



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 24, Shaw Crescent
West End, Southampton, SO30 3LH

Contact: Tobias Whiting
Abacus Energy (UK) Ltd
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Report Issue Date: 29/05/2024

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0943 Plot 25	Issued on Date	29/05/2024
Assessment Reference	As Built	Prop Type Ref	Block J Mid Terrace
Property	24, Shaw Crescent, West End, Southampton, SO30 3LH		
SAP Rating	89 B	DER	11.61
Environmental	91 B	TER	16.77
CO ₂ Emissions (t/year)	0.69	% DER<TER	30.78
General Requirements Compliance	Pass	DFEE	36.19
		TFEE	44.18
		% DFEE<TFEE	18.07
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)	16.77	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	11.61	kgCO ₂ /m ²	Pass
	-5.16 (-30.8%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	44.18	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	36.19	kWh/m ² /yr	
	-8.0 (-18.1%)	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	3.87 (measured in this dwelling)	m ³ /(h.m ²) @ 50 Pa	
Maximum	10.0	m ³ /(h.m ²) @ 50 Pa	Pass

Limiting System Efficiencies

4 Heating efficiency

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

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Main heating system

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

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Programmer, room thermostat and TRVs

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100 %

Minimum

75 %

Pass

8 Mechanical ventilation

Continuous extract system

Specific fan power

0.17

Maximum

0.7

Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Southern England)

Slight

Pass

Based on:

Overshading

Average

Windows facing East

4.31 m², No overhang

Windows facing West

7.00 m², No overhang

Air change rate

4.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

3.87 (measured in this dwelling)

m³/(h.m²) @ 50 Pa

Maximum

10.0

m³/(h.m²) @ 50 Pa

Pass

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BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

10 Key features

Party wall U-value	0.00	W/m ² K
Party wall U-value	0.00	W/m ² K
Roof U-value	0.10	W/m ² K
Floor U-value	0.12	W/m ² K
Door U-value	1.10	W/m ² K
Air permeability	3.9	m ³ /m ² h
Photovoltaic array	0.80	kW

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THERMAL BRIDGING

Calculation Type: New Build (As Built)

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SAP Rating	89 B	DER	11.61	TER	16.77
Environmental	91 B	% DER<TER	30.78		
CO ₂ Emissions (t/year)	0.69	DFEE	36.19	TFEE	44.18
General Requirements Compliance	Pass	% DFEE<TFEE	18.07		

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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	1.02	0.07	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.064	4.99	0.32	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.067	1.59	0.11	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.061	1.81	0.11	Birtley Supatherm
External wall	E3 Sill	Independently assessed	0.021	6.80	0.14	Knauf P5
External wall	E4 Jamb	Independently assessed	0.016	20.10	0.32	Knauf P6
External wall	E5 Ground floor (normal)	Table K1 - Default	0.320	9.73	3.11	
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	9.73	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	9.73	0.58	
External wall	E18 Party wall between dwellings	Independently assessed	0.036	20.00	0.72	Knauf P25 Halved
Party wall	P1 Party wall - Ground floor	Table K1 - Default	0.160	17.54	2.81	
Party wall	P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	0.000	17.54	0.00	
Party wall	P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	0.035	17.54	0.61	Knauf P29 Halved

Total: **8.91** W/mK:
Y-Value: **0.067** W/m²K:

FULL SAP CALCULATION PRINTOUT

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FULL SAP CALCULATION PRINTOUT

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

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

DWELLING AS BUILT

Mid-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) 16.77 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 11.61 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)44.2 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)36.2 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: 3.87 (measured in this dwelling)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas

Data from database

Vaillant ecoFIT sustain 835 VUW 356/6-3 (H-GB)

Combi boiler

Efficiency: 89.3% SEDBUK2009

Minimum: 88.0% OK

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls:

No cylinder

Boiler interlock

Yes

OK

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system

Specific fan power: 0.17
Maximum 0.7 OK

9 Summertime temperature

Overheating risk (Southern England): Slight OK

Based on:

Overshading: Average

Windows facing East: 4.31 m², No overhang

Windows facing West: 7.00 m², No overhang

Air change rate: 4.00 ach

Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K

Party wall U-value 0.00 W/m²K

Roof U-value 0.10 W/m²K

Floor U-value 0.12 W/m²K

Door U-value 1.10 W/m²K

Air permeability 3.9 m³/m²h

Photovoltaic array 0.80 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	42.4000 (1b)	x 2.3900 (2b)	= 101.3360 (1b) - (3b)
First floor	42.4000 (1c)	x 2.6100 (2c)	= 110.6640 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.0000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.8700
Infiltration rate					0.1935 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)]	=	0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20)	=	0.1645 (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	0.2097	0.2056	0.2015	0.1809	0.1768	0.1563	0.1563	0.1521	0.1645	0.1768	0.1850	0.1933 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Front Door			2.1500	1.1000	2.3650		(26)					
Windows (Uw = 1.20)			11.3100	1.1450	12.9504		(27)					
Ground Floor			42.4000	0.1200	5.0880	84.0000	3561.6000 (28a)					
Brick and Block	48.2000	13.4600	34.7400	0.2400	8.3376	42.2200	1466.7228 (29a)					
Pitched Roof	42.4000		42.4000	0.1000	4.2400	9.1000	385.8400 (30)					
Total net area of external elements Aum(A, m2)			133.0000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		32.9810		(33)					
Party Wall 1			44.0500	0.0000	0.0000	58.0600	2557.5430 (32)					
Party Wall 2			44.0500	0.0000	0.0000	58.0600	2557.5430 (32)					
Ground Floor Stud			72.3100			9.0000	650.7900 (32c)					
First Floor Stud			108.0200			9.0000	972.1800 (32c)					
Internal Floor 1			42.4000			18.0000	763.2000 (32d)					
Internal Ceiling 1			42.4000			18.0000	763.2000 (32e)					
Heat capacity Cm = Sum(A x k)					(28) ... (30) + (32) + (32a) ... (32e) =		13678.6188 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							161.3045 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.9108 (36)					
Total fabric heat loss						(33) + (36) =	41.8918 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 34.9800	Feb 34.9800	Mar 34.9800	Apr 34.9800	May 34.9800	Jun 34.9800	Jul 34.9800	Aug 34.9800	Sep 34.9800	Oct 34.9800	Nov 34.9800	Dec 34.9800 (38)
Heat transfer coeff	76.8718	76.8718	76.8718	76.8718	76.8718	76.8718	76.8718	76.8718	76.8718	76.8718	76.8718	76.8718 (39)
Average = Sum(39)m / 12 =												76.8718 (39)
HLP	Jan 0.9065	Feb 0.9065	Mar 0.9065	Apr 0.9065	May 0.9065	Jun 0.9065	Jul 0.9065	Aug 0.9065	Sep 0.9065	Oct 0.9065	Nov 0.9065	Dec 0.9065 (40)
HLP (average)												0.9065 (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												2.5477 (42)
Average daily hot water use (litres/day)												94.7069 (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	104.1776	100.3893	96.6010	92.8127	89.0245	85.2362	85.2362	89.0245	92.8127	96.6010	100.3893	104.1776 (44)
Energy conte	154.4923	135.1199	139.4317	121.5599	116.6396	100.6511	93.2681	107.0265	108.3047	126.2187	137.7776	149.6175 (45)
Energy content (annual)										Total = Sum (45)m =		1490.1077 (45)
Distribution loss (46)m = 0.15 x (45)m	23.1738	20.2680	20.9148	18.2340	17.4959	15.0977	13.9902	16.0540	16.2457	18.9328	20.6666	22.4426 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.6706	0.6070	0.6061	0.5077	0.4673	0.3861	0.3577	0.4288	0.4523	0.5487	0.6190	0.6495 (61)
Total heat required for water heating calculated for each month	155.1629	135.7270	140.0378	122.0676	117.1069	101.0372	93.6258	107.4552	108.7571	126.7674	138.3965	150.2670 (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	155.1629	135.7270	140.0378	122.0676	117.1069	101.0372	93.6258	107.4552	108.7571	126.7674	138.3965	150.2670 (64)
Heat gains from water heating, kWh/month	51.5363	45.0791	46.5126	40.5456	38.8995	33.5630	31.1011	35.6935	36.1244	42.1049	45.9658	49.9102 (65)
										Total per year (kWh/year) = Sum (64)m =		1496.4085 (64)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	127.3829	127.3829	127.3829	127.3829	127.3829	127.3829	127.3829	127.3829	127.3829	127.3829	127.3829	127.3829 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.1536	19.6766	16.0021	12.1146	9.0558	7.6453	8.2610	10.7380	14.4125	18.3000	21.3588	22.7693 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	229.1797	231.5579	225.5650	212.8068	196.7019	181.5655	171.4535	169.0753	175.0682	187.8264	203.9313	219.0677 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7383	35.7383	35.7383	35.7383	35.7383	35.7383	35.7383	35.7383	35.7383	35.7383	35.7383	35.7383 (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)	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063 (71)
Water heating gains (Table 5)	69.2693	67.0820	62.5169	56.3133	52.2843	46.6153	41.8025	47.9751	50.1728	56.5926	63.8414	67.0836 (72)
Total internal gains	384.8174	382.5314	368.2988	345.4496	322.2568	300.0410	285.7319	292.0033	303.8684	326.9338	353.3463	373.1354 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
East				4.3100	19.6403	0.6300	0.7000	0.7700	25.8700 (76)			
West				7.0000	19.6403	0.6300	0.7000	0.7700	42.0162 (80)			
Solar gains	67.8862	132.7999	218.7025	318.9645	390.9030	400.1588	380.9675	327.2454	254.3600	157.5783	84.6462	55.8263 (83)
Total gains	452.7036	515.3313	587.0013	664.4141	713.1598	700.1998	666.6994	619.2487	558.2284	484.5121	437.9925	428.9618 (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	49.4280	49.4280	49.4280	49.4280	49.4280	49.4280	49.4280	49.4280	49.4280	49.4280	49.4280	49.4280
alpha	4.2952	4.2952	4.2952	4.2952	4.2952	4.2952	4.2952	4.2952	4.2952	4.2952	4.2952	4.2952
util living area	0.9926	0.9863	0.9688	0.9190	0.8121	0.6484	0.4934	0.5478	0.7899	0.9507	0.9871	0.9941 (86)
MIT	19.6313	19.8036	20.1045	20.4759	20.7774	20.9377	20.9848	20.9764	20.8532	20.4442	19.9565	19.5811 (87)
Th 2	20.1620	20.1620	20.1620	20.1620	20.1620	20.1620	20.1620	20.1620	20.1620	20.1620	20.1620	20.1620 (88)
util rest of house	0.9910	0.9834	0.9620	0.9010	0.7721	0.5798	0.4054	0.4574	0.7316	0.9361	0.9838	0.9928 (89)
MIT 2	18.8978	19.0688	19.3656	19.7239	19.9982	20.1266	20.1561	20.1522	20.0675	19.7002	19.2218	18.8479 (90)
Living area fraction	19.0641	19.2355	19.5331	19.8944	20.1749	20.3105	20.3440	20.3391	20.2457	19.8689	19.3884	19.0142 (92)
MIT	19.0641	19.2355	19.5331	19.8944	20.1749	20.3105	20.3440	20.3391	20.2457	19.8689	19.3884	19.0142 (93)
Temperature adjustment												0.0000
adjusted MIT	19.0641	19.2355	19.5331	19.8944	20.1749	20.3105	20.3440	20.3391	20.2457	19.8689	19.3884	19.0142 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9883	0.9793	0.9557	0.8944	0.7728	0.5925	0.4250	0.4772	0.7380	0.9298	0.9799	0.9905 (94)
Ext temp.	447.4112	504.6576	561.0061	594.2378	551.0975	414.9028	283.3253	295.4765	411.9976	450.5182	429.1887	424.9036 (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	1134.9465	1101.9925	1001.8803	845.1599	651.4777	438.9758	287.8109	302.8049	472.4310	712.5188	944.6295	1138.7907 (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	511.5263	401.4091	328.0104	180.6639	74.6828	0.0000	0.0000	0.0000	0.0000	194.9284	371.1174	531.1320 (98)
Space heating per m2												2593.4702 (98)
										(98) / (4) =		30.5834 (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	2875.2442 (211)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	511.5263	401.4091	328.0104	180.6639	74.6828	0.0000	0.0000	0.0000	0.0000	194.9284	371.1174	531.1320 (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)	567.1023	445.0212	363.6479	200.2926	82.7969	0.0000	0.0000	0.0000	0.0000	216.1069	411.4383	588.8381 (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	155.1629	135.7270	140.0378	122.0676	117.1069	101.0372	93.6258	107.4552	108.7571	126.7674	138.3965	150.2670 (64)
Efficiency of water heater (217)m	86.5611	86.2628	85.5752	84.0765	81.2399	76.4000	76.4000	76.4000	76.4000	84.2063	85.9815	76.4000 (216)
Fuel for water heating, kWh/month	179.2525	157.3413	163.6429	145.1865	144.1495	132.2476	122.5469	140.6482	142.3522	150.5438	160.9609	173.2291 (219)
Water heating fuel used												1812.1014 (219)
Annual totals kWh/year												
Space heating fuel - main system												2875.2442 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.2380)												
mechanical ventilation fans (SFP = 0.2380)												61.5563 (230a)
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												136.5563 (231)
Electricity for lighting (calculated in Appendix L)												391.2387 (232)
Energy saving/generation technologies (Appendices M, N and Q)												
PV Unit 0 (0.80 + 0.80 + 908 + 1.00) =												-581.0267 (233)
Total delivered energy for all uses												4634.1139 (238)

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

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Space heating - main system 1	2875.2442	0.2160	621.0527 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1812.1014	0.2160	391.4139 (264)
Space and water heating			1012.4666 (265)
Pumps and fans	136.5563	0.5190	70.8727 (267)
Energy for lighting	391.2387	0.5190	203.0529 (268)
Energy saving/generation technologies			
PV Unit	-581.0267	0.5190	-301.5529 (269)
Total CO ₂ , kg/year			984.8394 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			11.6100 (273)

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

DER		11.6100	ZC1
Total Floor Area		84.8000	
Assumed number of occupants		2.5477	
CO ₂ emission factor in Table 12 for electricity displaced from grid		0.5190	
CO ₂ emissions from appliances, equation (L14)		16.0150	ZC2
CO ₂ emissions from cooking, equation (L16)		2.1243	ZC3
Total CO ₂ emissions		29.7493	ZC4
Residual CO ₂ emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m ² /year		0.0000	ZC6
Resulting CO ₂ emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO ₂ emissions		29.7493	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	42.4000 (1b)	x 2.3900 (2b)	= 101.3360 (1b) - (3b)
First floor	42.4000 (1c)	x 2.6100 (2c)	= 110.6640 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.0000 (5)

2. Ventilation rate

										main	secondary	other	total	m3 per hour										
										heating	heating													
Number of chimneys										0	+	0	+	0	=	0 * 40 =	0.0000 (6a)							
Number of open flues										0	+	0	+	0	=	0 * 20 =	0.0000 (6b)							
Number of intermittent fans																3 * 10 =	30.0000 (7a)							
Number of passive vents																0 * 10 =	0.0000 (7b)							
Number of flueless gas fires																0 * 40 =	0.0000 (7c)							
										Air changes per hour														
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000	/ (5) =	0.1415 (8)							
Pressure test										Yes														
Measured/design AP50										5.0000														
Infiltration rate										0.3915 (18)														
Number of sides sheltered										2 (19)														
Shelter factor										(20) = 1 - [0.075 x (19)] =					0.8500 (20)									
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =					0.3328 (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													0.4243	0.4160	0.4077	0.3661	0.3577	0.3161	0.3161	0.3078	0.3328	0.3577	0.3744	0.3910 (22b)
Effective ac													0.5900	0.5865	0.5831	0.5670	0.5640	0.5500	0.5500	0.5474	0.5554	0.5640	0.5701	0.5764 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			2.1500	1.0000	2.1500		(26)					
TER Opening Type (Uw = 1.40)			11.3100	1.3258	14.9943		(27)					
Ground Floor			42.4000	0.1300	5.5120		(28a)					
Brick and Block	48.2000	13.4600	34.7400	0.1800	6.2532		(29a)					
Pitched Roof	42.4000		42.4000	0.1300	5.5120		(30)					
Total net area of external elements Aum(A, m2)			133.0000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		34.4215		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.6641 (36)					
Total fabric heat loss						(33) + (36) =	43.0856 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 41.2774	Feb 41.0329	Mar 40.7932	Apr 39.6674	May 39.4567	Jun 38.4761	Jul 38.4761	Aug 38.2946	Sep 38.8538	Oct 39.4567	Nov 39.8828	Dec 40.3283 (38)
Heat transfer coeff	84.3630	84.1185	83.8788	82.7530	82.5423	81.5618	81.5618	81.3802	81.9395	82.5423	82.9685	83.4139 (39)
Average = Sum(39)m / 12 =												82.7520 (39)
HLP	Jan 0.9948	Feb 0.9920	Mar 0.9891	Apr 0.9759	May 0.9734	Jun 0.9618	Jul 0.9618	Aug 0.9597	Sep 0.9663	Oct 0.9734	Nov 0.9784	Dec 0.9837 (40)
HLP (average)												0.9758 (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												2.5477 (42)
Average daily hot water use (litres/day)												94.7069 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
	104.1776	100.3893	96.6010	92.8127	89.0245	85.2362	85.2362	89.0245	92.8127	96.6010	100.3893	104.1776 (44)
Energy conte	154.4923	135.1199	139.4317	121.5599	116.6396	100.6511	93.2681	107.0265	108.3047	126.2187	137.7776	149.6175 (45)
Energy content (annual)											Total = Sum(45)m =	1490.1077 (45)
Distribution loss	(46)m = 0.15 x (45)m											
	23.1738	20.2680	20.9148	18.2340	17.4959	15.0977	13.9902	16.0540	16.2457	18.9328	20.6666	22.4426 (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												

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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	49.2268	45.7707	45.3659	42.0343	43.4354	45.3659	45.7707	49.2268	49.3151	50.9589 (61)
Solar input	205.4512	181.1473	188.6585	167.3306	162.0055	142.6854	136.7035	152.3924	154.0754	175.4455	187.0927	200.5764 (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	205.4512	181.1473	188.6585	167.3306	162.0055	142.6854	136.7035	152.3924	154.0754	175.4455	187.0927	200.5764 (64)
	64.1084	56.4342	58.6677	51.8613	50.1242	43.9751	41.8705	46.9278	47.4540	54.2744	58.1398	62.4876 (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	127.3829	127.3829	127.3829	127.3829	127.3829	127.3829	127.3829	127.3829	127.3829	127.3829	127.3829	127.3829	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.1536	19.6766	16.0021	12.1146	9.0558	7.6453	8.2610	10.7380	14.4125	18.3000	21.3588	22.7693	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	229.1797	231.5579	225.5650	212.8068	196.7019	181.5655	171.4535	169.0753	175.0682	187.8264	203.9313	219.0677	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7383	35.7383	35.7383	35.7383	35.7383	35.7383	35.7383	35.7383	35.7383	35.7383	35.7383	35.7383	(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)	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	(71)
Water heating gains (Table 5)	86.1672	83.9795	78.8545	72.0296	67.3712	61.0765	56.2775	63.0750	65.9083	72.9495	80.7497	83.9887	(72)
Total internal gains	401.7153	399.4288	384.6364	361.1659	337.3437	314.5021	300.2069	307.1031	319.6039	343.2907	370.2547	390.0405	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W
East					4.3100	19.6403	0.6300	0.7000			0.7700	25.8700
West					7.0000	19.6403	0.6300	0.7000			0.7700	42.0162 (76)

Solar gains	67.8862	132.7999	218.7025	318.9645	390.9030	400.1588	380.9675	327.2454	254.3600	157.5783	84.6462	55.8263 (83)
Total gains	469.6016	532.2287	603.3389	680.1304	728.2467	714.6610	681.1744	634.3486	573.9639	500.8690	454.9009	445.8668 (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	69.8041	70.0071	70.2071	71.1623	71.3439	72.2016	72.2016	72.3627	71.8688	71.3439	70.9774	70.5984	
alpha	5.6536	5.6671	5.6805	5.7442	5.7563	5.8134	5.8134	5.8242	5.7913	5.7563	5.7318	5.7066	
util living area	0.9987	0.9969	0.9905	0.9625	0.8735	0.6945	0.5208	0.5786	0.8463	0.9808	0.9971	0.9990	(86)
MIT	19.9288	20.0607	20.2942	20.6034	20.8495	20.9706	20.9952	20.9916	20.9087	20.5798	20.2001	19.9082	(87)
Th 2	20.0876	20.0900	20.0924	20.1035	20.1056	20.1153	20.1153	20.1171	20.1115	20.1056	20.1014	20.0970	(88)
util rest of house	0.9982	0.9959	0.9871	0.9487	0.8306	0.6129	0.4193	0.4735	0.7805	0.9713	0.9959	0.9987	(89)
MIT 2	18.6468	18.8412	19.1825	19.6313	19.9565	20.0954	20.1134	20.1135	20.0367	19.6059	19.0537	18.6237	(90)
Living area fraction	18.9375	19.1178	19.4346	19.8517	20.1590	20.2939	20.3134	20.3126	20.2344	19.8268	19.3137	18.9150	(91)
MIT	18.9375	19.1178	19.4346	19.8517	20.1590	20.2939	20.3134	20.3126	20.2344	19.8268	19.3137	18.9150	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9375	19.1178	19.4346	19.8517	20.1590	20.2939	20.3134	20.3126	20.2344	19.8268	19.3137	18.9150	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	468.3693	529.2112	593.5909	642.0016	606.9747	450.3906	301.3546	315.5205	453.8763	484.5417	452.3461	444.9879	(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	1234.8676	1195.9774	1084.9355	906.2888	698.2262	464.4041	302.8726	318.4099	502.6526	761.6000	1013.3504	1227.4338	(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	570.2748	448.0669	365.5604	190.2868	67.8911	0.0000	0.0000	0.0000	0.0000	206.1313	403.9231	582.1397	(98)
Space heating												2834.2742	(98)
Space heating per m2												33.4230	(99)

8c. Space cooling requirement

Not applicable

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3034.5548 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	570.2748	448.0669	365.5604	190.2868	67.8911	0.0000	0.0000	0.0000	0.0000	206.1313	403.9231	582.1397	(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)	610.5726	479.7290	391.3923	203.7332	72.6886	0.0000	0.0000	0.0000	0.0000	220.6974	432.4658	623.2760	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	205.4512	181.1473	188.6585	167.3306	162.0055	142.6854	136.7035	152.3924	154.0754	175.4455	187.0927	200.5764	(64)
Efficiency of water heater (217)m	87.4856	87.2409	86.6884	85.3755	83.0398	80.3000	80.3000	80.3000	80.3000	85.4578	86.9384	87.5772	(217)
Fuel for water heating, kWh/month	234.8399	207.6403	217.6283	195.9938	195.0938	177.6904	170.2410	189.7788	191.8747	205.3007	215.2014	229.0280	(219)
Water heating fuel used												2430.3111	(219)
Annual totals kWh/year													
Space heating fuel - main system												3034.5548	(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)												391.2387	(232)
Total delivered energy for all uses												5931.1046	(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	3034.5548	0.2160	655.4638 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2430.3111	0.2160	524.9472 (264)
Space and water heating			1180.4110 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	391.2387	0.5190	203.0529 (268)
Total CO2, kg/m2/year			1422.3889 (272)
Emissions per m2 for space and water heating			13.9199 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3945 (272b)
Emissions per m2 for pumps and fans			0.4590 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.9199 * 1.00) + 2.3945 + 0.4590, rounded to 2 d.p.			16.7700 (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	42.4000 (1b)	x 2.3900 (2b)	= 101.3360 (1b) - (3b)
First floor	42.4000 (1c)	x 2.6100 (2c)	= 110.6640 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.0000 (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) = 0.1415 (8)
Pressure test					Yes
Measured/design AP50					3.8700
Infiltration rate					0.3350 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.2848 (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	0.3631	0.3559	0.3488	0.3132	0.3061	0.2705	0.2705	0.2634	0.2848	0.3061	0.3204	0.3346 (22b)
Effective ac	0.5659	0.5633	0.5608	0.5491	0.5469	0.5366	0.5366	0.5347	0.5405	0.5469	0.5513	0.5560 (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)			11.3100	1.1450	12.9504		(27)
Ground Floor			42.4000	0.1200	5.0880	84.0000	3561.6000 (28a)
Brick and Block	48.2000	13.4600	34.7400	0.2400	8.3376	42.2200	1466.7228 (29a)
Pitched Roof	42.4000		42.4000	0.1000	4.2400	9.1000	385.8400 (30)
Total net area of external elements Aum(A, m ²)			133.0000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.9810		(33)
Party Wall 1			44.0500	0.0000	0.0000	58.0600	2557.5430 (32)
Party Wall 2			44.0500	0.0000	0.0000	58.0600	2557.5430 (32)
Ground Floor Stud			72.3100			9.0000	650.7900 (32c)
First Floor Stud			108.0200			9.0000	972.1800 (32c)
Internal Floor 1			42.4000			18.0000	763.2000 (32d)
Internal Ceiling 1			42.4000			9.0000	381.6000 (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) = 13297.0188 (34)
156.8045 (35)
8.9108 (36)
(33) + (36) = 41.8918 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	39.5910	39.4119	39.2364	38.4121	38.2578	37.5399	37.5399	37.4069	37.8164	38.2578	38.5699	38.8960 (38)
Heat transfer coeff	81.4828	81.3037	81.1282	80.3039	80.1496	79.4317	79.4317	79.2987	79.7082	80.1496	80.4617	80.7878 (39)
Average = Sum(39)m / 12 =												80.3031 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9609	0.9588	0.9567	0.9470	0.9452	0.9367	0.9367	0.9351	0.9400	0.9452	0.9488	0.9527 (40)
HLP (average)												0.9470 (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)
2.5477 (42)
94.7069 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	104.1776	100.3893	96.6010	92.8127	89.0245	85.2362	85.2362	89.0245	92.8127	96.6010	100.3893	104.1776 (44)
Energy conte	154.4923	135.1199	139.4317	121.5599	116.6396	100.6511	93.2681	107.0265	108.3047	126.2187	137.7776	149.6175 (45)

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Energy content (annual)	Total = Sum(45)m = 1490.1077 (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	32.8296	28.7130	29.6292	25.8315	24.7859	21.3884	19.8195	22.7431	23.0148	26.8215	29.2777	31.7937 (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	127.3829	127.3829	127.3829	127.3829	127.3829	127.3829	127.3829	127.3829	127.3829	127.3829	127.3829	127.3829	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.1536	19.6766	16.0021	12.1146	9.0558	7.6453	8.2610	10.7380	14.4125	18.3000	21.3588	22.7693	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	229.1797	231.5579	225.5650	212.8068	196.7019	181.5655	171.4535	169.0753	175.0682	187.8264	203.9313	219.0677	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7383	35.7383	35.7383	35.7383	35.7383	35.7383	35.7383	35.7383	35.7383	35.7383	35.7383	35.7383	(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)	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	(71)
Water heating gains (Table 5)	44.1258	42.7277	39.8242	35.8771	33.3144	29.7061	26.6391	30.5687	31.9649	36.0504	40.6635	42.7335	(72)
Total internal gains	356.6739	355.1770	342.6061	322.0133	300.2869	280.1317	267.5684	271.5969	282.6605	303.3916	327.1685	345.7853	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
East					4.3100	19.6403	0.6300	0.7000	0.7700		25.8700	
West					7.0000	19.6403	0.6300	0.7000	0.7700		42.0162 (76)	
Solar gains	67.8862	132.7999	218.7025	318.9645	390.9030	400.1588	380.9675	327.2454	254.3600	157.5783	84.6462	55.8263 (83)
Total gains	424.5602	487.9769	561.3086	640.9778	691.1900	680.2905	648.5359	598.8423	537.0206	460.9699	411.8146	401.6117 (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	45.3300	45.4299	45.5281	45.9955	46.0840	46.5005	46.5005	46.5785	46.3392	46.0840	45.9053	45.7200	
alpha	4.0220	4.0287	4.0352	4.0664	4.0723	4.1000	4.1000	4.1052	4.0893	4.0723	4.0604	4.0480	
util living area	0.9936	0.9881	0.9729	0.9286	0.8319	0.6733	0.5183	0.5753	0.8130	0.9579	0.9890	0.9949	(86)
MIT	19.4500	19.6343	19.9584	20.3762	20.7175	20.9164	20.9778	20.9663	20.8117	20.3501	19.8222	19.4155	(87)
Th 2	20.1161	20.1178	20.1196	20.1278	20.1293	20.1364	20.1364	20.1377	20.1337	20.1293	20.1262	20.1229	(88)
util rest of house	0.9923	0.9856	0.9669	0.9122	0.7936	0.6036	0.4251	0.4806	0.7569	0.9450	0.9862	0.9938	(89)
MIT 2	18.6840	18.8685	19.1904	19.6026	19.9186	20.0880	20.1277	20.1235	20.0100	19.5852	19.0629	18.6549	(90)
Living area fraction	18.8577	19.0422	19.3646	19.7780	20.0998	20.2759	20.3205	20.3146	20.1918	19.7587	19.2351	18.8274	(92)
Temperature adjustment	18.8577	19.0422	19.3646	19.7780	20.0998	20.2759	20.3205	20.3146	20.1918	19.7587	19.2351	18.8274	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	420.1613	478.9649	539.0948	579.7572	547.5232	418.7574	288.9962	299.9854	408.7260	432.4940	404.5703	398.2388	(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	1186.2009	1149.8115	1043.6783	873.5470	673.2379	450.8427	295.5261	310.4241	485.5681	734.0653	976.4073	1181.7157	(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	569.9334	450.8089	375.4101	211.5286	93.5317	0.0000	0.0000	0.0000	0.0000	224.3690	411.7226	582.9068	(98)
Space heating													2920.2113 (98)
Space heating per m2													34.4365 (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	746.6578	587.7944	602.6703	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8680	0.9204	0.8978	0.0000	0.0000	0.0000	0.0000	(101)

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Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	648.0787	540.9938	541.0876	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	891.3174	852.2657	796.0463	0.0000	0.0000	0.0000	0.0000 (103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	175.1319	231.5863	189.6893	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												596.4075 (104)
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	43.7830	57.8966	47.4223	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												149.1019 (107)
Space cooling per m2												1.7583 (108)
Energy for space heating												34.4365 (99)
Energy for space cooling												1.7583 (108)
Total												36.1947 (109)
Dwelling Fabric Energy Efficiency (DFEE)												36.2 (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	42.4000 (1b)	x 2.3900 (2b)	= 101.3360 (1b) - (3b)
First floor	42.4000 (1c)	x 2.6100 (2c)	= 110.6640 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.0000 (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) = 0.1415 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3915 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3328 (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	0.4243	0.4160	0.4077	0.3661	0.3577	0.3161	0.3161	0.3078	0.3328	0.3577	0.3744	0.3910 (22b)
Effective ac	0.5900	0.5865	0.5831	0.5670	0.5640	0.5500	0.5500	0.5474	0.5554	0.5640	0.5701	0.5764 (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)			11.3100	1.3258	14.9943		(27)
Ground Floor			42.4000	0.1300	5.5120		(28a)
Brick and Block	48.2000	13.4600	34.7400	0.1800	6.2532		(29a)
Pitched Roof	42.4000		42.4000	0.1300	5.5120		(30)
Total net area of external elements Aum(A, m ²)			133.0000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.4215		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.6641 (36)
Total fabric heat loss						(33) + (36) =	43.0856 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	41.2774	41.0329	40.7932	39.6674	39.4567	38.4761	38.4761	38.2946	38.8538	39.4567	39.8828	40.3283 (38)
Heat transfer coeff	84.3630	84.1185	83.8788	82.7530	82.5423	81.5618	81.5618	81.3802	81.9395	82.5423	82.9685	83.4139 (39)
Average = Sum(39)m / 12 =												82.7520 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9948	0.9920	0.9891	0.9759	0.9734	0.9618	0.9618	0.9597	0.9663	0.9734	0.9784	0.9837 (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												2.5477 (42)
Average daily hot water use (litres/day)												94.7069 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	104.1776	100.3893	96.6010	92.8127	89.0245	85.2362	85.2362	89.0245	92.8127	96.6010	100.3893	104.1776 (44)
Energy conte	154.4923	135.1199	139.4317	121.5599	116.6396	100.6511	93.2681	107.0265	108.3047	126.2187	137.7776	149.6175 (45)
Energy content (annual)												Total = Sum(45)m = 1490.1077 (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												

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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)
	32.8296	28.7130	29.6292	25.8315	24.7859	21.3884	19.8195	22.7431	23.0148	26.8215	29.2777	31.7937 (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	127.3829	127.3829	127.3829	127.3829	127.3829	127.3829	127.3829	127.3829	127.3829	127.3829	127.3829	127.3829	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.1536	19.6766	16.0021	12.1146	9.0558	7.6453	8.2610	10.7380	14.4125	18.3000	21.3588	22.7693	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	229.1797	231.5579	225.5650	212.8068	196.7019	181.5655	171.4535	169.0753	175.0682	187.8264	203.9313	219.0677	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7383	35.7383	35.7383	35.7383	35.7383	35.7383	35.7383	35.7383	35.7383	35.7383	35.7383	35.7383	(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)	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	(71)
Water heating gains (Table 5)	44.1258	42.7277	39.8242	35.8771	33.3144	29.7061	26.6391	30.5687	31.9649	36.0504	40.6635	42.7335	(72)
Total internal gains	356.6739	355.1770	342.6061	322.0133	300.2869	280.1317	267.5684	271.5969	282.6605	303.3916	327.1685	345.7853	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
East					4.3100	19.6403	0.6300	0.7000			0.7700			25.8700 (76)
West					7.0000	19.6403	0.6300	0.7000			0.7700			42.0162 (80)

Solar gains	67.8862	132.7999	218.7025	318.9645	390.9030	400.1588	380.9675	327.2454	254.3600	157.5783	84.6462	55.8263 (83)		
Total gains	424.5602	487.9769	561.3086	640.9778	691.1900	680.2905	648.5359	598.8423	537.0206	460.9699	411.8146	401.6117 (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	69.8041	70.0071	70.2071	71.1623	71.3439	72.2016	72.2016	72.3627	71.8688	71.3439	70.9774	70.5984	
alpha	5.6536	5.6671	5.6805	5.7442	5.7563	5.8134	5.8134	5.8242	5.7913	5.7563	5.7318	5.7066	
util living area	0.9992	0.9980	0.9933	0.9708	0.8928	0.7215	0.5453	0.6093	0.8738	0.9869	0.9982	0.9994	(86)
MIT	19.8778	20.0110	20.2485	20.5665	20.8277	20.9642	20.9940	20.9891	20.8898	20.5383	20.1515	19.8579	(87)
Th 2	20.0876	20.0900	20.0924	20.1035	20.1056	20.1153	20.1153	20.1171	20.1115	20.1056	20.1014	20.0970	(88)
util rest of house	0.9989	0.9974	0.9909	0.9596	0.8536	0.6397	0.4399	0.5004	0.8135	0.9801	0.9975	0.9992	(89)
MIT 2	19.0530	19.1880	19.4262	19.7466	19.9868	20.0985	20.1137	20.1138	20.0477	19.7248	19.3378	19.0408	(90)
Living area fraction	19.2401	19.3746	19.6126	19.9325	20.1775	20.2948	20.3133	20.3123	20.2387	19.9092	19.5223	19.2261	(91)
MIT	19.2401	19.3746	19.6126	19.9325	20.1775	20.2948	20.3133	20.3123	20.2387	19.9092	19.5223	19.2261	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2401	19.3746	19.6126	19.9325	20.1775	20.2948	20.3133	20.3123	20.2387	19.9092	19.5223	19.2261	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	423.9602	486.3304	555.2205	613.4042	592.4750	447.1650	300.9230	314.5705	442.2112	450.9145	410.5251	401.1990	(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	1260.3885	1217.5812	1099.8724	912.9734	699.7505	464.4796	302.8638	318.3851	503.0003	768.4056	1030.6609	1253.3891	(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	622.3026	491.4005	405.2210	215.6898	79.8130	0.0000	0.0000	0.0000	0.0000	236.2134	446.4978	634.0294	(98)
Space heating												3131.1675	(98)
Space heating per m2												36.9241	(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	766.6806	603.5570	618.4893	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9092	0.9566	0.9376	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	697.0803	577.3672	579.8666	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	891.3174	852.2657	796.0463	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	139.8508	204.5245	160.8377	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												505.2130	(104)
Cooled fraction												1.0000	(105)

fC = cooled area / (4) =

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	34.9627	51.1311	40.2094	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											126.3032 (107)
Space cooling per m2											1.4894 (108)
Energy for space heating											36.9241 (99)
Energy for space cooling											1.4894 (108)
Total											38.4136 (109)
Target Fabric Energy Efficiency (TFEE)											44.2 (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	42.4000 (1b)	x 2.3900 (2b)	= 101.3360 (1b) - (3b)
First floor	42.4000 (1c)	x 2.6100 (2c)	= 110.6640 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.0000 (5)

2. Ventilation rate

					main heating	secondary heating	other		total	m3 per hour		
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											0 * 10 =	0.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =											0.0000 / (5) =	0.0000 (8)
Pressure test											Yes	
Measured/design AP50												3.8700
Infiltration rate												0.1935 (18)
Number of sides sheltered												2 (19)
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.1645 (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												
	0.1933	0.1809	0.1809	0.1645	0.1686	0.1604	0.1604	0.1563	0.1563	0.1686	0.1645	0.1686 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Front Door			2.1500	1.1000	2.3650		(26)					
Windows (Uw = 1.20)			11.3100	1.1450	12.9504		(27)					
Ground Floor			42.4000	0.1200	5.0880	84.0000	3561.6000 (28a)					
Brick and Block	48.2000	13.4600	34.7400	0.2400	8.3376	42.2200	1466.7228 (29a)					
Pitched Roof	42.4000		42.4000	0.1000	4.2400	9.1000	385.8400 (30)					
Total net area of external elements Aum(A, m2)			133.0000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		32.9810		(33)					
Party Wall 1			44.0500	0.0000	0.0000	58.0600	2557.5430 (32)					
Party Wall 2			44.0500	0.0000	0.0000	58.0600	2557.5430 (32)					
Ground Floor Stud			72.3100			9.0000	650.7900 (32c)					
First Floor Stud			108.0200			9.0000	972.1800 (32c)					
Internal Floor 1			42.4000			18.0000	763.2000 (32d)					
Internal Ceiling 1			42.4000			18.0000	763.2000 (32e)					
Heat capacity Cm = Sum(A x k)					(28) ... (30) + (32) + (32a) ... (32e) =		13678.6188 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							161.3045 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.9108 (36)					
Total fabric heat loss						(33) + (36) =	41.8918 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 34.9800	Feb 34.9800	Mar 34.9800	Apr 34.9800	May 34.9800	Jun 34.9800	Jul 34.9800	Aug 34.9800	Sep 34.9800	Oct 34.9800	Nov 34.9800	Dec 34.9800 (38)
Heat transfer coeff	76.8718	76.8718	76.8718	76.8718	76.8718	76.8718	76.8718	76.8718	76.8718	76.8718	76.8718	76.8718 (39)
Average = Sum(39)m / 12 =												76.8718 (39)
HLP	Jan 0.9065	Feb 0.9065	Mar 0.9065	Apr 0.9065	May 0.9065	Jun 0.9065	Jul 0.9065	Aug 0.9065	Sep 0.9065	Oct 0.9065	Nov 0.9065	Dec 0.9065 (40)
HLP (average)												0.9065 (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												2.5477 (42)
Average daily hot water use (litres/day)												94.7069 (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	104.1776	100.3893	96.6010	92.8127	89.0245	85.2362	85.2362	89.0245	92.8127	96.6010	100.3893	104.1776 (44)
Energy conte	154.4923	135.1199	139.4317	121.5599	116.6396	100.6511	93.2681	107.0265	108.3047	126.2187	137.7776	149.6175 (45)
Energy content (annual)										Total =	Sum (45)m =	1490.1077 (45)
Distribution loss (46)m = 0.15 x (45)m	23.1738	20.2680	20.9148	18.2340	17.4959	15.0977	13.9902	16.0540	16.2457	18.9328	20.6666	22.4426 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.6706	0.6070	0.6061	0.5077	0.4673	0.3861	0.3577	0.4288	0.4523	0.5487	0.6190	0.6495 (61)
Total heat required for water heating calculated for each month	155.1629	135.7270	140.0378	122.0676	117.1069	101.0372	93.6258	107.4552	108.7571	126.7674	138.3965	150.2670 (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	155.1629	135.7270	140.0378	122.0676	117.1069	101.0372	93.6258	107.4552	108.7571	126.7674	138.3965	150.2670 (64)
RHI water heating demand												
Heat gains from water heating, kWh/month	51.5363	45.0791	46.5126	40.5456	38.8995	33.5630	31.1011	35.6935	36.1244	42.1049	45.9658	49.9102 (65)
												1496 (64)

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

Metabolic gains (Table 5), Watts												
(66)m	152.8594	152.8594	152.8594	152.8594	152.8594	152.8594	152.8594	152.8594	152.8594	152.8594	152.8594	152.8594 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.3839	49.1915	40.0052	30.2865	22.6395	19.1132	20.6525	26.8449	36.0312	45.7499	53.3969	56.9232 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	342.0593	345.6088	336.6641	317.6221	293.5849	270.9933	255.9007	252.3512	261.2959	280.3379	304.3751	326.9667 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8336	52.8336	52.8336	52.8336	52.8336	52.8336	52.8336	52.8336	52.8336	52.8336	52.8336	52.8336 (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)	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063 (71)
Water heating gains (Table 5)	69.2693	67.0820	62.5169	56.3133	52.2843	46.6153	41.8025	47.9751	50.1728	56.5926	63.8414	67.0836 (72)
Total internal gains	573.4992	568.6690	545.9730	511.0086	475.2954	443.5086	425.1425	433.9580	454.2866	489.4672	528.4001	557.7602 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
East				4.3100	25.1733	0.6300		0.7000		0.7700		33.1580 (76)
West				7.0000	25.1733	0.6300		0.7000		0.7700		53.8529 (80)

Solar gains	87.0109	144.7926	241.9891	352.4466	404.8311	457.8381	419.0655	376.7535	294.0280	185.2275	108.1372	67.7282 (83)
Total gains	660.5101	713.4617	787.9620	863.4552	880.1265	901.3467	844.2080	810.7115	748.3146	674.6947	636.5374	625.4885 (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	49.4280	49.4280	49.4280	49.4280	49.4280	49.4280	49.4280	49.4280	49.4280	49.4280	49.4280	49.4280
Feb	4.2952	4.2952	4.2952	4.2952	4.2952	4.2952	4.2952	4.2952	4.2952	4.2952	4.2952	4.2952
Mar	0.9622	0.9474	0.9019	0.7988	0.6395	0.4280	0.2993	0.3022	0.5513	0.8168	0.9335	0.9678 (86)
Apr	20.1007	20.2173	20.4761	20.7569	20.9270	20.9897	20.9983	20.9983	20.9705	20.7817	20.4112	20.0637 (87)
May	20.1620	20.1620	20.1620	20.1620	20.1620	20.1620	20.1620	20.1620	20.1620	20.1620	20.1620	20.1620 (88)
Jun	0.9547	0.9372	0.8835	0.7640	0.5847	0.3605	0.2239	0.2237	0.4773	0.7752	0.9184	0.9612 (89)
Jul	19.3602	19.4730	19.7199	19.9754	20.1156	20.1575	20.1616	20.1616	20.1474	20.0033	19.6630	19.3246 (90)
Aug	19.5281	19.6418	19.8914	20.1526	20.2996	20.3462	20.3513	20.3513	20.3341	20.1798	19.8327	19.4922 (92)
Sep	1070.6774	1048.6695	944.8593	772.7604	553.4443	341.7901	203.8125	196.1262	379.2912	621.1102	863.4753	1060.2300 (97)
Oct	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)
Nov	330.7937	258.9494	188.9795	81.6553	22.7928	0.0000	0.0000	0.0000	0.0000	72.4991	203.9804	344.5172 (98)
Dec												1504.1674 (98)
Space heating												1504 (98)
RHI space heating demand												

8. Space heating requirement

Utilisation	0.9478	0.9297	0.8768	0.7636	0.5940	0.3755	0.2410	0.2415	0.4930	0.7762	0.9114	0.9547 (94)
Useful gains	626.0623	663.3281	690.8545	659.3504	522.8088	338.4755	203.4671	195.7911	368.9055	523.6652	580.1692	597.1693 (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	1070.6774	1048.6695	944.8593	772.7604	553.4443	341.7901	203.8125	196.1262	379.2912	621.1102	863.4753	1060.2300 (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	330.7937	258.9494	188.9795	81.6553	22.7928	0.0000	0.0000	0.0000	0.0000	72.4991	203.9804	344.5172 (98)
Space heating												1504.1674 (98)
RHI space heating demand												1504 (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	42.4000 (1b)	x 2.3900 (2b)	= 101.3360 (1b) - (3b)
First floor	42.4000 (1c)	x 2.6100 (2c)	= 110.6640 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.0000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.8700
Infiltration rate					0.1935 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.1645 (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	0.2097	0.2056	0.2015	0.1809	0.1768	0.1563	0.1563	0.1521	0.1645	0.1768	0.1850	0.1933 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Front Door			2.1500	1.1000	2.3650		(26)					
Windows (Uw = 1.20)			11.3100	1.1450	12.9504		(27)					
Ground Floor			42.4000	0.1200	5.0880	84.0000	3561.6000 (28a)					
Brick and Block	48.2000	13.4600	34.7400	0.2400	8.3376	42.2200	1466.7228 (29a)					
Pitched Roof	42.4000		42.4000	0.1000	4.2400	9.1000	385.8400 (30)					
Total net area of external elements Aum(A, m2)			133.0000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		32.9810		(33)					
Party Wall 1			44.0500	0.0000	0.0000	58.0600	2557.5430 (32)					
Party Wall 2			44.0500	0.0000	0.0000	58.0600	2557.5430 (32)					
Ground Floor Stud			72.3100			9.0000	650.7900 (32c)					
First Floor Stud			108.0200			9.0000	972.1800 (32c)					
Internal Floor 1			42.4000			18.0000	763.2000 (32d)					
Internal Ceiling 1			42.4000			18.0000	763.2000 (32e)					
Heat capacity Cm = Sum(A x k)					(28) ... (30) + (32) + (32a) ... (32e) =		13678.6188 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							161.3045 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.9108 (36)					
Total fabric heat loss						(33) + (36) =	41.8918 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 34.9800	Feb 34.9800	Mar 34.9800	Apr 34.9800	May 34.9800	Jun 34.9800	Jul 34.9800	Aug 34.9800	Sep 34.9800	Oct 34.9800	Nov 34.9800	Dec 34.9800 (38)
Heat transfer coeff	76.8718	76.8718	76.8718	76.8718	76.8718	76.8718	76.8718	76.8718	76.8718	76.8718	76.8718	76.8718 (39)
Average = Sum(39)m / 12 =												76.8718 (39)
HLP	Jan 0.9065	Feb 0.9065	Mar 0.9065	Apr 0.9065	May 0.9065	Jun 0.9065	Jul 0.9065	Aug 0.9065	Sep 0.9065	Oct 0.9065	Nov 0.9065	Dec 0.9065 (40)
HLP (average)												0.9065 (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												2.5477 (42)
Average daily hot water use (litres/day)												94.7069 (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	104.1776	100.3893	96.6010	92.8127	89.0245	85.2362	85.2362	89.0245	92.8127	96.6010	100.3893	104.1776 (44)
Energy conte	154.4923	135.1199	139.4317	121.5599	116.6396	100.6511	93.2681	107.0265	108.3047	126.2187	137.7776	149.6175 (45)
Energy content (annual)										Total =	Sum (45)m =	1490.1077 (45)
Distribution loss (46)m = 0.15 x (45)m	23.1738	20.2680	20.9148	18.2340	17.4959	15.0977	13.9902	16.0540	16.2457	18.9328	20.6666	22.4426 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.6706	0.6070	0.6061	0.5077	0.4673	0.3861	0.3577	0.4288	0.4523	0.5487	0.6190	0.6495 (61)
Total heat required for water heating calculated for each month	155.1629	135.7270	140.0378	122.0676	117.1069	101.0372	93.6258	107.4552	108.7571	126.7674	138.3965	150.2670 (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	155.1629	135.7270	140.0378	122.0676	117.1069	101.0372	93.6258	107.4552	108.7571	126.7674	138.3965	150.2670 (64)
Heat gains from water heating, kWh/month	51.5363	45.0791	46.5126	40.5456	38.8995	33.5630	31.1011	35.6935	36.1244	42.1049	45.9658	49.9102 (65)
Total per year (kWh/year) = Sum (64)m = 1496.4085 (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	152.8594	152.8594	152.8594	152.8594	152.8594	152.8594	152.8594	152.8594	152.8594	152.8594	152.8594	152.8594 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.3839	49.1915	40.0052	30.2865	22.6395	19.1132	20.6525	26.8449	36.0312	45.7499	53.3969	56.9232 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	342.0593	345.6088	336.6641	317.6221	293.5849	270.9933	255.9007	252.3512	261.2959	280.3379	304.3751	326.9667 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8336	52.8336	52.8336	52.8336	52.8336	52.8336	52.8336	52.8336	52.8336	52.8336	52.8336	52.8336 (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)	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063 (71)
Water heating gains (Table 5)	69.2693	67.0820	62.5169	56.3133	52.2843	46.6153	41.8025	47.9751	50.1728	56.5926	63.8414	67.0836 (72)
Total internal gains	573.4992	568.6690	545.9730	511.0086	475.2954	443.5086	425.1425	433.9580	454.2866	489.4672	528.4001	557.7602 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d				Gains W
East				4.3100	19.6403	0.6300	0.7000	0.7700				25.8700 (76)
West				7.0000	19.6403	0.6300	0.7000	0.7700				42.0162 (80)

Solar gains	67.8862	132.7999	218.7025	318.9645	390.9030	400.1588	380.9675	327.2454	254.3600	157.5783	84.6462	55.8263 (83)
Total gains	641.3854	701.4689	764.6755	829.9732	866.1984	843.6674	806.1100	761.2035	708.6467	647.0454	613.0463	613.5866 (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	49.4280	49.4280	49.4280	49.4280	49.4280	49.4280	49.4280	49.4280	49.4280	49.4280	49.4280	49.4280
alpha	4.2952	4.2952	4.2952	4.2952	4.2952	4.2952	4.2952	4.2952	4.2952	4.2952	4.2952	4.2952
util living area	0.9739	0.9602	0.9280	0.8543	0.7263	0.5577	0.4137	0.4551	0.6793	0.8859	0.9586	0.9781 (86)
MIT	19.9189	20.0748	20.3356	20.6373	20.8593	20.9648	20.9922	20.9883	20.9196	20.6289	20.2113	19.8661 (87)
Th 2	20.1620	20.1620	20.1620	20.1620	20.1620	20.1620	20.1620	20.1620	20.1620	20.1620	20.1620	20.1620 (88)
util rest of house	0.9689	0.9527	0.9145	0.8278	0.6809	0.4929	0.3375	0.3762	0.6158	0.8590	0.9495	0.9739 (89)
MIT 2	19.1813	19.3338	19.5863	19.8690	20.0625	20.1428	20.1591	20.1573	20.1135	19.8680	19.4698	19.1294 (90)
Living area fraction	19.3486	19.5018	19.7562	20.0432	20.2432	20.3292	20.3480	20.3458	20.2963	20.0405	19.6379	19.2965 (92)
MIT	19.3486	19.5018	19.7562	20.0432	20.2432	20.3292	20.3480	20.3458	20.2963	20.0405	19.6379	19.2965 (93)
Temperature adjustment												0.0000
adjusted MIT	19.3486	19.5018	19.7562	20.0432	20.2432	20.3292	20.3480	20.3458	20.2963	20.0405	19.6379	19.2965 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9630	0.9457	0.9069	0.8237	0.6856	0.5062	0.3546	0.3938	0.6266	0.8546	0.9427	0.9684 (94)
Ext temp.	617.6503	663.3800	693.5217	683.6730	593.8551	427.0836	285.8771	299.7854	444.0318	552.9386	577.8905	594.1998 (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	1156.8093	1122.4687	1019.0314	856.5974	656.7285	440.4130	288.1166	303.3183	476.3183	725.7099	963.8122	1160.4937 (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	401.1343	308.5076	242.1792	124.5056	46.7778	0.0000	0.0000	0.0000	0.0000	128.5418	277.8637	421.3227 (98)
Space heating per m2												1950.8326 (98)
												(98) / (4) = 23.0051 (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	2162.7856	(211)											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	401.1343	308.5076	242.1792	124.5056	46.7778	0.0000	0.0000	0.0000	0.0000	128.5418	277.8637	421.3227	(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)	444.7165	342.0261	268.4914	138.0328	51.8601	0.0000	0.0000	0.0000	0.0000	142.5076	308.0529	467.0983	(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	155.1629	135.7270	140.0378	122.0676	117.1069	101.0372	93.6258	107.4552	108.7571	126.7674	138.3965	150.2670	(64)
Efficiency of water heater	85.8736	85.4824	84.6012	82.7963	79.8887	76.4000	76.4000	76.4000	76.4000	82.7761	85.0900	86.1109	(216)
(217)m	85.8736	85.4824	84.6012	82.7963	79.8887	76.4000	76.4000	76.4000	76.4000	82.7761	85.0900	86.1109	(217)
Fuel for water heating, kWh/month	180.6876	158.7776	165.5270	147.4313	146.5876	132.2476	122.5469	140.6482	142.3522	153.1449	162.6473	174.5040	(219)
Water heating fuel used	180.6876	158.7776	165.5270	147.4313	146.5876	132.2476	122.5469	140.6482	142.3522	153.1449	162.6473	1827.1023	(219)
Annual totals kWh/year													
Space heating fuel - main system												2162.7856	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.2380)													
mechanical ventilation fans (SFP = 0.2380)												61.5563	(230a)
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												136.5563	(231)
Electricity for lighting (calculated in Appendix L)												391.2387	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.80 * 908 * 1.00) =										-581.0267		-581.0267	(233)
Total delivered energy for all uses												3936.6562	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2162.7856	3.4800	75.2649 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1827.1023	3.4800	63.5832 (247)
Mechanical ventilation fans	61.5563	13.1900	8.1193 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	391.2387	13.1900	51.6044 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-581.0267	13.1900	-76.6374 (252)
Total energy cost			251.8268 (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] =	0.8148 (257)
SAP value		88.6329
SAP rating (Section 12)		89 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2162.7856	0.2160	467.1617 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1827.1023	0.2160	394.6541 (264)
Space and water heating			861.8158 (265)
Pumps and fans	136.5563	0.5190	70.8727 (267)
Energy for lighting	391.2387	0.5190	203.0529 (268)
Energy saving/generation technologies			
PV Unit	-581.0267	0.5190	-301.5529 (269)
Total kg/year			834.1886 (272)
CO2 emissions per m2			9.8400 (273)
EI value			91.3882
EI rating			91 (274)
EI band			B

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Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9020 = 3.858$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9020 = 0.2395$, stars = 4
Water heating energy efficiency	$3.48 / 0.8152 = 4.269$, stars = 4
Water heating environmental impact	$0.216 / 0.8152 = 0.2650$, 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	42.4000 (1b)	x 2.3900 (2b)	= 101.3360 (1b) - (3b)
First floor	42.4000 (1c)	x 2.6100 (2c)	= 110.6640 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.0000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.8700
Infiltration rate					0.1935 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.1645 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)
Adj infilt rate	0.1933	0.1809	0.1809	0.1645	0.1686	0.1604	0.1604	0.1563	0.1563	0.1686	0.1645	0.1686 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Front Door			2.1500	1.1000	2.3650		(26)					
Windows (Uw = 1.20)			11.3100	1.1450	12.9504		(27)					
Ground Floor			42.4000	0.1200	5.0880	84.0000	3561.6000 (28a)					
Brick and Block	48.2000	13.4600	34.7400	0.2400	8.3376	42.2200	1466.7228 (29a)					
Pitched Roof	42.4000		42.4000	0.1000	4.2400	9.1000	385.8400 (30)					
Total net area of external elements Aum(A, m2)			133.0000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		32.9810		(33)					
Party Wall 1			44.0500	0.0000	0.0000	58.0600	2557.5430 (32)					
Party Wall 2			44.0500	0.0000	0.0000	58.0600	2557.5430 (32)					
Ground Floor Stud			72.3100			9.0000	650.7900 (32c)					
First Floor Stud			108.0200			9.0000	972.1800 (32c)					
Internal Floor 1			42.4000			18.0000	763.2000 (32d)					
Internal Ceiling 1			42.4000			18.0000	763.2000 (32e)					
Heat capacity Cm = Sum(A x k)					(28) ... (30) + (32) + (32a) ... (32e) =		13678.6188 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							161.3045 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.9108 (36)					
Total fabric heat loss						(33) + (36) =	41.8918 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 34.9800	Feb 34.9800	Mar 34.9800	Apr 34.9800	May 34.9800	Jun 34.9800	Jul 34.9800	Aug 34.9800	Sep 34.9800	Oct 34.9800	Nov 34.9800	Dec 34.9800 (38)
Heat transfer coeff	76.8718	76.8718	76.8718	76.8718	76.8718	76.8718	76.8718	76.8718	76.8718	76.8718	76.8718	76.8718 (39)
Average = Sum(39)m / 12 =												76.8718 (39)
HLP	Jan 0.9065	Feb 0.9065	Mar 0.9065	Apr 0.9065	May 0.9065	Jun 0.9065	Jul 0.9065	Aug 0.9065	Sep 0.9065	Oct 0.9065	Nov 0.9065	Dec 0.9065 (40)
HLP (average)												0.9065 (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												2.5477 (42)
Average daily hot water use (litres/day)												94.7069 (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	104.1776	100.3893	96.6010	92.8127	89.0245	85.2362	85.2362	89.0245	92.8127	96.6010	100.3893	104.1776 (44)
Energy conte	154.4923	135.1199	139.4317	121.5599	116.6396	100.6511	93.2681	107.0265	108.3047	126.2187	137.7776	149.6175 (45)
Energy content (annual)										Total =	Sum (45)m =	1490.1077 (45)
Distribution loss (46)m = 0.15 x (45)m	23.1738	20.2680	20.9148	18.2340	17.4959	15.0977	13.9902	16.0540	16.2457	18.9328	20.6666	22.4426 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.6706	0.6070	0.6061	0.5077	0.4673	0.3861	0.3577	0.4288	0.4523	0.5487	0.6190	0.6495 (61)
Total heat required for water heating calculated for each month												
Solar input	155.1629	135.7270	140.0378	122.0676	117.1069	101.0372	93.6258	107.4552	108.7571	126.7674	138.3965	150.2670 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum (63)m =												0.0000 (63)
Output from w/h	155.1629	135.7270	140.0378	122.0676	117.1069	101.0372	93.6258	107.4552	108.7571	126.7674	138.3965	150.2670 (64)
Heat gains from water heating, kWh/month	51.5363	45.0791	46.5126	40.5456	38.8995	33.5630	31.1011	35.6935	36.1244	42.1049	45.9658	49.9102 (65)
Total per year (kWh/year) = Sum (64)m =												1496.4085 (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	152.8594	152.8594	152.8594	152.8594	152.8594	152.8594	152.8594	152.8594	152.8594	152.8594	152.8594	152.8594 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.3839	49.1915	40.0052	30.2865	22.6395	19.1132	20.6525	26.8449	36.0312	45.7499	53.3969	56.9232 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	342.0593	345.6088	336.6641	317.6221	293.5849	270.9933	255.9007	252.3512	261.2959	280.3379	304.3751	326.9667 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8336	52.8336	52.8336	52.8336	52.8336	52.8336	52.8336	52.8336	52.8336	52.8336	52.8336	52.8336 (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)	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063 (71)
Water heating gains (Table 5)	69.2693	67.0820	62.5169	56.3133	52.2843	46.6153	41.8025	47.9751	50.1728	56.5926	63.8414	67.0836 (72)
Total internal gains	573.4992	568.6690	545.9730	511.0086	475.2954	443.5086	425.1425	433.9580	454.2866	489.4672	528.4001	557.7602 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
East				4.3100	25.1733	0.6300	0.7000	0.7700	33.1580 (76)			
West				7.0000	25.1733	0.6300	0.7000	0.7700	53.8529 (80)			
Solar gains	87.0109	144.7926	241.9891	352.4466	404.8311	457.8381	419.0655	376.7535	294.0280	185.2275	108.1372	67.7282 (83)
Total gains	660.5101	713.4617	787.9620	863.4552	880.1265	901.3467	844.2080	810.7115	748.3146	674.6947	636.5374	625.4885 (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	49.4280	49.4280	49.4280	49.4280	49.4280	49.4280	49.4280	49.4280	49.4280	49.4280	49.4280	49.4280
alpha	4.2952	4.2952	4.2952	4.2952	4.2952	4.2952	4.2952	4.2952	4.2952	4.2952	4.2952	4.2952
util living area	0.9622	0.9474	0.9019	0.7988	0.6395	0.4280	0.2993	0.3022	0.5513	0.8168	0.9335	0.9678 (86)
MIT	20.1007	20.2173	20.4761	20.7569	20.9270	20.9897	20.9993	20.9983	20.9705	20.7817	20.4112	20.0637 (87)
Th 2	20.1620	20.1620	20.1620	20.1620	20.1620	20.1620	20.1620	20.1620	20.1620	20.1620	20.1620	20.1620 (88)
util rest of house	0.9547	0.9372	0.8835	0.7640	0.5847	0.3605	0.2239	0.2237	0.4773	0.7752	0.9184	0.9612 (89)
MIT 2	19.3602	19.4730	19.7199	19.9754	20.1156	20.1575	20.1616	20.1616	20.1474	20.0033	19.6630	19.3246 (90)
Living area fraction	19.5281	19.6418	19.8914	20.1526	20.2996	20.3462	20.3513	20.3513	20.3341	20.1798	19.8327	19.4922 (92)
MIT	19.5281	19.6418	19.8914	20.1526	20.2996	20.3462	20.3513	20.3513	20.3341	20.1798	19.8327	19.4922 (93)
Temperature adjustment												0.0000
adjusted MIT	19.5281	19.6418	19.8914	20.1526	20.2996	20.3462	20.3513	20.3513	20.3341	20.1798	19.8327	19.4922 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	626.0623	663.3281	690.8545	659.3504	522.8088	338.4755	203.4671	195.7911	368.9055	523.6652	580.1692	597.1693 (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	1070.6774	1048.6695	944.8593	772.7604	553.4443	341.7901	203.8125	196.1262	379.2912	621.1102	863.4753	1060.2300 (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	330.7937	258.9494	188.9795	81.6553	22.7928	0.0000	0.0000	0.0000	0.0000	72.4991	203.9804	344.5172 (98)
Space heating												1504.1674 (98)
Space heating per m2												17.7378 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1667.5914 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	330.7937	258.9494	188.9795	81.6553	22.7928	0.0000	0.0000	0.0000	0.0000	72.4991	203.9804	344.5172	(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)	366.7336	287.0836	209.5117	90.5269	25.2692	0.0000	0.0000	0.0000	0.0000	80.3759	226.1424	381.9481	(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	155.1629	135.7270	140.0378	122.0676	117.1069	101.0372	93.6258	107.4552	108.7571	126.7674	138.3965	150.2670	(64)
Efficiency of water heater (217)m	85.2815	84.9247	83.7605	81.3911	78.3530	76.4000	76.4000	76.4000	76.4000	80.9034	84.0623	85.5092	(216)
Fuel for water heating, kWh/month	181.9420	159.8203	167.1883	149.9767	149.4606	132.2476	122.5469	140.6482	142.3522	156.6899	164.6357	175.7320	(219)
Water heating fuel used												1843.2405	(219)
Annual totals kWh/year													
Space heating fuel - main system												1667.5914	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.2380)													
mechanical ventilation fans (SFP = 0.2380)												61.5563	(230a)
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												136.5563	(231)
Electricity for lighting (calculated in Appendix L)												391.2387	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.80 * 1030 * 1.00) =										-659.2380		-659.2380	(233)
Total delivered energy for all uses												3379.3889	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1667.5914	7.6100	126.9037 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1843.2405	7.6100	140.2706 (247)
Mechanical ventilation fans	61.5563	31.0800	19.1317 (249)
Pumps and fans for heating	75.0000	31.0800	23.3100 (249)
Energy for lighting	391.2387	31.0800	121.5970 (250)
Additional standing charges			105.0000 (251)
Energy saving/generation technologies			
PV Unit	-659.2380	31.0800	-204.8912 (252)
Total energy cost			331.3218 (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	1667.5914	0.2160	360.1997 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1843.2405	0.2160	398.1399 (264)
Space and water heating			758.3397 (265)
Pumps and fans	136.5563	0.5190	70.8727 (267)
Energy for lighting	391.2387	0.5190	203.0529 (268)
Energy saving/generation technologies			
PV Unit	-659.2380	0.5190	-342.1445 (269)
Total kg/year			690.1208 (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	1667.5914	1.2200	2034.4615 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1843.2405	1.2200	2248.7534 (264)
Space and water heating			4283.2148 (265)
Pumps and fans	136.5563	3.0700	419.2279 (267)
Energy for lighting	391.2387	3.0700	1201.1029 (268)

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Energy saving/generation technologies			
PV Unit	-659.2380	3.0700	-2023.8607 (269)
Primary energy kWh/year			3879.6850 (272)
Primary energy kWh/m2/year			45.7510 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	B 89
Current environmental impact rating:	B 91

(For testing purposes):

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

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.3	-£ 66	-206 kg (29.9%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£66 2.43 kg/m²	B 90	A 93
Total Savings	£66 2.43 kg/m²		

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

Fuel prices for cost data on this page from database revision number 542 TEST (30 Apr 2024)
Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£164	£180	-£16
Mains gas	£372	£290	£82
Space heating	£274	£274	£0
Water heating	£140	£74	£66
Lighting	£122	£122	£0
Generated (PV)	-£205	-£205	£0
Total cost of fuels	£331	£265	£66
Total cost of uses	£331	£265	£66
Delivered energy	40 kWh/m²	28 kWh/m²	12 kWh/m²
Carbon dioxide emissions	0.7 tonnes	0.5 tonnes	0.2 tonnes
CO2 emissions per m²	8 kg/m²	6 kg/m²	2 kg/m²
Primary energy	46 kWh/m²	32 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	42.4000 (1b)	x 2.3900 (2b)	= 101.3360 (1b) - (3b)
First floor	42.4000 (1c)	x 2.6100 (2c)	= 110.6640 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.0000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.8700
Infiltration rate					0.1935 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)]	=	0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20)	=	0.1645 (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	0.2097	0.2056	0.2015	0.1809	0.1768	0.1563	0.1563	0.1521	0.1645	0.1768	0.1850	0.1933 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Front Door			2.1500	1.1000	2.3650		(26)					
Windows (Uw = 1.20)			11.3100	1.1450	12.9504		(27)					
Ground Floor			42.4000	0.1200	5.0880	84.0000	3561.6000 (28a)					
Brick and Block	48.2000	13.4600	34.7400	0.2400	8.3376	42.2200	1466.7228 (29a)					
Pitched Roof	42.4000		42.4000	0.1000	4.2400	9.1000	385.8400 (30)					
Total net area of external elements Aum(A, m2)			133.0000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		32.9810		(33)					
Party Wall 1			44.0500	0.0000	0.0000	58.0600	2557.5430 (32)					
Party Wall 2			44.0500	0.0000	0.0000	58.0600	2557.5430 (32)					
Ground Floor Stud			72.3100			9.0000	650.7900 (32c)					
First Floor Stud			108.0200			9.0000	972.1800 (32c)					
Internal Floor 1			42.4000			18.0000	763.2000 (32d)					
Internal Ceiling 1			42.4000			18.0000	763.2000 (32e)					
Heat capacity Cm = Sum(A x k)					(28) ... (30) + (32) + (32a) ... (32e) =		13678.6188 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							161.3045 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.9108 (36)					
Total fabric heat loss						(33) + (36) =	41.8918 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 34.9800	Feb 34.9800	Mar 34.9800	Apr 34.9800	May 34.9800	Jun 34.9800	Jul 34.9800	Aug 34.9800	Sep 34.9800	Oct 34.9800	Nov 34.9800	Dec 34.9800 (38)
Heat transfer coeff	76.8718	76.8718	76.8718	76.8718	76.8718	76.8718	76.8718	76.8718	76.8718	76.8718	76.8718	76.8718 (39)
Average = Sum(39)m / 12 =												76.8718 (39)
HLP	Jan 0.9065	Feb 0.9065	Mar 0.9065	Apr 0.9065	May 0.9065	Jun 0.9065	Jul 0.9065	Aug 0.9065	Sep 0.9065	Oct 0.9065	Nov 0.9065	Dec 0.9065 (40)
HLP (average)												0.9065 (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												2.5477 (42)
Average daily hot water use (litres/day)												94.7069 (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 FOR IMPROVED DWELLING 09 Jan 2014

Daily hot water use	104.1776	100.3893	96.6010	92.8127	89.0245	85.2362	85.2362	89.0245	92.8127	96.6010	100.3893	104.1776 (44)
Energy conte	154.4923	135.1199	139.4317	121.5599	116.6396	100.6511	93.2681	107.0265	108.3047	126.2187	137.7776	149.6175 (45)
Energy content (annual)												
Distribution loss (46)m = 0.15 x (45)m	23.1738	20.2680	20.9148	18.2340	17.4959	15.0977	13.9902	16.0540	16.2457	18.9328	20.6666	22.4426 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.6706	0.6070	0.6061	0.5077	0.4673	0.3861	0.3577	0.4288	0.4523	0.5487	0.6190	0.6495 (61)
Total heat required for water heating calculated for each month	155.1629	135.7270	140.0378	122.0676	117.1069	101.0372	93.6258	107.4552	108.7571	126.7674	138.3965	150.2670 (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												1.2171 (H8)
Utilisation factor												0.5603 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												94.7069 (H14)
Volume ratio Veff/V												0.7919 (H15)
Solar storage volume factor												0.9533 (H16)
Solar input												-851.7906 (H17)
Solar input	-24.7002	-41.2176	-70.1983	-94.0795	-116.2273	-114.2700	-112.7598	-98.5188	-77.1600	-52.6912	-29.2980	-20.6699 (63)
Solar input (sum of months) = Sum (63)m =												-851.7906 (63)
Output from w/h	130.4627	94.5094	69.8395	27.9881	0.8796	0.0000	0.0000	8.9364	31.5971	74.0762	109.0985	129.5971 (64)
Total per year (kWh/year) = Sum (64)m =												676.9846 (64)
Heat gains from water heating, kWh/month	51.5363	45.0791	46.5126	40.5456	38.8995	33.5630	31.1011	35.6935	36.1244	42.1049	45.9658	49.9102 (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	152.8594	152.8594	152.8594	152.8594	152.8594	152.8594	152.8594	152.8594	152.8594	152.8594	152.8594	152.8594	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.3839	49.1915	40.0052	30.2865	22.6395	19.1132	20.6525	26.8449	36.0312	45.7499	53.3969	56.9232	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	342.0593	345.6088	336.6641	317.6221	293.5849	270.9933	255.9007	252.3512	261.2959	280.3379	304.3751	326.9667	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8336	52.8336	52.8336	52.8336	52.8336	52.8336	52.8336	52.8336	52.8336	52.8336	52.8336	52.8336	(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)	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	(71)
Water heating gains (Table 5)	69.2693	67.0820	62.5169	56.3133	52.2843	46.6153	41.8025	47.9751	50.1728	56.5926	63.8414	67.0836	(72)
Total internal gains	573.4992	568.6690	545.9730	511.0086	475.2954	443.5086	425.1425	433.9580	454.2866	489.4672	528.4001	557.7602	(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 6c								
East	4.3100	19.6403	0.6300	0.7000	0.7700	25.8700 (76)							
West	7.0000	19.6403	0.6300	0.7000	0.7700	42.0162 (80)							
Solar gains	67.8862	132.7999	218.7025	318.9645	390.9030	400.1588	380.9675	327.2454	254.3600	157.5783	84.6462	55.8263	(83)
Total gains	641.3854	701.4689	764.6755	829.9732	866.1984	843.6674	806.1100	761.2035	708.6467	647.0454	613.0463	613.5866	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
alpha	4.2952	4.2952	4.2952	4.2952	4.2952	4.2952	4.2952	4.2952	4.2952	4.2952	4.2952	4.2952	
util living area	0.9739	0.9602	0.9280	0.8543	0.7263	0.5577	0.4137	0.4551	0.6793	0.8859	0.9586	0.9781	(86)
MIT	19.9189	20.0748	20.3356	20.6373	20.8593	20.9648	20.9922	20.9883	20.9196	20.6289	20.2113	19.8661	(87)
Th 2	20.1620	20.1620	20.1620	20.1620	20.1620	20.1620	20.1620	20.1620	20.1620	20.1620	20.1620	20.1620	(88)
util rest of house	0.9689	0.9527	0.9145	0.8278	0.6809	0.4929	0.3375	0.3762	0.6158	0.8590	0.9495	0.9739	(89)
MIT 2	19.1813	19.3338	19.5863	19.8690	20.0625	20.1428	20.1591	20.1573	20.1135	19.8680	19.4698	19.1294	(90)
Living area fraction									fLA = Living area / (4) =			0.2268	(91)
MIT	19.3486	19.5018	19.7562	20.0432	20.2432	20.3292	20.3480	20.3458	20.2963	20.0405	19.6379	19.2965	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3486	19.5018	19.7562	20.0432	20.2432	20.3292	20.3480	20.3458	20.2963	20.0405	19.6379	19.2965	(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	0.9630	0.9457	0.9069	0.8237	0.6856	0.5062	0.3546	0.3938	0.6266	0.8546	0.9427	0.9684	(94)
Useful gains	617.6503	663.3800	693.5217	683.6730	593.8551	427.0836	285.8771	299.7854	444.0318	552.9386	577.8905	594.1998	(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	1156.8093	1122.4687	1019.0314	856.5974	656.7285	440.4130	288.1166	303.3183	476.3183	725.7099	963.8122	1160.4937	(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	401.1343	308.5076	242.1792	124.5056	46.7778	0.0000	0.0000	0.0000	0.0000	128.5418	277.8637	421.3227	(98)
Space heating												1950.8326	(98)
Space heating per m2											(98) / (4) =	23.0051	(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													2162.7856 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	401.1343	308.5076	242.1792	124.5056	46.7778	0.0000	0.0000	0.0000	0.0000	128.5418	277.8637	421.3227	(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)	444.7165	342.0261	268.4914	138.0328	51.8601	0.0000	0.0000	0.0000	0.0000	142.5076	308.0529	467.0983	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	130.4627	94.5094	69.8395	27.9881	0.8796	0.0000	0.0000	8.9364	31.5971	74.0762	109.0985	129.5971	(64)
Efficiency of water heater	86.3712	86.5346	86.6949	87.3057	89.9003	76.4000	76.4000	76.4000	76.4000	84.6125	85.8291	86.5236	(216)
(217)m	86.3712	86.5346	86.6949	87.3057	89.9003	76.4000	76.4000	76.4000	76.4000	84.6125	85.8291	86.5236	(217)
Fuel for water heating, kWh/month	151.0488	109.2158	80.5578	32.0576	0.9784	0.0000	0.0000	11.6969	41.3574	87.5476	127.1113	149.7825	(219)
Water heating fuel used												791.3541	(219)
Annual totals kWh/year													
Space heating fuel - main system												2162.7856	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.2380)													
mechanical ventilation fans (SFP = 0.2380)													61.5563 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
pump for solar water heating													50.0000 (230g)
Total electricity for the above, kWh/year													186.5563 (231)
Electricity for lighting (calculated in Appendix L)													391.2387 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.80 * 908 * 1.00) =										-581.0267		-581.0267	(233)
Total delivered energy for all uses												2950.9081	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2162.7856	3.4800	75.2649	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	791.3541	3.4800	27.5391	(247)
Mechanical ventilation fans	61.5563	13.1900	8.1193	(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	391.2387	13.1900	51.6044	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	-581.0267	13.1900	-76.6374	(252)
Total energy cost			222.3778	(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] =	0.7196 (257)
SAP value		89.9622
SAP rating (Section 12)		90 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2162.7856	0.2160	467.1617 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	791.3541	0.2160	170.9325 (264)
Space and water heating			638.0942 (265)
Pumps and fans	186.5563	0.5190	96.8227 (267)
Energy for lighting	391.2387	0.5190	203.0529 (268)
Energy saving/generation technologies			
PV Unit	-581.0267	0.5190	-301.5529 (269)
Total kg/year			636.4170 (272)
CO2 emissions per m2			7.5000 (273)
EI value			93.4299
EI rating			93 (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	42.4000 (1b)	x 2.3900 (2b)	= 101.3360 (1b) - (3b)
First floor	42.4000 (1c)	x 2.6100 (2c)	= 110.6640 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.0000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.8700
Infiltration rate					0.1935 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)]	=	0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20)	=	0.1645 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)
Adj infilt rate	0.1933	0.1809	0.1809	0.1645	0.1686	0.1604	0.1604	0.1563	0.1563	0.1686	0.1645	0.1686 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Front Door			2.1500	1.1000	2.3650		(26)					
Windows (Uw = 1.20)			11.3100	1.1450	12.9504		(27)					
Ground Floor			42.4000	0.1200	5.0880	84.0000	3561.6000 (28a)					
Brick and Block	48.2000	13.4600	34.7400	0.2400	8.3376	42.2200	1466.7228 (29a)					
Pitched Roof	42.4000		42.4000	0.1000	4.2400	9.1000	385.8400 (30)					
Total net area of external elements Aum(A, m2)			133.0000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		32.9810		(33)					
Party Wall 1			44.0500	0.0000	0.0000	58.0600	2557.5430 (32)					
Party Wall 2			44.0500	0.0000	0.0000	58.0600	2557.5430 (32)					
Ground Floor Stud			72.3100			9.0000	650.7900 (32c)					
First Floor Stud			108.0200			9.0000	972.1800 (32c)					
Internal Floor 1			42.4000			18.0000	763.2000 (32d)					
Internal Ceiling 1			42.4000			18.0000	763.2000 (32e)					
Heat capacity Cm = Sum(A x k)					(28) ... (30) + (32) + (32a) ... (32e) =		13678.6188 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							161.3045 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.9108 (36)					
Total fabric heat loss						(33) + (36) =	41.8918 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 34.9800	Feb 34.9800	Mar 34.9800	Apr 34.9800	May 34.9800	Jun 34.9800	Jul 34.9800	Aug 34.9800	Sep 34.9800	Oct 34.9800	Nov 34.9800	Dec 34.9800 (38)
Heat transfer coeff	76.8718	76.8718	76.8718	76.8718	76.8718	76.8718	76.8718	76.8718	76.8718	76.8718	76.8718	76.8718 (39)
Average = Sum(39)m / 12 =												76.8718 (39)
HLP	Jan 0.9065	Feb 0.9065	Mar 0.9065	Apr 0.9065	May 0.9065	Jun 0.9065	Jul 0.9065	Aug 0.9065	Sep 0.9065	Oct 0.9065	Nov 0.9065	Dec 0.9065 (40)
HLP (average)												0.9065 (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												2.5477 (42)
Average daily hot water use (litres/day)												94.7069 (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	104.1776	100.3893	96.6010	92.8127	89.0245	85.2362	85.2362	89.0245	92.8127	96.6010	100.3893	104.1776 (44)
Energy conte	154.4923	135.1199	139.4317	121.5599	116.6396	100.6511	93.2681	107.0265	108.3047	126.2187	137.7776	149.6175 (45)
Energy content (annual)										Total =	Sum (45)m =	1490.1077 (45)
Distribution loss (46)m = 0.15 x (45)m	23.1738	20.2680	20.9148	18.2340	17.4959	15.0977	13.9902	16.0540	16.2457	18.9328	20.6666	22.4426 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.6706	0.6070	0.6061	0.5077	0.4673	0.3861	0.3577	0.4288	0.4523	0.5487	0.6190	0.6495 (61)
Total heat required for water heating calculated for each month	155.1629	135.7270	140.0378	122.0676	117.1069	101.0372	93.6258	107.4552	108.7571	126.7674	138.3965	150.2670 (62)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.7000 (H2)
Collector heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0050 (H3a)
Collector effective heat loss coefficient												1.8063 (H3b)
Collector performance ratio												2.5804 (H4)
Annual solar radiation per m2												1206.0102 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												2026.0972 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.3597 (H8)
Utilisation factor												0.5207 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												94.7069 (H14)
Volume ratio Veff/V												0.7919 (H15)
Solar storage volume factor												0.9533 (H16)
Solar input												-884.3844 (H17)
Solar input	-28.8586	-41.0402	-71.2152	-95.7965	-111.3220	-121.0861	-114.8081	-104.6938	-81.9436	-56.6365	-34.1332	-22.8507 (63)
Solar input (sum of months) = Sum (63)m =												-884.3844 (63)
Output from w/h	126.3043	94.6868	68.8226	26.2711	5.7849	0.0000	0.0000	2.7614	26.8134	70.1309	104.2634	127.4163 (64)
Total per year (kWh/year) = Sum (64)m =												653.2552 (64)
Heat gains from water heating, kWh/month	51.5363	45.0791	46.5126	40.5456	38.8995	33.5630	31.1011	35.6935	36.1244	42.1049	45.9658	49.9102 (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	152.8594	152.8594	152.8594	152.8594	152.8594	152.8594	152.8594	152.8594	152.8594	152.8594	152.8594	152.8594	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.3839	49.1915	40.0052	30.2865	22.6395	19.1132	20.6525	26.8449	36.0312	45.7499	53.3969	56.9232	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	342.0593	345.6088	336.6641	317.6221	293.5849	270.9933	255.9007	252.3512	261.2959	280.3379	304.3751	326.9667	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8336	52.8336	52.8336	52.8336	52.8336	52.8336	52.8336	52.8336	52.8336	52.8336	52.8336	52.8336	(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)	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	-101.9063	(71)
Water heating gains (Table 5)	69.2693	67.0820	62.5169	56.3133	52.2843	46.6153	41.8025	47.9751	50.1728	56.5926	63.8414	67.0836	(72)
Total internal gains	573.4992	568.6690	545.9730	511.0086	475.2954	443.5086	425.1425	433.9580	454.2866	489.4672	528.4001	557.7602	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
East					4.3100	25.1733	0.6300	0.7000			0.7700			33.1580 (76)
West					7.0000	25.1733	0.6300	0.7000			0.7700			53.8529 (80)
Solar gains	87.0109	144.7926	241.9891	352.4466	404.8311	457.8381	419.0655	376.7535	294.0280	185.2275	108.1372			67.7282 (83)
Total gains	660.5101	713.4617	787.9620	863.4552	880.1265	901.3467	844.2080	810.7115	748.3146	674.6947	636.5374			625.4885 (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	49.4280	49.4280	49.4280	49.4280	49.4280	49.4280	49.4280	49.4280	49.4280	49.4280	49.4280	49.4280
alpha	4.2952	4.2952	4.2952	4.2952	4.2952	4.2952	4.2952	4.2952	4.2952	4.2952	4.2952	4.2952
util living area	0.9622	0.9474	0.9019	0.7988	0.6395	0.4280	0.2993	0.3022	0.5513	0.8168	0.9335	0.9678 (86)
MIT	20.1007	20.2173	20.4761	20.7569	20.9270	20.9897	20.9983	20.9983	20.9705	20.7817	20.4112	20.0637 (87)
Th 2	20.1620	20.1620	20.1620	20.1620	20.1620	20.1620	20.1620	20.1620	20.1620	20.1620	20.1620	20.1620 (88)
util rest of house	0.9547	0.9372	0.8835	0.7640	0.5847	0.3605	0.2239	0.2237	0.4773	0.7752	0.9184	0.9612 (89)
MIT 2	19.3602	19.4730	19.7199	19.9754	20.1156	20.1575	20.1616	20.1616	20.1474	20.0033	19.6630	19.3246 (90)
Living area fraction									fLA = Living area / (4) =			0.2268 (91)
MIT	19.5281	19.6418	19.8914	20.1526	20.2996	20.3462	20.3513	20.3513	20.3341	20.1798	19.8327	19.4922 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5281	19.6418	19.8914	20.1526	20.2996	20.3462	20.3513	20.3513	20.3341	20.1798	19.8327	19.4922 (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	0.9478	0.9297	0.8768	0.7636	0.5940	0.3755	0.2410	0.2415	0.4930	0.7762	0.9114	0.9547	(94)
Useful gains	626.0623	663.3281	690.8545	659.3504	522.8088	338.4755	203.4671	195.7911	368.9055	523.6652	580.1692	597.1693	(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	1070.6774	1048.6695	944.8593	772.7604	553.4443	341.7901	203.8125	196.1262	379.2912	621.1102	863.4753	1060.2300	(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	330.7937	258.9494	188.9795	81.6553	22.7928	0.0000	0.0000	0.0000	0.0000	72.4991	203.9804	344.5172	(98)
Space heating												1504.1674	(98)
Space heating per m2											(98) / (4) =	17.7378	(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													1667.5914	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	330.7937	258.9494	188.9795	81.6553	22.7928	0.0000	0.0000	0.0000	0.0000	72.4991	203.9804	344.5172	(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)	366.7336	287.0836	209.5117	90.5269	25.2692	0.0000	0.0000	0.0000	0.0000	80.3759	226.1424	381.9481	(211)	
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Water heating														
Water heating requirement	126.3043	94.6868	68.8226	26.2711	5.7849	0.0000	0.0000	2.7614	26.8134	70.1309	104.2634	127.4163	(64)	
Efficiency of water heater	85.9121	86.0389	86.0506	86.4011	87.0183	76.4000	76.4000	76.4000	76.4000	82.8424	85.0063	86.0057	(216)	
Fuel for water heating, kWh/month	147.0158	110.0512	79.9792	30.4060	6.6479	0.0000	0.0000	3.6144	35.0961	84.6558	122.6537	148.1487	(219)	
Water heating fuel used												768.2688	(219)	
Annual totals kWh/year														
Space heating fuel - main system												1667.5914	(211)	
Space heating fuel - secondary												0.0000	(215)	
Electricity for pumps and fans:														
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.2380)														
mechanical ventilation fans (SFP = 0.2380)													61.5563	(230a)
central heating pump													30.0000	(230c)
main heating flue fan													45.0000	(230e)
pump for solar water heating													50.0000	(230g)
Total electricity for the above, kWh/year													186.5563	(231)
Electricity for lighting (calculated in Appendix L)													391.2387	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.80 * 1030 * 1.00) =										-659.2380			-659.2380	(233)
Total delivered energy for all uses													2354.4172	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1667.5914	7.6100	126.9037	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	768.2688	7.6100	58.4653	(247)
Mechanical ventilation fans	61.5563	31.0800	19.1317	(249)
Pumps and fans for heating	75.0000	31.0800	23.3100	(249)
Pump for solar water heating	50.0000	31.0800	15.5400	(249)
Energy for lighting	391.2387	31.0800	121.5970	(250)
Additional standing charges			105.0000	(251)
Energy saving/generation technologies				
PV Unit	-659.2380	31.0800	-204.8912	(252)
Total energy cost			265.0565	(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	1667.5914	0.2160	360.1997	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	768.2688	0.2160	165.9461	(264)
Space and water heating			526.1458	(265)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Pumps and fans	186.5563	0.5190	96.8227 (267)
Energy for lighting	391.2387	0.5190	203.0529 (268)
Energy saving/generation technologies			
PV Unit	-659.2380	0.5190	-342.1445 (269)
Total kg/year			483.8769 (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	1667.5914	1.2200	2034.4615 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	768.2688	1.2200	937.2879 (264)
Space and water heating			2971.7494 (265)
Pumps and fans	186.5563	3.0700	572.7279 (267)
Energy for lighting	391.2387	3.0700	1201.1029 (268)
Energy saving/generation technologies			
PV Unit	-659.2380	3.0700	-2023.8607 (269)
Primary energy kWh/year			2721.7195 (272)
Primary energy kWh/m2/year			32.0957 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0943 Plot 25	Issued on Date	29/05/2024
Assessment Reference	As Built	Prop Type Ref	Block J Mid Terrace
Project	24, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	89 B	DER	11.61	TER	16.77
Environmental	91 B	% DER<TER	30.78		
CO ₂ Emissions (t/year)	0.69	DFEE	36.19	TFEE	44.18
General Requirements Compliance	Pass	% DFEE<TFEE	18.07		

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 25	Issued on Date	29/05/2024
Assessment Reference	As Built	Prop Type Ref	Block J Mid Terrace
Project	24, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	89 B	DER	11.61	TER	16.77
Environmental	91 B	% DER<TER	30.78		
CO ₂ Emissions (t/year)	0.69	DFEE	36.19	TFEE	44.18
General Requirements Compliance	Pass	% DFEE<TFEE	18.07		

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 25	Issued on Date	29/05/2024
Assessment Reference	As Built	Prop Type Ref	Block J Mid Terrace
Project	24, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	89 B	DER	11.61	TER	16.77
Environmental	91 B	% DER<TER	30.78		
CO ₂ Emissions (t/year)	0.69	DFEE	36.19	TFEE	44.18
General Requirements Compliance	Pass	% DFEE<TFEE	18.07		

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

Building Elements

Floor 000003 - Worst Case Slab

Floor Type: Slab On Ground Floor

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

Horizontal edge insulation: none

Vertical edge insulation: none

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

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

Total correction = 0.0096 m² K/W

U-value (unrounded) = 0.12 W/m² K

Unheated space: None

Total thickness: 321 mm

U-value: 0.12 W/m² K

Kappa: 84.00 kJ/m² K

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Property Reference	SAP 0943 Plot 25	Issued on Date	29/05/2024
Assessment Reference	As Built	Prop Type Ref	Block J Mid Terrace
Property	24, Shaw Crescent, West End, Southampton, SO30 3LH		
SAP Rating	89 B	DER	11.61
Environmental	91 B	TER	16.77
CO ₂ Emissions (t/year)	0.69	% DER<TER	30.78
General Requirements Compliance	Pass	DFEE	36.19
		TFEE	44.18
		% DFEE<TFEE	18.07
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com		Assessor ID
			E477-0001
Client	Foreman Homes, FORE		

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

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

6.0 Measurements		Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	Ground Floor:	9.64 m	42.40 m ²	2.39 m
	1st Storey:	9.64 m	42.40 m ²	2.61 m

7.0 Living Area	19.23	m ²
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8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	161.3	kJ/m ² K

9.0 External Walls				U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type	Construction					
Brick and Block	Cavity Wall	Other		0.24	42.22	48.20	34.74

9.1 Party Walls				U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)
Description	Type	Construction				
Party Wall 1	Filled Cavity with Edge Sealing	Other		0.00	58.06	44.05
Party Wall 2	Filled Cavity with Edge Sealing	Other		0.00	58.06	44.05

9.2 Internal Walls				Kappa (kJ/m ² K)	Area (m ²)
Description	Construction				
Ground Floor Stud	Plasterboard on timber frame			9.00	72.31
First Floor Stud	Plasterboard on timber frame			9.00	108.02

10.0 External Roofs

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area (m²)	Nett Area (m²)
Pitched Roof	External Plane Roof	Other	0.10	9.10	42.40	42.40

10.2 Internal Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Ceiling 1	Plasterboard ceiling, carpeted chipboard floor	9.00	42.40

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	42.40

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	42.40

12.0 Opening Types

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

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
Front Door	Solid Door	[1] Brick and Block	East							2.15	
Front Elevation	Window	[1] Brick and Block	East	None	0.00					4.31	
Rear Elevation	Window	[1] Brick and Block	West	None	0.00					7.00	

14.0 Conservatory

None

15.0 Draught Proofing

100 %

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	1.02	0.071	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	4.99	0.064	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.59	0.067	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.81	0.061	No	Birtley Supatherm
Independently assessed	E3 Sill	6.80	0.021	No	Knauf P5
Independently assessed	E4 Jamb	20.10	0.016	No	Knauf P6
Table K1 - Default	E5 Ground floor (normal)	9.73	0.320	No	
Independently assessed	E6 Intermediate floor within a dwelling	9.73	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	9.73	0.060	No	
Independently assessed	E18 Party wall between dwellings	20.00	0.036	No	Knauf P25 Halved
Table K1 - Default	P1 Party wall - Ground floor	17.54	0.160	No	
Table K1 - Default	P2 Party wall - Intermediate floor within a dwelling	17.54	0.000	No	
Independently assessed	P4 Party wall - Roof (insulation at ceiling level)	17.54	0.035	No	Knauf P29 Halved

Y-value	0.067	W/m²K
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18.0 Pressure Testing

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

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

As Built AP₅₀

3.87

m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Windows half open
Cross ventilation possible	Yes
Night Ventilation	No
Air change rate	4.00

Mechanical Ventilation

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

20.0 Fans, Open Fireplaces, Flues

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

21.0 Fixed Cooling System

No

22.0 Lighting

Internal

Total number of light fittings	22	
Total number of L.E.L. fittings	22	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	Yes
Light and motion sensor	Yes

23.0 Electricity Tariff

Standard

24.0 Main Heating 1

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

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Sap Code	2106
Flue Type	Balanced
Fan Assisted Flue	Yes
Is MHS Pumped	Pump in heated space
Heat Emitter	Radiators
Flow Temperature	Normal (> 45°C)
Combi boiler type	Standard Combi
Combi keep hot type	None
25.0 Main Heating 2	None

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

29.0 Hot Water Cylinder	None
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32.0 Photovoltaic Unit		One Dwelling		
PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
0.80	West	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	£66	B 90	