



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 19, Shaw Crescent
West End, Southampton, SO30 3LH

Contact: Tobias Whiting
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Report Issue Date: 09/07/2024

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0943 Plot 9	Issued on Date	09/07/2024
Assessment Reference	As Built	Prop Type Ref	Type C Terrace
Property	19, Shaw Crescent, West End, Southampton, SO30 3LH		
SAP Rating	88 B	DER	12.67
Environmental	91 B	TER	17.51
CO ₂ Emissions (t/year)	0.75	% DER<TER	27.66
General Requirements Compliance	Pass	DfEE	41.06
		TfEE	48.29
		% DfEE<TfEE	14.98
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com		Assessor ID
			E477-0001
Client	Foreman Homes, FORE		

SUMMARY FOR INPUT DATA FOR New Build (As Built)

Criterion 1 – Achieving the TER and TfEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	17.51	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	12.67	kgCO ₂ /m ²	Pass
	-4.84 (-27.6%)	kgCO ₂ /m ²	

1b TfEE and DfEE

Target Fabric Energy Efficiency (TfEE)	48.29	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DfEE)	41.06	kWh/m ² /yr	
	-7.2 (-14.9%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	2.62 (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 830 VUW 306/6-3 (H-GB)
Combi boiler
Efficiency: 89.3% SEDBUK2009
Minimum: 88.0%

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Programmer, room thermostat and TRVs

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100 %

Minimum

75 %

Pass

8 Mechanical ventilation

Continuous extract system

Specific fan power

0.16

Maximum

0.7

Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Southern England)

Slight

Pass

Based on:

Overshading

Average

Windows facing North

3.28 m², No overhang

Windows facing East

1.91 m², No overhang

Windows facing South

7.82 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

2.62 (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	2.6	m ³ /m ² h
Photovoltaic array	0.73	kW

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THERMAL BRIDGING

Calculation Type: New Build (As Built)

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SAP Rating	88 B	DER	12.67
Environmental	91 B	TER	17.51
CO ₂ Emissions (t/year)	0.75	% DER<TER	27.66
General Requirements Compliance	Pass	DFEE	41.06
		TFEE	48.29
		% DFEE<TFEE	14.98
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com		Assessor ID
			E477-0001
Client	Foreman Homes, FORE		

	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.071	5.57	0.40	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.064	3.74	0.24	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.067	1.59	0.11	Birtley Supatherm
External wall	E3 Sill	Independently assessed	0.021	8.29	0.17	Knauf P5
External wall	E4 Jamb	Independently assessed	0.016	27.00	0.43	Knauf P6
External wall	E5 Ground floor (normal)	Table K1 - Default	0.320	18.33	5.87	
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	18.33	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	9.69	0.58	
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.044	8.83	0.39	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	8.83	1.41	
Party wall	P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	0.000	8.83	0.00	
Party wall	P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	0.035	8.83	0.31	Knauf P29 Halved

Total: **10.65** W/mK:
Y-Value: **0.060** W/m²K:

FULL SAP CALCULATION PRINTOUT

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General Requirements Compliance	Pass	% DFEE<TFEE	14.98		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com			Assessor ID	E477-0001
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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

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DWELLING AS BUILT

End-Terrace House, total floor area 85 m²

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

1a TER and DER

Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 17.51 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 12.67 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)48.3 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)41.1 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: 2.62 (measured in this dwelling)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from database
Vaillant ecoFIT sustain 830 VUW 306/6-3 (H-GB)
Combi boiler
Efficiency: 89.3% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls: No cylinder

Boiler interlock Yes OK

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system
Specific fan power: 0.16
Maximum 0.7 OK

9 Summertime temperature

Overheating risk (Southern England): Slight OK

Based on:

Overshading: Average
Windows facing North: 3.28 m², No overhang
Windows facing East: 1.91 m², No overhang
Windows facing South: 7.82 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 2.6 m³/m²h
Photovoltaic array 0.73 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	42.2900 (1b)	x 2.3900 (2b)	= 101.0731 (1b) - (3b)
First floor	42.2900 (1c)	x 2.6100 (2c)	= 110.3769 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.5800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.4500 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					2.6200
Infiltration rate					0.1310 (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) =	0.1114 (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	0.1420	0.1392	0.1364	0.1225	0.1197	0.1058	0.1058	0.1030	0.1114	0.1197	0.1253	0.1308 (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)			13.0100	1.1450	14.8969		(27)					
Ground Floor			42.2900	0.1200	5.0748	84.0000	3552.3600 (28a)					
Brick and Block	91.8500	15.1600	76.6900	0.2400	18.4056	42.2200	3237.8518 (29a)					
Pitched Roof	42.2900		42.2900	0.1000	4.2290	9.1000	384.8390 (30)					
Total net area of external elements Aum(A, m2)			176.4300				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.9713		(33)					
Party Wall 1			43.9300	0.0000	0.0000	110.0000	4832.3000 (32)					
Ground Floor Stud			23.1100			75.0000	1733.2500 (32c)					
Ground Floor Stud			44.5500			9.0000	400.9500 (32c)					
First Floor Stud			98.5900			9.0000	887.3100 (32c)					
Internal Floor 1			42.2900			18.0000	761.2200 (32d)					
Internal Ceiling 1			42.2900			18.0000	761.2200 (32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	16551.3008 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							195.6881 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.6548 (36)					
Total fabric heat loss						(33) + (36) =	55.6262 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	34.8893	34.8893	34.8893	34.8893	34.8893	34.8893	34.8893	34.8893	34.8893	34.8893	34.8893	34.8893 (38)
Average = Sum(39)m / 12 =	90.5154	90.5154	90.5154	90.5154	90.5154	90.5154	90.5154	90.5154	90.5154	90.5154	90.5154	90.5154 (39)
												90.5154 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0702	1.0702	1.0702	1.0702	1.0702	1.0702	1.0702	1.0702	1.0702	1.0702	1.0702	1.0702 (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												2.5440 (42)
Average daily hot water use (litres/day)												94.6210 (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	104.0831	100.2983	96.5134	92.7286	88.9438	85.1589	85.1589	88.9438	92.7286	96.5134	100.2983	104.0831 (44)
Energy conte	154.3523	134.9975	139.3053	121.4497	116.5339	100.5599	93.1835	106.9295	108.2066	126.1043	137.6527	149.4819 (45)
Energy content (annual)												1488.7572 (45)
Distribution loss (46)m = 0.15 x (45)m	23.1528	20.2496	20.8958	18.2175	17.4801	15.0840	13.9775	16.0394	16.2310	18.9156	20.6479	22.4223 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	1.7091	1.5510	1.5462	1.2951	1.1920	0.9848	0.9126	1.0937	1.1539	1.3996	1.5815	1.6552 (61)
Total heat required for water heating calculated for each month	156.0614	136.5485	140.8515	122.7449	117.7259	101.5447	94.0961	108.0232	109.3604	127.5039	139.2342	151.1371 (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	156.0614	136.5485	140.8515	122.7449	117.7259	101.5447	94.0961	108.0232	109.3604	127.5039	139.2342	151.1371 (64)
Heat gains from water heating, kWh/month	51.7494	45.2744	46.7056	40.7058	39.0455	33.6824	31.2117	35.8275	36.2672	42.2796	46.1649	50.1165 (65)
Total per year (kWh/year) = Sum(64)m =												1504.8319 (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	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.4451	19.0473	15.4903	11.7272	8.7662	7.4008	7.9968	10.3946	13.9516	17.7147	20.6757	22.0411 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.7461	231.1198	225.1382	212.4041	196.3297	181.2220	171.1291	168.7554	174.7370	187.4710	203.5455	218.6532 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202 (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)	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617 (71)
Water heating gains (Table 5)	69.5557	67.3726	62.7763	56.5359	52.4805	46.7811	41.9512	48.1552	50.3710	56.8274	64.1179	67.3609 (72)
Total internal gains	383.9075	381.7004	367.5654	344.8278	321.7371	299.5645	285.2377	291.4659	303.2202	326.1738	352.4997	372.2159 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d		Gains W	
North				3.2800	10.6334	0.6300	0.7000		0.7700		10.6590 (74)	
East				1.9100	19.6403	0.6300	0.7000		0.7700		11.4644 (76)	
South				7.8200	46.7521	0.6300	0.7000		0.7700		111.7325 (78)	
Solar gains	133.8559	225.7858	304.6429	372.9125	415.4401	411.9533	397.3303	365.3402	328.0680	248.2299	159.8852	114.8608 (83)
Total gains	517.7634	607.4862	672.2083	717.7403	737.1771	711.5178	682.5680	656.8060	631.2883	574.4037	512.3849	487.0767 (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	50.7934	50.7934	50.7934	50.7934	50.7934	50.7934	50.7934	50.7934	50.7934	50.7934	50.7934	50.7934
alpha	4.3862	4.3862	4.3862	4.3862	4.3862	4.3862	4.3862	4.3862	4.3862	4.3862	4.3862	4.3862
util living area	0.9940	0.9873	0.9734	0.9398	0.8640	0.7225	0.5593	0.5996	0.8099	0.9520	0.9884	0.9954 (86)
MIT	19.6396	19.8299	20.1019	20.4259	20.7205	20.9110	20.9775	20.9692	20.8455	20.4616	19.9742	19.5865 (87)
Th 2	20.0253	20.0253	20.0253	20.0253	20.0253	20.0253	20.0253	20.0253	20.0253	20.0253	20.0253	20.0253 (88)
util rest of house	0.9924	0.9840	0.9661	0.9224	0.8232	0.6415	0.4463	0.4874	0.7426	0.9346	0.9848	0.9942 (89)
MIT 2	18.7841	18.9728	19.2409	19.5546	19.8250	19.9780	20.0179	20.0143	19.9331	19.5937	19.1174	18.7314 (90)
Living area fraction									fLA = Living area /	(4) =		0.2213 (91)
MIT	18.9735	19.1625	19.4315	19.7474	20.0232	20.1845	20.2303	20.2257	20.1350	19.7858	19.3070	18.9206 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9735	19.1625	19.4315	19.7474	20.0232	20.1845	20.2303	20.2257	20.1350	19.7858	19.3070	18.9206 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9901	0.9803	0.9606	0.9165	0.8231	0.6559	0.4711	0.5117	0.7511	0.9293	0.9813	0.9923 (94)
Ext temp.	512.6607	595.4929	645.7483	657.8107	606.7583	466.6525	321.5583	336.0787	474.1896	533.7994	502.7882	483.3191 (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	1328.1752	1290.9753	1170.4971	981.8598	753.3797	505.4848	328.5969	346.2816	546.2646	831.4538	1104.9215	1332.4456 (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	606.7428	467.3641	390.4131	233.3154	109.0863	0.0000	0.0000	0.0000	0.0000	221.4549	433.5359	631.7501 (98)
Space heating per m2												3093.6627 (98)
												(98) / (4) = 36.5768 (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													3429.7812 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	606.7428	467.3641	390.4131	233.3154	109.0863	0.0000	0.0000	0.0000	0.0000	221.4549	433.5359	631.7501	(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)	672.6638	518.1421	432.8305	258.6645	120.9383	0.0000	0.0000	0.0000	0.0000	245.5154	480.6385	700.3881	(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	156.0614	136.5485	140.8515	122.7449	117.7259	101.5447	94.0961	108.0232	109.3604	127.5039	139.2342	151.1371	(64)
Efficiency of water heater (217)m	86.9323	86.6024	86.0104	84.8273	82.3472	76.2000	76.2000	76.2000	76.2000	84.5257	86.3437	76.2000	(216)
Fuel for water heating, kWh/month	179.5205	157.6729	163.7610	144.6996	142.9629	133.2608	123.4857	141.7627	143.5176	150.8463	161.2558	173.5008	(219)
Water heating fuel used													1816.2469 (219)
Annual totals kWh/year													
Space heating fuel - main system													3429.7812 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.2240)													
mechanical ventilation fans (SFP = 0.2240)													57.7851 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													132.7851 (231)
Electricity for lighting (calculated in Appendix L)													378.7265 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.73 * 1080 * 1.00) =													-630.4424 (233)
Total delivered energy for all uses													5127.0972 (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	3429.7812	0.2160	740.8327 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1816.2469	0.2160	392.3093 (264)
Space and water heating			1133.1421 (265)
Pumps and fans	132.7851	0.5190	68.9154 (267)
Energy for lighting	378.7265	0.5190	196.5590 (268)
Energy saving/generation technologies			
PV Unit	-630.4424	0.5190	-327.1996 (269)
Total CO2, kg/year			1071.4170 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			12.6700 (273)

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

DER		12.6700 ZC1
Total Floor Area	TFA	84.5800
Assumed number of occupants	N	2.5440
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.0263 ZC2
CO2 emissions from cooking, equation (L16)		2.1288 ZC3
Total CO2 emissions		30.8251 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		30.8251 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	42.2900 (1b)	x 2.3900 (2b)	= 101.0731 (1b) - (3b)
First floor	42.2900 (1c)	x 2.6100 (2c)	= 110.3769 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.5800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.4500 (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) = 0.1419 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3919 (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) =				0.3331 (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	0.4247	0.4164	0.4080	0.3664	0.3581	0.3164	0.3164	0.3081	0.3331	0.3581	0.3747	0.3914 (22b)
Effective ac	0.5902	0.5867	0.5832	0.5671	0.5641	0.5501	0.5501	0.5475	0.5555	0.5641	0.5702	0.5766 (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)			13.0100	1.3258	17.2481		(27)
Ground Floor			42.2900	0.1300	5.4977		(28a)
Brick and Block	91.8500	15.1600	76.6900	0.1800	13.8042		(29a)
Pitched Roof	42.2900		42.2900	0.1300	5.4977		(30)
Total net area of external elements Aum(A, m ²)			176.4300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.1977		(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)							9.6195 (36)
Total fabric heat loss						(33) + (36) =	53.8172 (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	41.1821	40.9378	40.6983	39.5732	39.3627	38.3829	38.3829	38.2014	38.7603	39.3627	39.7886	40.2337 (38)
Heat transfer coeff	94.9994	94.7550	94.5155	93.3904	93.1800	92.2001	92.2001	92.0186	92.5775	93.1800	93.6058	94.0509 (39)
Average = Sum(39)m / 12 =												93.3894 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1232	1.1203	1.1175	1.1042	1.1017	1.0901	1.0901	1.0879	1.0946	1.1017	1.1067	1.1120 (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												2.5440 (42)
Average daily hot water use (litres/day)												94.6210 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	104.0831	100.2983	96.5134	92.7286	88.9438	85.1589	85.1589	88.9438	92.7286	96.5134	100.2983	104.0831 (44)
Energy conte	154.3523	134.9975	139.3053	121.4497	116.5339	100.5599	93.1835	106.9295	108.2066	126.1043	137.6527	149.4819 (45)
Energy content (annual)										Total = Sum(45)m =		1488.7572 (45)
Distribution loss (46)m = 0.15 x (45)m	23.1528	20.2496	20.8958	18.2175	17.4801	15.0840	13.9775	16.0394	16.2310	18.9156	20.6479	22.4223 (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	49.1822	45.7292	45.3248	41.9962	43.3961	45.3248	45.7292	49.1822	49.3151	50.9589 (61)
Solar input	205.3112	181.0249	188.4875	167.1789	161.8587	142.5561	136.5796	152.2542	153.9357	175.2865	186.9678	200.4408 (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	205.3112	181.0249	188.4875	167.1789	161.8587	142.5561	136.5796	152.2542	153.9357	175.2865	186.9678	200.4408 (64)
	64.0619	56.3935	58.6146	51.8143	50.0787	43.9352	41.8325	46.8852	47.4110	54.2252	58.0983	62.4425 (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	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.4451	19.0473	15.4903	11.7272	8.7662	7.4008	7.9968	10.3946	13.9516	17.7147	20.6757	22.0411	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.7461	231.1198	225.1382	212.4041	196.3297	181.2220	171.1291	168.7554	174.7370	187.4710	203.5455	218.6532	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	(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)	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	(71)
Water heating gains (Table 5)	86.1046	83.9189	78.7830	71.9644	67.3101	61.0211	56.2265	63.0178	65.8486	72.8834	80.6921	83.9280	(72)
Total internal gains	400.4565	398.2466	383.5722	360.2563	336.5666	313.8045	299.5131	306.3284	318.6978	342.2298	369.0739	388.7830	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d			Gains W	
North				3.2800	10.6334	0.6300	0.7000	0.7700			10.6590 (74)	
East				1.9100	19.6403	0.6300	0.7000	0.7700			11.4644 (76)	
South				7.8200	46.7521	0.6300	0.7000	0.7700			111.7325 (78)	
Solar gains	133.8559	225.7858	304.6429	372.9125	415.4401	411.9533	397.3303	365.3402	328.0680	248.2299	159.8852	114.8608 (83)
Total gains	534.3124	624.0324	688.2150	733.1688	752.0067	725.7579	696.8434	671.6686	646.7658	590.4597	528.9590	503.6438 (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	61.8279	61.9874	62.1444	62.8931	63.0351	63.7050	63.7050	63.8307	63.4453	63.0351	62.7484	62.4514	
alpha	5.1219	5.1325	5.1430	5.1929	5.2023	5.2470	5.2470	5.2554	5.2297	5.2023	5.1832	5.1634	
util living area	0.9975	0.9940	0.9854	0.9601	0.8919	0.7423	0.5674	0.6084	0.8342	0.9689	0.9944	0.9981	(86)
MIT	19.8244	19.9893	20.2267	20.5229	20.7806	20.9424	20.9885	20.9836	20.8887	20.5553	20.1325	19.7954	(87)
Th 2	19.9819	19.9843	19.9866	19.9974	19.9995	20.0089	20.0089	20.0107	20.0053	19.9995	19.9954	19.9911	(88)
util rest of house	0.9966	0.9919	0.9802	0.9451	0.8503	0.6539	0.4472	0.4884	0.7616	0.9541	0.9921	0.9975	(89)
MIT 2	18.4175	18.6593	19.0048	19.4341	19.7797	19.9693	20.0046	20.0038	19.9164	19.4868	18.8769	18.3816	(90)
Living area fraction	18.7289	18.9537	19.2753	19.6751	20.0012	20.1847	20.2223	20.2206	20.1316	19.7233	19.1548	18.6945	(91)
MIT	18.7289	18.9537	19.2753	19.6751	20.0012	20.1847	20.2223	20.2206	20.1316	19.7233	19.1548	18.6945	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7289	18.9537	19.2753	19.6751	20.0012	20.1847	20.2223	20.2206	20.1316	19.7233	19.1548	18.6945	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9951	0.9890	0.9754	0.9390	0.8504	0.6709	0.4740	0.5150	0.7721	0.9488	0.9894	0.9963	(94)
Ext temp.	531.6883	617.1892	671.2507	688.4403	639.4738	486.9241	330.2737	345.8898	499.3758	560.2257	523.3713	501.7822	(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	1370.7355	1331.6559	1207.4609	1006.2891	773.5090	514.9076	333.9784	351.5686	558.3894	850.1058	1128.4015	1363.2239	(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	624.2511	480.1216	398.9404	228.8511	99.7222	0.0000	0.0000	0.0000	0.0000	215.6707	435.6218	640.9127	(98)
Space heating per m2												3124.0916	(98)
												36.9365	(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												3344.8518 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	624.2511	480.1216	398.9404	228.8511	99.7222	0.0000	0.0000	0.0000	0.0000	215.6707	435.6218	640.9127 (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)	668.3631	514.0488	427.1310	245.0226	106.7689	0.0000	0.0000	0.0000	0.0000	230.9109	466.4045	686.2020 (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	205.3112	181.0249	188.4875	167.1789	161.8587	142.5561	136.5796	152.2542	153.9357	175.2865	186.9678	200.4408 (64)
Efficiency of water heater (217)m	87.6709	87.3904	86.8931	85.8422	83.8724	80.3000	80.3000	80.3000	80.3000	85.5742	87.1097	80.3000 (216)
Fuel for water heating, kWh/month	234.1840	207.1451	216.9188	194.7515	192.9821	177.5294	170.0867	189.6068	191.7008	204.8357	214.6349	228.3706 (219)
Water heating fuel used												2422.7463 (219)
Annual totals kWh/year												
Space heating fuel - main system												3344.8518 (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)												378.7265 (232)
Total delivered energy for all uses												6221.3246 (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	3344.8518	0.2160	722.4880 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2422.7463	0.2160	523.3132 (264)
Space and water heating			1245.8012 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	378.7265	0.5190	196.5590 (268)
Total CO2, kg/m2/year			1481.2852 (272)
Emissions per m2 for space and water heating			14.7293 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3239 (272b)
Emissions per m2 for pumps and fans			0.4602 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.7293 * 1.00) + 2.3239 + 0.4602, rounded to 2 d.p.			17.5100 (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	42.2900 (1b)	x 2.3900 (2b)	= 101.0731 (1b) - (3b)
First floor	42.2900 (1c)	x 2.6100 (2c)	= 110.3769 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.5800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.4500 (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) = 0.1419 (8)
Pressure test					Yes
Measured/design AP50					2.6200
Infiltration rate					0.2729 (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) =	0.2319 (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	0.2957	0.2899	0.2841	0.2551	0.2493	0.2203	0.2203	0.2145	0.2319	0.2493	0.2609	0.2725 (22b)
Effective ac	0.5437	0.5420	0.5404	0.5325	0.5311	0.5243	0.5243	0.5230	0.5269	0.5311	0.5340	0.5371 (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)			13.0100	1.1450	14.8969		(27)
Ground Floor			42.2900	0.1200	5.0748	84.0000	3552.3600 (28a)
Brick and Block	91.8500	15.1600	76.6900	0.2400	18.4056	42.2200	3237.8518 (29a)
Pitched Roof	42.2900		42.2900	0.1000	4.2290	9.1000	384.8390 (30)
Total net area of external elements Aum(A, m ²)			176.4300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.9713		(33)
Party Wall 1			43.9300	0.0000	0.0000	110.0000	4832.3000 (32)
Ground Floor Stud			23.1100			75.0000	1733.2500 (32c)
Ground Floor Stud			44.5500			9.0000	400.9500 (32c)
First Floor Stud			98.5900			9.0000	887.3100 (32c)
Internal Floor 1			42.2900			18.0000	761.2200 (32d)
Internal Ceiling 1			42.2900			9.0000	380.6100 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 16170.6908 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 191.1881 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.6548 (36)
Total fabric heat loss (33) + (36) = 55.6262 (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	37.9406	37.8221	37.7059	37.1604	37.0584	36.5832	36.5832	36.4953	36.7663	37.0584	37.2648	37.4807 (38)
Heat transfer coeff	93.5667	93.4482	93.3321	92.7866	92.6845	92.2094	92.2094	92.1214	92.3924	92.6845	92.8910	93.1069 (39)
Average = Sum(39)m / 12 =												92.7861 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1063	1.1049	1.1035	1.0970	1.0958	1.0902	1.0902	1.0892	1.0924	1.0958	1.0983	1.1008 (40)
HLP (average)												1.0970 (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 2.5440 (42)
Average daily hot water use (litres/day) 94.6210 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	104.0831	100.2983	96.5134	92.7286	88.9438	85.1589	85.1589	88.9438	92.7286	96.5134	100.2983	104.0831 (44)
Energy conte	154.3523	134.9975	139.3053	121.4497	116.5339	100.5599	93.1835	106.9295	108.2066	126.1043	137.6527	149.4819 (45)

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Energy content (annual)	Total = Sum(45)m = 1488.7572 (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	32.7999	28.6870	29.6024	25.8081	24.7635	21.3690	19.8015	22.7225	22.9939	26.7972	29.2512	31.7649 (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	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.4451	19.0473	15.4903	11.7272	8.7662	7.4008	7.9968	10.3946	13.9516	17.7147	20.6757	22.0411	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.7461	231.1198	225.1382	212.4041	196.3297	181.2220	171.1291	168.7554	174.7370	187.4710	203.5455	218.6532	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	(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)	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	(71)
Water heating gains (Table 5)	44.0858	42.6889	39.7881	35.8445	33.2842	29.6791	26.6149	30.5410	31.9360	36.0177	40.6267	42.6948	(72)
Total internal gains	355.4376	354.0167	341.5773	321.1365	299.5408	279.4626	266.9015	270.8516	281.7852	302.3641	326.0085	344.5497	(73)

6. Solar gains

[Jan]			Area m2		Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North			3.2800		10.6334		0.6300		0.7000		0.7700		10.6590 (74)
East			1.9100		19.6403		0.6300		0.7000		0.7700		11.4644 (76)
South			7.8200		46.7521		0.6300		0.7000		0.7700		111.7325 (78)
Solar gains	133.8559	225.7858	304.6429	372.9125	415.4401	411.9533	397.3303	365.3402	328.0680	248.2299	159.8852	114.8608	(83)
Total gains	489.2936	579.8024	646.2202	694.0490	714.9808	691.4159	664.2317	636.1918	609.8532	550.5940	485.8936	459.4105	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	48.0070	48.0679	48.1277	48.4106	48.4640	48.7137	48.7137	48.7602	48.6172	48.4640	48.3562	48.2441	
alpha	4.2005	4.2045	4.2085	4.2274	4.2309	4.2476	4.2476	4.2507	4.2411	4.2309	4.2237	4.2163	
util living area	0.9948	0.9888	0.9762	0.9456	0.8761	0.7405	0.5791	0.6212	0.8267	0.9576	0.9899	0.9960	(86)
MIT	19.5180	19.7168	20.0041	20.3562	20.6747	20.8920	20.9709	20.9605	20.8157	20.3971	19.8819	19.4737	(87)
Th 2	19.9957	19.9969	19.9980	20.0033	20.0042	20.0088	20.0088	20.0097	20.0071	20.0042	20.0023	20.0002	(88)
util rest of house	0.9934	0.9859	0.9697	0.9296	0.8374	0.6601	0.4626	0.5063	0.7618	0.9420	0.9868	0.9949	(89)
MIT 2	18.6422	18.8405	19.1253	19.4718	19.7682	19.9503	19.9991	19.9953	19.8949	19.5169	19.0099	18.6016	(90)
Living area fraction	18.8361	19.0345	19.3198	19.6675	19.9688	20.1587	20.2142	20.2089	20.0987	19.7117	19.2029	18.7946	(91)
MIT	18.8361	19.0345	19.3198	19.6675	19.9688	20.1587	20.2142	20.2089	20.0987	19.7117	19.2029	18.7946	(92)
Temperature adjustment	18.8361	19.0345	19.3198	19.6675	19.9688	20.1587	20.2142	20.2089	20.0987	19.7117	19.2029	18.7946	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9912	0.9822	0.9641	0.9231	0.8358	0.6734	0.4880	0.5309	0.7686	0.9362	0.9834	0.9931	(94)
Ext temp.	484.9977	569.4539	623.0431	640.6721	597.5936	465.6225	324.1480	337.7640	468.7622	515.4814	477.8139	456.2572	(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	1360.0923	1320.8397	1196.4979	999.0804	766.3936	512.5671	333.2632	350.8840	554.2346	844.5128	1124.2536	1358.8570	(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	651.0704	504.9313	426.6504	258.0540	125.5872	0.0000	0.0000	0.0000	0.0000	244.7993	465.4366	671.5342	(98)
Space heating per m2	(98) / (4) =												39.5846 (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	866.7685	682.3496	700.1228	0.0000	0.0000	0.0000	0.0000	(100)

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Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8260	0.8934	0.8750	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	715.9487	609.5983	612.5911	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	903.8547	870.1247	839.1114	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	135.2923	193.8317	168.5311	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												497.6550 (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	33.8231	48.4579	42.1328	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												124.4138 (107)
Space cooling per m2												1.4710 (108)
Energy for space heating												39.5846 (99)
Energy for space cooling												1.4710 (108)
Total												41.0555 (109)
Dwelling Fabric Energy Efficiency (DFEE)												41.1 (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	42.2900 (1b)	x 2.3900 (2b)	= 101.0731 (1b) - (3b)
First floor	42.2900 (1c)	x 2.6100 (2c)	= 110.3769 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.5800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.4500 (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) = 0.1419 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3919 (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) =	0.3331 (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	0.4247	0.4164	0.4080	0.3664	0.3581	0.3164	0.3164	0.3081	0.3331	0.3581	0.3747	0.3914 (22b)
Effective ac	0.5902	0.5867	0.5832	0.5671	0.5641	0.5501	0.5501	0.5475	0.5555	0.5641	0.5702	0.5766 (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)			13.0100	1.3258	17.2481		(27)
Ground Floor			42.2900	0.1300	5.4977		(28a)
Brick and Block	91.8500	15.1600	76.6900	0.1800	13.8042		(29a)
Pitched Roof	42.2900		42.2900	0.1300	5.4977		(30)
Total net area of external elements Aum(A, m ²)			176.4300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.1977		(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)							9.6195 (36)
Total fabric heat loss						(33) + (36) =	53.8172 (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	41.1821	40.9378	40.6983	39.5732	39.3627	38.3829	38.3829	38.2014	38.7603	39.3627	39.7886	40.2337 (38)
Heat transfer coeff	94.9994	94.7550	94.5155	93.3904	93.1800	92.2001	92.2001	92.0186	92.5775	93.1800	93.6058	94.0509 (39)
Average = Sum(39)m / 12 =												93.3894 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1232	1.1203	1.1175	1.1042	1.1017	1.0901	1.0901	1.0879	1.0946	1.1017	1.1067	1.1120 (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												2.5440 (42)
Average daily hot water use (litres/day)												94.6210 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	104.0831	100.2983	96.5134	92.7286	88.9438	85.1589	85.1589	88.9438	92.7286	96.5134	100.2983	104.0831 (44)
Energy conte	154.3523	134.9975	139.3053	121.4497	116.5339	100.5599	93.1835	106.9295	108.2066	126.1043	137.6527	149.4819 (45)
Energy content (annual)										Total = Sum(45)m =		1488.7572 (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	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	0.0000 (59)
	32.7999	28.6870	29.6024	25.8081	24.7635	21.3690	19.8015	22.7225	22.9939	26.7972	29.2512	31.7649	(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	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.4451	19.0473	15.4903	11.7272	8.7662	7.4008	7.9968	10.3946	13.9516	17.7147	20.6757	22.0411	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.7461	231.1198	225.1382	212.4041	196.3297	181.2220	171.1291	168.7554	174.7370	187.4710	203.5455	218.6532	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	(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)	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	(71)
Water heating gains (Table 5)	44.0858	42.6889	39.7881	35.8445	33.2842	29.6791	26.6149	30.5410	31.9360	36.0177	40.6267	42.6948	(72)
Total internal gains	355.4376	354.0167	341.5773	321.1365	299.5408	279.4626	266.9015	270.8516	281.7852	302.3641	326.0085	344.5497	(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			3.2800	10.6334		0.6300		0.7000		0.7700		10.6590	(74)
East			1.9100	19.6403		0.6300		0.7000		0.7700		11.4644	(76)
South			7.8200	46.7521		0.6300		0.7000		0.7700		111.7325	(78)

Solar gains	133.8559	225.7858	304.6429	372.9125	415.4401	411.9533	397.3303	365.3402	328.0680	248.2299	159.8852	114.8608	(83)
Total gains	489.2936	579.8024	646.2202	694.0490	714.9808	691.4159	664.2317	636.1918	609.8532	550.5940	485.8936	459.4105	(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	61.8279	61.9874	62.1444	62.8931	63.0351	63.7050	63.7050	63.8307	63.4453	63.0351	62.7484	62.4514	
alpha	5.1219	5.1325	5.1430	5.1929	5.2023	5.2470	5.2470	5.2554	5.2297	5.2023	5.1832	5.1634	
util living area	0.9983	0.9957	0.9888	0.9677	0.9076	0.7668	0.5920	0.6370	0.8583	0.9765	0.9962	0.9988	(86)
MIT	19.7748	19.9413	20.1829	20.4867	20.7562	20.9327	20.9860	20.9797	20.8706	20.5167	20.0855	19.7464	(87)
Th 2	19.9819	19.9843	19.9866	19.9974	19.9995	20.0089	20.0089	20.0107	20.0053	19.9995	19.9954	19.9911	(88)
util rest of house	0.9978	0.9942	0.9848	0.9551	0.8698	0.6797	0.4682	0.5139	0.7903	0.9648	0.9946	0.9984	(89)
MIT 2	18.8643	19.0321	19.2736	19.5792	19.8298	19.9766	20.0052	20.0047	19.9327	19.6134	19.1853	18.8433	(90)
Living area fraction									fLA = Living area / (4) =			0.2213	(91)
MIT	19.0659	19.2334	19.4749	19.7801	20.0348	20.1882	20.2223	20.2205	20.1403	19.8133	19.3845	19.0432	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0659	19.2334	19.4749	19.7801	20.0348	20.1882	20.2223	20.2205	20.1403	19.8133	19.3845	19.0432	(93)

8. Space heating requirement													

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9970	0.9927	0.9821	0.9517	0.8714	0.6969	0.4959	0.5414	0.8010	0.9620	0.9933	0.9978	(94)
Ext temp.	487.8442	575.5705	634.6604	660.4927	623.0075	481.8684	329.4122	344.4182	488.4840	529.6781	482.6501	458.4174	(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	1402.7470	1358.1566	1226.3258	1016.0928	776.6396	515.2371	333.9772	351.5586	559.1941	858.4986	1149.9031	1396.0154	(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	(98)
Space heating per m2	680.6877	525.8979	440.1991	256.0321	114.3023	0.0000	0.0000	0.0000	0.0000	244.6424	480.4222	697.5729	(98)
												3439.7566	(98)
												40.6687	(99)

8c. Space cooling requirement													

Calculated for June, July and August. See Table 10b													
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	866.6808	682.2807	699.3416	0.0000	0.0000	0.0000	0.0000	(100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.8570	0.9229	0.9060	0.0000	0.0000	0.0000	0.0000	(101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	742.7660	629.6451	633.5987	0.0000	0.0000	0.0000	0.0000	(102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	903.8547	870.1247	839.1114	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	115.9839	178.9168	152.9014	0.0000	0.0000	0.0000	0.0000	(104)
												447.8022	(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	28.9960	44.7292	38.2254	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												111.9505 (107)
Space cooling per m2												1.3236 (108)
Energy for space heating												40.6687 (99)
Energy for space cooling												1.3236 (108)
Total												41.9923 (109)
Target Fabric Energy Efficiency (TFEE)												48.3 (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	42.2900 (1b)	x 2.3900 (2b)	= 101.0731 (1b) - (3b)
First floor	42.2900 (1c)	x 2.6100 (2c)	= 110.3769 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.5800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.4500 (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											2.6200	
Infiltration rate											0.1310	(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) =		0.1114	(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)
	0.1308	0.1225	0.1225	0.1114	0.1141	0.1086	0.1086	0.1058	0.1058	0.1141	0.1114	0.1141 (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)			13.0100	1.1450	14.8969		(27)					
Ground Floor			42.2900	0.1200	5.0748	84.0000	3552.3600 (28a)					
Brick and Block	91.8500	15.1600	76.6900	0.2400	18.4056	42.2200	3237.8518 (29a)					
Pitched Roof	42.2900		42.2900	0.1000	4.2290	9.1000	384.8390 (30)					
Total net area of external elements Aum(A, m2)			176.4300				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.9713		(33)					
Party Wall 1			43.9300	0.0000	0.0000	110.0000	4832.3000 (32)					
Ground Floor Stud			23.1100			75.0000	1733.2500 (32c)					
Ground Floor Stud			44.5500			9.0000	400.9500 (32c)					
First Floor Stud			98.5900			9.0000	887.3100 (32c)					
Internal Floor 1			42.2900			18.0000	761.2200 (32d)					
Internal Ceiling 1			42.2900			18.0000	761.2200 (32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	16551.3008 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							195.6881 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.6548 (36)					
Total fabric heat loss						(33) + (36) =	55.6262 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 34.8893	Feb 34.8893	Mar 34.8893	Apr 34.8893	May 34.8893	Jun 34.8893	Jul 34.8893	Aug 34.8893	Sep 34.8893	Oct 34.8893	Nov 34.8893	Dec 34.8893 (38)
Heat transfer coeff	90.5154	90.5154	90.5154	90.5154	90.5154	90.5154	90.5154	90.5154	90.5154	90.5154	90.5154	90.5154 (39)
Average = Sum(39)m / 12 =												90.5154 (39)
HLP	Jan 1.0702	Feb 1.0702	Mar 1.0702	Apr 1.0702	May 1.0702	Jun 1.0702	Jul 1.0702	Aug 1.0702	Sep 1.0702	Oct 1.0702	Nov 1.0702	Dec 1.0702 (40)
HLP (average)												1.0702 (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												2.5440 (42)
Average daily hot water use (litres/day)												94.6210 (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	104.0831	100.2983	96.5134	92.7286	88.9438	85.1589	85.1589	88.9438	92.7286	96.5134	100.2983	104.0831 (44)
Energy conte	154.3523	134.9975	139.3053	121.4497	116.5339	100.5599	93.1835	106.9295	108.2066	126.1043	137.6527	149.4819 (45)
Energy content (annual)												1488.7572 (45)
Distribution loss (46)m = 0.15 x (45)m	23.1528	20.2496	20.8958	18.2175	17.4801	15.0840	13.9775	16.0394	16.2310	18.9156	20.6479	22.4223 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	1.7091	1.5510	1.5462	1.2951	1.1920	0.9848	0.9126	1.0937	1.1539	1.3996	1.5815	1.6552 (61)
Total heat required for water heating calculated for each month	156.0614	136.5485	140.8515	122.7449	117.7259	101.5447	94.0961	108.0232	109.3604	127.5039	139.2342	151.1371 (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	156.0614	136.5485	140.8515	122.7449	117.7259	101.5447	94.0961	108.0232	109.3604	127.5039	139.2342	151.1371 (64)
RHI water heating demand												1504.8319 (64)
Heat gains from water heating, kWh/month	51.7494	45.2744	46.7056	40.7058	39.0455	33.6824	31.2117	35.8275	36.2672	42.2796	46.1649	50.1165 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	53.6127	47.6183	38.7258	29.3179	21.9155	18.5020	19.9920	25.9864	34.8789	44.2868	51.6892	55.1027 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	341.4121	344.9549	336.0272	317.0211	293.0294	270.4806	255.4166	251.8738	260.8015	279.8075	303.7992	326.3481 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083 (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)	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617 (71)
Water heating gains (Table 5)	69.5557	67.3726	62.7763	56.5359	52.4805	46.7811	41.9512	48.1552	50.3710	56.8274	64.1179	67.3609 (72)
Total internal gains	571.2696	566.6350	544.2184	509.5641	474.1146	442.4528	424.0489	432.7046	452.7406	487.6109	526.2955	555.5009 (73)

6. Solar gains

[Jan]		Area	Solar flux	g	FF	Access	Gains
		m2	Table 6a	W/m2	Specific data	factor	W
					or Table 6b	Table 6d	
North		3.2800	13.4684	0.6300	0.7000	0.7700	13.5009 (74)
East		1.9100	25.1733	0.6300	0.7000	0.7700	14.6942 (76)
South		7.8200	56.5862	0.6300	0.7000	0.7700	135.2350 (78)

Solar gains	163.4301	234.5070	322.7531	399.2527	421.6085	464.2138	429.5303	409.5345	364.6163	278.2767	194.5200	132.8009 (83)
Total gains	734.6996	801.1419	866.9715	908.8167	895.7231	906.6665	853.5793	842.2391	817.3569	765.8875	720.8156	688.3018 (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	50.7934	50.7934	50.7934	50.7934	50.7934	50.7934	50.7934	50.7934	50.7934	50.7934	50.7934	
alpha	4.3862	4.3862	4.3862	4.3862	4.3862	4.3862	4.3862	4.3862	4.3862	4.3862	4.3862	
util living area	0.9706	0.9570	0.9218	0.8462	0.7130	0.4959	0.3477	0.3418	0.5888	0.8343	0.9435	0.9760 (86)
MIT	20.0709	20.1934	20.4354	20.7031	20.8957	20.9836	20.9973	20.9976	20.9650	20.7727	20.3965	20.0269 (87)
Th 2	20.0253	20.0253	20.0253	20.0253	20.0253	20.0253	20.0253	20.0253	20.0253	20.0253	20.0253	20.0253 (88)
util rest of house	0.9632	0.9465	0.9029	0.8096	0.6484	0.4068	0.2462	0.2388	0.4986	0.7867	0.9274	0.9698 (89)
MIT 2	19.2092	19.3277	19.5588	19.8034	19.9624	20.0191	20.0248	20.0249	20.0100	19.8686	19.5263	19.1668 (90)
Living area fraction	19.3999	19.5193	19.7528	20.0025	20.1690	20.2326	20.2401	20.2402	20.2214	20.0687	19.7189	0.2213 (91)
MIT	19.3999	19.5193	19.7528	20.0025	20.1690	20.2326	20.2401	20.2402	20.2214	20.0687	19.7189	19.3572 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3999	19.5193	19.7528	20.0025	20.1690	20.2326	20.2401	20.2402	20.2214	20.0687	19.7189	19.3572 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	703.4038	753.0821	777.5106	734.9276	589.8975	386.4656	229.3805	220.4123	422.9811	604.3779	664.1063	663.8735 (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	1249.1068	1223.7065	1100.0152	896.3295	639.8525	392.1631	229.9137	220.8722	436.4112	721.2908	1006.4291	1236.1835 (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	406.0030	316.2596	239.9435	116.2093	37.1666	0.0000	0.0000	0.0000	0.0000	86.9832	246.4724	425.7987 (98)
Space heating												1874.8363 (98)
RHI space heating demand												1875 (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	42.2900 (1b)	x 2.3900 (2b)	= 101.0731 (1b) - (3b)
First floor	42.2900 (1c)	x 2.6100 (2c)	= 110.3769 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.5800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.4500 (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											2.6200	
Infiltration rate											0.1310 (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) =	0.1114 (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	0.1420	0.1392	0.1364	0.1225	0.1197	0.1058	0.1058	0.1030	0.1114	0.1197	0.1253	0.1308 (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)			13.0100	1.1450	14.8969		(27)					
Ground Floor			42.2900	0.1200	5.0748	84.0000	3552.3600 (28a)					
Brick and Block	91.8500	15.1600	76.6900	0.2400	18.4056	42.2200	3237.8518 (29a)					
Pitched Roof	42.2900		42.2900	0.1000	4.2290	9.1000	384.8390 (30)					
Total net area of external elements Aum(A, m2)			176.4300				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.9713		(33)					
Party Wall 1			43.9300	0.0000	0.0000	110.0000	4832.3000 (32)					
Ground Floor Stud			23.1100			75.0000	1733.2500 (32c)					
Ground Floor Stud			44.5500			9.0000	400.9500 (32c)					
First Floor Stud			98.5900			9.0000	887.3100 (32c)					
Internal Floor 1			42.2900			18.0000	761.2200 (32d)					
Internal Ceiling 1			42.2900			18.0000	761.2200 (32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	16551.3008 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							195.6881 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.6548 (36)					
Total fabric heat loss						(33) + (36) =	55.6262 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 34.8893	Feb 34.8893	Mar 34.8893	Apr 34.8893	May 34.8893	Jun 34.8893	Jul 34.8893	Aug 34.8893	Sep 34.8893	Oct 34.8893	Nov 34.8893	Dec 34.8893 (38)
Heat transfer coeff	90.5154	90.5154	90.5154	90.5154	90.5154	90.5154	90.5154	90.5154	90.5154	90.5154	90.5154	90.5154 (39)
Average = Sum(39)m / 12 =												90.5154 (39)
HLP	Jan 1.0702	Feb 1.0702	Mar 1.0702	Apr 1.0702	May 1.0702	Jun 1.0702	Jul 1.0702	Aug 1.0702	Sep 1.0702	Oct 1.0702	Nov 1.0702	Dec 1.0702 (40)
HLP (average)												1.0702 (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												2.5440 (42)
Average daily hot water use (litres/day)												94.6210 (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	104.0831	100.2983	96.5134	92.7286	88.9438	85.1589	85.1589	88.9438	92.7286	96.5134	100.2983	104.0831 (44)
Energy conte	154.3523	134.9975	139.3053	121.4497	116.5339	100.5599	93.1835	106.9295	108.2066	126.1043	137.6527	149.4819 (45)
Energy content (annual)										Total = Sum (45)m =		1488.7572 (45)
Distribution loss (46)m = 0.15 x (45)m	23.1528	20.2496	20.8958	18.2175	17.4801	15.0840	13.9775	16.0394	16.2310	18.9156	20.6479	22.4223 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	1.7091	1.5510	1.5462	1.2951	1.1920	0.9848	0.9126	1.0937	1.1539	1.3996	1.5815	1.6552 (61)
Total heat required for water heating calculated for each month	156.0614	136.5485	140.8515	122.7449	117.7259	101.5447	94.0961	108.0232	109.3604	127.5039	139.2342	151.1371 (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	156.0614	136.5485	140.8515	122.7449	117.7259	101.5447	94.0961	108.0232	109.3604	127.5039	139.2342	151.1371 (64)
Heat gains from water heating, kWh/month	51.7494	45.2744	46.7056	40.7058	39.0455	33.6824	31.2117	35.8275	36.2672	42.2796	46.1649	50.1165 (65)
Total per year (kWh/year) = Sum (64)m = 1504.8319 (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	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	53.6127	47.6183	38.7258	29.3179	21.9155	18.5020	19.9920	25.9864	34.8789	44.2868	51.6892	55.1027 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	341.4121	344.9549	336.0272	317.0211	293.0294	270.4806	255.4166	251.8738	260.8015	279.8075	303.7992	326.3481 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083 (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)	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617 (71)
Water heating gains (Table 5)	69.5557	67.3726	62.7763	56.5359	52.4805	46.7811	41.9512	48.1552	50.3710	56.8274	64.1179	67.3609 (72)
Total internal gains	571.2696	566.6350	544.2184	509.5641	474.1146	442.4528	424.0489	432.7046	452.7406	487.6109	526.2955	555.5009 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W
North					3.2800	10.6334		0.6300	0.7000	0.7700	10.6590 (74)	
East					1.9100	19.6403		0.6300	0.7000	0.7700	11.4644 (76)	
South					7.8200	46.7521		0.6300	0.7000	0.7700	111.7325 (78)	
Solar gains	133.8559	225.7858	304.6429	372.9125	415.4401	411.9533	397.3303	365.3402	328.0680	248.2299	159.8852	114.8608 (83)
Total gains	705.1255	792.4208	848.8613	882.4766	889.5546	854.4061	821.3792	798.0448	780.8086	735.8408	686.1807	670.3617 (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	50.7934	50.7934	50.7934	50.7934	50.7934	50.7934	50.7934	50.7934	50.7934	50.7934	50.7934	50.7934
alpha	4.3862	4.3862	4.3862	4.3862	4.3862	4.3862	4.3862	4.3862	4.3862	4.3862	4.3862	4.3862
util living area	0.9809	0.9672	0.9422	0.8904	0.7912	0.6327	0.4742	0.5069	0.7140	0.8991	0.9669	0.9844 (86)
MIT	19.8811	20.0573	20.3005	20.5778	20.8117	20.9472	20.9881	20.9839	20.9085	20.6183	20.1885	19.8255 (87)
Th 2	20.0253	20.0253	20.0253	20.0253	20.0253	20.0253	20.0253	20.0253	20.0253	20.0253	20.0253	20.0253 (88)
util rest of house	0.9763	0.9596	0.9285	0.8638	0.7413	0.5521	0.3742	0.4062	0.6392	0.8691	0.9578	0.9806 (89)
MIT 2	19.0223	19.1947	19.4302	19.6913	19.8967	19.9988	20.0216	20.0199	19.9744	19.7338	19.3256	18.9677 (90)
Living area fraction									fLA = Living area / (4) =			0.2213 (91)
MIT	19.2124	19.3856	19.6228	19.8875	20.0993	20.2087	20.2355	20.2332	20.1811	19.9296	19.5166	19.1575 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2124	19.3856	19.6228	19.8875	20.0993	20.2087	20.2355	20.2332	20.1811	19.9296	19.5166	19.1575 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9715	0.9535	0.9218	0.8595	0.7454	0.5680	0.3963	0.4283	0.6520	0.8657	0.9519	0.9763 (94)
Ext temp.	684.9995	755.5400	782.5076	758.5007	663.0633	485.3182	325.4727	341.8288	509.1074	637.0342	653.1770	654.4963 (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	1349.8025	1311.1719	1187.8197	994.5389	760.2622	507.6757	329.0675	346.9663	550.4373	844.4693	1123.8944	1353.8854 (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	494.6134	373.3846	301.5522	169.9475	72.3160	0.0000	0.0000	0.0000	0.0000	154.3317	338.9165	520.3455 (98)
Space heating per m2												2425.4075 (98)
												(98) / (4) = 28.6759 (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													2688.9218 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	494.6134	373.3846	301.5522	169.9475	72.3160	0.0000	0.0000	0.0000	0.0000	154.3317	338.9165	520.3455	(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)	548.3519	413.9519	334.3151	188.4118	80.1729	0.0000	0.0000	0.0000	0.0000	171.0995	375.7390	576.8797	(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	156.0614	136.5485	140.8515	122.7449	117.7259	101.5447	94.0961	108.0232	109.3604	127.5039	139.2342	151.1371	(64)
Efficiency of water heater	86.3930	85.9704	85.2154	83.7474	80.9830	76.2000	76.2000	76.2000	76.2000	83.2780	85.6194	76.2000	(216)
Fuel for water heating, kWh/month	180.6412	158.8319	165.2888	146.5656	145.3711	133.2608	123.4857	141.7627	143.5176	153.1064	162.6200	174.4868	(219)
Water heating fuel used												1828.9389	(219)
Annual totals kWh/year													
Space heating fuel - main system												2688.9218	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.2240)													
mechanical ventilation fans (SFP = 0.2240)													57.7851 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													132.7851 (231)
Electricity for lighting (calculated in Appendix L)													378.7265 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.73 * 1080 * 1.00) =										-630.4424			-630.4424 (233)
Total delivered energy for all uses													4398.9299 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2688.9218	3.4800	93.5745 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1828.9389	3.4800	63.6471 (247)
Mechanical ventilation fans	57.7851	13.1900	7.6218 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	378.7265	13.1900	49.9540 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-630.4424	13.1900	-83.1553 (252)
Total energy cost			261.5346 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.4200 (256)
SAP value		0.8477 (257)
SAP rating (Section 12)		88.1746
SAP band		B (258)

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	2688.9218	0.2160	580.8071 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1828.9389	0.2160	395.0508 (264)
Space and water heating			975.8579 (265)
Pumps and fans	132.7851	0.5190	68.9154 (267)
Energy for lighting	378.7265	0.5190	196.5590 (268)
Energy saving/generation technologies			
PV Unit	-630.4424	0.5190	-327.1996 (269)
Total kg/year			914.1328 (272)
CO2 emissions per m2			10.8100 (273)
EI value			90.5469
EI rating			91 (274)

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Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

EI band

B

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9020 = 3.858$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9020 = 0.2395$, stars = 4
Water heating energy efficiency	$3.48 / 0.8189 = 4.250$, stars = 4
Water heating environmental impact	$0.216 / 0.8189 = 0.2638$, 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	42.2900 (1b)	x 2.3900 (2b)	= 101.0731 (1b) - (3b)
First floor	42.2900 (1c)	x 2.6100 (2c)	= 110.3769 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.5800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.4500 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					2.6200
Infiltration rate					0.1310 (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) =		0.1114 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)
Adj infilt rate	0.1308	0.1225	0.1225	0.1114	0.1141	0.1086	0.1086	0.1058	0.1058	0.1141	0.1114	0.1141 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.20)			13.0100	1.1450	14.8969		(27)
Ground Floor			42.2900	0.1200	5.0748	84.0000	3552.3600 (28a)
Brick and Block	91.8500	15.1600	76.6900	0.2400	18.4056	42.2200	3237.8518 (29a)
Pitched Roof	42.2900		42.2900	0.1000	4.2290	9.1000	384.8390 (30)
Total net area of external elements Aum(A, m ²)			176.4300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.9713		(33)
Party Wall 1			43.9300	0.0000	0.0000	110.0000	4832.3000 (32)
Ground Floor Stud			23.1100			75.0000	1733.2500 (32c)
Ground Floor Stud			44.5500			9.0000	400.9500 (32c)
First Floor Stud			98.5900			9.0000	887.3100 (32c)
Internal Floor 1			42.2900			18.0000	761.2200 (32d)
Internal Ceiling 1			42.2900			18.0000	761.2200 (32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	16551.3008 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		195.6881 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)		10.6548 (36)
Total fabric heat loss	(33) + (36) =	55.6262 (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	34.8893	34.8893	34.8893	34.8893	34.8893	34.8893	34.8893	34.8893	34.8893	34.8893	34.8893	34.8893 (38)
Heat transfer coeff	90.5154	90.5154	90.5154	90.5154	90.5154	90.5154	90.5154	90.5154	90.5154	90.5154	90.5154	90.5154 (39)
Average = Sum(39)m / 12 =												90.5154 (39)
HLP	1.0702	1.0702	1.0702	1.0702	1.0702	1.0702	1.0702	1.0702	1.0702	1.0702	1.0702	1.0702 (40)
HLP (average)												1.0702 (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												2.5440 (42)
Average daily hot water use (litres/day)												94.6210 (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	104.0831	100.2983	96.5134	92.7286	88.9438	85.1589	85.1589	88.9438	92.7286	96.5134	100.2983	104.0831 (44)
Energy conte	154.3523	134.9975	139.3053	121.4497	116.5339	100.5599	93.1835	106.9295	108.2066	126.1043	137.6527	149.4819 (45)
Energy content (annual)												1488.7572 (45)
Distribution loss (46)m = 0.15 x (45)m	23.1528	20.2496	20.8958	18.2175	17.4801	15.0840	13.9775	16.0394	16.2310	18.9156	20.6479	22.4223 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	1.7091	1.5510	1.5462	1.2951	1.1920	0.9848	0.9126	1.0937	1.1539	1.3996	1.5815	1.6552 (61)
Total heat required for water heating calculated for each month	156.0614	136.5485	140.8515	122.7449	117.7259	101.5447	94.0961	108.0232	109.3604	127.5039	139.2342	151.1371 (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	156.0614	136.5485	140.8515	122.7449	117.7259	101.5447	94.0961	108.0232	109.3604	127.5039	139.2342	151.1371 (64)
Heat gains from water heating, kWh/month	51.7494	45.2744	46.7056	40.7058	39.0455	33.6824	31.2117	35.8275	36.2672	42.2796	46.1649	50.1165 (65)
Total per year (kWh/year) = Sum(64)m = 1504.8319 (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	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	53.6127	47.6183	38.7258	29.3179	21.9155	18.5020	19.9920	25.9864	34.8789	44.2868	51.6892	55.1027 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	341.4121	344.9549	336.0272	317.0211	293.0294	270.4806	255.4166	251.8738	260.8015	279.8075	303.7992	326.3481 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083 (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)	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617 (71)
Water heating gains (Table 5)	69.5557	67.3726	62.7763	56.5359	52.4805	46.7811	41.9512	48.1552	50.3710	56.8274	64.1179	67.3609 (72)
Total internal gains	571.2696	566.6350	544.2184	509.5641	474.1146	442.4528	424.0489	432.7046	452.7406	487.6109	526.2955	555.5009 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W	
North				3.2800	13.4684		0.6300		0.7000		0.7700		13.5009 (74)	
East				1.9100	25.1733		0.6300		0.7000		0.7700		14.6942 (76)	
South				7.8200	56.5862		0.6300		0.7000		0.7700		135.2350 (78)	
Solar gains	163.4301	234.5070	322.7531	399.2527	421.6085	464.2138	429.5303	409.5345	364.6163	278.2767	194.5200	132.8009	(83)	
Total gains	734.6996	801.1419	866.9715	908.8167	895.7231	906.6665	853.5793	842.2391	817.3569	765.8875	720.8156	688.3018	(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	50.7934	50.7934	50.7934	50.7934	50.7934	50.7934	50.7934	50.7934	50.7934	50.7934	50.7934	50.7934
alpha	4.3862	4.3862	4.3862	4.3862	4.3862	4.3862	4.3862	4.3862	4.3862	4.3862	4.3862	4.3862
util living area	0.9706	0.9570	0.9218	0.8462	0.7130	0.4959	0.3477	0.3418	0.5888	0.8343	0.9435	0.9760 (86)
MIT	20.0709	20.1934	20.4354	20.7031	20.8957	20.9836	20.9973	20.9976	20.9650	20.7727	20.3965	20.0269 (87)
Th 2	20.0253	20.0253	20.0253	20.0253	20.0253	20.0253	20.0253	20.0253	20.0253	20.0253	20.0253	20.0253 (88)
util rest of house	0.9632	0.9465	0.9029	0.8096	0.6484	0.4068	0.2462	0.2388	0.4986	0.7867	0.9274	0.9698 (89)
MIT 2	19.2092	19.3277	19.5588	19.8034	19.9624	20.0191	20.0248	20.0249	20.0100	19.8686	19.5263	19.1668 (90)
Living area fraction									fLA = Living area / (4) =			0.2213 (91)
MIT	19.3999	19.5193	19.7528	20.0025	20.1690	20.2326	20.2401	20.2402	20.2214	20.0687	19.7189	19.3572 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3999	19.5193	19.7528	20.0025	20.1690	20.2326	20.2401	20.2402	20.2214	20.0687	19.7189	19.3572 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9574	0.9400	0.8968	0.8087	0.6586	0.4262	0.2687	0.2617	0.5175	0.7891	0.9213	0.9645 (94)
Ext temp.	703.4038	753.0821	777.5106	734.9276	589.8975	386.4656	229.3805	220.4123	422.9811	604.3779	664.1063	663.8735 (95)
Heat loss rate W	5.6000	6.0000	7.6000	10.1000	13.1000	15.9000	17.7000	17.8000	15.4000	12.1000	8.6000	5.7000 (96)
Month fracti	1249.1068	1223.7065	1100.0152	896.3295	639.8525	392.1631	229.9137	220.8722	436.4112	721.2908	1006.4291	1236.1835 (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	406.0030	316.2596	239.9435	116.2093	37.1666	0.0000	0.0000	0.0000	0.0000	86.9832	246.4724	425.7987 (98)
Space heating per m2												1874.8363 (98)
										(98) / (4) =		22.1664 (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													2078.5325 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	406.0030	316.2596	239.9435	116.2093	37.1666	0.0000	0.0000	0.0000	0.0000	86.9832	246.4724	425.7987	(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)	450.1142	350.6204	266.0127	128.8352	41.2046	0.0000	0.0000	0.0000	0.0000	96.4337	273.2510	472.0606	(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	156.0614	136.5485	140.8515	122.7449	117.7259	101.5447	94.0961	108.0232	109.3604	127.5039	139.2342	151.1371	(64)
Efficiency of water heater (217)m	85.8219	85.4649	84.4602	82.4214	79.1477	76.2000	76.2000	76.2000	76.2000	81.3185	84.5898	76.2000	(216)
Fuel for water heating, kWh/month	181.8432	159.7715	166.7666	148.9235	148.7420	133.2608	123.4857	141.7627	143.5176	156.7957	164.5994	175.6224	(219)
Water heating fuel used												1845.0912	(219)
Annual totals kWh/year													
Space heating fuel - main system												2078.5325	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.2240)													
mechanical ventilation fans (SFP = 0.2240)													57.7851 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													132.7851 (231)
Electricity for lighting (calculated in Appendix L)													378.7265 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.73 * 1206 * 1.00) =										-704.3100			-704.3100 (233)
Total delivered energy for all uses													3730.8253 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2078.5325	7.3800	153.3957 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1845.0912	7.3800	136.1677 (247)
Mechanical ventilation fans	57.7851	28.6600	16.5612 (249)
Pumps and fans for heating	75.0000	28.6600	21.4950 (249)
Energy for lighting	378.7265	28.6600	108.5430 (250)
Additional standing charges			107.0000 (251)
Energy saving/generation technologies			
PV Unit	-704.3100	28.6600	-201.8552 (252)
Total energy cost			341.3074 (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	2078.5325	0.2160	448.9630 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1845.0912	0.2160	398.5397 (264)
Space and water heating			847.5027 (265)
Pumps and fans	132.7851	0.5190	68.9154 (267)
Energy for lighting	378.7265	0.5190	196.5590 (268)
Energy saving/generation technologies			
PV Unit	-704.3100	0.5190	-365.5369 (269)
Total kg/year			747.4403 (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	2078.5325	1.2200	2535.8096 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1845.0912	1.2200	2251.0113 (264)
Space and water heating			4786.8209 (265)
Pumps and fans	132.7851	3.0700	407.6501 (267)
Energy for lighting	378.7265	3.0700	1162.6903 (268)

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Energy saving/generation technologies			
PV Unit	-704.3100	3.0700	-2162.2316 (269)
Primary energy kWh/year			4194.9297 (272)
Primary energy kWh/m2/year			49.5972 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	B 88
Current environmental impact rating:	B 91

(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	-£ 65	-206 kg (27.5%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£65 2.43 kg/m²	B 90	A 93
Total Savings	£65 2.43 kg/m²		

Potential energy efficiency rating:	B 90
Potential environmental impact rating:	A 93

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	£147	£161	-£14
Mains gas	£397	£317	£79
Space heating	£298	£298	£0
Water heating	£136	£71	£65
Lighting	£109	£109	£0
Generated (PV)	-£202	-£202	£0
Total cost of fuels	£342	£276	£65
Total cost of uses	£341	£276	£65
Delivered energy	44 kWh/m²	32 kWh/m²	12 kWh/m²
Carbon dioxide emissions	0.7 tonnes	0.5 tonnes	0.2 tonnes
CO2 emissions per m²	9 kg/m²	6 kg/m²	2 kg/m²
Primary energy	50 kWh/m²	36 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	42.2900 (1b)	x 2.3900 (2b)	= 101.0731 (1b) - (3b)
First floor	42.2900 (1c)	x 2.6100 (2c)	= 110.3769 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.5800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.4500 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					2.6200
Infiltration rate					0.1310 (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) =	0.1114 (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	0.1420	0.1392	0.1364	0.1225	0.1197	0.1058	0.1058	0.1030	0.1114	0.1197	0.1253	0.1308 (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)			13.0100	1.1450	14.8969		(27)					
Ground Floor			42.2900	0.1200	5.0748	84.0000	3552.3600 (28a)					
Brick and Block	91.8500	15.1600	76.6900	0.2400	18.4056	42.2200	3237.8518 (29a)					
Pitched Roof	42.2900		42.2900	0.1000	4.2290	9.1000	384.8390 (30)					
Total net area of external elements Aum(A, m2)			176.4300				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.9713		(33)					
Party Wall 1			43.9300	0.0000	0.0000	110.0000	4832.3000 (32)					
Ground Floor Stud			23.1100			75.0000	1733.2500 (32c)					
Ground Floor Stud			44.5500			9.0000	400.9500 (32c)					
First Floor Stud			98.5900			9.0000	887.3100 (32c)					
Internal Floor 1			42.2900			18.0000	761.2200 (32d)					
Internal Ceiling 1			42.2900			18.0000	761.2200 (32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	16551.3008 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							195.6881 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.6548 (36)					
Total fabric heat loss						(33) + (36) =	55.6262 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	34.8893	34.8893	34.8893	34.8893	34.8893	34.8893	34.8893	34.8893	34.8893	34.8893	34.8893	34.8893 (38)
Average = Sum(39)m / 12 =	90.5154	90.5154	90.5154	90.5154	90.5154	90.5154	90.5154	90.5154	90.5154	90.5154	90.5154	90.5154 (39)
												90.5154 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0702	1.0702	1.0702	1.0702	1.0702	1.0702	1.0702	1.0702	1.0702	1.0702	1.0702	1.0702 (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												2.5440 (42)
Average daily hot water use (litres/day)												94.6210 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

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CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Daily hot water use	104.0831	100.2983	96.5134	92.7286	88.9438	85.1589	85.1589	88.9438	92.7286	96.5134	100.2983	104.0831 (44)
Energy conte	154.3523	134.9975	139.3053	121.4497	116.5339	100.5599	93.1835	106.9295	108.2066	126.1043	137.6527	149.4819 (45)
Energy content (annual)										Total = Sum(45)m =		1488.7572 (45)
Distribution loss	(46)m = 0.15 x (45)m											
	23.1528	20.2496	20.8958	18.2175	17.4801	15.0840	13.9775	16.0394	16.2310	18.9156	20.6479	22.4223 (46)
Water storage loss:												
Total storage loss												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	1.7091	1.5510	1.5462	1.2951	1.1920	0.9848	0.9126	1.0937	1.1539	1.3996	1.5815	1.6552 (61)
Total heat required for water heating calculated for each month												
	156.0614	136.5485	140.8515	122.7449	117.7259	101.5447	94.0961	108.0232	109.3604	127.5039	139.2342	151.1371 (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												1.2182 (H8)
Utilisation factor												0.5600 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												94.6210 (H14)
Volume ratio Veff/V												0.7926 (H15)
Solar storage volume factor												0.9535 (H16)
Solar input												-851.4546 (H17)
Solar input	-24.6905	-41.2013	-70.1706	-94.0424	-116.1814	-114.2249	-112.7153	-98.4800	-77.1296	-52.6704	-29.2865	-20.6617 (63)
								Solar input (sum of months) = Sum(63)m =				-851.4546 (63)
Output from w/h												
	131.3709	95.3472	70.6809	28.7025	1.5444	0.0000	0.0000	9.5432	32.2309	74.8335	109.9478	130.4754 (64)
								Total per year (kWh/year) = Sum(64)m =				684.6767 (64)
Heat gains from water heating, kWh/month												
	51.7494	45.2744	46.7056	40.7058	39.0455	33.6824	31.2117	35.8275	36.2672	42.2796	46.1649	50.1165 (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	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	53.6127	47.6183	38.7258	29.3179	21.9155	18.5020	19.9920	25.9864	34.8789	44.2868	51.6892	55.1027 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	341.4121	344.9549	336.0272	317.0211	293.0294	270.4806	255.4166	251.8738	260.8015	279.8075	303.7992	326.3481 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083 (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)												
	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617 (71)
Water heating gains (Table 5)												
	69.5557	67.3726	62.7763	56.5359	52.4805	46.7811	41.9512	48.1552	50.3710	56.8274	64.1179	67.3609 (72)
Total internal gains												
	571.2696	566.6350	544.2184	509.5641	474.1146	442.4528	424.0489	432.7046	452.7406	487.6109	526.2955	555.5009 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				3.2800	10.6334	0.6300	0.7000	0.7700	10.6590 (74)			
East				1.9100	19.6403	0.6300	0.7000	0.7700	11.4644 (76)			
South				7.8200	46.7521	0.6300	0.7000	0.7700	111.7325 (78)			
Solar gains	133.8559	225.7858	304.6429	372.9125	415.4401	411.9533	397.3303	365.3402	328.0680	248.2299	159.8852	114.8608 (83)
Total gains	705.1255	792.4208	848.8613	882.4766	889.5546	854.4061	821.3792	798.0448	780.8086	735.8408	686.1807	670.3617 (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	50.7934	50.7934	50.7934	50.7934	50.7934	50.7934	50.7934	50.7934	50.7934	50.7934	50.7934	50.7934
alpha	4.3862	4.3862	4.3862	4.3862	4.3862	4.3862	4.3862	4.3862	4.3862	4.3862	4.3862	4.3862
util living area												
	0.9809	0.9672	0.9422	0.8904	0.7912	0.6327	0.4742	0.5069	0.7140	0.8991	0.9669	0.9844 (86)
MIT	19.8811	20.0573	20.3005	20.5778	20.8117	20.9472	20.9881	20.9839	20.9085	20.6183	20.1885	19.8255 (87)
Th 2	20.0253	20.0253	20.0253	20.0253	20.0253	20.0253	20.0253	20.0253	20.0253	20.0253	20.0253	20.0253 (88)
util rest of house												
	0.9763	0.9596	0.9285	0.8638	0.7413	0.5521	0.3742	0.4062	0.6392	0.8691	0.9578	0.9806 (89)
MIT 2	19.0223	19.1947	19.4302	19.6913	19.8967	19.9988	20.0216	20.0199	19.9744	19.7338	19.3256	18.9677 (90)
Living area fraction												
MIT	19.2124	19.3856	19.6228	19.8875	20.0993	20.2087	20.2355	20.2332	20.1811	19.9296	19.5166	19.1575 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2124	19.3856	19.6228	19.8875	20.0993	20.2087	20.2355	20.2332	20.1811	19.9296	19.5166	19.1575 (93)

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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	0.9715	0.9535	0.9218	0.8595	0.7454	0.5680	0.3963	0.4283	0.6520	0.8657	0.9519	0.9763	(94)
Useful gains	684.9995	755.5400	782.5076	758.5007	663.0633	485.3182	325.4727	341.8288	509.1074	637.0342	653.1770	654.4963	(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	1349.8025	1311.1719	1187.8197	994.5389	760.2622	507.6757	329.0675	346.9663	550.4373	844.4693	1123.8944	1353.8854	(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	494.6134	373.3846	301.5522	169.9475	72.3160	0.0000	0.0000	0.0000	0.0000	154.3317	338.9165	520.3455	(98)
Space heating												2425.4075	(98)
Space heating per m2											(98) / (4) =	28.6759	(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													2688.9218 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	494.6134	373.3846	301.5522	169.9475	72.3160	0.0000	0.0000	0.0000	0.0000	154.3317	338.9165	520.3455	(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)	548.3519	413.9519	334.3151	188.4118	80.1729	0.0000	0.0000	0.0000	0.0000	171.0995	375.7390	576.8797	(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	131.3709	95.3472	70.6809	28.7025	1.5444	0.0000	0.0000	9.5432	32.2309	74.8335	109.9478	130.4754	(64)
Efficiency of water heater (217)m	86.8512	86.9504	87.1593	87.8674	89.8548	76.2000	76.2000	76.2000	76.2000	85.0947	86.3155	76.2000	(216)
Fuel for water heating, kWh/month	151.2597	109.6570	81.0939	32.6656	1.7188	0.0000	0.0000	12.5239	42.2978	87.9415	127.3789	149.9792	(219)
Water heating fuel used												796.5163	(219)
Annual totals kWh/year													
Space heating fuel - main system												2688.9218	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.2240)													
mechanical ventilation fans (SFP = 0.2240)													57.7851 (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													182.7851 (231)
Electricity for lighting (calculated in Appendix L)													378.7265 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.73 * 1080 * 1.00) =										-630.4424		-630.4424	(233)
Total delivered energy for all uses												3416.5073	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2688.9218	3.4800	93.5745 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	796.5163	3.4800	27.7188 (247)
Mechanical ventilation fans	57.7851	13.1900	7.6218 (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	378.7265	13.1900	49.9540 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-630.4424	13.1900	-83.1553 (252)
Total energy cost			232.2013 (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] =	0.7526 (257)
SAP value		89.5009
SAP rating (Section 12)		90 (258)
SAP band		B

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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	2688.9218	0.2160	580.8071 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	796.5163	0.2160	172.0475 (264)
Space and water heating			752.8546 (265)
Pumps and fans	182.7851	0.5190	94.8654 (267)
Energy for lighting	378.7265	0.5190	196.5590 (268)
Energy saving/generation technologies			
PV Unit	-630.4424	0.5190	-327.1996 (269)
Total kg/year			717.0795 (272)
CO2 emissions per m2			8.4800 (273)
EI value			92.5846
EI rating			93 (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	42.2900 (1b)	x 2.3900 (2b)	= 101.0731 (1b) - (3b)
First floor	42.2900 (1c)	x 2.6100 (2c)	= 110.3769 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.5800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	211.4500 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					2.6200
Infiltration rate					0.1310 (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) =	0.1114 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)
Adj infilt rate	0.1308	0.1225	0.1225	0.1114	0.1141	0.1086	0.1086	0.1058	0.1058	0.1141	0.1114	0.1141 (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)			13.0100	1.1450	14.8969		(27)					
Ground Floor			42.2900	0.1200	5.0748	84.0000	3552.3600 (28a)					
Brick and Block	91.8500	15.1600	76.6900	0.2400	18.4056	42.2200	3237.8518 (29a)					
Pitched Roof	42.2900		42.2900	0.1000	4.2290	9.1000	384.8390 (30)					
Total net area of external elements Aum(A, m2)			176.4300				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.9713		(33)					
Party Wall 1			43.9300	0.0000	0.0000	110.0000	4832.3000 (32)					
Ground Floor Stud			23.1100			75.0000	1733.2500 (32c)					
Ground Floor Stud			44.5500			9.0000	400.9500 (32c)					
First Floor Stud			98.5900			9.0000	887.3100 (32c)					
Internal Floor 1			42.2900			18.0000	761.2200 (32d)					
Internal Ceiling 1			42.2900			18.0000	761.2200 (32e)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		16551.3008 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							195.6881 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.6548 (36)					
Total fabric heat loss						(33) + (36) =	55.6262 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	34.8893	34.8893	34.8893	34.8893	34.8893	34.8893	34.8893	34.8893	34.8893	34.8893	34.8893	34.8893 (38)
Average = Sum(39)m / 12 =	90.5154	90.5154	90.5154	90.5154	90.5154	90.5154	90.5154	90.5154	90.5154	90.5154	90.5154	90.5154 (39)
												90.5154 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0702	1.0702	1.0702	1.0702	1.0702	1.0702	1.0702	1.0702	1.0702	1.0702	1.0702	1.0702 (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												2.5440 (42)
Average daily hot water use (litres/day)												94.6210 (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	104.0831	100.2983	96.5134	92.7286	88.9438	85.1589	85.1589	88.9438	92.7286	96.5134	100.2983	104.0831 (44)
Energy conte	154.3523	134.9975	139.3053	121.4497	116.5339	100.5599	93.1835	106.9295	108.2066	126.1043	137.6527	149.4819 (45)
Energy content (annual)												1488.7572 (45)
Distribution loss (46)m = 0.15 x (45)m												
	23.1528	20.2496	20.8958	18.2175	17.4801	15.0840	13.9775	16.0394	16.2310	18.9156	20.6479	22.4223 (46)
Water storage loss:												
Total storage loss												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	1.7091	1.5510	1.5462	1.2951	1.1920	0.9848	0.9126	1.0937	1.1539	1.3996	1.5815	1.6552 (61)
Total heat required for water heating calculated for each month												
	156.0614	136.5485	140.8515	122.7449	117.7259	101.5447	94.0961	108.0232	109.3604	127.5039	139.2342	151.1371 (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												1.3609 (H8)
Utilisation factor												0.5204 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												94.6210 (H14)
Volume ratio Veff/V												0.7926 (H15)
Solar storage volume factor												0.9535 (H16)
Solar input												-884.0098 (H17)
Solar input	-28.8464	-41.0228	-71.1851	-95.7559	-111.2749	-121.0348	-114.7594	-104.6495	-81.9089	-56.6125	-34.1187	-22.8410 (63)
Solar input (sum of months) = Sum (63)m =												-884.0098 (63)
Output from w/h												
	127.2150	95.5257	69.6664	26.9889	6.4510	0.0000	0.0000	3.3737	27.4515	70.8914	105.1155	128.2961 (64)
Total per year (kWh/year) = Sum (64)m =												660.9755 (64)
Heat gains from water heating, kWh/month												
	51.7494	45.2744	46.7056	40.7058	39.0455	33.6824	31.2117	35.8275	36.2672	42.2796	46.1649	50.1165 (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	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	53.6127	47.6183	38.7258	29.3179	21.9155	18.5020	19.9920	25.9864	34.8789	44.2868	51.6892	55.1027 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	341.4121	344.9549	336.0272	317.0211	293.0294	270.4806	255.4166	251.8738	260.8015	279.8075	303.7992	326.3481 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083 (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)												
	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617 (71)
Water heating gains (Table 5)												
	69.5557	67.3726	62.7763	56.5359	52.4805	46.7811	41.9512	48.1552	50.3710	56.8274	64.1179	67.3609 (72)
Total internal gains												
	571.2696	566.6350	544.2184	509.5641	474.1146	442.4528	424.0489	432.7046	452.7406	487.6109	526.2955	555.5009 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				3.2800	13.4684	0.6300	0.7000	0.7700	13.5009 (74)			
East				1.9100	25.1733	0.6300	0.7000	0.7700	14.6942 (76)			
South				7.8200	56.5862	0.6300	0.7000	0.7700	135.2350 (78)			
Solar gains	163.4301	234.5070	322.7531	399.2527	421.6085	464.2138	429.5303	409.5345	364.6163	278.2767	194.5200	132.8009 (83)
Total gains	734.6996	801.1419	866.9715	908.8167	895.7231	906.6665	853.5793	842.2391	817.3569	765.8875	720.8156	688.3018 (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	50.7934	50.7934	50.7934	50.7934	50.7934	50.7934	50.7934	50.7934	50.7934	50.7934	50.7934	50.7934
alpha	4.3862	4.3862	4.3862	4.3862	4.3862	4.3862	4.3862	4.3862	4.3862	4.3862	4.3862	4.3862
util living area												
	0.9706	0.9570	0.9218	0.8462	0.7130	0.4959	0.3477	0.3418	0.5888	0.8343	0.9435	0.9760 (86)
MIT	20.0709	20.1934	20.4354	20.7031	20.8957	20.9836	20.9973	20.9976	20.9650	20.7727	20.3965	20.0269 (87)
Th 2	20.0253	20.0253	20.0253	20.0253	20.0253	20.0253	20.0253	20.0253	20.0253	20.0253	20.0253	20.0253 (88)
util rest of house												
	0.9632	0.9465	0.9029	0.8096	0.6484	0.4068	0.2462	0.2388	0.4986	0.7867	0.9274	0.9698 (89)
MIT 2	19.2092	19.3277	19.5588	19.8034	19.9624	20.0191	20.0248	20.0249	20.0100	19.8686	19.5263	19.1668 (90)
Living area fraction												
	19.3999	19.5193	19.7528	20.0025	20.1690	20.2326	20.2401	20.2402	20.2214	20.0687	19.7189	19.3572 (92)
MIT												0.0000
Temperature adjustment												
adjusted MIT	19.3999	19.5193	19.7528	20.0025	20.1690	20.2326	20.2401	20.2402	20.2214	20.0687	19.7189	19.3572 (93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9574	0.9400	0.8968	0.8087	0.6586	0.4262	0.2687	0.2617	0.5175	0.7891	0.9213	0.9645	(94)
Useful gains	703.4038	753.0821	777.5106	734.9276	589.8975	386.4656	229.3805	220.4123	422.9811	604.3779	664.1063	663.8735	(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	1249.1068	1223.7065	1100.0152	896.3295	639.8525	392.1631	229.9137	220.8722	436.4112	721.2908	1006.4291	1236.1835	(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	406.0030	316.2596	239.9435	116.2093	37.1666	0.0000	0.0000	0.0000	0.0000	86.9832	246.4724	425.7987	(98)
Space heating												1874.8363	(98)
Space heating per m2												22.1664	(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													2078.5325 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	406.0030	316.2596	239.9435	116.2093	37.1666	0.0000	0.0000	0.0000	0.0000	86.9832	246.4724	425.7987	(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)	450.1142	350.6204	266.0127	128.8352	41.2046	0.0000	0.0000	0.0000	0.0000	96.4337	273.2510	472.0606	(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	127.2150	95.5257	69.6664	26.9889	6.4510	0.0000	0.0000	3.3737	27.4515	70.8914	105.1155	128.2961	(64)
Efficiency of water heater (217)m	86.4122	86.5127	86.6191	87.1811	87.8138	76.2000	76.2000	76.2000	76.2000	83.3256	85.5033	76.2000	(216)
Fuel for water heating, kWh/month	147.2187	110.4181	80.4285	30.9573	7.3463	0.0000	0.0000	4.4275	36.0256	85.0776	122.9373	148.2859	(219)
Water heating fuel used												773.1228	(219)
Annual totals kWh/year													
Space heating fuel - main system												2078.5325	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.2240)													
mechanical ventilation fans (SFP = 0.2240)													57.7851 (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													182.7851 (231)
Electricity for lighting (calculated in Appendix L)													378.7265 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.73 * 1206 * 1.00) =										-704.3100		-704.3100	(233)
Total delivered energy for all uses												2708.8569	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2078.5325	7.3800	153.3957 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	773.1228	7.3800	57.0565 (247)
Mechanical ventilation fans	57.7851	28.6600	16.5612 (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	378.7265	28.6600	108.5430 (250)
Additional standing charges			107.0000 (251)
Energy saving/generation technologies			
PV Unit	-704.3100	28.6600	-201.8552 (252)
Total energy cost			276.5261 (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	2078.5325	0.2160	448.9630 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	773.1228	0.2160	166.9945 (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			615.9576 (265)
Pumps and fans	182.7851	0.5190	94.8654 (267)
Energy for lighting	378.7265	0.5190	196.5590 (268)
Energy saving/generation technologies			
PV Unit	-704.3100	0.5190	-365.5369 (269)
Total kg/year			541.8452 (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	2078.5325	1.2200	2535.8096 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	773.1228	1.2200	943.2099 (264)
Space and water heating			3479.0195 (265)
Pumps and fans	182.7851	3.0700	561.1501 (267)
Energy for lighting	378.7265	3.0700	1162.6903 (268)
Energy saving/generation technologies			
PV Unit	-704.3100	3.0700	-2162.2316 (269)
Primary energy kWh/year			3040.6283 (272)
Primary energy kWh/m2/year			35.9497 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0943 Plot 9	Issued on Date	09/07/2024
Assessment Reference	As Built	Prop Type Ref	Type C Terrace
Project	19, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	12.67	TER	17.51
Environmental	91 B	% DER<TER	27.66		
CO ₂ Emissions (t/year)	0.75	DFEE	41.06	TFEE	48.29
General Requirements Compliance	Pass	% DFEE<TFEE	14.98		

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 9	Issued on Date	09/07/2024
Assessment Reference	As Built	Prop Type Ref	Type C Terrace
Project	19, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	12.67	TER	17.51
Environmental	91 B	% DER<TER	27.66		
CO ₂ Emissions (t/year)	0.75	DFEE	41.06	TFEE	48.29
General Requirements Compliance	Pass	% DFEE<TFEE	14.98		

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 9	Issued on Date	09/07/2024
Assessment Reference	As Built	Prop Type Ref	Type C Terrace
Project	19, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	12.67	TER	17.51
Environmental	91 B	% DER<TER	27.66		
CO ₂ Emissions (t/year)	0.75	DFEE	41.06	TFEE	48.29
General Requirements Compliance	Pass	% DFEE<TFEE	14.98		

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

Floor 000003 - Worst Case Slab

Floor Type: Slab On Ground Floor

Area = 34.96 m², Perimeter = 16.87 m, Wall thickness = 275.00 mm, Soil: Unknown

Horizontal edge insulation: none

Vertical edge insulation: none

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	Concrete, medium density						
	Main construction	100	1.3500	0.0741	100.00		
Layer 2	Polythene,1000 gauge						
	Main construction	0.5	0.0000	0.0000	100.00		
Layer 3	Celotex XR4000						
	Main construction	150	0.0220	6.8182	100.00		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 4	Polythene, 500 gauge						
	Main construction	0.5	0.0000	0.0000	100.00		
Layer 5	Screed						
	Main construction	70	1.1500	0.0609	100.00	1200	1000
Int surface				0.1700			

Total resistance: Upper limit = 6.953 m² K/W Lower limit = 6.953 m² K/W Average = 6.953 m² K/W

Total correction = 0.0096 m² K/W

U-value (unrounded) = 0.12 W/m² K

Unheated space: None

Total thickness: 321 mm

U-value: 0.12 W/m² K

Kappa: 84.00 kJ/m² K

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Property Reference	SAP 0943 Plot 9			Issued on Date	09/07/2024
Assessment Reference	As Built	Prop Type Ref	Type C Terrace		
Property	19, Shaw Crescent, West End, Southampton, SO30 3LH				
SAP Rating	88 B	DER	12.67	TER	17.51
Environmental	91 B	% DER<TER	27.66		
CO ₂ Emissions (t/year)	0.75	DFEE	41.06	TFEE	48.29
General Requirements Compliance	Pass	% DFEE<TFEE	14.98		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com			Assessor ID	E477-0001
Client	Foreman Homes, FORE				

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

Orientation	North
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	House, End-Terrace
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:	18.37 m	42.29 m ²	2.39 m
	1st Storey:	18.37 m	42.29 m ²	2.61 m

7.0 Living Area	18.72	m ²
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8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	195.69	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	91.85	76.69

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	43.93

9.2 Internal Walls			Kappa (kJ/m ² K)	Area (m ²)
Description	Construction			
Ground Floor Stud	Dense block, plasterboard on dabs		75.00	23.11
Ground Floor Stud	Plasterboard on timber frame		9.00	44.55
First Floor Stud	Plasterboard on timber frame		9.00	98.59

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	42.29	42.29

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	42.29

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	42.29

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	42.29

12.0 Opening Types

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

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
Front Door	Solid Door	[1] Brick and Block	North							2.15	
Front Elevation	Window	[1] Brick and Block	North	None	0.00					3.28	
Side Elevation	Window	[1] Brick and Block	East	None	0.00					1.91	
Rear Elevation	Window	[1] Brick and Block	South	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)	5.57	0.071	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	3.74	0.064	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.59	0.067	No	Birtley Supatherm
Independently assessed	E3 Sill	8.29	0.021	No	Knauf P5
Independently assessed	E4 Jamb	27.00	0.016	No	Knauf P6
Table K1 - Default	E5 Ground floor (normal)	18.33	0.320	No	
Independently assessed	E6 Intermediate floor within a dwelling	18.33	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	9.69	0.060	No	
Independently assessed	E12 Gable (insulation at ceiling level)	8.83	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	8.83	0.160	No	
Table K1 - Default	P2 Party wall - Intermediate floor within a dwelling	8.83	0.000	No	
Independently assessed	P4 Party wall - Roof (insulation at ceiling level)	8.83	0.035	No	Knauf P29 Halved

Y-value	0.060	W/m²K
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18.0 Pressure Testing

Designed AP ₅₀	Yes	
Property Tested ?	5.00	m³/(h.m²) @ 50 Pa
As Built AP ₅₀	Yes	
	2.62	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	Yes
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	2
Manufacturer SFP	0.16
Duct Type	Rigid
Wet Rooms	2

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	17	
Total number of L.E.L. fittings	17	
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	17959	
Main Heating	Mains gas	
SAP Code	BGW	
In Winter	104	
In Summer	90.2	
Controls	76.2	
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
0.73	South	30°	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	£65	B 90	