



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 23 , 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 11			Issued on Date	09/07/2024
Assessment Reference	As Built	Prop Type Ref	Type C Terrace		
Property	23 , Shaw Crescent, West End, Southampton, SO30 3LH				
SAP Rating	88 B	DER	13.32	TER	17.66
Environmental	90 B	% DER<TER	24.56		
CO ₂ Emissions (t/year)	0.77	DFEE	44.06	TFEE	48.71
General Requirements Compliance	Pass	% DFEE<TFEE	9.54		
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)	17.66	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	13.32	kgCO ₂ /m ²	Pass
	-4.34 (-24.6%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	48.71	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	44.06	kWh/m ² /yr	
	-4.6 (-9.4%)	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	1.18 (max. 2.00)	1.20 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	5.61 (average for dwelling type)	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

0.96 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

5.61 (average for dwelling type) 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
Photovoltaic array	0.73	kW

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THERMAL BRIDGING

Calculation Type: New Build (As Built)

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Environmental	90 B	% DER<TER	24.56		
CO ₂ Emissions (t/year)	0.77	DFEE	44.06	TFEE	48.71
General Requirements Compliance	Pass	% DFEE<TFEE	9.54		

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Client	Foreman Homes, FORE
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	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.071	4.66	0.33	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	7.38	0.15	Knauf P5
External wall	E4 Jamb	Independently assessed	0.016	24.90	0.40	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: **10.54** W/mK:
Y-Value: **0.060** W/m²K:

FULL SAP CALCULATION PRINTOUT

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

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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) 17.66 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 13.32 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)48.7 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)44.1 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	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 5.61 (average for dwelling type)
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: 0.96 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
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	=	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												5.6100
Infiltration rate												0.2805 (18)
Number of sides sheltered												1 (19)
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.2595 (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												
	0.3308	0.3243	0.3178	0.2854	0.2789	0.2465	0.2465	0.2400	0.2595	0.2789	0.2919	0.3049 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5808	0.5743	0.5678	0.5354	0.5289	0.5000	0.5000	0.5000	0.5095	0.5289	0.5419	0.5549 (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)			12.0600	1.1450	13.8092		(27)					
Ground Floor			42.2900	0.1200	5.0748	84.0000	3552.3600 (28a)					
Brick and Block	91.8500	14.2100	77.6400	0.2400	18.6336	42.2200	3277.9608 (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) =	44.1116		(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) =	16591.4098 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							196.1623 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.5375 (36)					
Total fabric heat loss						(33) + (36) =	54.6491 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 40.5284	Feb 40.0758	Mar 39.6231	Apr 37.3600	May 36.9074	Jun 34.8893	Jul 34.8893	Aug 34.8893	Sep 35.5495	Oct 36.9074	Nov 37.8126	Dec 38.7179 (38)
Heat transfer coeff	95.1774	94.7248	94.2722	92.0091	91.5565	89.5383	89.5383	89.5383	90.1986	91.5565	92.4617	93.3669 (39)
Average = Sum(39)m / 12 =												91.9949 (39)
HLP	Jan 1.1253	Feb 1.1199	Mar 1.1146	Apr 1.0878	May 1.0825	Jun 1.0586	Jul 1.0586	Aug 1.0586	Sep 1.0664	Oct 1.0825	Nov 1.0932	Dec 1.1039 (40)
HLP (average)												1.0877 (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)

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	21.7912	19.3547	15.7403	11.9164	8.9077	7.5202	8.1259	10.5623	14.1767	18.0006	21.0094	22.3968 (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	384.2536	382.0078	367.8154	345.0171	321.8786	299.6839	285.3668	291.6336	303.4454	326.4597	352.8334	372.5716 (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				0.9600	19.6403		0.6300		0.7000		0.7700		5.7622 (76)	
South				7.8200	46.7521		0.6300		0.7000		0.7700		111.7325 (78)	
Solar gains	128.1537	214.6311	286.2726	346.1206	382.6056	378.3414	365.3303	337.8527	306.7027	234.9939	152.7752	110.1716	(83)	
Total gains	512.4073	596.6388	654.0881	691.1377	704.4841	678.0253	650.6971	629.4863	610.1481	561.4536	505.6086	482.7432	(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	48.4225	48.6538	48.8874	50.0899	50.3375	51.4721	51.4721	51.4721	51.0953	50.3375	49.8447	49.3614
alpha	4.2282	4.2436	4.2592	4.3393	4.3558	4.4315	4.4315	4.4315	4.4064	4.3558	4.3230	4.2908
util living area	0.9943	0.9886	0.9769	0.9480	0.8814	0.7415	0.5778	0.6160	0.8230	0.9563	0.9892	0.9956 (86)
MIT	19.5469	19.7401	20.0182	20.3785	20.6868	20.9040	20.9754	20.9670	20.8361	20.4359	19.9361	19.5292 (87)
Th 2	19.9802	19.9846	19.9889	20.0108	20.0152	20.0348	20.0348	20.0348	20.0283	20.0152	20.0064	19.9977 (88)
util rest of house	0.9928	0.9855	0.9705	0.9324	0.8434	0.6619	0.4635	0.5032	0.7576	0.9401	0.9858	0.9944 (89)
MIT 2	18.6567	18.8518	19.1300	19.4981	19.7881	19.9831	20.0266	20.0229	19.9296	19.5612	19.0647	18.6526 (90)
Living area fraction									fLA = Living area / (4) =			0.2213 (91)
MIT	18.8537	19.0485	19.3266	19.6930	19.9870	20.1869	20.2366	20.2319	20.1302	19.7548	19.2576	18.8466 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8537	19.0485	19.3266	19.6930	19.9870	20.1869	20.2366	20.2319	20.1302	19.7548	19.2576	18.8466 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	507.5622	585.8074	631.2627	640.1854	593.2790	458.0716	317.8703	332.0888	467.0105	524.8086	496.6855	479.1455 (94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1385.1867	1340.2096	1209.1934	993.0495	758.7318	500.2441	325.6172	343.0986	543.9165	838.1826	1124.1102	1367.5117 (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	652.9526	506.9582	429.9805	254.0622	123.0969	0.0000	0.0000	0.0000	0.0000	233.1503	451.7458	660.9445 (98)
Space heating												3312.8910 (98)
Space heating per m2												(98) / (4) = 39.1687 (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	3672.8281 (211)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	652.9526	506.9582	429.9805	254.0622	123.0969	0.0000	0.0000	0.0000	0.0000	233.1503	451.7458	660.9445 (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)	723.8943	562.0380	476.6967	281.6654	136.4711	0.0000	0.0000	0.0000	0.0000	258.4815	500.8268	732.7544 (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	87.1126	86.8154	86.2882	85.1065	82.7664	76.2000	76.2000	76.2000	76.2000	84.6985	86.4576	76.2000 (216)
Fuel for water heating, kWh/month	179.1491	157.2860	163.2338	144.2251	142.2388	133.2608	123.4857	141.7627	143.5176	150.5386	161.0434	173.2872 (219)
Water heating fuel used												1813.0287 (219)
Annual totals kWh/year												3672.8281 (211)
Space heating fuel - main system												0.0000 (215)
Space heating fuel - secondary												
Electricity for pumps and fans:												
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.2240)												
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)												384.8387 (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												5373.0382 (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	3672.8281	0.2160	793.3309 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1813.0287	0.2160	391.6142 (264)
Space and water heating			1184.9451 (265)
Pumps and fans	132.7851	0.5190	68.9154 (267)
Energy for lighting	384.8387	0.5190	199.7313 (268)
Energy saving/generation technologies			
PV Unit	-630.4424	0.5190	-327.1996 (269)
Total CO2, kg/year			1126.3922 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			13.3200 (273)

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

DER		13.3200 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		31.4751 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		31.4751 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					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3625 (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	0.4622	0.4531	0.4440	0.3987	0.3897	0.3444	0.3444	0.3353	0.3625	0.3897	0.4078	0.4259 (22b)
Effective ac	0.6068	0.6027	0.5986	0.5795	0.5759	0.5593	0.5593	0.5562	0.5657	0.5759	0.5831	0.5907 (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)			12.0600	1.3258	15.9886		(27)
Ground Floor			42.2900	0.1300	5.4977		(28a)
Brick and Block	91.8500	14.2100	77.6400	0.1800	13.9752		(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) =	43.1092		(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)							9.4235 (36)
Total fabric heat loss						(33) + (36) =	52.5327 (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	42.3416	42.0523	41.7686	40.4363	40.1870	39.0266	39.0266	38.8117	39.4736	40.1870	40.6913	41.2185 (38)
Heat transfer coeff	94.8744	94.5850	94.3013	92.9690	92.7198	91.5593	91.5593	91.3445	92.0063	92.7198	93.2240	93.7512 (39)
Average = Sum(39)m / 12 =												92.9678 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1217	1.1183	1.1149	1.0992	1.0962	1.0825	1.0825	1.0800	1.0878	1.0962	1.1022	1.1084 (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	21.7912	19.3547	15.7403	11.9164	8.9077	7.5202	8.1259	10.5623	14.1767	18.0006	21.0094	22.3968	(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	400.8025	398.5540	383.8222	360.4456	336.7081	313.9240	299.6421	306.4962	318.9229	342.5157	369.4076	389.1387	(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					0.9600	19.6403	0.6300	0.7000			0.7700			5.7622 (76)
South					7.8200	46.7521	0.6300	0.7000			0.7700			111.7325 (78)
Solar gains	128.1537	214.6311	286.2726	346.1206	382.6056	378.3414	365.3303	337.8527	306.7027	234.9939	152.7752	110.1716	(83)	
Total gains	528.9563	613.1851	670.0948	706.5662	719.3137	692.2654	664.9725	644.3489	625.6256	577.5096	522.1828	499.3103	(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	61.9093	62.0988	62.2855	63.1782	63.3480	64.1509	64.1509	64.3018	63.8392	63.3480	63.0053	62.6510	(86)
alpha	5.1273	5.1399	5.1524	5.2119	5.2232	5.2767	5.2767	5.2868	5.2559	5.2232	5.2004	5.1767	(87)
util living area	0.9976	0.9944	0.9869	0.9651	0.9049	0.7633	0.5881	0.6267	0.8462	0.9713	0.9947	0.9982	(88)
MIT	19.8206	19.9803	20.2110	20.5035	20.7630	20.9353	20.9867	20.9816	20.8816	20.5477	20.1303	19.7954	(89)
Th 2	19.9831	19.9859	19.9887	20.0015	20.0039	20.0151	20.0151	20.0172	20.0108	20.0039	19.9990	19.9940	(90)
util rest of house	0.9968	0.9925	0.9822	0.9516	0.8664	0.6764	0.4655	0.5054	0.7760	0.9575	0.9926	0.9976	(91)
MIT 2	18.4127	18.6474	18.9840	19.4110	19.7630	19.9697	20.0100	20.0093	19.9149	19.4800	18.8765	18.3838	(92)
Living area fraction	18.7243	18.9424	19.2556	19.6528	19.9843	20.1834	20.2262	20.2245	20.1288	19.7163	19.1540	18.6962	(93)
MIT	18.7243	18.9424	19.2556	19.6528	19.9843	20.1834	20.2262	20.2245	20.1288	19.7163	19.1540	18.6962	(94)
Temperature adjustment													(95)
adjusted MIT	18.7243	18.9424	19.2556	19.6528	19.9843	20.1834	20.2262	20.2245	20.1288	19.7163	19.1540	18.6962	(96)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9953	0.9898	0.9777	0.9457	0.8655	0.6926	0.4928	0.5322	0.7857	0.9522	0.9900	0.9964	(97)
Ext temp.	526.4684	606.9174	655.1194	668.1673	622.5949	479.4854	327.6998	342.9259	491.5280	549.9156	516.9429	497.5352	(98)
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	(99)
Month fracti	1368.4962	1328.1995	1202.8671	999.6808	768.1180	511.2169	332.0110	349.3493	554.6916	845.2624	1123.7261	1359.0378	(100)
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	(101)
Space heating	626.4687	484.7016	407.5243	238.6897	108.2692	0.0000	0.0000	0.0000	0.0000	219.7380	436.8839	640.9580	(102)
Space heating per m2													(103)

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													3386.7596 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	626.4687	484.7016	407.5243	238.6897	108.2692	0.0000	0.0000	0.0000	0.0000	219.7380	436.8839	640.9580	(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)	670.7374	518.9524	436.3215	255.5564	115.9199	0.0000	0.0000	0.0000	0.0000	235.2655	467.7558	686.2505	(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	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	87.6779	87.4104	86.9417	85.9472	84.0644	80.3000	80.3000	80.3000	80.3000	85.6213	87.1161	80.3000	(216)
Fuel for water heating, kWh/month	234.1652	207.0976	216.7976	194.5135	192.5412	177.5294	170.0867	189.6068	191.7008	204.7231	214.6191	228.3703	(219)
Water heating fuel used												2421.7511	(219)
Annual totals kWh/year													
Space heating fuel - main system												3386.7596	(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)												384.8387	(232)
Total delivered energy for all uses												6268.3494	(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	3386.7596	0.2160	731.5401 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2421.7511	0.2160	523.0982 (264)
Space and water heating			1254.6383 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	384.8387	0.5190	199.7313 (268)
Total CO2, kg/m2/year			1493.2946 (272)
Emissions per m2 for space and water heating			14.8337 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3614 (272b)
Emissions per m2 for pumps and fans			0.4602 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.8337 * 1.00) + 2.3614 + 0.4602, rounded to 2 d.p.			17.6600 (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					5.6100
Infiltration rate					0.4224 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3907 (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	0.4981	0.4884	0.4786	0.4298	0.4200	0.3712	0.3712	0.3614	0.3907	0.4200	0.4395	0.4591 (22b)
Effective ac	0.6241	0.6193	0.6145	0.5924	0.5882	0.5689	0.5689	0.5653	0.5763	0.5882	0.5966	0.6054 (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)			12.0600	1.1450	13.8092		(27)
Ground Floor			42.2900	0.1200	5.0748	84.0000	3552.3600 (28a)
Brick and Block	91.8500	14.2100	77.6400	0.2400	18.6336	42.2200	3277.9608 (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) =	44.1116		(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)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 16210.7998 (34)
191.6623 (35)
10.5375 (36)
(33) + (36) = 54.6491 (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	43.5468	43.2107	42.8811	41.3333	41.0438	39.6957	39.6957	39.4461	40.2149	41.0438	41.6296	42.2420 (38)
Heat transfer coeff	98.1959	97.8597	97.5302	95.9824	95.6928	94.3448	94.3448	94.0951	94.8640	95.6928	96.2786	96.8911 (39)
Average = Sum(39)m / 12 =												95.9810 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1610	1.1570	1.1531	1.1348	1.1314	1.1154	1.1154	1.1125	1.1216	1.1314	1.1383	1.1456 (40)
HLP (average)												1.1348 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy
Average daily hot water use (litres/day)
2.5440 (42)
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)

FULL SAP CALCULATION PRINTOUT

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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	21.7912	19.3547	15.7403	11.9164	8.9077	7.5202	8.1259	10.5623	14.1767	18.0006	21.0094	22.3968	(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	355.7837	354.3241	341.8273	321.3258	299.6822	279.5820	267.0305	271.0194	282.0103	302.6500	326.3422	344.9054	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g	FF		Access factor Table 6d	Gains W		
						Specific data or Table 6b	Specific data or Table 6c					
North				3.2800	10.6334	0.6300	0.7000		0.7700	10.6590 (74)		
East				0.9600	19.6403	0.6300	0.7000		0.7700	5.7622 (76)		
South				7.8200	46.7521	0.6300	0.7000		0.7700	111.7325 (78)		
Solar gains	128.1537	214.6311	286.2726	346.1206	382.6056	378.3414	365.3303	337.8527	306.7027	234.9939	152.7752	110.1716 (83)
Total gains	483.9375	568.9551	628.0999	667.4464	682.2878	657.9234	632.3609	608.8721	588.7130	537.6439	479.1173	455.0770 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	45.8573	46.0148	46.1703	46.9148	47.0568	47.7292	47.7292	47.8558	47.4679	47.0568	46.7705	46.4749	
alpha	4.0572	4.0677	4.0780	4.1277	4.1371	4.1819	4.1819	4.1904	4.1645	4.1371	4.1180	4.0983	
util living area	0.9950	0.9898	0.9794	0.9541	0.8956	0.7709	0.6127	0.6516	0.8466	0.9624	0.9906	0.9961	(86)
MIT	19.4267	19.6237	19.9128	20.2833	20.6187	20.8674	20.9621	20.9504	20.7860	20.3468	19.8210	19.3993	(87)
Th 2	19.9513	19.9545	19.9577	19.9725	19.9753	19.9882	19.9882	19.9906	19.9832	19.9753	19.9697	19.9638	(88)
util rest of house	0.9937	0.9871	0.9736	0.9399	0.8603	0.6916	0.4907	0.5329	0.7843	0.9481	0.9876	0.9951	(89)
MIT 2	18.5170	18.7153	19.0039	19.3777	19.6951	19.9151	19.9754	19.9723	19.8511	19.4456	18.9242	18.4993	(90)
Living area fraction	18.7184	18.9163	19.2050	19.5781	19.8995	20.1259	20.1937	20.1888	20.0581	19.6450	19.1227	18.6985	(92)
MIT	18.7184	18.9163	19.2050	19.5781	19.8995	20.1259	20.1937	20.1888	20.0581	19.6450	19.1227	18.6985	(92)
Temperature adjustment	18.7184	18.9163	19.2050	19.5781	19.8995	20.1259	20.1937	20.1888	20.0581	19.6450	19.1227	18.6985	(93)
adjusted MIT	18.7184	18.9163	19.2050	19.5781	19.8995	20.1259	20.1937	20.1888	20.0581	19.6450	19.1227	18.6985	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	479.8304	559.5592	608.0731	622.8656	584.8446	462.9522	326.9693	339.7811	464.8470	506.5437	471.6078	452.0345	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1415.8250	1371.6349	1239.1242	1024.9107	784.6341	521.3369	339.0502	356.5051	565.2054	865.5464	1157.5255	1404.7770	(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	696.3799	545.7149	469.5020	289.4725	148.6434	0.0000	0.0000	0.0000	0.0000	267.0980	493.8607	708.8404	(98)
Space heating												3619.5117	(98)
Space heating per m2												42.7939	(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	886.8407	698.1512	715.1229	0.0000	0.0000	0.0000	0.0000	(100)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7968	0.8710	0.8529	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	706.6043	608.0885	609.9622	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	864.8666	833.0448	807.4025	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	113.9489	167.3675	146.8956	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												428.2120 (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	28.4872	41.8419	36.7239	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												107.0530 (107)
Space cooling per m2												1.2657 (108)
Energy for space heating												42.7939 (99)
Energy for space cooling												1.2657 (108)
Total												44.0596 (109)
Dwelling Fabric Energy Efficiency (DFEE)												44.1 (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					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3625 (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	0.4622	0.4531	0.4440	0.3987	0.3897	0.3444	0.3444	0.3353	0.3625	0.3897	0.4078	0.4259 (22b)
Effective ac	0.6068	0.6027	0.5986	0.5795	0.5759	0.5593	0.5593	0.5562	0.5657	0.5759	0.5831	0.5907 (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)			12.0600	1.3258	15.9886		(27)
Ground Floor			42.2900	0.1300	5.4977		(28a)
Brick and Block	91.8500	14.2100	77.6400	0.1800	13.9752		(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) =	43.1092		(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)							9.4235 (36)
Total fabric heat loss						(33) + (36) =	52.5327 (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	42.3416	42.0523	41.7686	40.4363	40.1870	39.0266	39.0266	38.8117	39.4736	40.1870	40.6913	41.2185 (38)
Heat transfer coeff	94.8744	94.5850	94.3013	92.9690	92.7198	91.5593	91.5593	91.3445	92.0063	92.7198	93.2240	93.7512 (39)
Average = Sum(39)m / 12 =												92.9678 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1217	1.1183	1.1149	1.0992	1.0962	1.0825	1.0825	1.0800	1.0878	1.0962	1.1022	1.1084 (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 (57)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
	32.7999	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												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	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	21.7912	19.3547	15.7403	11.9164	8.9077	7.5202	8.1259	10.5623	14.1767	18.0006	21.0094	22.3968 (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	355.7837	354.3241	341.8273	321.3258	299.6822	279.5820	267.0305	271.0194	282.0103	302.6500	326.3422	344.9054 (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				0.9600	19.6403		0.6300	0.7000		0.7700		5.7622 (76)
South				7.8200	46.7521		0.6300	0.7000		0.7700		111.7325 (78)

Solar gains	128.1537	214.6311	286.2726	346.1206	382.6056	378.3414	365.3303	337.8527	306.7027	234.9939	152.7752	110.1716 (83)
Total gains	483.9375	568.9551	628.0999	667.4464	682.2878	657.9234	632.3609	608.8721	588.7130	537.6439	479.1173	455.0770 (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	61.9093	62.0988	62.2855	63.1782	63.3480	64.1509	64.1509	64.3018	63.8392	63.3480	63.0053	62.6510
alpha	5.1273	5.1399	5.1524	5.2119	5.2232	5.2767	5.2767	5.2868	5.2559	5.2232	5.2004	5.1767
util living area	0.9984	0.9960	0.9901	0.9721	0.9199	0.7883	0.6143	0.6568	0.8701	0.9785	0.9964	0.9988 (86)
MIT	19.7709	19.9322	20.1669	20.4664	20.7369	20.9243	20.9838	20.9772	20.8623	20.5086	20.0833	19.7464 (87)
Th 2	19.9831	19.9859	19.9887	20.0015	20.0039	20.0151	20.0151	20.0172	20.0108	20.0039	19.9990	19.9940 (88)
util rest of house	0.9979	0.9947	0.9865	0.9610	0.8855	0.7034	0.4883	0.5326	0.8051	0.9677	0.9950	0.9985 (89)
MIT 2	18.8614	19.0243	19.2596	19.5636	19.8180	19.9780	20.0108	20.0104	19.9323	19.6096	19.1860	18.8456 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.0627	19.2253	19.4604	19.7634	20.0214	20.1874	20.2261	20.2243	20.1382	19.8086	19.3846	19.0450 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.0627	19.2253	19.4604	19.7634	20.0214	20.1874	20.2261	20.2243	20.1382	19.8086	19.3846	19.0450 (93)

8. Space heating requirement												

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9972	0.9933	0.9840	0.9576	0.8862	0.7198	0.5166	0.5604	0.8148	0.9650	0.9937	0.9979 (94)
Useful gains	482.5730	565.1205	618.0436	639.1517	604.6224	473.5766	326.6482	341.1912	479.7021	518.8073	476.1044	454.1365 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1400.6018	1354.9558	1222.1839	1009.9630	771.5542	511.5812	332.0058	349.3326	555.5484	853.8171	1145.2226	1391.7369 (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	683.0135	530.7693	449.4804	266.9841	124.1972	0.0000	0.0000	0.0000	0.0000	249.2473	481.7651	697.5747 (98)
Space heating												3483.0316 (98)
Space heating per m2	(98) / (4) =											41.1803 (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	860.6578	677.5391	694.2178	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.8427	0.9136	0.8971	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	725.2976	619.0328	622.7857	0.0000	0.0000	0.0000	0.0000 (102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	864.8666	833.0448	807.4025	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	100.4897	159.2249	137.3550	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												397.0696 (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	25.1224	39.8062	34.3387	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												99.2674 (107)
Space cooling per m2												1.1737 (108)
Energy for space heating												41.1803 (99)
Energy for space cooling												1.1737 (108)
Total												42.3540 (109)
Target Fabric Energy Efficiency (TFEE)												48.7 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.2900 (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) =											Air changes per hour		
Pressure test											0.0000 / (5) =		0.0000 (8)
Measured/design AP50											Yes		
Infiltration rate											5.6100		
Number of sides sheltered											0.2805 (18)		
											1 (19)		
Shelter factor											(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =		0.2595 (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)	
	0.3049	0.2854	0.2854	0.2595	0.2659	0.2530	0.2530	0.2465	0.2465	0.2659	0.2595	0.2659 (22b)	
Mechanical extract ventilation - centralised													
If mechanical ventilation:													0.5000 (23a)
Effective ac	0.5549	0.5354	0.5354	0.5095	0.5159	0.5030	0.5030	0.5000	0.5000	0.5159	0.5095	0.5159 (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)			12.0600	1.1450	13.8092		(27)					
Ground Floor			42.2900	0.1200	5.0748	84.0000	3552.3600 (28a)					
Brick and Block	91.8500	14.2100	77.6400	0.2400	18.6336	42.2200	3277.9608 (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) =	44.1116			(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) =	16591.4098		(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							196.1623 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.5375 (36)					
Total fabric heat loss				(33) + (36) =	54.6491		(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 38.7179	Feb 37.3600	Mar 37.3600	Apr 35.5495	May 36.0022	Jun 35.0969	Jul 35.0969	Aug 34.8893	Sep 34.8893	Oct 36.0022	Nov 35.5495	Dec 36.0022 (38)
Heat transfer coeff	93.3669	92.0091	92.0091	90.1986	90.6512	89.7460	89.7460	89.5383	89.5383	90.6512	90.1986	90.6512 (39)
Average = Sum(39)m / 12 =												90.6920 (39)
HLP	Jan 1.1039	Feb 1.0878	Mar 1.0878	Apr 1.0664	May 1.0718	Jun 1.0611	Jul 1.0611	Aug 1.0586	Sep 1.0586	Oct 1.0718	Nov 1.0664	Dec 1.0718 (40)
HLP (average)												1.0723 (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	54.4779	48.3868	39.3508	29.7911	22.2692	18.8006	20.3147	26.4058	35.4418	45.0015	52.5234	55.9920 (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	572.1348	567.4035	544.8434	510.0372	474.4683	442.7514	424.3716	433.1239	453.3035	488.3256	527.1297	556.3902 (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		0.9600	25.1733	0.6300	0.7000	0.7700	7.3855 (76)
South		7.8200	56.5862	0.6300	0.7000	0.7700	135.2350 (78)

Solar gains	156.1215	222.3449	302.4268	369.6484	387.6041	425.7570	394.3303	377.8886	339.9190	262.7182	185.4369	127.1119 (83)
Total gains	728.2563	789.7484	847.2702	879.6856	862.0724	868.5084	818.7019	811.0125	793.2225	751.0438	712.5666	683.5021 (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	49.3614	50.0899	50.0899	51.0953	50.8402	51.3530	51.3530	51.4721	51.4721	50.8402	51.0953	50.8402
alpha	4.2908	4.3393	4.3393	4.4064	4.3893	4.4235	4.4235	4.4315	4.4315	4.3893	4.4064	4.3893
util living area	0.9726	0.9600	0.9290	0.8573	0.7321	0.5119	0.3592	0.3510	0.5989	0.8424	0.9455	0.9768 (86)
MIT	20.0137	20.1562	20.3952	20.6878	20.8843	20.9821	20.9971	20.9975	20.9640	20.7629	20.3937	20.0206 (87)
Th 2	19.9977	20.0108	20.0108	20.0283	20.0239	20.0327	20.0327	20.0348	20.0348	20.0239	20.0283	20.0239 (88)
util rest of house	0.9656	0.9502	0.9113	0.8222	0.6681	0.4213	0.2553	0.2463	0.5086	0.7959	0.9298	0.9708 (89)
MIT 2	19.1310	19.2799	19.5091	19.7936	19.9535	20.0260	20.0322	20.0344	20.0190	19.8598	19.5263	19.1594 (90)
Living area fraction									fLA = Living area / (4) =			0.2213 (91)
MIT	19.3264	19.4738	19.7052	19.9915	20.1595	20.2376	20.2458	20.2475	20.2282	20.0596	19.7183	19.3500 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3264	19.4738	19.7052	19.9915	20.1595	20.2376	20.2458	20.2475	20.2282	20.0596	19.7183	19.3500 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	698.9684	745.2302	766.6864	721.9949	584.1644	383.0274	227.8921	218.6614	418.4367	599.1649	658.2471	659.9339 (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	1281.5931	1239.7136	1113.7885	892.1991	639.9523	389.2792	228.4745	219.1466	432.3049	721.5518	1002.8528	1237.3882 (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	433.4728	332.2929	258.2440	122.5470	41.5063	0.0000	0.0000	0.0000	0.0000	91.0558	248.1161	429.6260 (98)
Space heating												1956.8610 (98)
RHI space heating demand												1957 (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												5.6100
Infiltration rate												0.2805 (18)
Number of sides sheltered												1 (19)
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.2595 (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												
	0.3308	0.3243	0.3178	0.2854	0.2789	0.2465	0.2465	0.2400	0.2595	0.2789	0.2919	0.3049 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5808	0.5743	0.5678	0.5354	0.5289	0.5000	0.5000	0.5000	0.5095	0.5289	0.5419	0.5549 (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)			12.0600	1.1450	13.8092		(27)					
Ground Floor			42.2900	0.1200	5.0748	84.0000	3552.3600 (28a)					
Brick and Block	91.8500	14.2100	77.6400	0.2400	18.6336	42.2200	3277.9608 (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) =	44.1116			(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) =	16591.4098		(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							196.1623 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.5375 (36)					
Total fabric heat loss				(33) + (36) =	54.6491		(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 40.5284	Feb 40.0758	Mar 39.6231	Apr 37.3600	May 36.9074	Jun 34.8893	Jul 34.8893	Aug 34.8893	Sep 35.5495	Oct 36.9074	Nov 37.8126	Dec 38.7179 (38)
Heat transfer coeff	95.1774	94.7248	94.2722	92.0091	91.5565	89.5383	89.5383	89.5383	90.1986	91.5565	92.4617	93.3669 (39)
Average = Sum(39)m / 12 =												91.9949 (39)
HLP	Jan 1.1253	Feb 1.1199	Mar 1.1146	Apr 1.0878	May 1.0825	Jun 1.0586	Jul 1.0586	Aug 1.0586	Sep 1.0664	Oct 1.0825	Nov 1.0932	Dec 1.1039 (40)
HLP (average)												1.0877 (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	54.4779	48.3868	39.3508	29.7911	22.2692	18.8006	20.3147	26.4058	35.4418	45.0015	52.5234	55.9920 (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	572.1348	567.4035	544.8434	510.0372	474.4683	442.7514	424.3716	433.1239	453.3035	488.3256	527.1297	556.3902 (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				0.9600	19.6403	0.6300	0.7000	0.7700		5.7622 (76)		
South				7.8200	46.7521	0.6300	0.7000	0.7700		111.7325 (78)		
Solar gains	128.1537	214.6311	286.2726	346.1206	382.6056	378.3414	365.3303	337.8527	306.7027	234.9939	152.7752	110.1716 (83)
Total gains	700.2885	782.0345	831.1160	856.1578	857.0739	821.0928	789.7019	770.9767	760.0062	723.3195	679.9049	666.5618 (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	48.4225	48.6538	48.8874	50.0899	50.3375	51.4721	51.4721	51.4721	51.0953	50.3375	49.8447	49.3614
alpha	4.2282	4.2436	4.2592	4.3393	4.3558	4.4315	4.4315	4.4315	4.4064	4.3558	4.3230	4.2908
util living area	0.9823	0.9705	0.9492	0.9020	0.8106	0.6480	0.4871	0.5182	0.7258	0.9058	0.9689	0.9852 (86)
MIT	19.7869	19.9680	20.2204	20.5373	20.7871	20.9440	20.9873	20.9832	20.9035	20.5966	20.1511	19.7673 (87)
Th 2	19.9802	19.9846	19.9889	20.0108	20.0152	20.0348	20.0348	20.0348	20.0283	20.0152	20.0064	19.9977 (88)
util rest of house	0.9779	0.9634	0.9366	0.8770	0.7622	0.5674	0.3858	0.4167	0.6515	0.8770	0.9602	0.9816 (89)
MIT 2	18.8936	19.0746	19.3238	19.6425	19.8684	20.0065	20.0308	20.0291	19.9744	19.7059	19.2740	18.8882 (90)
Living area fraction									fLA = Living area / (4) =			0.2213 (91)
MIT	19.0913	19.2724	19.5222	19.8406	20.0717	20.2140	20.2425	20.2403	20.1800	19.9030	19.4681	19.0827 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0913	19.2724	19.5222	19.8406	20.0717	20.2140	20.2425	20.2403	20.1800	19.9030	19.4681	19.0827 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9731	0.9572	0.9296	0.8721	0.7653	0.5832	0.4081	0.4390	0.6640	0.8732	0.9543	0.9773 (94)
Ext temp.	681.4240	748.5462	772.6263	746.6264	655.8783	478.8534	322.3108	338.4632	504.6590	631.5686	648.8335	651.4194 (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	1407.8027	1361.4186	1227.6330	1006.6307	766.4859	502.6665	326.1454	343.8501	548.4099	851.7533	1143.5760	1389.5564 (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	540.4257	411.8503	338.5250	187.2031	82.2921	0.0000	0.0000	0.0000	0.0000	163.8174	356.2146	549.1739 (98)
Space heating per m2												2629.5021 (98)
										(98) / (4) =		31.0889 (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													2915.1908 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	540.4257	411.8503	338.5250	187.2031	82.2921	0.0000	0.0000	0.0000	0.0000	163.8174	356.2146	549.1739	(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)	599.1416	456.5967	375.3049	207.5422	91.2329	0.0000	0.0000	0.0000	0.0000	181.6158	394.9164	608.8403	(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	86.6335	86.2541	85.5801	84.0822	81.3978	76.2000	76.2000	76.2000	76.2000	83.4866	85.7714	76.2000	(216)
Fuel for water heating, kWh/month	180.1398	158.3095	164.5843	145.9819	144.6302	133.2608	123.4857	141.7627	143.5176	152.7238	162.3317	174.2016	(219)
Water heating fuel used												1824.9297	(219)
Annual totals kWh/year													
Space heating fuel - main system												2915.1908	(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)													384.8387 (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													4627.3019 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2915.1908	3.4800	101.4486 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1824.9297	3.4800	63.5076 (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	384.8387	13.1900	50.7602 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-630.4424	13.1900	-83.1553 (252)
Total energy cost			270.0754 (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		0.8754 (257)
SAP rating (Section 12)		87.7885
SAP band		88 (258)
		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2915.1908	0.2160	629.6812 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1824.9297	0.2160	394.1848 (264)
Space and water heating			1023.8660 (265)
Pumps and fans	132.7851	0.5190	68.9154 (267)
Energy for lighting	384.8387	0.5190	199.7313 (268)
Energy saving/generation technologies			
PV Unit	-630.4424	0.5190	-327.1996 (269)
Total kg/year			965.3132 (272)
CO2 emissions per m2			11.4100 (273)
EI value			90.0176
EI rating			90 (274)

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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	$3.48 / 0.8206 = 4.241$, stars = 4
Water heating environmental impact	$0.216 / 0.8206 = 0.2632$, 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	=	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												5.6100
Infiltration rate												0.2805 (18)
Number of sides sheltered												1 (19)
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.2595 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)
Adj infilt rate												
	0.3049	0.2854	0.2854	0.2595	0.2659	0.2530	0.2530	0.2465	0.2465	0.2659	0.2595	0.2659 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5549	0.5354	0.5354	0.5095	0.5159	0.5030	0.5030	0.5000	0.5000	0.5159	0.5095	0.5159 (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)			12.0600	1.1450	13.8092		(27)					
Ground Floor			42.2900	0.1200	5.0748	84.0000	3552.3600 (28a)					
Brick and Block	91.8500	14.2100	77.6400	0.2400	18.6336	42.2200	3277.9608 (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) =	44.1116			(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) =		16591.4098 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							196.1623 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.5375 (36)					
Total fabric heat loss						(33) + (36) =	54.6491 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 38.7179	Feb 37.3600	Mar 37.3600	Apr 35.5495	May 36.0022	Jun 35.0969	Jul 35.0969	Aug 34.8893	Sep 34.8893	Oct 36.0022	Nov 35.5495	Dec 36.0022 (38)
Heat transfer coeff	93.3669	92.0091	92.0091	90.1986	90.6512	89.7460	89.7460	89.5383	89.5383	90.6512	90.1986	90.6512 (39)
Average = Sum(39)m / 12 =												90.6920 (39)
HLP	Jan 1.1039	Feb 1.0878	Mar 1.0878	Apr 1.0664	May 1.0718	Jun 1.0611	Jul 1.0611	Aug 1.0586	Sep 1.0586	Oct 1.0718	Nov 1.0664	Dec 1.0718 (40)
HLP (average)												1.0723 (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)										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	54.4779	48.3868	39.3508	29.7911	22.2692	18.8006	20.3147	26.4058	35.4418	45.0015	52.5234	55.9920 (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	572.1348	567.4035	544.8434	510.0372	474.4683	442.7514	424.3716	433.1239	453.3035	488.3256	527.1297	556.3902 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data FF or Table 6c		Access factor Table 6d	Gains W		
North				3.2800	13.4684	0.6300	0.7000		0.7700	13.5009 (74)		
East				0.9600	25.1733	0.6300	0.7000		0.7700	7.3855 (76)		
South				7.8200	56.5862	0.6300	0.7000		0.7700	135.2350 (78)		
Solar gains	156.1215	222.3449	302.4268	369.6484	387.6041	425.7570	394.3303	377.8886	339.9190	262.7182	185.4369	127.1119 (83)
Total gains	728.2563	789.7484	847.2702	879.6856	862.0724	868.5084	818.7019	811.0125	793.2225	751.0438	712.5666	683.5021 (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	49.3614	50.0899	50.0899	51.0953	50.8402	51.3530	51.3530	51.4721	51.4721	50.8402	51.0953	50.8402
alpha	4.2908	4.3393	4.3393	4.4064	4.3893	4.4235	4.4235	4.4315	4.4315	4.3893	4.4064	4.3893
util living area	0.9726	0.9600	0.9290	0.8573	0.7321	0.5119	0.3592	0.3510	0.5989	0.8424	0.9455	0.9768 (86)
MIT	20.0137	20.1562	20.3952	20.6878	20.8843	20.9821	20.9971	20.9975	20.9640	20.7629	20.3937	20.0206 (87)
Th 2	19.9977	20.0108	20.0108	20.0283	20.0239	20.0327	20.0327	20.0348	20.0348	20.0239	20.0283	20.0239 (88)
util rest of house	0.9656	0.9502	0.9113	0.8222	0.6681	0.4213	0.2553	0.2463	0.5086	0.7959	0.9298	0.9708 (89)
MIT 2	19.1310	19.2799	19.5091	19.7936	19.9535	20.0260	20.0322	20.0344	20.0190	19.8598	19.5263	19.1594 (90)
Living area fraction									fLA = Living area / (4) =			0.2213 (91)
MIT	19.3264	19.4738	19.7052	19.9915	20.1595	20.2376	20.2458	20.2475	20.2282	20.0596	19.7183	19.3500 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3264	19.4738	19.7052	19.9915	20.1595	20.2376	20.2458	20.2475	20.2282	20.0596	19.7183	19.3500 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9598	0.9436	0.9049	0.8207	0.6776	0.4410	0.2784	0.2696	0.5275	0.7978	0.9238	0.9655 (94)
Ext temp.	698.9684	745.2302	766.6864	721.9949	584.1644	383.0274	227.8921	218.6614	418.4367	599.1649	658.2471	659.9339 (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	1281.5931	1239.7136	1113.7885	892.1991	639.9523	389.2792	228.4745	219.1466	432.3049	721.5518	1002.8528	1237.3882 (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	433.4728	332.2929	258.2440	122.5470	41.5063	0.0000	0.0000	0.0000	0.0000	91.0558	248.1161	429.6260 (98)
Space heating per m2												1956.8610 (98)
										(98) / (4) =		23.1362 (99)

FULL SAP CALCULATION PRINTOUT

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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													2169.4689 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	433.4728	332.2929	258.2440	122.5470	41.5063	0.0000	0.0000	0.0000	0.0000	91.0558	248.1161	429.6260	(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)	480.5685	368.3957	286.3015	135.8614	46.0158	0.0000	0.0000	0.0000	0.0000	100.9488	275.0733	476.3038	(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	86.0165	85.6186	84.7074	82.6055	79.4129	76.2000	76.2000	76.2000	76.2000	81.4680	84.6121	76.2000	(216)
Fuel for water heating, kWh/month	181.4320	159.4847	166.2800	148.5917	148.2453	133.2608	123.4857	141.7627	143.5176	156.5080	164.5559	175.5692	(219)
Water heating fuel used												1842.6937	(219)
Annual totals kWh/year													
Space heating fuel - main system												2169.4689	(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)													384.8387 (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													3825.4764 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2169.4689	7.3800	160.1068 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1842.6937	7.3800	135.9908 (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	384.8387	28.6600	110.2948 (250)
Additional standing charges			107.0000 (251)
Energy saving/generation technologies			
PV Unit	-704.3100	28.6600	-201.8552 (252)
Total energy cost			349.5933 (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	2169.4689	0.2160	468.6053 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1842.6937	0.2160	398.0218 (264)
Space and water heating			866.6271 (265)
Pumps and fans	132.7851	0.5190	68.9154 (267)
Energy for lighting	384.8387	0.5190	199.7313 (268)
Energy saving/generation technologies			
PV Unit	-704.3100	0.5190	-365.5369 (269)
Total kg/year			769.7370 (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	2169.4689	1.2200	2646.7521 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1842.6937	1.2200	2248.0863 (264)
Space and water heating			4894.8384 (265)
Pumps and fans	132.7851	3.0700	407.6501 (267)
Energy for lighting	384.8387	3.0700	1181.4548 (268)

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Energy saving/generation technologies			
PV Unit	-704.3100	3.0700	-2162.2316 (269)
Primary energy kWh/year			4321.7117 (272)
Primary energy kWh/m2/year			51.0961 (273)

SAP 2012 EPC IMPROVEMENTS

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

(For testing purposes):

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

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.3	-£ 65	-205 kg (26.7%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£65 2.43 kg/m²	B 89	A 92
Total Savings	£65 2.43 kg/m²		

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

Fuel prices for cost data on this page from database revision number 550 TEST (28 Jun 2024)
Recommendation texts revision number 4.9c (22 Feb 2014)

Typical heating and lighting costs of this home (per year, Southern England):

	Current	Potential	Saving
Electricity	£148	£163	-£14
Mains gas	£403	£324	£79
Space heating	£305	£305	£0
Water heating	£136	£71	£65
Lighting	£110	£110	£0
Generated (PV)	-£202	-£202	£0
Total cost of fuels	£349	£285	£65
Total cost of uses	£349	£284	£65
Delivered energy	45 kWh/m²	33 kWh/m²	12 kWh/m²
Carbon dioxide emissions	0.8 tonnes	0.6 tonnes	0.2 tonnes
CO2 emissions per m²	9 kg/m²	7 kg/m²	2 kg/m²
Primary energy	51 kWh/m²	37 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	=	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												5.6100
Infiltration rate												0.2805 (18)
Number of sides sheltered												1 (19)
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.2595 (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												
	0.3308	0.3243	0.3178	0.2854	0.2789	0.2465	0.2465	0.2400	0.2595	0.2789	0.2919	0.3049 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5808	0.5743	0.5678	0.5354	0.5289	0.5000	0.5000	0.5000	0.5095	0.5289	0.5419	0.5549 (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)			12.0600	1.1450	13.8092		(27)					
Ground Floor			42.2900	0.1200	5.0748	84.0000	3552.3600 (28a)					
Brick and Block	91.8500	14.2100	77.6400	0.2400	18.6336	42.2200	3277.9608 (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) =	44.1116		(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) =	16591.4098 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							196.1623 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.5375 (36)					
Total fabric heat loss						(33) + (36) =	54.6491 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 40.5284	Feb 40.0758	Mar 39.6231	Apr 37.3600	May 36.9074	Jun 34.8893	Jul 34.8893	Aug 34.8893	Sep 35.5495	Oct 36.9074	Nov 37.8126	Dec 38.7179 (38)
Heat transfer coeff	95.1774	94.7248	94.2722	92.0091	91.5565	89.5383	89.5383	89.5383	90.1986	91.5565	92.4617	93.3669 (39)
Average = Sum(39)m / 12 =												91.9949 (39)
HLP	Jan 1.1253	Feb 1.1199	Mar 1.1146	Apr 1.0878	May 1.0825	Jun 1.0586	Jul 1.0586	Aug 1.0586	Sep 1.0664	Oct 1.0825	Nov 1.0932	Dec 1.1039 (40)
HLP (average)												1.0877 (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)												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	54.4779	48.3868	39.3508	29.7911	22.2692	18.8006	20.3147	26.4058	35.4418	45.0015	52.5234	55.9920 (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	572.1348	567.4035	544.8434	510.0372	474.4683	442.7514	424.3716	433.1239	453.3035	488.3256	527.1297	556.3902 (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				0.9600	19.6403	0.6300	0.7000	0.7700	5.7622 (76)			
South				7.8200	46.7521	0.6300	0.7000	0.7700	111.7325 (78)			
Solar gains	128.1537	214.6311	286.2726	346.1206	382.6056	378.3414	365.3303	337.8527	306.7027	234.9939	152.7752	110.1716 (83)
Total gains	700.2885	782.0345	831.1160	856.1578	857.0739	821.0928	789.7019	770.9767	760.0062	723.3195	679.9049	666.5618 (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	48.4225	48.6538	48.8874	50.0899	50.3375	51.4721	51.4721	51.4721	51.0953	50.3375	49.8447	49.3614
alpha	4.2282	4.2436	4.2592	4.3393	4.3558	4.4315	4.4315	4.4315	4.4064	4.3558	4.3230	4.2908
util living area	0.9823	0.9705	0.9492	0.9020	0.8106	0.6480	0.4871	0.5182	0.7258	0.9058	0.9689	0.9852 (86)
MIT	19.7869	19.9680	20.2204	20.5373	20.7871	20.9440	20.9873	20.9832	20.9035	20.5966	20.1511	19.7673 (87)
Th 2	19.9802	19.9846	19.9889	20.0108	20.0152	20.0348	20.0348	20.0348	20.0283	20.0152	20.0064	19.9977 (88)
util rest of house	0.9779	0.9634	0.9366	0.8770	0.7622	0.5674	0.3858	0.4167	0.6515	0.8770	0.9602	0.9816 (89)
MIT 2	18.8936	19.0746	19.3238	19.6425	19.8684	20.0065	20.0308	20.0291	19.9744	19.7059	19.2740	18.8882 (90)
Living area fraction									fLA = Living area / (4) =			0.2213 (91)
MIT	19.0913	19.2724	19.5222	19.8406	20.0717	20.2140	20.2425	20.2403	20.1800	19.9030	19.4681	19.0827 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0913	19.2724	19.5222	19.8406	20.0717	20.2140	20.2425	20.2403	20.1800	19.9030	19.4681	19.0827 (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	0.9731	0.9572	0.9296	0.8721	0.7653	0.5832	0.4081	0.4390	0.6640	0.8732	0.9543	0.9773	(94)
Useful gains	681.4240	748.5462	772.6263	746.6264	655.8783	478.8534	322.3108	338.4632	504.6590	631.5686	648.8335	651.4194	(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	1407.8027	1361.4186	1227.6330	1006.6307	766.4859	502.6665	326.1454	343.8501	548.4099	851.7533	1143.5760	1389.5564	(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	540.4257	411.8503	338.5250	187.2031	82.2921	0.0000	0.0000	0.0000	0.0000	163.8174	356.2146	549.1739	(98)
Space heating												2629.5021	(98)
Space heating per m2												31.0889	(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													2915.1908 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	540.4257	411.8503	338.5250	187.2031	82.2921	0.0000	0.0000	0.0000	0.0000	163.8174	356.2146	549.1739	(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)	599.1416	456.5967	375.3049	207.5422	91.2329	0.0000	0.0000	0.0000	0.0000	181.6158	394.9164	608.8403	(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	87.0717	87.1886	87.4256	88.0494	89.8957	76.2000	76.2000	76.2000	76.2000	85.2865	86.4537	76.2000	(216)
Fuel for water heating, kWh/month	150.8767	109.3573	80.8469	32.5981	1.7180	0.0000	0.0000	12.5239	42.2978	87.7437	127.1753	149.7532	(219)
Water heating fuel used												794.8911	(219)
Annual totals kWh/year													
Space heating fuel - main system												2915.1908	(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)													384.8387 (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												3647.2632	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2915.1908	3.4800	101.4486 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	794.8911	3.4800	27.6622 (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	384.8387	13.1900	50.7602 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-630.4424	13.1900	-83.1553 (252)
Total energy cost			240.8251 (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] =	0.7806 (257)
SAP value		89.1110
SAP rating (Section 12)		89 (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	2915.1908	0.2160	629.6812 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	794.8911	0.2160	171.6965 (264)
Space and water heating			801.3777 (265)
Pumps and fans	182.7851	0.5190	94.8654 (267)
Energy for lighting	384.8387	0.5190	199.7313 (268)
Energy saving/generation technologies			
PV Unit	-630.4424	0.5190	-327.1996 (269)
Total kg/year			768.7748 (272)
CO2 emissions per m2			9.0900 (273)
EI value			92.0500
EI rating			92 (274)
EI band			A

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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	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							0 * 10 =	0.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =								Air changes per hour				
Pressure test							0.0000 / (5) =	0.0000 (8)				
Measured/design AP50							Yes					
Infiltration rate								5.6100				
Number of sides sheltered								0.2805 (18)				
								1 (19)				
Shelter factor						(20) = 1 - [0.075 x (19)] =		0.9250 (20)				
Infiltration rate adjusted to include shelter factor						(21) = (18) x (20) =		0.2595 (21)				
Wind speed	Jan 4.7000	Feb 4.4000	Mar 4.4000	Apr 4.0000	May 4.1000	Jun 3.9000	Jul 3.9000	Aug 3.8000	Sep 3.8000	Oct 4.1000	Nov 4.0000	Dec 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	0.3049	0.2854	0.2854	0.2595	0.2659	0.2530	0.2530	0.2465	0.2465	0.2659	0.2595	0.2659 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5549	0.5354	0.5354	0.5095	0.5159	0.5030	0.5030	0.5000	0.5000	0.5159	0.5095	0.5159 (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)			12.0600	1.1450	13.8092		(27)					
Ground Floor			42.2900	0.1200	5.0748	84.0000	3552.3600 (28a)					
Brick and Block	91.8500	14.2100	77.6400	0.2400	18.6336	42.2200	3277.9608 (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) =	44.1116			(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) =		16591.4098 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							196.1623 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.5375 (36)					
Total fabric heat loss						(33) + (36) =	54.6491 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 38.7179	Feb 37.3600	Mar 37.3600	Apr 35.5495	May 36.0022	Jun 35.0969	Jul 35.0969	Aug 34.8893	Sep 34.8893	Oct 36.0022	Nov 35.5495	Dec 36.0022 (38)
Heat transfer coeff	93.3669	92.0091	92.0091	90.1986	90.6512	89.7460	89.7460	89.5383	89.5383	90.6512	90.1986	90.6512 (39)
Average = Sum(39)m / 12 =												90.6920 (39)
HLP	Jan 1.1039	Feb 1.0878	Mar 1.0878	Apr 1.0664	May 1.0718	Jun 1.0611	Jul 1.0611	Aug 1.0586	Sep 1.0586	Oct 1.0718	Nov 1.0664	Dec 1.0718 (40)
HLP (average)												1.0723 (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 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)												
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												
Zero-loss collector efficiency												3.0000 (H1)
Collector heat loss coefficient												0.7000 (H2)
Collector 2nd order heat loss coefficient												1.8000 (H3)
Collector effective heat loss coefficient												0.0050 (H3a)
Collector performance ratio												1.8063 (H3b)
Annual solar radiation per m2												2.5804 (H4)
Overshading factor												1206.0102 (H5)
Solar energy available												0.8000 (H6)
Adjustment factor for showers												2026.0972 (H7)
Solar-to-load ratio												1.0000 (H7a)
Utilisation factor												1.3609 (H8)
Collector performance factor												0.5204 (H9)
Dedicated solar storage volume												0.8793 (H10)
Effective solar volume												75.0000 (H11)
Daily hot water demand												75.0000 (H13)
Volume ratio Veff/V												94.6210 (H14)
Solar storage volume factor												0.7926 (H15)
Solar input												0.9535 (H16)
Solar input	-28.8464	-41.0228	-71.1851	-95.7559	-111.2749	-121.0348	-114.7594	-104.6495	-81.9089	-56.6125	-34.1187	-884.0098 (H17)
Solar input (sum of months) = Sum (63)m =												-22.8410 (63)
												-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												
	54.4779	48.3868	39.3508	29.7911	22.2692	18.8006	20.3147	26.4058	35.4418	45.0015	52.5234	55.9920 (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												
	572.1348	567.4035	544.8434	510.0372	474.4683	442.7514	424.3716	433.1239	453.3035	488.3256	527.1297	556.3902 (73)

6. Solar gains

[Jan]												
	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	W/m2	Specific data	factor	W						
				or Table 6b	or Table 6c							
North	3.2800	13.4684	0.6300	0.7000	0.7700	13.5009 (74)						
East	0.9600	25.1733	0.6300	0.7000	0.7700	7.3855 (76)						
South	7.8200	56.5862	0.6300	0.7000	0.7700	135.2350 (78)						
Solar gains	156.1215	222.3449	302.4268	369.6484	387.6041	425.7570	394.3303	377.8886	339.9190	262.7182	185.4369	127.1119 (83)
Total gains	728.2563	789.7484	847.2702	879.6856	862.0724	868.5084	818.7019	811.0125	793.2225	751.0438	712.5666	683.5021 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	49.3614	50.0899	50.0899	51.0953	50.8402	51.3530	51.3530	51.4721	51.4721	50.8402	51.0953	50.8402
alpha	4.2908	4.3393	4.3393	4.4064	4.3893	4.4235	4.4235	4.4315	4.4315	4.3893	4.4064	4.3893
util living area												
	0.9726	0.9600	0.9290	0.8573	0.7321	0.5119	0.3592	0.3510	0.5989	0.8424	0.9455	0.9768 (86)
MIT	20.0137	20.1562	20.3952	20.6878	20.8843	20.9821	20.9971	20.9975	20.9640	20.7629	20.3937	20.0206 (87)
Th 2	19.9977	20.0108	20.0108	20.0283	20.0239	20.0327	20.0327	20.0348	20.0348	20.0239	20.0283	20.0239 (88)
util rest of house												
	0.9656	0.9502	0.9113	0.8222	0.6681	0.4213	0.2553	0.2463	0.5086	0.7959	0.9298	0.9708 (89)
MIT 2	19.1310	19.2799	19.5091	19.7936	19.9535	20.0260	20.0322	20.0344	20.0190	19.8598	19.5263	19.1594 (90)
Living area fraction												
	19.3264	19.4738	19.7052	19.9915	20.1595	20.2376	20.2458	20.2475	20.2282	20.0596	19.7183	19.3500 (92)
MIT												0.0000
Temperature adjustment												
adjusted MIT	19.3264	19.4738	19.7052	19.9915	20.1595	20.2376	20.2458	20.2475	20.2282	20.0596	19.7183	19.3500 (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	0.9598	0.9436	0.9049	0.8207	0.6776	0.4410	0.2784	0.2696	0.5275	0.7978	0.9238	0.9655	(94)
Useful gains	698.9684	745.2302	766.6864	721.9949	584.1644	383.0274	227.8921	218.6614	418.4367	599.1649	658.2471	659.9339	(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	1281.5931	1239.7136	1113.7885	892.1991	639.9523	389.2792	228.4745	219.1466	432.3049	721.5518	1002.8528	1237.3882	(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	433.4728	332.2929	258.2440	122.5470	41.5063	0.0000	0.0000	0.0000	0.0000	91.0558	248.1161	429.6260	(98)
Space heating												1956.8610	(98)
Space heating per m2											(98) / (4) =	23.1362	(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													2169.4689 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	433.4728	332.2929	258.2440	122.5470	41.5063	0.0000	0.0000	0.0000	0.0000	91.0558	248.1161	429.6260	(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)	480.5685	368.3957	286.3015	135.8614	46.0158	0.0000	0.0000	0.0000	0.0000	100.9488	275.0733	476.3038	(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	86.5904	86.6455	86.8114	87.3050	88.0245	76.2000	76.2000	76.2000	76.2000	83.4856	85.5241	86.5436	(216)
Fuel for water heating, kWh/month	146.9159	110.2489	80.2503	30.9134	7.3287	0.0000	0.0000	4.4275	36.0256	84.9145	122.9076	148.2444	(219)
Water heating fuel used												772.1768	(219)
Annual totals kWh/year													
Space heating fuel - main system												2169.4689	(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)													384.8387 (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												2804.9594	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2169.4689	7.3800	160.1068 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	772.1768	7.3800	56.9866 (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	384.8387	28.6600	110.2948 (250)
Additional standing charges			107.0000 (251)
Energy saving/generation technologies			
PV Unit	-704.3100	28.6600	-201.8552 (252)
Total energy cost			284.9192 (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	2169.4689	0.2160	468.6053 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	772.1768	0.2160	166.7902 (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			635.3955 (265)
Pumps and fans	182.7851	0.5190	94.8654 (267)
Energy for lighting	384.8387	0.5190	199.7313 (268)
Energy saving/generation technologies			
PV Unit	-704.3100	0.5190	-365.5369 (269)
Total kg/year			564.4553 (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	2169.4689	1.2200	2646.7521 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	772.1768	1.2200	942.0556 (264)
Space and water heating			3588.8077 (265)
Pumps and fans	182.7851	3.0700	561.1501 (267)
Energy for lighting	384.8387	3.0700	1181.4548 (268)
Energy saving/generation technologies			
PV Unit	-704.3100	3.0700	-2162.2316 (269)
Primary energy kWh/year			3169.1810 (272)
Primary energy kWh/m2/year			37.4696 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0943 Plot 11	Issued on Date	09/07/2024
Assessment Reference	As Built	Prop Type Ref	Type C Terrace
Project	23 , Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	13.32	TER	17.66
Environmental	90 B	% DER<TER	24.56		
CO ₂ Emissions (t/year)	0.77	DFEE	44.06	TFEE	48.71
General Requirements Compliance	Pass	% DFEE<TFEE	9.54		

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 11	Issued on Date	09/07/2024
Assessment Reference	As Built	Prop Type Ref	Type C Terrace
Project	23 , Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	13.32	TER	17.66
Environmental	90 B	% DER<TER	24.56		
CO ₂ Emissions (t/year)	0.77	DFEE	44.06	TFEE	48.71
General Requirements Compliance	Pass	% DFEE<TFEE	9.54		

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 11	Issued on Date	09/07/2024
Assessment Reference	As Built	Prop Type Ref	Type C Terrace
Project	23 , Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	13.32	TER	17.66
Environmental	90 B	% DER<TER	24.56		
CO ₂ Emissions (t/year)	0.77	DFEE	44.06	TFEE	48.71
General Requirements Compliance	Pass	% DFEE<TFEE	9.54		

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 11	Issued on Date	09/07/2024
Assessment Reference	As Built	Prop Type Ref	Type C Terrace
Property	23 , Shaw Crescent, West End, Southampton, SO30 3LH		
SAP Rating	88 B	DER	13.32
Environmental	90 B	TER	17.66
CO ₂ Emissions (t/year)	0.77	% DER<TER	24.56
General Requirements Compliance	Pass	DfEE	44.06
		TFEE	48.71
		% DfEE<TFEE	9.54
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	1						
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 m²		2.39 m	
1st Storey:		18.37 m		42.29 m²		2.61 m	
7.0 Living Area	18.72			m²			
8.0 Thermal Mass Parameter	Precise calculation						
Thermal Mass	196.16			kJ/m²K			
9.0 External Walls							
Description	Type	Construction		U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area (m²)	Nett Area (m²)
Brick and Block	Cavity Wall	Other		0.24	42.22	91.85	77.64
9.1 Party Walls							
Description	Type	Construction		U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	
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							
Description	Construction				Kappa (kJ/m²K)	Area (m²)	
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							
Description	Type	Construction		U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area (m²)	Nett Area (m²)
Pitched Roof	External Plane Roof	Other		0.10	9.10	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					0.96	
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)	4.66	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	7.38	0.021	No	Knauf P5
Independently assessed	E4 Jamb	24.90	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	5.00	m³/(h.m²) @ 50 Pa
Property Tested ?	No	
As Built AP ₅₀	3.61	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			
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 89	