZC1
Total Floor Area	TFA	84.3600
Assumed number of occupants	N	2.5404
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.0375 ZC2
CO2 emissions from cooking, equation (L16)		2.1334 ZC3
Total CO2 emissions		31.5909 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		31.5909 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	42.1800 (1b)	x 2.3900 (2b)	= 100.8102 (1b) - (3b)
First floor	42.1800 (1c)	x 2.6100 (2c)	= 110.0898 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.3600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 210.9000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					30.0000 / (5) = 0.1422 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3922 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3334 (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	0.4251	0.4168	0.4084	0.3668	0.3584	0.3167	0.3167	0.3084	0.3334	0.3584	0.3751	0.3918 (22b)
Effective ac	0.5904	0.5868	0.5834	0.5673	0.5642	0.5502	0.5502	0.5476	0.5556	0.5642	0.5703	0.5767 (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)			15.5300	1.3258	20.5890		(27)
Ground Floor			42.1800	0.1300	5.4834		(28a)
Brick and Block	100.3000	17.6800	82.6200	0.1800	14.8716		(29a)
Pitched Roof	42.1800		42.1800	0.1300	5.4834		(30)
Total net area of external elements Aum(A, m ²)			184.6600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	48.5774		(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)							9.7618 (36)
Total fabric heat loss						(33) + (36) =	58.3392 (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	41.0869	40.8427	40.6033	39.4791	39.2688	38.2896	38.2896	38.1083	38.6668	39.2688	39.6943	40.1392 (38)
Heat transfer coeff	99.4261	99.1819	98.9426	97.8183	97.6080	96.6288	96.6288	96.4475	97.0060	97.6080	98.0335	98.4784 (39)
Average = Sum(39)m / 12 =												97.8173 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1786	1.1757	1.1729	1.1595	1.1570	1.1454	1.1454	1.1433	1.1499	1.1570	1.1621	1.1674 (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												2.5404 (42)
Average daily hot water use (litres/day)												94.5346 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	103.9880	100.2066	96.4253	92.6439	88.8625	85.0811	85.0811	88.8625	92.6439	96.4253	100.2066	103.9880 (44)
Energy conte	154.2112	134.8741	139.1780	121.3388	116.4274	100.4680	93.0984	106.8318	108.1077	125.9891	137.5269	149.3454 (45)
Energy content (annual)										Total = Sum(45)m =		1487.3969 (45)
Distribution loss (46)m = 0.15 x (45)m	23.1317	20.2311	20.8767	18.2008	17.4641	15.0702	13.9648	16.0248	16.2162	18.8984	20.6290	22.4018 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Total heat required for water heating calculated for each month	50.9589	46.0274	49.1373	45.6874	45.2834	41.9578	43.3564	45.2834	45.6874	49.1373	49.3151	50.9589 (61)
Solar input	205.1701	180.9015	188.3153	167.0262	161.7108	142.4258	136.4548	152.1151	153.7951	175.1263	186.8420	200.3043 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	205.1701	180.9015	188.3153	167.0262	161.7108	142.4258	136.4548	152.1151	153.7951	175.1263	186.8420	200.3043 (64)
	64.0150	56.3525	58.5610	51.7670	50.0330	43.8951	41.7943	46.8424	47.3677	54.1757	58.0565	62.3971 (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	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.7166	18.4003	14.9641	11.3288	8.4684	7.1494	7.7252	10.0415	13.4776	17.1130	19.9733	21.2924	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.3113	230.6804	224.7102	212.0004	195.9565	180.8775	170.8038	168.4346	174.4048	187.1147	203.1586	218.2376	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020	(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)	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	(71)
Water heating gains (Table 5)	86.0416	83.8579	78.7110	71.8986	67.2486	60.9654	56.1752	62.9602	65.7884	72.8168	80.6340	83.8670	(72)
Total internal gains	399.1755	397.0446	382.4914	359.3338	335.7796	313.0983	298.8102	305.5424	317.7769	341.1505	367.8720	387.5030	(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				7.8200	10.6334	0.6300	0.7000	0.7700		25.4127 (74)		
East				1.9100	19.6403	0.6300	0.7000	0.7700		11.4644 (76)		
South				5.8000	46.7521	0.6300	0.7000	0.7700		82.8706 (78)		

Solar gains	119.7477	206.7125	292.3417	381.8166	448.1925	454.6863	434.2629	382.7881	322.7737	230.8091	143.8746	102.2209 (83)
Total gains	518.9233	603.7572	674.8331	741.1504	783.9721	767.7846	733.0730	688.3305	640.5506	571.9596	511.7465	489.7239 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.9215	59.0665	59.2094	59.8899	60.0190	60.6272	60.6272	60.7412	60.3915	60.0190	59.7585	59.4885	
alpha	4.9281	4.9378	4.9473	4.9927	5.0013	5.0418	5.0418	5.0494	5.0261	5.0013	4.9839	4.9659	
util living area	0.9978	0.9949	0.9872	0.9616	0.8881	0.7333	0.5637	0.6177	0.8518	0.9744	0.9952	0.9983	(86)
MIT	19.7345	19.8962	20.1480	20.4766	20.7648	20.9383	20.9867	20.9794	20.8623	20.4910	20.0521	19.7065	(87)
Th 2	19.9372	19.9395	19.9418	19.9525	19.9545	19.9639	19.9639	19.9656	19.9603	19.9545	19.9505	19.9462	(88)
util rest of house	0.9970	0.9931	0.9825	0.9467	0.8446	0.6417	0.4393	0.4920	0.7806	0.9617	0.9933	0.9978	(89)
MIT 2	18.2544	18.4917	18.8588	19.3348	19.7207	19.9221	19.9590	19.9571	19.8487	19.3633	18.7279	18.2200	(90)
Living area fraction	18.5930	18.8131	19.1538	19.5960	19.9595	20.1546	20.1941	20.1910	20.0806	19.6213	19.0308	18.5601	(91)
MIT	18.5930	18.8131	19.1538	19.5960	19.9595	20.1546	20.1941	20.1910	20.0806	19.6213	19.0308	18.5601	(92)
Temperature adjustment	18.5930	18.8131	19.1538	19.5960	19.9595	20.1546	20.1941	20.1910	20.0806	19.6213	19.0308	18.5601	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9956	0.9904	0.9778	0.9403	0.8448	0.6600	0.4679	0.5207	0.7902	0.9562	0.9908	0.9966	(94)
Ext temp.	516.6180	597.9821	659.8310	696.8949	662.2968	506.7159	343.0202	358.4465	506.1628	546.9160	507.0358	488.0678	(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	1421.1020	1379.9231	1251.9955	1046.2687	806.1977	536.7328	347.2945	365.6285	580.1514	880.5527	1169.6193	1414.1550	(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	672.9361	525.4644	440.5704	251.5492	107.0623	0.0000	0.0000	0.0000	0.0000	248.2257	477.0601	689.0089	(98)
Space heating per m2												3411.8770	(98)
												40.4443	(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												3652.9733 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	672.9361	525.4644	440.5704	251.5492	107.0623	0.0000	0.0000	0.0000	0.0000	248.2257	477.0601	689.0089 (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)	720.4884	562.5957	471.7027	269.3246	114.6278	0.0000	0.0000	0.0000	0.0000	265.7663	510.7710	737.6969 (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	205.1701	180.9015	188.3153	167.0262	161.7108	142.4258	136.4548	152.1151	153.7951	175.1263	186.8420	200.3043 (64)
Efficiency of water heater (217)m	87.8192	87.5789	87.1188	86.0797	84.0402	80.3000	80.3000	80.3000	80.3000	85.9291	87.3094	80.3000 (216)
Fuel for water heating, kWh/month	233.6280	206.5583	216.1592	194.0367	192.4209	177.3672	169.9313	189.4335	191.5256	203.8033	213.9998	227.8527 (219)
Water heating fuel used												2416.7165 (219)
Annual totals kWh/year												
Space heating fuel - main system												3652.9733 (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)												365.8614 (232)
Total delivered energy for all uses												6510.5512 (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	3652.9733	0.2160	789.0422 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2416.7165	0.2160	522.0108 (264)
Space and water heating			1311.0530 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	365.8614	0.5190	189.8821 (268)
Total CO2, kg/m2/year			1539.8601 (272)
Emissions per m2 for space and water heating			15.5412 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.2509 (272b)
Emissions per m2 for pumps and fans			0.4614 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.5412 * 1.00) + 2.2509 + 0.4614, rounded to 2 d.p.			18.2500 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.1800 (1b)	x 2.3900 (2b)	= 100.8102 (1b) - (3b)
First floor	42.1800 (1c)	x 2.6100 (2c)	= 110.0898 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.3600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 210.9000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1422 (8)
Pressure test					Yes
Measured/design AP50					3.8400
Infiltration rate					0.3342 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.2841 (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	0.3622	0.3551	0.3480	0.3125	0.3054	0.2699	0.2699	0.2628	0.2841	0.3054	0.3196	0.3338 (22b)
Effective ac	0.5656	0.5631	0.5606	0.5488	0.5466	0.5364	0.5364	0.5345	0.5404	0.5466	0.5511	0.5557 (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)			15.5300	1.1450	17.7824		(27)
Ground Floor			42.1800	0.1200	5.0616	84.0000	3543.1200 (28a)
Brick and Block	100.3000	17.6800	82.6200	0.2400	19.8288	42.2200	3488.2164 (29a)
Pitched Roof	42.1800		42.1800	0.1000	4.2180	9.1000	383.8380 (30)
Total net area of external elements Aum(A, m ²)			184.6600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	49.2558		(33)
Party Wall 1			29.8900	0.0000	0.0000	110.0000	3287.9000 (32)
Ground Floor Block			28.5200			75.0000	2139.0000 (32c)
Ground Floor Stud			47.8900			9.0000	431.0100 (32c)
First Floor Stud			102.7200			9.0000	924.4800 (32c)
Internal Floor 1			42.1800			18.0000	759.2400 (32d)
Internal Ceiling 1			42.1800			9.0000	379.6200 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 15336.4244 (34)
181.7973 (35)
11.0087 (36)
(33) + (36) = 60.2645 (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	39.3647	39.1874	39.0136	38.1973	38.0445	37.3335	37.3335	37.2019	37.6074	38.0445	38.3535	38.6765 (38)
Heat transfer coeff	99.6292	99.4519	99.2781	98.4618	98.3090	97.5980	97.5980	97.4664	97.8719	98.3090	98.6180	98.9410 (39)
Average = Sum(39)m / 12 =												98.4610 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1810	1.1789	1.1768	1.1672	1.1654	1.1569	1.1569	1.1554	1.1602	1.1654	1.1690	1.1728 (40)
HLP (average)												1.1672 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy
Average daily hot water use (litres/day)
2.5404 (42)
94.5346 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	103.9880	100.2066	96.4253	92.6439	88.8625	85.0811	85.0811	88.8625	92.6439	96.4253	100.2066	103.9880 (44)
Energy conte	154.2112	134.8741	139.1780	121.3388	116.4274	100.4680	93.0984	106.8318	108.1077	125.9891	137.5269	149.3454 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Energy content (annual)	Total = Sum(45)m = 1487.3969 (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	32.7699	28.6608	29.5753	25.7845	24.7408	21.3495	19.7834	22.7018	22.9729	26.7727	29.2245	31.7359 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.7166	18.4003	14.9641	11.3288	8.4684	7.1494	7.7252	10.0415	13.4776	17.1130	19.9733	21.2924	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.3113	230.6804	224.7102	212.0004	195.9565	180.8775	170.8038	168.4346	174.4048	187.1147	203.1586	218.2376	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020	(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)	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	(71)
Water heating gains (Table 5)	44.0455	42.6499	39.7518	35.8118	33.2538	29.6520	26.5906	30.5131	31.9068	35.9848	40.5895	42.6558	(72)
Total internal gains	354.1795	352.8367	340.5322	320.2470	298.7848	278.7849	266.2256	270.0953	280.8953	301.3185	324.8275	343.2917	(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				7.8200	10.6334	0.6300	0.7000			0.7700			25.4127 (74)
East				1.9100	19.6403	0.6300	0.7000			0.7700			11.4644 (76)
South				5.8000	46.7521	0.6300	0.7000			0.7700			82.8706 (78)
Solar gains	119.7477	206.7125	292.3417	381.8166	448.1925	454.6863	434.2629	382.7881	322.7737	230.8091	143.8746	102.2209	(83)
Total gains	473.9272	559.5492	632.8738	702.0636	746.9773	733.4713	700.4885	652.8833	603.6690	532.1276	468.7021	445.5126	(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	42.7597	42.8360	42.9110	43.2667	43.3339	43.6496	43.6496	43.7086	43.5275	43.3339	43.1982	43.0571	
alpha	3.8506	3.8557	3.8607	3.8844	3.8889	3.9100	3.9100	3.9139	3.9018	3.8889	3.8799	3.8705	
util living area	0.9943	0.9886	0.9761	0.9431	0.8672	0.7280	0.5745	0.6280	0.8380	0.9605	0.9897	0.9955	(86)
MIT	19.3194	19.5224	19.8408	20.2517	20.6230	20.8715	20.9618	20.9457	20.7601	20.2769	19.7184	19.2793	(87)
Th 2	19.9352	19.9369	19.9386	19.9464	19.9478	19.9546	19.9546	19.9559	19.9520	19.9478	19.9449	19.9418	(88)
util rest of house	0.9929	0.9857	0.9697	0.9266	0.8267	0.6454	0.4544	0.5090	0.7746	0.9460	0.9866	0.9944	(89)
MIT 2	18.4031	18.6061	18.9223	19.3284	19.6744	19.8848	19.9417	19.9356	19.8031	19.3600	18.8082	18.3682	(90)
Living area fraction	18.6127	18.8157	19.1324	19.5396	19.8915	20.1106	20.1751	20.1667	20.0220	19.5698	19.0165	18.5767	(91)
MIT	18.6127	18.8157	19.1324	19.5396	19.8915	20.1106	20.1751	20.1667	20.0220	19.5698	19.0165	18.5767	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6127	18.8157	19.1324	19.5396	19.8915	20.1106	20.1751	20.1667	20.0220	19.5698	19.0165	18.5767	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	469.3542	549.2726	609.6764	645.0754	615.6749	483.2873	337.0531	349.1867	470.5545	499.7944	460.6494	442.0785	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1425.9667	1383.9475	1254.1207	1047.5970	805.2947	537.8206	348.9187	367.1292	579.5993	881.8104	1175.1784	1422.4412	(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	711.7196	560.9015	479.4666	289.8155	141.0771	0.0000	0.0000	0.0000	0.0000	284.2199	514.4609	729.3898	(98)
Space heating												3711.0510	(98)
Space heating per m2												43.9906	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	917.4214	722.2254	740.7443	0.0000	0.0000	0.0000	0.0000	(100)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8110	0.8774	0.8505	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	744.0368	633.7143	629.9986	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	952.5343	912.0054	858.0173	0.0000	0.0000	0.0000	0.0000 (103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	150.1182	207.0486	169.6459	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												526.8127 (104)
Cooled fraction									FC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)												
Intermittency factor	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	37.5296	51.7622	42.4115	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												131.7032 (107)
Space cooling per m2												1.5612 (108)
Energy for space heating												43.9906 (99)
Energy for space cooling												1.5612 (108)
Total												45.5519 (109)
Dwelling Fabric Energy Efficiency (DFEE)												45.6 (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	42.1800 (1b)	x 2.3900 (2b)	= 100.8102 (1b) - (3b)
First floor	42.1800 (1c)	x 2.6100 (2c)	= 110.0898 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.3600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 210.9000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					30.0000 / (5) = 0.1422 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3922 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3334 (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	0.4251	0.4168	0.4084	0.3668	0.3584	0.3167	0.3167	0.3084	0.3334	0.3584	0.3751	0.3918 (22b)
Effective ac	0.5904	0.5868	0.5834	0.5673	0.5642	0.5502	0.5502	0.5476	0.5556	0.5642	0.5703	0.5767 (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)			15.5300	1.3258	20.5890		(27)
Ground Floor			42.1800	0.1300	5.4834		(28a)
Brick and Block	100.3000	17.6800	82.6200	0.1800	14.8716		(29a)
Pitched Roof	42.1800		42.1800	0.1300	5.4834		(30)
Total net area of external elements Aum(A, m ²)			184.6600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	48.5774		(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)							9.7618 (36)
Total fabric heat loss						(33) + (36) =	58.3392 (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	41.0869	40.8427	40.6033	39.4791	39.2688	38.2896	38.2896	38.1083	38.6668	39.2688	39.6943	40.1392 (38)
Heat transfer coeff	99.4261	99.1819	98.9426	97.8183	97.6080	96.6288	96.6288	96.4475	97.0060	97.6080	98.0335	98.4784 (39)
Average = Sum(39)m / 12 =												97.8173 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1786	1.1757	1.1729	1.1595	1.1570	1.1454	1.1454	1.1433	1.1499	1.1570	1.1621	1.1674 (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												2.5404 (42)
Average daily hot water use (litres/day)												94.5346 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	103.9880	100.2066	96.4253	92.6439	88.8625	85.0811	85.0811	88.8625	92.6439	96.4253	100.2066	103.9880 (44)
Energy conte	154.2112	134.8741	139.1780	121.3388	116.4274	100.4680	93.0984	106.8318	108.1077	125.9891	137.5269	149.3454 (45)
Energy content (annual)										Total = Sum(45)m =		1487.3969 (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												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
	32.7699	28.6608	29.5753	25.7845	24.7408	21.3495	19.7834	22.7018	22.9729	26.7727	29.2245	31.7359 (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	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.7166	18.4003	14.9641	11.3288	8.4684	7.1494	7.7252	10.0415	13.4776	17.1130	19.9733	21.2924 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.3113	230.6804	224.7102	212.0004	195.9565	180.8775	170.8038	168.4346	174.4048	187.1147	203.1586	218.2376 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020 (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)	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161 (71)
Water heating gains (Table 5)	44.0455	42.6499	39.7518	35.8118	33.2538	29.6520	26.5906	30.5131	31.9068	35.9848	40.5895	42.6558 (72)
Total internal gains	354.1795	352.8367	340.5322	320.2470	298.7848	278.7849	266.2256	270.0953	280.8953	301.3185	324.8275	343.2917 (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				7.8200	10.6334	0.6300	0.7000		0.7700			25.4127 (74)
East				1.9100	19.6403	0.6300	0.7000		0.7700			11.4644 (76)
South				5.8000	46.7521	0.6300	0.7000		0.7700			82.8706 (78)

Solar gains	119.7477	206.7125	292.3417	381.8166	448.1925	454.6863	434.2629	382.7881	322.7737	230.8091	143.8746	102.2209 (83)
Total gains	473.9272	559.5492	632.8738	702.0636	746.9773	733.4713	700.4885	652.8833	603.6690	532.1276	468.7021	445.5126 (84)

7. Mean internal temperature (heating season)												

Temperature during heating periods in the living area from Table 9, Thl (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	58.9215	59.0665	59.2094	59.8899	60.0190	60.6272	60.6272	60.7412	60.3915	60.0190	59.7585	59.4885
alpha	4.9281	4.9378	4.9473	4.9927	5.0013	5.0418	5.0418	5.0494	5.0261	5.0013	4.9839	4.9659
util living area	0.9985	0.9963	0.9902	0.9686	0.9031	0.7562	0.5867	0.6453	0.8740	0.9808	0.9968	0.9989 (86)
MIT	19.6852	19.8483	20.1042	20.4404	20.7408	20.9289	20.9842	20.9751	20.8422	20.4516	20.0053	19.6578 (87)
Th 2	19.9372	19.9395	19.9418	19.9525	19.9545	19.9639	19.9639	19.9656	19.9603	19.9545	19.9505	19.9462 (88)
util rest of house	0.9980	0.9951	0.9865	0.9561	0.8632	0.6656	0.4588	0.5167	0.8080	0.9708	0.9954	0.9985 (89)
MIT 2	18.7391	18.9036	19.1595	19.4970	19.7756	19.9304	19.9598	19.9584	19.8704	19.5137	19.0693	18.7190 (90)
Living area fraction									fLA = Living area / (4) =			0.2288 (91)
MIT	18.9555	19.1197	19.3756	19.7128	19.9964	20.1588	20.1942	20.1910	20.0928	19.7283	19.2835	18.9338 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9555	19.1197	19.3756	19.7128	19.9964	20.1588	20.1942	20.1910	20.0928	19.7283	19.2835	18.9338 (93)

8. Space heating requirement												

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9973	0.9937	0.9840	0.9525	0.8651	0.6843	0.4884	0.5464	0.8179	0.9680	0.9942	0.9980 (94)
Ext temp.	472.6638	556.0199	622.7174	668.6933	646.2277	501.8804	342.1323	356.7520	493.7682	515.0804	466.0018	444.6347 (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	1457.1440	1410.3388	1273.9470	1057.6897	809.7998	537.1418	347.3013	365.6292	581.3343	890.9932	1194.3871	1450.9614 (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	732.4533	574.1023	484.5148	280.0774	121.6976	0.0000	0.0000	0.0000	0.0000	279.6791	524.4375	748.7070 (98)
Space heating per m2												3745.6690 (98)
										(98) / (4) =		44.4010 (99)

8c. Space cooling requirement												

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	908.3111	715.0535	733.0011	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8537	0.9178	0.8929	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	775.3974	656.2411	654.5006	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	952.5343	912.0054	858.0173	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	127.5386	190.2887	151.4164	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												469.2437 (104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Cooled fraction											FC = cooled area / (4) =	1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	31.8847	47.5722	37.8541	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												117.3109 (107)
Space cooling per m2												1.3906 (108)
Energy for space heating												44.4010 (99)
Energy for space cooling												1.3906 (108)
Total												45.7916 (109)
Target Fabric Energy Efficiency (TFEE)												52.7 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.1800 (1b)	x 2.3900 (2b)	= 100.8102 (1b) - (3b)
First floor	42.1800 (1c)	x 2.6100 (2c)	= 110.0898 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.3600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 210.9000 (5)

2. Ventilation rate

					main heating	+	secondary heating	+	other	=	total	m3 per hour
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											0 * 10 =	0.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =										0.0000 / (5) =	0.0000 (8)
Pressure test											Yes	
Measured/design AP50												3.8400
Infiltration rate												0.1920 (18)
Number of sides sheltered												2 (19)
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.1632 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)
Adj infilt rate												
	0.1918	0.1795	0.1795	0.1632	0.1673	0.1591	0.1591	0.1550	0.1550	0.1673	0.1632	0.1673 (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)			15.5300	1.1450	17.7824		(27)					
Ground Floor			42.1800	0.1200	5.0616	84.0000	3543.1200 (28a)					
Brick and Block	100.3000	17.6800	82.6200	0.2400	19.8288	42.2200	3488.2164 (29a)					
Pitched Roof	42.1800		42.1800	0.1000	4.2180	9.1000	383.8380 (30)					
Total net area of external elements Aum(A, m2)			184.6600				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =	49.2558			(33)					
Party Wall 1			29.8900	0.0000	0.0000	110.0000	3287.9000 (32)					
Ground Floor Block			28.5200			75.0000	2139.0000 (32c)					
Ground Floor Stud			47.8900			9.0000	431.0100 (32c)					
First Floor Stud			102.7200			9.0000	924.4800 (32c)					
Internal Floor 1			42.1800			18.0000	759.2400 (32d)					
Internal Ceiling 1			42.1800			18.0000	759.2400 (32e)					
Heat capacity Cm = Sum(A x k)					(28) ... (30) + (32) + (32a) ... (32e) =	15716.0444	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							186.2973 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.0087 (36)					
Total fabric heat loss						(33) + (36) =	60.2645 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 34.7985	Feb 34.7985	Mar 34.7985	Apr 34.7985	May 34.7985	Jun 34.7985	Jul 34.7985	Aug 34.7985	Sep 34.7985	Oct 34.7985	Nov 34.7985	Dec 34.7985 (38)
Heat transfer coeff	95.0630	95.0630	95.0630	95.0630	95.0630	95.0630	95.0630	95.0630	95.0630	95.0630	95.0630	95.0630 (39)
Average = Sum(39)m / 12 =												95.0630 (39)
HLP	Jan 1.1269	Feb 1.1269	Mar 1.1269	Apr 1.1269	May 1.1269	Jun 1.1269	Jul 1.1269	Aug 1.1269	Sep 1.1269	Oct 1.1269	Nov 1.1269	Dec 1.1269 (40)
HLP (average)												1.1269 (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												2.5404 (42)
Average daily hot water use (litres/day)												94.5346 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Daily hot water use	103.9880	100.2066	96.4253	92.6439	88.8625	85.0811	85.0811	88.8625	92.6439	96.4253	100.2066	103.9880 (44)
Energy conte	154.2112	134.8741	139.1780	121.3388	116.4274	100.4680	93.0984	106.8318	108.1077	125.9891	137.5269	149.3454 (45)
Energy content (annual)										Total =	Sum(45)m =	1487.3969 (45)
Distribution loss (46)m = 0.15 x (45)m	23.1317	20.2311	20.8767	18.2008	17.4641	15.0702	13.9648	16.0248	16.2162	18.8984	20.6290	22.4018 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.6706	0.6069	0.6039	0.5059	0.4656	0.3847	0.3564	0.4272	0.4507	0.5467	0.6188	0.6494 (61)
Total heat required for water heating calculated for each month	154.8818	135.4810	139.7819	121.8446	116.8930	100.8527	93.4548	107.2590	108.5584	126.5358	138.1458	149.9948 (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	154.8818	135.4810	139.7819	121.8446	116.8930	100.8527	93.4548	107.2590	108.5584	126.5358	138.1458	149.9948 (64)
RHI water heating demand												1494 (64)
Heat gains from water heating, kWh/month	51.4429	44.9974	46.4277	40.4716	38.8285	33.5018	31.0443	35.6284	36.0585	42.0280	45.8824	49.8197 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	51.7915	46.0007	37.4103	28.3220	21.1710	17.8735	19.3129	25.1037	33.6941	42.7824	49.9334	53.2309 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	340.7631	344.2991	335.3884	316.4185	292.4724	269.9664	254.9310	251.3950	260.3057	279.2756	303.2217	325.7277 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828 (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)	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161 (71)
Water heating gains (Table 5)	69.1437	66.9604	62.4028	56.2106	52.1889	46.5303	41.7262	47.8876	50.0812	56.4893	63.7256	66.9619 (72)
Total internal gains	568.2891	563.8511	541.7924	507.5419	472.4231	440.9610	422.5611	430.9771	450.6719	485.1382	523.4716	552.5115 (73)

6. Solar gains

[Jan]				Area	Solar flux	g		FF	Access		Gains	
				m2	Table 6a	Specific data		Specific data	factor		W	
					W/m2	or Table 6b		or Table 6c	Table 6d			
North				7.8200	13.4684	0.6300		0.7000	0.7700		32.1881 (74)	
East				1.9100	25.1733	0.6300		0.7000	0.7700		14.6942 (76)	
South				5.8000	56.5862	0.6300		0.7000	0.7700		100.3022 (78)	

Solar gains	147.1844	216.7546	313.9316	415.1272	461.2839	518.8861	475.7477	435.6293	364.0458	261.6359	176.3533	118.8902 (83)
Total gains	715.4735	780.6057	855.7240	922.6691	933.7071	959.8471	898.3088	866.6064	814.7177	746.7741	699.8248	671.4017 (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	45.9229	45.9229	45.9229	45.9229	45.9229	45.9229	45.9229	45.9229	45.9229	45.9229	45.9229	45.9229
alpha	4.0615	4.0615	4.0615	4.0615	4.0615	4.0615	4.0615	4.0615	4.0615	4.0615	4.0615	4.0615
util living area	0.9713	0.9589	0.9247	0.8460	0.7070	0.4890	0.3460	0.3478	0.6079	0.8491	0.9474	0.9762 (86)
MIT	19.9222	20.0506	20.3237	20.6418	20.8727	20.9783	20.9960	20.9960	20.9481	20.7029	20.2771	19.8802 (87)
Th 2	19.9789	19.9789	19.9789	19.9789	19.9789	19.9789	19.9789	19.9789	19.9789	19.9789	19.9789	19.9789 (88)
util rest of house	0.9643	0.9490	0.9066	0.8095	0.6412	0.3979	0.2406	0.2385	0.5139	0.8036	0.9323	0.9702 (89)
MIT 2	19.0301	19.1548	19.4169	19.7095	19.9015	19.9707	19.9782	19.9783	19.9557	19.7703	19.3773	18.9895 (90)
Living area fraction	19.2342	19.3597	19.6244	19.9228	20.1237	20.2012	20.2111	20.2111	20.1827	19.9837	19.5832	19.1932 (91)
MIT	19.2342	19.3597	19.6244	19.9228	20.1237	20.2012	20.2111	20.2111	20.1827	19.9837	19.5832	19.1932 (93)
Temperature adjustment												0.0000
adjusted MIT	19.2342	19.3597	19.6244	19.9228	20.1237	20.2012	20.2111	20.2111	20.1827	19.9837	19.5832	19.1932 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	685.2883	735.0622	769.4204	744.7841	608.0399	401.4551	237.9040	228.4481	434.8236	600.3025	647.4729	647.4162 (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	1296.1117	1270.0136	1143.0750	933.7843	667.6959	408.8879	238.7105	229.2093	454.6607	749.4450	1044.0956	1282.7085 (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	454.4526	359.4873	277.9990	136.0802	44.3841	0.0000	0.0000	0.0000	0.0000	110.9620	285.5683	472.6574 (98)
Space heating												2141.5909 (98)
RHI space heating demand												2142 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.1800 (1b)	x 2.3900 (2b)	= 100.8102 (1b) - (3b)
First floor	42.1800 (1c)	x 2.6100 (2c)	= 110.0898 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.3600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 210.9000 (5)

2. Ventilation rate

										main	secondary	other	total	m3 per hour							
										heating	heating										
Number of chimneys										0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues										0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans																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																3.8400					
Infiltration rate																0.1920 (18)					
Number of sides sheltered																2 (19)					
Shelter factor										(20) = 1 - [0.075 x (19)] =						0.8500 (20)					
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =						0.1632 (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	0.2081	0.2040	0.1999	0.1795	0.1754	0.1550	0.1550	0.1510	0.1632	0.1754	0.1836	0.1918 (22b)									
Mechanical extract ventilation - centralised																					
If mechanical ventilation:																					
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)			15.5300	1.1450	17.7824		(27)					
Ground Floor			42.1800	0.1200	5.0616	84.0000	3543.1200 (28a)					
Brick and Block	100.3000	17.6800	82.6200	0.2400	19.8288	42.2200	3488.2164 (29a)					
Pitched Roof	42.1800		42.1800	0.1000	4.2180	9.1000	383.8380 (30)					
Total net area of external elements Aum(A, m2)			184.6600				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =	49.2558			(33)					
Party Wall 1			29.8900	0.0000	0.0000	110.0000	3287.9000 (32)					
Ground Floor Block			28.5200			75.0000	2139.0000 (32c)					
Ground Floor Stud			47.8900			9.0000	431.0100 (32c)					
First Floor Stud			102.7200			9.0000	924.4800 (32c)					
Internal Floor 1			42.1800			18.0000	759.2400 (32d)					
Internal Ceiling 1			42.1800			18.0000	759.2400 (32e)					
Heat capacity Cm = Sum(A x k)					(28) ... (30) + (32) + (32a) ... (32e) =		15716.0444 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							186.2973 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.0087 (36)					
Total fabric heat loss						(33) + (36) =	60.2645 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 34.7985	Feb 34.7985	Mar 34.7985	Apr 34.7985	May 34.7985	Jun 34.7985	Jul 34.7985	Aug 34.7985	Sep 34.7985	Oct 34.7985	Nov 34.7985	Dec 34.7985 (38)
Heat transfer coeff	95.0630	95.0630	95.0630	95.0630	95.0630	95.0630	95.0630	95.0630	95.0630	95.0630	95.0630	95.0630 (39)
Average = Sum(39)m / 12 =												95.0630 (39)
HLP	Jan 1.1269	Feb 1.1269	Mar 1.1269	Apr 1.1269	May 1.1269	Jun 1.1269	Jul 1.1269	Aug 1.1269	Sep 1.1269	Oct 1.1269	Nov 1.1269	Dec 1.1269 (40)
HLP (average)												1.1269 (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												2.5404 (42)
Average daily hot water use (litres/day)												94.5346 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Daily hot water use	103.9880	100.2066	96.4253	92.6439	88.8625	85.0811	85.0811	88.8625	92.6439	96.4253	100.2066	103.9880 (44)
Energy conte	154.2112	134.8741	139.1780	121.3388	116.4274	100.4680	93.0984	106.8318	108.1077	125.9891	137.5269	149.3454 (45)
Energy content (annual)										Total = Sum (45)m =		1487.3969 (45)
Distribution loss (46)m = 0.15 x (45)m	23.1317	20.2311	20.8767	18.2008	17.4641	15.0702	13.9648	16.0248	16.2162	18.8984	20.6290	22.4018 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.6706	0.6069	0.6039	0.5059	0.4656	0.3847	0.3564	0.4272	0.4507	0.5467	0.6188	0.6494 (61)
Total heat required for water heating calculated for each month	154.8818	135.4810	139.7819	121.8446	116.8930	100.8527	93.4548	107.2590	108.5584	126.5358	138.1458	149.9948 (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	154.8818	135.4810	139.7819	121.8446	116.8930	100.8527	93.4548	107.2590	108.5584	126.5358	138.1458	149.9948 (64)
Heat gains from water heating, kWh/month	51.4429	44.9974	46.4277	40.4716	38.8285	33.5018	31.0443	35.6284	36.0585	42.0280	45.8824	49.8197 (65)
										Total per year (kWh/year) = Sum (64)m =		1493.6837 (64)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	51.7915	46.0007	37.4103	28.3220	21.1710	17.8735	19.3129	25.1037	33.6941	42.7824	49.9334	53.2309 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	340.7631	344.2991	335.3884	316.4185	292.4724	269.9664	254.9310	251.3950	260.3057	279.2756	303.2217	325.7277 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828 (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)	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161 (71)
Water heating gains (Table 5)	69.1437	66.9604	62.4028	56.2106	52.1889	46.5303	41.7262	47.8876	50.0812	56.4893	63.7256	66.9619 (72)
Total internal gains	568.2891	563.8511	541.7924	507.5419	472.4231	440.9610	422.5611	430.9771	450.6719	485.1382	523.4716	552.5115 (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				7.8200	10.6334	0.6300	0.7000		0.7700	25.4127 (74)		
East				1.9100	19.6403	0.6300	0.7000		0.7700	11.4644 (76)		
South				5.8000	46.7521	0.6300	0.7000		0.7700	82.8706 (78)		
Solar gains	119.7477	206.7125	292.3417	381.8166	448.1925	454.6863	434.2629	382.7881	322.7737	230.8091	143.8746	102.2209 (83)
Total gains	688.0368	770.5636	834.1340	889.3585	920.6157	895.6473	856.8240	813.7652	773.4456	715.9473	667.3461	654.7324 (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	45.9229	45.9229	45.9229	45.9229	45.9229	45.9229	45.9229	45.9229	45.9229	45.9229	45.9229	45.9229
alpha	4.0615	4.0615	4.0615	4.0615	4.0615	4.0615	4.0615	4.0615	4.0615	4.0615	4.0615	4.0615
util living area	0.9807	0.9684	0.9443	0.8904	0.7859	0.6265	0.4742	0.5165	0.7314	0.9076	0.9681	0.9840 (86)
MIT	19.7208	19.9008	20.1721	20.4977	20.7749	20.9338	20.9833	20.9762	20.8736	20.5251	20.0536	19.6647 (87)
Th 2	19.9789	19.9789	19.9789	19.9789	19.9789	19.9789	19.9789	19.9789	19.9789	19.9789	19.9789	19.9789 (88)
util rest of house	0.9762	0.9612	0.9311	0.8639	0.7351	0.5442	0.3705	0.4110	0.6562	0.8795	0.9594	0.9803 (89)
MIT 2	18.8314	19.0080	19.2716	19.5797	19.8244	19.9454	19.9737	19.9708	19.9070	19.6119	19.1604	18.7762 (90)
Living area fraction									fLA = Living area / (4) =			0.2288 (91)
MIT	19.0349	19.2122	19.4776	19.7897	20.0418	20.1715	20.2046	20.2008	20.1281	19.8208	19.3648	18.9795 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0349	19.2122	19.4776	19.7897	20.0418	20.1715	20.2046	20.2008	20.1281	19.8208	19.3648	18.9795 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9709	0.9543	0.9234	0.8582	0.7385	0.5606	0.3941	0.4347	0.6682	0.8744	0.9529	0.9755 (94)
Ext temp.	667.9812	735.3866	770.2006	763.2791	679.8861	502.0914	337.6484	353.7673	516.7994	625.9951	635.8828	638.6640 (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	1400.7393	1360.5644	1233.6935	1035.2075	793.0004	529.6476	342.6688	361.3185	573.0522	876.5566	1165.9246	1404.9817 (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	545.1721	420.1195	344.8388	195.7884	84.1570	0.0000	0.0000	0.0000	0.0000	186.4178	381.6301	570.1404 (98)
Space heating per m2												2728.2640 (98)
										(98) / (4) =		32.3407 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3024.6829 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	545.1721	420.1195	344.8388	195.7884	84.1570	0.0000	0.0000	0.0000	0.0000	186.4178	381.6301	570.1404	(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)	604.4036	465.7644	382.3046	217.0603	93.3005	0.0000	0.0000	0.0000	0.0000	206.6716	423.0932	632.0846	(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	154.8818	135.4810	139.7819	121.8446	116.8930	100.8527	93.4548	107.2590	108.5584	126.5358	138.1458	149.9948	(64)
Efficiency of water heater (217)m	86.7339	86.3947	85.7333	84.3551	81.6275	76.4000	76.4000	76.4000	76.4000	84.0608	86.0681	76.4000	(216)
Fuel for water heating, kWh/month	178.5713	156.8164	163.0427	144.4425	143.2030	132.0061	122.3231	140.3913	142.0921	150.5289	160.5075	172.5476	(219)
Water heating fuel used												1806.4726	(219)
Annual totals kWh/year													
Space heating fuel - main system												3024.6829	(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)												61.2369	(230a)
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												136.2369	(231)
Electricity for lighting (calculated in Appendix L)												365.8614	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.74 * 1068 * 1.00) =										-632.2977		-632.2977	(233)
Total delivered energy for all uses												4700.9561	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3024.6829	3.4800	105.2590	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1806.4726	3.4800	62.8652	(247)
Mechanical ventilation fans	61.2369	13.1900	8.0772	(249)
Pumps and fans for heating	75.0000	13.1900	9.8925	(249)
Energy for lighting	365.8614	13.1900	48.2571	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	-632.2977	13.1900	-83.4001	(252)
Total energy cost			270.9509	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.8797	(257)
SAP value		87.7280	
SAP rating (Section 12)		88	(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	3024.6829	0.2160	653.3315	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1806.4726	0.2160	390.1981	(264)
Space and water heating			1043.5296	(265)
Pumps and fans	136.2369	0.5190	70.7070	(267)
Energy for lighting	365.8614	0.5190	189.8821	(268)
Energy saving/generation technologies				
PV Unit	-632.2977	0.5190	-328.1625	(269)
Total kg/year			975.9561	(272)
CO2 emissions per m2			11.5700	(273)
EI value			89.8904	
EI rating			90	(274)

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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	$3.48 / 0.8229 = 4.229$, stars = 4
Water heating environmental impact	$0.216 / 0.8229 = 0.2625$, 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	42.1800 (1b)	x 2.3900 (2b)	= 100.8102 (1b) - (3b)
First floor	42.1800 (1c)	x 2.6100 (2c)	= 110.0898 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.3600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 210.9000 (5)

2. Ventilation rate

					main heating	+	secondary heating	+	other	=	total	m3 per hour	
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)	
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)	
Number of intermittent fans											0 * 10 =	0.0000 (7a)	
Number of passive vents											0 * 10 =	0.0000 (7b)	
Number of flueless gas fires											0 * 40 =	0.0000 (7c)	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =												0.0000 / (5) =	0.0000 (8)
Pressure test											Yes		
Measured/design AP50												3.8400	
Infiltration rate												0.1920 (18)	
Number of sides sheltered												2 (19)	
Shelter factor									(20) = 1 - [0.075 x (19)] =			0.8500 (20)	
Infiltration rate adjusted to include shelter factor									(21) = (18) x (20) =			0.1632 (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)	
	0.1918	0.1795	0.1795	0.1632	0.1673	0.1591	0.1591	0.1550	0.1550	0.1673	0.1632	0.1673 (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)			15.5300	1.1450	17.7824		(27)					
Ground Floor			42.1800	0.1200	5.0616	84.0000	3543.1200 (28a)					
Brick and Block	100.3000	17.6800	82.6200	0.2400	19.8288	42.2200	3488.2164 (29a)					
Pitched Roof	42.1800		42.1800	0.1000	4.2180	9.1000	383.8380 (30)					
Total net area of external elements Aum(A, m2)			184.6600				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =	49.2558			(33)					
Party Wall 1			29.8900	0.0000	0.0000	110.0000	3287.9000 (32)					
Ground Floor Block			28.5200			75.0000	2139.0000 (32c)					
Ground Floor Stud			47.8900			9.0000	431.0100 (32c)					
First Floor Stud			102.7200			9.0000	924.4800 (32c)					
Internal Floor 1			42.1800			18.0000	759.2400 (32d)					
Internal Ceiling 1			42.1800			18.0000	759.2400 (32e)					
Heat capacity Cm = Sum(A x k)				(28) ... (30) + (32) + (32a) ... (32e) =	15716.0444		(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							186.2973 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.0087 (36)					
Total fabric heat loss				(33) + (36) =			60.2645 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 34.7985	Feb 34.7985	Mar 34.7985	Apr 34.7985	May 34.7985	Jun 34.7985	Jul 34.7985	Aug 34.7985	Sep 34.7985	Oct 34.7985	Nov 34.7985	Dec 34.7985 (38)
Heat transfer coeff	95.0630	95.0630	95.0630	95.0630	95.0630	95.0630	95.0630	95.0630	95.0630	95.0630	95.0630	95.0630 (39)
Average = Sum(39)m / 12 =												95.0630 (39)
HLP	Jan 1.1269	Feb 1.1269	Mar 1.1269	Apr 1.1269	May 1.1269	Jun 1.1269	Jul 1.1269	Aug 1.1269	Sep 1.1269	Oct 1.1269	Nov 1.1269	Dec 1.1269 (40)
HLP (average)												1.1269 (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												2.5404 (42)
Average daily hot water use (litres/day)												94.5346 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Daily hot water use	103.9880	100.2066	96.4253	92.6439	88.8625	85.0811	85.0811	88.8625	92.6439	96.4253	100.2066	103.9880 (44)
Energy conte	154.2112	134.8741	139.1780	121.3388	116.4274	100.4680	93.0984	106.8318	108.1077	125.9891	137.5269	149.3454 (45)
Energy content (annual)										Total =	Sum (45)m =	1487.3969 (45)
Distribution loss (46)m = 0.15 x (45)m	23.1317	20.2311	20.8767	18.2008	17.4641	15.0702	13.9648	16.0248	16.2162	18.8984	20.6290	22.4018 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.6706	0.6069	0.6039	0.5059	0.4656	0.3847	0.3564	0.4272	0.4507	0.5467	0.6188	0.6494 (61)
Total heat required for water heating calculated for each month	154.8818	135.4810	139.7819	121.8446	116.8930	100.8527	93.4548	107.2590	108.5584	126.5358	138.1458	149.9948 (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	154.8818	135.4810	139.7819	121.8446	116.8930	100.8527	93.4548	107.2590	108.5584	126.5358	138.1458	149.9948 (64)
Heat gains from water heating, kWh/month	51.4429	44.9974	46.4277	40.4716	38.8285	33.5018	31.0443	35.6284	36.0585	42.0280	45.8824	49.8197 (65)
										Total per year (kWh/year) =	Sum (64)m =	1493.6837 (64)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	51.7915	46.0007	37.4103	28.3220	21.1710	17.8735	19.3129	25.1037	33.6941	42.7824	49.9334	53.2309	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	340.7631	344.2991	335.3884	316.4185	292.4724	269.9664	254.9310	251.3950	260.3057	279.2756	303.2217	325.7277	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	(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)	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	(71)
Water heating gains (Table 5)	69.1437	66.9604	62.4028	56.2106	52.1889	46.5303	41.7262	47.8876	50.0812	56.4893	63.7256	66.9619	(72)
Total internal gains	568.2891	563.8511	541.7924	507.5419	472.4231	440.9610	422.5611	430.9771	450.6719	485.1382	523.4716	552.5115	(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				7.8200	13.4684	0.6300	0.7000			0.7700	32.1881 (74)	
East				1.9100	25.1733	0.6300	0.7000			0.7700	14.6942 (76)	
South				5.8000	56.5862	0.6300	0.7000			0.7700	100.3022 (78)	
Solar gains	147.1844	216.7546	313.9316	415.1272	461.2839	518.8861	475.7477	435.6293	364.0458	261.6359	176.3533	118.8902 (83)
Total gains	715.4735	780.6057	855.7240	922.6691	933.7071	959.8471	898.3088	866.6064	814.7177	746.7741	699.8248	671.4017 (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	45.9229	45.9229	45.9229	45.9229	45.9229	45.9229	45.9229	45.9229	45.9229	45.9229	45.9229	45.9229
alpha	4.0615	4.0615	4.0615	4.0615	4.0615	4.0615	4.0615	4.0615	4.0615	4.0615	4.0615	4.0615
util living area	0.9713	0.9589	0.9247	0.8460	0.7070	0.4890	0.3460	0.3478	0.6079	0.8491	0.9474	0.9762 (86)
MIT	19.9222	20.0506	20.3237	20.6418	20.8727	20.9783	20.9960	20.9960	20.9481	20.7029	20.2771	19.8802 (87)
Th 2	19.9789	19.9789	19.9789	19.9789	19.9789	19.9789	19.9789	19.9789	19.9789	19.9789	19.9789	19.9789 (88)
util rest of house	0.9643	0.9490	0.9066	0.8095	0.6412	0.3979	0.2406	0.2385	0.5139	0.8036	0.9323	0.9702 (89)
MIT 2	19.0301	19.1548	19.4169	19.7095	19.9015	19.9707	19.9782	19.9783	19.9557	19.7703	19.3773	18.9895 (90)
Living area fraction									fLA = Living area / (4) =			0.2288 (91)
MIT	19.2342	19.3597	19.6244	19.9228	20.1237	20.2012	20.2111	20.2111	20.1827	19.9837	19.5832	19.1932 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2342	19.3597	19.6244	19.9228	20.1237	20.2012	20.2111	20.2111	20.1827	19.9837	19.5832	19.1932 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9578	0.9417	0.8991	0.8072	0.6512	0.4182	0.2648	0.2636	0.5337	0.8039	0.9252	0.9643 (94)
Useful gains	685.2883	735.0622	769.4204	744.7841	608.0399	401.4551	237.9040	228.4481	434.8236	600.3025	647.4729	647.4162 (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	1296.1117	1270.0136	1143.0750	933.7843	667.6959	408.8879	238.7105	229.2093	454.6607	749.4450	1044.0956	1282.7085 (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	454.4526	359.4873	277.9990	136.0802	44.3841	0.0000	0.0000	0.0000	0.0000	110.9620	285.5683	472.6574 (98)
Space heating												2141.5909 (98)
Space heating per m2										(98) / (4) =		25.3863 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2374.2693 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	454.4526	359.4873	277.9990	136.0802	44.3841	0.0000	0.0000	0.0000	0.0000	110.9620	285.5683	472.6574	(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)	503.8277	398.5447	308.2029	150.8649	49.2063	0.0000	0.0000	0.0000	0.0000	123.0177	316.5946	524.0105	(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	154.8818	135.4810	139.7819	121.8446	116.8930	100.8527	93.4548	107.2590	108.5584	126.5358	138.1458	149.9948	(64)
Efficiency of water heater (217)m	86.2405	85.9505	85.0594	83.1084	79.7582	76.4000	76.4000	76.4000	76.4000	82.2815	85.1834	76.4000	(216)
Fuel for water heating, kWh/month	179.5929	157.6268	164.3344	146.6093	146.5593	132.0061	122.3231	140.3913	142.0921	153.7840	162.1744	173.5271	(219)
Water heating fuel used												1821.0209	(219)
Annual totals kWh/year													
Space heating fuel - main system												2374.2693	(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)													61.2369 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													136.2369 (231)
Electricity for lighting (calculated in Appendix L)													365.8614 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.74 * 1184 * 1.00) =													-700.8788 (233)
Total delivered energy for all uses													3996.5098 (238)

10a. Fuel costs - using BEDF prices (£550)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2374.2693	7.3800	175.2211	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1821.0209	7.3800	134.3913	(247)
Mechanical ventilation fans	61.2369	28.6600	17.5505	(249)
Pumps and fans for heating	75.0000	28.6600	21.4950	(249)
Energy for lighting	365.8614	28.6600	104.8559	(250)
Additional standing charges			107.0000	(251)
Energy saving/generation technologies				
PV Unit	-700.8788	28.6600	-200.8719	(252)
Total energy cost			359.6419	(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	2374.2693	0.2160	512.8422	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1821.0209	0.2160	393.3405	(264)
Space and water heating			906.1827	(265)
Pumps and fans	136.2369	0.5190	70.7070	(267)
Energy for lighting	365.8614	0.5190	189.8821	(268)
Energy saving/generation technologies				
PV Unit	-700.8788	0.5190	-363.7561	(269)
Total kg/year			803.0156	(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	2374.2693	1.2200	2896.6086	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1821.0209	1.2200	2221.6456	(264)
Space and water heating			5118.2541	(265)
Pumps and fans	136.2369	3.0700	418.2474	(267)
Energy for lighting	365.8614	3.0700	1123.1946	(268)

FULL SAP CALCULATION PRINTOUT

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

Energy saving/generation technologies			
PV Unit	-700.8788	3.0700	-2151.6980 (269)
Primary energy kWh/year			4507.9981 (272)
Primary energy kWh/m2/year			53.4376 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	B 88
Current environmental impact rating:	B 90

(For testing purposes):

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

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.3	-£ 64	-204 kg (25.4%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£64 2.42 kg/m²	B 89	A 92
Total Savings	£64 2.42 kg/m²		

Potential energy efficiency rating:	B 89
Potential environmental impact rating:	A 92

Fuel prices for cost data on this page from database revision number 550 TEST (28 Jun 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	£144	£158	-£14
Mains gas	£417	£338	£78
Space heating	£321	£321	£0
Water heating	£134	£70	£64
Lighting	£105	£105	£0
Generated (PV)	-£201	-£201	£0
Total cost of fuels	£360	£295	£64
Total cost of uses	£359	£295	£64
Delivered energy	47 kWh/m²	35 kWh/m²	12 kWh/m²
Carbon dioxide emissions	0.8 tonnes	0.6 tonnes	0.2 tonnes
CO2 emissions per m²	10 kg/m²	7 kg/m²	2 kg/m²
Primary energy	53 kWh/m²	40 kWh/m²	14 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.1800 (1b)	x 2.3900 (2b)	= 100.8102 (1b) - (3b)
First floor	42.1800 (1c)	x 2.6100 (2c)	= 110.0898 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.3600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 210.9000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.8400
Infiltration rate					0.1920 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.1632 (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	0.2081	0.2040	0.1999	0.1795	0.1754	0.1550	0.1550	0.1510	0.1632	0.1754	0.1836	0.1918 (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)			15.5300	1.1450	17.7824		(27)					
Ground Floor			42.1800	0.1200	5.0616	84.0000	3543.1200 (28a)					
Brick and Block	100.3000	17.6800	82.6200	0.2400	19.8288	42.2200	3488.2164 (29a)					
Pitched Roof	42.1800		42.1800	0.1000	4.2180	9.1000	383.8380 (30)					
Total net area of external elements Aum(A, m2)			184.6600				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		49.2558		(33)					
Party Wall 1			29.8900	0.0000	0.0000	110.0000	3287.9000 (32)					
Ground Floor Block			28.5200			75.0000	2139.0000 (32c)					
Ground Floor Stud			47.8900			9.0000	431.0100 (32c)					
First Floor Stud			102.7200			9.0000	924.4800 (32c)					
Internal Floor 1			42.1800			18.0000	759.2400 (32d)					
Internal Ceiling 1			42.1800			18.0000	759.2400 (32e)					
Heat capacity Cm = Sum(A x k)					(28) ... (30) + (32) + (32a) ... (32e) =		15716.0444 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							186.2973 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.0087 (36)					
Total fabric heat loss						(33) + (36) =	60.2645 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 34.7985	Feb 34.7985	Mar 34.7985	Apr 34.7985	May 34.7985	Jun 34.7985	Jul 34.7985	Aug 34.7985	Sep 34.7985	Oct 34.7985	Nov 34.7985	Dec 34.7985 (38)
Heat transfer coeff	95.0630	95.0630	95.0630	95.0630	95.0630	95.0630	95.0630	95.0630	95.0630	95.0630	95.0630	95.0630 (39)
Average = Sum(39)m / 12 =												95.0630 (39)
HLP	Jan 1.1269	Feb 1.1269	Mar 1.1269	Apr 1.1269	May 1.1269	Jun 1.1269	Jul 1.1269	Aug 1.1269	Sep 1.1269	Oct 1.1269	Nov 1.1269	Dec 1.1269 (40)
HLP (average)												1.1269 (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												2.5404 (42)
Average daily hot water use (litres/day)												94.5346 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

Daily hot water use	103.9880	100.2066	96.4253	92.6439	88.8625	85.0811	85.0811	88.8625	92.6439	96.4253	100.2066	103.9880 (44)
Energy conte	154.2112	134.8741	139.1780	121.3388	116.4274	100.4680	93.0984	106.8318	108.1077	125.9891	137.5269	149.3454 (45)
Energy content (annual)	Total = Sum(45)m =										1487.3969 (45)	
Distribution loss (46)m = 0.15 x (45)m	23.1317	20.2311	20.8767	18.2008	17.4641	15.0702	13.9648	16.0248	16.2162	18.8984	20.6290	22.4018 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.6706	0.6069	0.6039	0.5059	0.4656	0.3847	0.3564	0.4272	0.4507	0.5467	0.6188	0.6494 (61)
Total heat required for water heating calculated for each month	154.8818	135.4810	139.7819	121.8446	116.8930	100.8527	93.4548	107.2590	108.5584	126.5358	138.1458	149.9948 (62)
Aperture area of solar collector											3.0000 (H1)	
Zero-loss collector efficiency											0.7000 (H2)	
Collector heat loss coefficient											1.8000 (H3)	
Collector 2nd order heat loss coefficient											0.0050 (H3a)	
Collector effective heat loss coefficient											1.8063 (H3b)	
Collector performance ratio											2.5804 (H4)	
Annual solar radiation per m2											1079.5246 (H5)	
Overshading factor											0.8000 (H6)	
Solar energy available											1813.6014 (H7)	
Adjustment factor for showers											1.0000 (H7a)	
Solar-to-load ratio											1.2193 (H8)	
Utilisation factor											0.5596 (H9)	
Collector performance factor											0.8793 (H10)	
Dedicated solar storage volume											75.0000 (H11)	
Effective solar volume											75.0000 (H13)	
Daily hot water demand											94.5346 (H14)	
Volume ratio Veff/V											0.7934 (H15)	
Solar storage volume factor											0.9537 (H16)	
Solar input											-851.1157 (H17)	
Solar input	-24.6807	-41.1849	-70.1426	-94.0050	-116.1352	-114.1794	-112.6705	-98.4408	-77.0989	-52.6494	-29.2748	-20.6535 (63)
	Solar input (sum of months) = Sum(63)m =										-851.1157 (63)	
Output from w/h	130.2012	94.2961	69.6393	27.8397	0.7578	0.0000	0.0000	8.8182	31.4595	73.8863	108.8710	129.3413 (64)
	Total per year (kWh/year) = Sum(64)m =										675.1104 (64)	
Heat gains from water heating, kWh/month	51.4429	44.9974	46.4277	40.4716	38.8285	33.5018	31.0443	35.6284	36.0585	42.0280	45.8824	49.8197 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	51.7915	46.0007	37.4103	28.3220	21.1710	17.8735	19.3129	25.1037	33.6941	42.7824	49.9334	53.2309 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	340.7631	344.2991	335.3884	316.4185	292.4724	269.9664	254.9310	251.3950	260.3057	279.2756	303.2217	325.7277 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828 (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)	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161 (71)
Water heating gains (Table 5)	69.1437	66.9604	62.4028	56.2106	52.1889	46.5303	41.7262	47.8876	50.0812	56.4893	63.7256	66.9619 (72)
Total internal gains	568.2891	563.8511	541.7924	507.5419	472.4231	440.9610	422.5611	430.9771	450.6719	485.1382	523.4716	552.5115 (73)

[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	7.8200	10.6334	0.6300	0.7000	0.7700	25.4127 (74)
East	1.9100	19.6403	0.6300	0.7000	0.7700	11.4644 (76)
South	5.8000	46.7521	0.6300	0.7000	0.7700	82.8706 (78)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n _{li,m} (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	45.9229	45.9229	45.9229	45.9229	45.9229	45.9229	45.9229	45.9229	45.9229	45.9229	45.9229	45.9229
alpha	4.0615	4.0615	4.0615	4.0615	4.0615	4.0615	4.0615	4.0615	4.0615	4.0615	4.0615	4.0615
util living area												
	0.9807	0.9684	0.9443	0.8904	0.7859	0.6265	0.4742	0.5165	0.7314	0.9076	0.9681	0.9840 (86)
MIT	19.7208	19.9008	20.1721	20.4977	20.7749	20.9338	20.9833	20.9762	20.8736	20.5251	20.0536	19.6647 (87)
Th 2	19.9789	19.9789	19.9789	19.9789	19.9789	19.9789	19.9789	19.9789	19.9789	19.9789	19.9789	19.9789 (88)
util rest of house												
	0.9762	0.9612	0.9311	0.8639	0.7351	0.5442	0.3705	0.4110	0.6562	0.8795	0.9594	0.9803 (89)
MIT 2	18.8314	19.0080	19.2716	19.5797	19.8244	19.9454	19.9737	19.9708	19.9070	19.6119	19.1604	18.7762 (90)
Living area fraction									f _{LA} = Living area / (4) =			0.2288 (91)
MIT	19.0349	19.2122	19.4776	19.7897	20.0418	20.1715	20.2046	20.2008	20.1281	19.8208	19.3648	18.9795 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0349	19.2122	19.4776	19.7897	20.0418	20.1715	20.2046	20.2008	20.1281	19.8208	19.3648	18.9795 (93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9709	0.9543	0.9234	0.8582	0.7385	0.5606	0.3941	0.4347	0.6682	0.8744	0.9529	0.9755	(94)
Useful gains	667.9812	735.3866	770.2006	763.2791	679.8861	502.0914	337.6484	353.7673	516.7994	625.9951	635.8828	638.6640	(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	1400.7393	1360.5644	1233.6935	1035.2075	793.0004	529.6476	342.6688	361.3185	573.0522	876.5566	1165.9246	1404.9817	(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	545.1721	420.1195	344.8388	195.7884	84.1570	0.0000	0.0000	0.0000	0.0000	186.4178	381.6301	570.1404	(98)
Space heating												2728.2640	(98)
Space heating per m2												32.3407	(99)
												(98) / (4) =	

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3024.6829 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	545.1721	420.1195	344.8388	195.7884	84.1570	0.0000	0.0000	0.0000	0.0000	186.4178	381.6301	570.1404	(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)	604.4036	465.7644	382.3046	217.0603	93.3005	0.0000	0.0000	0.0000	0.0000	206.6716	423.0932	632.0846	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	130.2012	94.2961	69.6393	27.8397	0.7578	0.0000	0.0000	8.8182	31.4595	73.8863	108.8710	129.3413	(64)
Efficiency of water heater (217)m	87.1647	87.3092	87.5432	88.2163	90.0548	76.4000	76.4000	76.4000	76.4000	85.8009	86.7231	76.4000	(216)
Fuel for water heating, kWh/month	149.3737	108.0026	79.5485	31.5584	0.8415	0.0000	0.0000	11.5422	41.1774	86.1137	125.5386	148.1832	(219)
Water heating fuel used												781.8797	(219)
Annual totals kWh/year													
Space heating fuel - main system												3024.6829	(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)													61.2369 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
pump for solar water heating													50.0000 (230g)
Total electricity for the above, kWh/year													186.2369 (231)
Electricity for lighting (calculated in Appendix L)													365.8614 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.74 * 1068 * 1.00) =										-632.2977		-632.2977	(233)
Total delivered energy for all uses												3726.3632	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3024.6829	3.4800	105.2590 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	781.8797	3.4800	27.2094 (247)
Mechanical ventilation fans	61.2369	13.1900	8.0772 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Pump for solar water heating	50.0000	13.1900	6.5950 (249)
Energy for lighting	365.8614	13.1900	48.2571 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-632.2977	13.1900	-83.4001 (252)
Total energy cost			241.8901 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7854 (257)
SAP value		89.0443
SAP rating (Section 12)		B9 (258)
SAP band		B

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3024.6829	0.2160	653.3315 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	781.8797	0.2160	168.8860 (264)
Space and water heating			822.2175 (265)
Pumps and fans	186.2369	0.5190	96.6570 (267)
Energy for lighting	365.8614	0.5190	189.8821 (268)
Energy saving/generation technologies			
PV Unit	-632.2977	0.5190	-328.1625 (269)
Total kg/year			780.5941 (272)
CO2 emissions per m2			9.2500 (273)
EI value			91.9141
EI rating			92 (274)
EI band			A

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.1800 (1b)	x 2.3900 (2b)	= 100.8102 (1b) - (3b)
First floor	42.1800 (1c)	x 2.6100 (2c)	= 110.0898 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.3600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 210.9000 (5)

2. Ventilation rate

	main heating		secondary heating		other		total		m3 per hour			
Number of chimneys		0	+	0	+	0	=	0 * 40 =	0.0000	(6a)		
Number of open flues		0	+	0	+	0	=	0 * 20 =	0.0000	(6b)		
Number of intermittent fans								0 * 10 =	0.0000	(7a)		
Number of passive vents								0 * 10 =	0.0000	(7b)		
Number of flueless gas fires								0 * 40 =	0.0000	(7c)		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =									Air changes per hour			
Pressure test								0.0000 / (5) =	0.0000	(8)		
Measured/design AP50									Yes			
Infiltration rate									3.8400			
Number of sides sheltered									0.1920	(18)		
									2	(19)		
Shelter factor							(20) = 1 - [0.075 x (19)] =		0.8500	(20)		
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =		0.1632	(21)		
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000
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
Adj infilt rate												
	0.1918	0.1795	0.1795	0.1632	0.1673	0.1591	0.1591	0.1550	0.1550	0.1673	0.1632	0.1673
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000
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)			15.5300	1.1450	17.7824			(27)					
Ground Floor			42.1800	0.1200	5.0616	84.0000	3543.1200	(28a)					
Brick and Block	100.3000	17.6800	82.6200	0.2400	19.8288	42.2200	3488.2164	(29a)					
Pitched Roof	42.1800		42.1800	0.1000	4.2180	9.1000	383.8380	(30)					
Total net area of external elements Aum(A, m2)			184.6600					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	49.2558			(33)					
Party Wall 1			29.8900	0.0000	0.0000	110.0000	3287.9000	(32)					
Ground Floor Block			28.5200			75.0000	2139.0000	(32c)					
Ground Floor Stud			47.8900			9.0000	431.0100	(32c)					
First Floor Stud			102.7200			9.0000	924.4800	(32c)					
Internal Floor 1			42.1800			18.0000	759.2400	(32d)					
Internal Ceiling 1			42.1800			18.0000	759.2400	(32e)					
Heat capacity Cm = Sum(A x k)						(28) ... (30) + (32) + (32a) ... (32e) =	15716.0444	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							186.2973	(35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.0087	(36)					
Total fabric heat loss						(33) + (36) =	60.2645	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 34.7985	Feb 34.7985	Mar 34.7985	Apr 34.7985	May 34.7985	Jun 34.7985	Jul 34.7985	Aug 34.7985	Sep 34.7985	Oct 34.7985	Nov 34.7985	Dec 34.7985	(38)
Heat transfer coeff	95.0630	95.0630	95.0630	95.0630	95.0630	95.0630	95.0630	95.0630	95.0630	95.0630	95.0630	95.0630	(39)
Average = Sum(39)m / 12 =												95.0630	(39)
HLP	Jan 1.1269	Feb 1.1269	Mar 1.1269	Apr 1.1269	May 1.1269	Jun 1.1269	Jul 1.1269	Aug 1.1269	Sep 1.1269	Oct 1.1269	Nov 1.1269	Dec 1.1269	(40)
HLP (average)												1.1269	(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												2.5404 (42)
Average daily hot water use (litres/day)												94.5346 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Daily hot water use	103.9880	100.2066	96.4253	92.6439	88.8625	85.0811	85.0811	88.8625	92.6439	96.4253	100.2066	103.9880 (44)
Energy conte	154.2112	134.8741	139.1780	121.3388	116.4274	100.4680	93.0984	106.8318	108.1077	125.9891	137.5269	149.3454 (45)
Energy content (annual)										Total = Sum(45)m =		1487.3969 (45)
Distribution loss (46)m = 0.15 x (45)m												
	23.1317	20.2311	20.8767	18.2008	17.4641	15.0702	13.9648	16.0248	16.2162	18.8984	20.6290	22.4018 (46)
Water storage loss:												
Total storage loss												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.6706	0.6069	0.6039	0.5059	0.4656	0.3847	0.3564	0.4272	0.4507	0.5467	0.6188	0.6494 (61)
Total heat required for water heating calculated for each month												
	154.8818	135.4810	139.7819	121.8446	116.8930	100.8527	93.4548	107.2590	108.5584	126.5358	138.1458	149.9948 (62)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.7000 (H2)
Collector heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0050 (H3a)
Collector effective heat loss coefficient												1.8063 (H3b)
Collector performance ratio												2.5804 (H4)
Annual solar radiation per m2												1206.0102 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												2026.0972 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.3622 (H8)
Utilisation factor												0.5201 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												94.5346 (H14)
Volume ratio Veff/V												0.7934 (H15)
Solar storage volume factor												0.9537 (H16)
Solar input												-883.6320 (H17)
Solar input	-28.8340	-41.0052	-71.1546	-95.7150	-111.2273	-120.9830	-114.7104	-104.6047	-81.8739	-56.5883	-34.1041	-22.8312 (63)
										Solar input (sum of months) = Sum(63)m =		-883.6320 (63)
Output from w/h												
	126.0478	94.4758	68.6273	26.1296	5.6657	0.0000	0.0000	2.6542	26.6845	69.9475	104.0417	127.1635 (64)
										Total per year (kWh/year) = Sum(64)m =		651.4376 (64)
Heat gains from water heating, kWh/month												
	51.4429	44.9974	46.4277	40.4716	38.8285	33.5018	31.0443	35.6284	36.0585	42.0280	45.8824	49.8197 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	51.7915	46.0007	37.4103	28.3220	21.1710	17.8735	19.3129	25.1037	33.6941	42.7824	49.9334	53.2309 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	340.7631	344.2991	335.3884	316.4185	292.4724	269.9664	254.9310	251.3950	260.3057	279.2756	303.2217	325.7277 (68)
Pumps, fans	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828 (69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161 (71)
Total internal gains	69.1437	66.9604	62.4028	56.2106	52.1889	46.5303	41.7262	47.8876	50.0812	56.4893	63.7256	66.9619 (72)
	568.2891	563.8511	541.7924	507.5419	472.4231	440.9610	422.5611	430.9771	450.6719	485.1382	523.4716	552.5115 (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				7.8200	13.4684	0.6300	0.7000		0.7700	32.1881 (74)		
East				1.9100	25.1733	0.6300	0.7000		0.7700	14.6942 (76)		
South				5.8000	56.5862	0.6300	0.7000		0.7700	100.3022 (78)		
Solar gains	147.1844	216.7546	313.9316	415.1272	461.2839	518.8861	475.7477	435.6293	364.0458	261.6359	176.3533	118.8902 (83)
Total gains	715.4735	780.6057	855.7240	922.6691	933.7071	959.8471	898.3088	866.6064	814.7177	746.7741	699.8248	671.4017 (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	45.9229	45.9229	45.9229	45.9229	45.9229	45.9229	45.9229	45.9229	45.9229	45.9229	45.9229	45.9229 (86)
alpha	4.0615	4.0615	4.0615	4.0615	4.0615	4.0615	4.0615	4.0615	4.0615	4.0615	4.0615	4.0615 (87)
util living area	0.9713	0.9589	0.9247	0.8460	0.7070	0.4890	0.3460	0.3478	0.6079	0.8491	0.9474	0.9762 (88)
MIT	19.9222	20.0506	20.3237	20.6418	20.8727	20.9783	20.9960	20.9960	20.9481	20.7029	20.2771	19.8802 (89)
Th 2	19.9789	19.9789	19.9789	19.9789	19.9789	19.9789	19.9789	19.9789	19.9789	19.9789	19.9789	19.9789 (90)
util rest of house	0.9643	0.9490	0.9066	0.8095	0.6412	0.3979	0.2406	0.2385	0.5139	0.8036	0.9323	0.9702 (91)
MIT 2	19.0301	19.1548	19.4169	19.7095	19.9015	19.9707	19.9782	19.9783	19.9557	19.7703	19.3773	18.9895 (92)
Living area fraction	19.2342	19.3597	19.6244	19.9228	20.1237	20.2012	20.2111	20.2111	19.1827	19.9837	19.5832	19.1932 (93)
MIT	19.2342	19.3597	19.6244	19.9228	20.1237	20.2012	20.2111	20.2111	19.1827	19.9837	19.5832	19.1932 (94)
Temperature adjustment												0.0000
adjusted MIT	19.2342	19.3597	19.6244	19.9228	20.1237	20.2012	20.2111	20.2111	19.1827	19.9837	19.5832	19.1932 (95)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9578	0.9417	0.8991	0.8072	0.6512	0.4182	0.2648	0.2636	0.5337	0.8039	0.9252	0.9643	(94)
Useful gains	685.2883	735.0622	769.4204	744.7841	608.0399	401.4551	237.9040	228.4481	434.8236	600.3025	647.4729	647.4162	(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	1296.1117	1270.0136	1143.0750	933.7843	667.6959	408.8879	238.7105	229.2093	454.6607	749.4450	1044.0956	1282.7085	(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	454.4526	359.4873	277.9990	136.0802	44.3841	0.0000	0.0000	0.0000	0.0000	110.9620	285.5683	472.6574	(98)
Space heating												2141.5909	(98)
Space heating per m2											(98) / (4) =	25.3863	(99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2374.2693 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	454.4526	359.4873	277.9990	136.0802	44.3841	0.0000	0.0000	0.0000	0.0000	110.9620	285.5683	472.6574	(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)	503.8277	398.5447	308.2029	150.8649	49.2063	0.0000	0.0000	0.0000	0.0000	123.0177	316.5946	524.0105	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	126.0478	94.4758	68.6273	26.1296	5.6657	0.0000	0.0000	2.6542	26.6845	69.9475	104.0417	127.1635	(64)
Efficiency of water heater (217)m	86.7958	86.9321	87.0856	87.6497	88.3926	76.4000	76.4000	76.4000	76.4000	84.3118	86.0494	76.4000	(216)
Fuel for water heating, kWh/month	145.2234	108.6777	78.8044	29.8114	6.4097	0.0000	0.0000	3.4741	34.9273	82.9629	120.9092	146.3782	(219)
Water heating fuel used												757.5783	(219)
Annual totals kWh/year													
Space heating fuel - main system												2374.2693	(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)													61.2369 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
pump for solar water heating													50.0000 (230g)
Total electricity for the above, kWh/year													186.2369 (231)
Electricity for lighting (calculated in Appendix L)													365.8614 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.74 * 1184 * 1.00) =										-700.8788		-700.8788	(233)
Total delivered energy for all uses												2983.0671	(238)

10a. Fuel costs - using BEDF prices (550)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2374.2693	7.3800	175.2211 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	757.5783	7.3800	55.9093 (247)
Mechanical ventilation fans	61.2369	28.6600	17.5505 (249)
Pumps and fans for heating	75.0000	28.6600	21.4950 (249)
Pump for solar water heating	50.0000	28.6600	14.3300 (249)
Energy for lighting	365.8614	28.6600	104.8559 (250)
Additional standing charges			107.0000 (251)
Energy saving/generation technologies			
PV Unit	-700.8788	28.6600	-200.8719 (252)
Total energy cost			295.4899 (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	2374.2693	0.2160	512.8422 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	757.5783	0.2160	163.6369 (264)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Space and water heating			676.4791 (265)
Pumps and fans	186.2369	0.5190	96.6570 (267)
Energy for lighting	365.8614	0.5190	189.8821 (268)
Energy saving/generation technologies			
PV Unit	-700.8788	0.5190	-363.7561 (269)
Total kg/year			599.2620 (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	2374.2693	1.2200	2896.6086 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	757.5783	1.2200	924.2455 (264)
Space and water heating			3820.8540 (265)
Pumps and fans	186.2369	3.0700	571.7474 (267)
Energy for lighting	365.8614	3.0700	1123.1946 (268)
Energy saving/generation technologies			
PV Unit	-700.8788	3.0700	-2151.6980 (269)
Primary energy kWh/year			3364.0980 (272)
Primary energy kWh/m2/year			39.8779 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0943 Plot 29	Issued on Date	11/07/2024
Assessment Reference	As Built	Prop Type Ref	Type F
Project	2, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	13.42	TER	18.25
Environmental	90 B	% DER<TER	26.48		
CO ₂ Emissions (t/year)	0.80	DFEE	45.55	TFEE	52.66
General Requirements Compliance	Pass	% DFEE<TFEE	13.50		

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 29	Issued on Date	11/07/2024
Assessment Reference	As Built	Prop Type Ref	Type F
Project	2, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	13.42	TER	18.25
Environmental	90 B	% DER<TER	26.48		
CO ₂ Emissions (t/year)	0.80	DFEE	45.55	TFEE	52.66
General Requirements Compliance	Pass	% DFEE<TFEE	13.50		

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

Wall 000001

Wall Type: Standard Wall

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

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

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

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0943 Plot 29	Issued on Date	11/07/2024
Assessment Reference	As Built	Prop Type Ref	Type F
Project	2, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	13.42	TER	18.25
Environmental	90 B	% DER<TER	26.48		
CO ₂ Emissions (t/year)	0.80	DFEE	45.55	TFEE	52.66
General Requirements Compliance	Pass	% DFEE<TFEE	13.50		

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

Building Elements

Floor 000003 - Worst Case Slab

Floor Type: Slab On Ground Floor

Area = 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 29			Issued on Date	11/07/2024
Assessment Reference	As Built	Prop Type Ref	Type F		
Property	2, Shaw Crescent, West End, Southampton, SO30 3LH				
SAP Rating	88 B	DER	13.42	TER	18.25
Environmental	90 B	% DER<TER	26.48		
CO ₂ Emissions (t/year)	0.80	DFEE	45.55	TFEE	52.66
General Requirements Compliance	Pass	% DFEE<TFEE	13.50		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com			Assessor ID	E477-0001
Client	Foreman Homes, FORE				

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

Orientation	South
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	House, Semi-Detached
2.0 Number of Storeys	2
3.0 Date Built	2023
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements		Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	Ground Floor:	20.06 m	42.18 m ²	2.39 m
	1st Storey:	20.06 m	42.18 m ²	2.61 m

7.0 Living Area	19.30	m ²
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8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	186.3	kJ/m ² K

9.0 External Walls			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type	Construction				
Brick and Block	Cavity Wall	Other	0.24	42.22	100.30	82.62

9.1 Party Walls			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)
Description	Type	Construction			
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	29.89

9.2 Internal Walls			Kappa (kJ/m ² K)	Area (m ²)
Description	Construction			
Ground Floor Block	Dense block, plasterboard on dabs		75.00	28.52
Ground Floor Stud	Plasterboard on timber frame		9.00	47.89
First Floor Stud	Plasterboard on timber frame		9.00	102.72

10.0 External Roofs			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type	Construction				
Pitched Roof	External Plane Roof	Other	0.10	9.10	42.18	42.18

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

10.2 Internal Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Ceiling 1	Plasterboard ceiling, carpeted chipboard floor	9.00	42.18

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	42.18

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	42.18

12.0 Opening Types

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

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
Front Door	Solid Door	[1] Brick and Block	South							2.15	
Front Elevation	Window	[1] Brick and Block	South	None	0.00					5.80	
Side Elevation	Window	[1] Brick and Block	East	None	0.00					1.91	
Rear Elevation	Window	[1] Brick and Block	North	None	0.00					7.82	

14.0 Conservatory

None

15.0 Draught Proofing

100 %

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	2.84	0.071	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	8.74	0.064	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.59	0.067	No	Birtley Supatherm
Independently assessed	E3 Sill	10.55	0.021	No	Knauf P5
Independently assessed	E4 Jamb	29.10	0.016	No	Knauf P6
Table K1 - Default	E5 Ground floor (normal)	20.06	0.320	No	
Independently assessed	E6 Intermediate floor within a dwelling	20.06	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	14.10	0.060	No	
Independently assessed	E12 Gable (insulation at ceiling level)	6.02	0.044	No	Knauf P21
Independently assessed	E16 Corner (normal)	10.00	0.039	No	Knauf P23
Independently assessed	E18 Party wall between dwellings	10.00	0.036	No	Knauf P25 Halved
Table K1 - Default	P1 Party wall - Ground floor	6.02	0.160	No	
Table K1 - Default	P2 Party wall - Intermediate floor within a dwelling	6.02	0.000	No	
Independently assessed	P4 Party wall - Roof (insulation at ceiling level)	6.02	0.035	No	Knauf P29 Halved

Y-value 0.060 W/m²K

18.0 Pressure Testing

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

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

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	3
Manufacturer SFP	0.17
Duct Type	Rigid
Wet Rooms	3

20.0 Fans, Open Fireplaces, Flues

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

21.0 Fixed Cooling System

No

22.0 Lighting

Internal

Total number of light fittings	21	
Total number of L.E.L. fittings	21	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	Yes
Light and motion sensor	Yes

23.0 Electricity Tariff

Standard

24.0 Main Heating 1

Description	Database	
Percentage of Heat	Gas Combi	%
Database Ref. No.	100	
Fuel Type	17960	
Main Heating	Mains gas	
SAP Code	BGW	
In Winter	104	
In Summer	90.2	
Controls	76.4	
PCDF Controls	CBE Programmer, room thermostat and TRVs	
Delayed Start Stat	0	
Sap Code	No	
Flue Type	2106	
	Balanced	

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

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

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

29.0 Hot Water Cylinder	None
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32.0 Photovoltaic Unit		One Dwelling		
PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
0.74	South	45°	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar water heating	£4,000 - £6,000	£64	B 89	