



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

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

Contact: Tobias Whiting
Abacus Energy (UK) Ltd
toby@abacusenergyuk.com

Report Issue Date: 13/06/2024

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0943 Plot 2			Issued on Date	13/06/2024
Assessment Reference	As Built	Prop Type Ref	Type B Terrace		
Property	3, Shaw Crescent, West End, Southampton, SO30 3LH				
SAP Rating	90 B	DER	10.34	TER	17.40
Environmental	93 A	% DER<TER	40.59		
CO ₂ Emissions (t/year)	0.46	DFEE	34.93	TFEE	43.13
General Requirements Compliance	Pass	% DFEE<TFEE	19.01		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com			Assessor ID	E477-0001
Client	Foreman Homes, FORE				

SUMMARY FOR INPUT DATA FOR New Build (As Built)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	17.40	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	10.34	kgCO ₂ /m ²	Pass
	-7.06 (-40.6%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	43.13	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	34.93	kWh/m ² /yr	
	-8.2 (-19.0%)	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)	0.16 (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	3.57 (measured in this dwelling)	m ³ /(h.m ²) @ 50 Pa	
Maximum	10.0	m ³ /(h.m ²) @ 50 Pa	Pass

Limiting System Efficiencies

4 Heating efficiency

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

BUILDING REGULATION COMPLIANCE

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Main heating system

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

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Programmer, room thermostat and TRVs

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100 %

Minimum

75 %

Pass

8 Mechanical ventilation

Continuous extract system

Specific fan power

0.17

Maximum

0.7

Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Southern England)

Slight

Pass

Based on:

Overshading

Average

Windows facing North

3.14 m², No overhang

Windows facing South

7.82 m², No overhang

Air change rate

4.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

3.57 (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	3.6	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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Assessment Reference	As Built	Prop Type Ref	Type B Terrace
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SAP Rating	90 B	DER	10.34
Environmental	93 A	TER	17.40
CO ₂ Emissions (t/year)	0.46	% DER<TER	40.59
General Requirements Compliance	Pass	DFEE	34.93
		TFEE	43.13
		% DFEE<TFEE	19.01
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com		Assessor ID
			E477-0001
Client	Foreman Homes, FORE		

	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.071	3.75	0.27	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.064	3.74	0.24	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.067	1.59	0.11	Birtley Supatherm
External wall	E3 Sill	Independently assessed	0.021	6.47	0.14	Knauf P5
External wall	E4 Jamb	Independently assessed	0.016	22.50	0.36	Knauf P6
External wall	E5 Ground floor (normal)	Table K1 - Default	0.320	8.26	2.64	
External wall	E20 Exposed floor (normal)	Table K1 - Default	0.320	1.01	0.32	
External wall	E21 Exposed floor (inverted)	Table K1 - Default	0.320	2.07	0.66	
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	6.26	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	8.12	0.49	
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	17.67	2.83	
Party wall	P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	0.000	17.67	0.00	
Party wall	P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	0.035	17.67	0.62	Knauf P29 Halved

Total: **9.39** W/mK:
Y-Value: **0.085** W/m²K:

FULL SAP CALCULATION PRINTOUT

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

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DWELLING AS BUILT

Mid-Terrace House, total floor area 70 m²

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

1a TER and DER

Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 17.40 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 10.34 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)43.1 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)34.9 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)	0.16 (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: 3.57 (measured in this dwelling)
Maximum 10.0 OK

4 Heating efficiency

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

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls: No cylinder

Boiler interlock Yes OK

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system
Specific fan power: 0.17
Maximum 0.7 OK

9 Summertime temperature

Overheating risk (Southern England): Slight OK
Based on:
Overshading: Average
Windows facing North: 3.14 m², No overhang
Windows facing South: 7.82 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
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 3.6 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	34.8800 (1b)	x 2.6800 (2b)	= 93.4784 (1b) - (3b)
First floor	35.1800 (1c)	x 2.3200 (2c)	= 81.6176 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.0600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 175.0960 (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												3.5700
Infiltration rate												0.1785 (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) =	0.1517 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
	0.1934	0.1897	0.1859	0.1669	0.1631	0.1441	0.1441	0.1403	0.1517	0.1631	0.1707	0.1783 (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)			10.9600	1.1450	12.5496		(27)					
Ground Floor			34.8800	0.1200	4.1856	84.0000	2929.9200 (28a)					
Above Entrance			0.2000	0.1600	0.0320	22.4400	4.4880 (28b)					
Brick and Block	40.7400	13.1100	27.6300	0.2400	6.6312	42.2200	1166.5386 (29a)					
Pitched Roof	35.1800		35.1800	0.1000	3.5180	9.1000	320.1380 (30)					
Total net area of external elements Aum(A, m2)			111.0000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.2814		(33)					
Party Wall 1			44.0300	0.0000	0.0000	110.0000	4843.3000 (32)					
Party Wall 2			44.0300	0.0000	0.0000	110.0000	4843.3000 (32)					
Ground Floor Stud			56.8600			9.0000	511.7400 (32c)					
First Floor Stud			59.2300			9.0000	533.0700 (32c)					
Internal Floor 1			34.8800			18.0000	627.8400 (32d)					
Internal Ceiling 1			34.8800			18.0000	627.8400 (32e)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		16408.1746 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							234.2017 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.3897 (36)					
Total fabric heat loss						(33) + (36) =	38.6711 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 28.8908	Feb 28.8908	Mar 28.8908	Apr 28.8908	May 28.8908	Jun 28.8908	Jul 28.8908	Aug 28.8908	Sep 28.8908	Oct 28.8908	Nov 28.8908	Dec 28.8908 (38)
Heat transfer coeff	67.5619	67.5619	67.5619	67.5619	67.5619	67.5619	67.5619	67.5619	67.5619	67.5619	67.5619	67.5619 (39)
Average = Sum(39)m / 12 =												67.5619 (39)
HLP	Jan 0.9643	Feb 0.9643	Mar 0.9643	Apr 0.9643	May 0.9643	Jun 0.9643	Jul 0.9643	Aug 0.9643	Sep 0.9643	Oct 0.9643	Nov 0.9643	Dec 0.9643 (40)
HLP (average)												0.9643 (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	2.2476 (42)
Average daily hot water use (litres/day)	87.5800 (43)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	96.3380	92.8348	89.3316	85.8284	82.3252	78.8220	78.8220	82.3252	85.8284	89.3316	92.8348	96.3380	(44)
Energy conte	142.8665	124.9520	128.9393	112.4124	107.8623	93.0770	86.2495	98.9726	100.1546	116.7206	127.4096	138.3586	(45)
Energy content (annual)										Total =	Sum (45)m =	1377.9751	(45)
Distribution loss (46)m = 0.15 x (45)m	21.4300	18.7428	19.3409	16.8619	16.1794	13.9616	12.9374	14.8459	15.0232	17.5081	19.1114	20.7538	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	1.5828	1.3340	1.3246	1.1095	1.0212	0.8437	0.7818	0.9370	0.9886	1.1991	1.3602	1.5329	(61)
Total heat required for water heating calculated for each month	144.4493	126.2860	130.2639	113.5219	108.8835	93.9207	87.0313	99.9096	101.1432	117.9197	128.7699	139.8915	(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	144.4493	126.2860	130.2639	113.5219	108.8835	93.9207	87.0313	99.9096	101.1432	117.9197	128.7699	139.8915	(64)
Heat gains from water heating, kWh/month	47.8988	41.8800	43.2035	37.6545	36.1195	31.1590	28.8734	33.1426	33.5486	39.1094	42.7038	46.3875	(65)
										Total per year (kWh/year) =	Sum (64)m =	1391.9904	(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	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4463	16.3838	13.3242	10.0873	7.5404	6.3659	6.8786	8.9410	12.0006	15.2375	17.7845	18.9589	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.4371	199.4858	194.3230	183.3319	169.4576	156.4177	147.7062	145.6575	150.8203	161.8114	175.6857	188.7256	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379	(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)	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	(71)
Water heating gains (Table 5)	64.3801	62.3215	58.0692	52.2979	48.5477	43.2764	38.8084	44.5466	46.5952	52.5663	59.3108	62.3487	(72)
Total internal gains	339.9772	337.9048	325.4301	305.4308	285.2594	265.7737	253.1069	258.8587	269.1299	289.3290	312.4947	329.7470	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
North					3.1400	10.6334	0.6300	0.7000			0.7700			10.2041 (74)
South					7.8200	46.7521	0.6300	0.7000			0.7700			111.7325 (78)
Solar gains	121.9365	202.4895	266.2316	316.6736	346.2287	340.9534	329.7985	307.5410	283.3361	220.5836	145.0291	105.0537 (83)		
Total gains	461.9137	540.3943	591.6617	622.1044	631.4881	606.7271	582.9054	566.3998	552.4660	509.9126	457.5238	434.8007 (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	67.4615	67.4615	67.4615	67.4615	67.4615	67.4615	67.4615	67.4615	67.4615	67.4615	67.4615	67.4615	
alpha	5.4974	5.4974	5.4974	5.4974	5.4974	5.4974	5.4974	5.4974	5.4974	5.4974	5.4974	5.4974	
util living area	0.9956	0.9891	0.9743	0.9359	0.8440	0.6769	0.5037	0.5394	0.7663	0.9462	0.9901	0.9968 (86)	
MIT	20.0221	20.1906	20.4101	20.6558	20.8605	20.9682	20.9947	20.9923	20.9373	20.6779	20.2888	19.9735 (87)	
Th 2	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132 (88)	
util rest of house	0.9943	0.9859	0.9665	0.9162	0.7983	0.5970	0.4055	0.4401	0.6938	0.9256	0.9866	0.9959 (89)	
MIT 2	19.2220	19.3889	19.6042	19.8386	20.0191	20.0981	20.1117	20.1108	20.0796	19.8633	19.4872	19.1737 (90)	
Living area fraction									fLA = Living area / (4) =			0.2618 (91)	
MIT	19.4315	19.5988	19.8152	20.0525	20.2394	20.3259	20.3428	20.3416	20.3041	20.0766	19.6971	19.3831 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.4315	19.5988	19.8152	20.0525	20.2394	20.3259	20.3428	20.3416	20.3041	20.0766	19.6971	19.3831 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9930	0.9836	0.9634	0.9146	0.8054	0.6170	0.4313	0.4662	0.7106	0.9246	0.9845	0.9948	(94)
Useful gains	458.6835	531.5408	570.0041	568.9710	508.6289	374.3722	251.4139	264.0557	392.5777	471.4466	450.4224	432.5559	(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	1022.3111	993.0760	899.5976	753.4862	576.9352	386.8531	252.8722	266.2994	419.1615	640.2542	851.0812	1025.7967	(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	419.3390	310.1517	245.2175	132.8510	50.8198	0.0000	0.0000	0.0000	0.0000	125.5929	288.4743	441.3711	(98)
Space heating												2013.8174	(98)
Space heating per m2												28.7442	(99)
												(98) / (4) =	

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	2232.6135 (211)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	419.3390	310.1517	245.2175	132.8510	50.8198	0.0000	0.0000	0.0000	0.0000	125.5929	288.4743	441.3711 (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)	464.8991	343.8489	271.8598	147.2849	56.3413	0.0000	0.0000	0.0000	0.0000	139.2382	319.8163	489.3250 (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	144.4493	126.2860	130.2639	113.5219	108.8835	93.9207	87.0313	99.9096	101.1432	117.9197	128.7699	139.8915 (64)
Efficiency of water heater (217)m	86.1449	85.6468	84.7952	83.1600	80.1591	76.2000	76.2000	76.2000	76.2000	82.8307	85.3599	76.2000 (216)
Fuel for water heating, kWh/month	167.6818	147.4497	153.6218	136.5103	135.8343	123.2555	114.2144	131.1150	132.7338	142.3623	150.8551	161.9480 (219)
Water heating fuel used	1697.5821 (219)											
Annual totals kWh/year	1697.5821 (219)											
Space heating fuel - main system	2232.6135 (211)											
Space heating fuel - secondary	0.0000 (215)											
Electricity for pumps and fans: (MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.2380)												
mechanical ventilation fans (SFP = 0.2380)	50.8409 (230a)											
central heating pump	30.0000 (230c)											
main heating flue fan	45.0000 (230e)											
Total electricity for the above, kWh/year	125.8409 (231)											
Electricity for lighting (calculated in Appendix L)	325.7666 (232)											
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 0.80 * 1080 * 1.00) =											-690.8958	-690.8958 (233)
Total delivered energy for all uses	3690.9073 (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	2232.6135	0.2160	482.2445 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1697.5821	0.2160	366.6777 (264)
Space and water heating			848.9222 (265)
Pumps and fans	125.8409	0.5190	65.3114 (267)
Energy for lighting	325.7666	0.5190	169.0729 (268)
Energy saving/generation technologies			
PV Unit	-690.8958	0.5190	-358.5749 (269)
Total CO2, kg/year			724.7316 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			10.3400 (273)

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

DER		10.3400 ZC1
Total Floor Area	TFA	70.0600
Assumed number of occupants	N	2.2476
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.6996 ZC2
CO2 emissions from cooking, equation (L16)		2.4685 ZC3
Total CO2 emissions		29.5080 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		29.5080 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	34.8800 (1b)	x 2.6800 (2b)	= 93.4784 (1b) - (3b)
First floor	35.1800 (1c)	x 2.3200 (2c)	= 81.6176 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.0600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 175.0960 (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							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) =	0.1713 (8)				
Pressure test							Yes					
Measured/design AP50							5.0000					
Infiltration rate							0.4213 (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) =	0.3581 (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	0.4566	0.4477	0.4387	0.3939	0.3850	0.3402	0.3402	0.3313	0.3581	0.3850	0.4029	0.4208 (22b)
Effective ac	0.6043	0.6002	0.5962	0.5776	0.5741	0.5579	0.5579	0.5549	0.5641	0.5741	0.5812	0.5885 (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)			10.9600	1.3258	14.5303			(27)					
Ground Floor			34.8800	0.1300	4.5344			(28a)					
Above Entrance			0.2000	0.1300	0.0260			(28b)					
Brick and Block	40.7400	13.1100	27.6300	0.1800	4.9734			(29a)					
Pitched Roof	35.1800		35.1800	0.1300	4.5734			(30)					
Total net area of external elements Aum(A, m2)			111.0000					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.7875			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.4309	(36)					
Total fabric heat loss						(33) + (36) =	40.2184	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 34.9147	Feb 34.6808	Mar 34.4515	Apr 33.3746	May 33.1731	Jun 32.2351	Jul 32.2351	Aug 32.0614	Sep 32.5964	Oct 33.1731	Nov 33.5807	Dec 34.0068	(38)
Heat transfer coeff	75.1331	74.8992	74.6699	73.5930	73.3915	72.4535	72.4535	72.2798	72.8148	73.3915	73.7991	74.2252	(39)
Average = Sum(39)m / 12 =												73.5920	(39)
HLP	Jan 1.0724	Feb 1.0691	Mar 1.0658	Apr 1.0504	May 1.0476	Jun 1.0342	Jul 1.0342	Aug 1.0317	Sep 1.0393	Oct 1.0476	Nov 1.0534	Dec 1.0595	(40)
HLP (average)												1.0504	(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												2.2476 (42)
Average daily hot water use (litres/day)												87.5800 (43)
Daily hot water use	Jan 96.3380	Feb 92.8348	Mar 89.3316	Apr 85.8284	May 82.3252	Jun 78.8220	Jul 78.8220	Aug 82.3252	Sep 85.8284	Oct 89.3316	Nov 92.8348	Dec 96.3380 (44)
Energy conte	142.8665	124.9520	128.9393	112.4124	107.8623	93.0770	86.2495	98.9726	100.1546	116.7206	127.4096	138.3586 (45)
Energy content (annual)										Total = Sum(45)m =		1377.9751 (45)
Distribution loss (46)m = 0.15 x (45)m	21.4300	18.7428	19.3409	16.8619	16.1794	13.9616	12.9374	14.8459	15.0232	17.5081	19.1114	20.7538 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	49.0928	42.7295	45.5224	42.3264	41.9520	38.8711	40.1668	41.9520	42.3264	45.5224	45.7816	49.0928 (61)
Total heat required for water heating calculated for each month	191.9593	167.6814	174.4617	154.7387	149.8144	131.9481	126.4164	140.9246	142.4810	162.2430	173.1912	187.4514 (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	191.9593	167.6814	174.4617	154.7387	149.8144	131.9481	126.4164	140.9246	142.4810	162.2430	173.1912	187.4514 (64)
Heat gains from water heating, kWh/month	59.7763	52.2289	54.2529	47.9587	46.3522	40.6659	38.7197	43.3964	43.8830	50.1902	53.8091	58.2774 (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	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4463	16.3838	13.3242	10.0873	7.5404	6.3659	6.8786	8.9410	12.0006	15.2375	17.7845	18.9589 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.4371	199.4858	194.3230	183.3319	169.4576	156.4177	147.7062	145.6575	150.8203	161.8114	175.6857	188.7256 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379 (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)	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032 (71)
Water heating gains (Table 5)	80.3445	77.7216	72.9206	66.6093	62.3014	56.4804	52.0426	58.3285	60.9486	67.4599	74.7349	78.3299 (72)
Total internal gains	355.9416	353.3049	340.2815	319.7422	299.0130	278.9777	266.3411	272.6407	283.4833	304.2226	327.9188	345.7282 (73)

6. Solar gains

[Jan]														
	Area				Solar flux		g		FF		Access		Gains	
	m2				Table 6a		or Table 6b		Specific data		factor		W	
					W/m2				or Table 6c		Table 6d			
North	3.1400				10.6334		0.6300		0.7000		0.7700		10.2041 (74)	
South	7.8200				46.7521		0.6300		0.7000		0.7700		111.7325 (78)	
Solar gains	121.9365	202.4895	266.2316	316.6736	346.2287	340.9534	329.7985	307.5410	283.3361	220.5836	145.0291	105.0537	(83)	
Total gains	477.8781	555.7944	606.5131	636.4158	645.2418	619.9311	596.1396	580.1817	566.8194	524.8062	472.9479	450.7819	(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	64.7555	64.9577	65.1572	66.1106	66.2921	67.1503	67.1503	67.3117	66.8172	66.2921	65.9260	65.5475
alpha	5.3170	5.3305	5.3438	5.4074	5.4195	5.4767	5.4767	5.4874	5.4545	5.4195	5.3951	5.3698
util living area	0.9963	0.9913	0.9796	0.9475	0.8669	0.7026	0.5266	0.5612	0.7899	0.9549	0.9917	0.9973 (86)
MIT	19.9413	20.1089	20.3349	20.6075	20.8318	20.9615	20.9933	20.9906	20.9252	20.6419	20.2402	19.9131 (87)
Th 2	20.0234	20.0262	20.0289	20.0415	20.0439	20.0550	20.0550	20.0570	20.0507	20.0439	20.0391	20.0341 (88)
util rest of house	0.9951	0.9884	0.9728	0.9292	0.8213	0.6168	0.4178	0.4523	0.7139	0.9354	0.9885	0.9964 (89)
MIT 2	18.6178	18.8633	19.1910	19.5844	19.8790	20.0291	20.0524	20.0531	19.9933	19.6393	19.0650	18.5845 (90)
Living area fraction	18.9643	19.1893	19.4904	19.8522	20.1284	20.2732	20.2987	20.2985	20.2373	19.9018	19.3727	18.9323 (92)
MIT	18.9643	19.1893	19.4904	19.8522	20.1284	20.2732	20.2987	20.2985	20.2373	19.9018	19.3727	18.9323 (93)
Temperature adjustment												0.0000
adjusted MIT	18.9643	19.1893	19.4904	19.8522	20.1284	20.2732	20.2987	20.2985	20.2373	19.9018	19.3727	18.9323 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	474.6742	547.5385	587.0388	588.5549	532.8850	395.3563	266.1256	279.0048	413.9250	489.0081	466.0521	448.5011 (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	1101.7732	1070.2597	969.9945	806.0066	618.5740	411.0441	267.9860	281.7849	446.8830	682.6722	905.7107	1093.5092 (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	466.5616	351.2686	284.9190	156.5653	63.7526	0.0000	0.0000	0.0000	0.0000	144.0861	316.5542	479.8861 (98)
Space heating												2263.5935 (98)
Space heating per m2												32.3094 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												93.4000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												2423.5476 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	466.5616	351.2686	284.9190	156.5653	63.7526	0.0000	0.0000	0.0000	0.0000	144.0861	316.5542	479.8861 (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)	499.5307	376.0906	305.0525	167.6288	68.2576	0.0000	0.0000	0.0000	0.0000	154.2678	338.9231	513.7966 (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	191.9593	167.6814	174.4617	154.7387	149.8144	131.9481	126.4164	140.9246	142.4810	162.2430	173.1912	187.4514 (64)
Efficiency of water heater (217)m	87.2028	86.8695	86.2787	85.0807	83.0705	80.3000	80.3000	80.3000	80.3000	84.7540	86.5503	80.3000 (216)
Fuel for water heating, kWh/month	220.1299	193.0268	202.2072	181.8728	180.3460	164.3190	157.4301	175.4977	177.4359	191.4282	200.1047	214.6838 (219)
Water heating fuel used												2258.4820 (219)
Annual totals kWh/year												
Space heating fuel - main system												2423.5476 (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)												325.7666 (232)
Total delivered energy for all uses												5082.7963 (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	2423.5476	0.2160	523.4863 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2258.4820	0.2160	487.8321 (264)
Space and water heating			1011.3184 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	325.7666	0.5190	169.0729 (268)
Total CO2, kg/m2/year			1219.3163 (272)
Emissions per m2 for space and water heating			14.4350 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4133 (272b)
Emissions per m2 for pumps and fans			0.5556 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.4350 * 1.00) + 2.4133 + 0.5556, rounded to 2 d.p.			17.4000 (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	34.8800 (1b)	x 2.6800 (2b)	= 93.4784 (1b) - (3b)
First floor	35.1800 (1c)	x 2.3200 (2c)	= 81.6176 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.0600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 175.0960 (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) = 0.1713 (8)
Pressure test					Yes
Measured/design AP50					3.5700
Infiltration rate					0.3498 (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) =	0.2974 (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	0.3791	0.3717	0.3643	0.3271	0.3197	0.2825	0.2825	0.2751	0.2974	0.3197	0.3345	0.3494 (22b)
Effective ac	0.5719	0.5691	0.5663	0.5535	0.5511	0.5399	0.5399	0.5378	0.5442	0.5511	0.5560	0.5610 (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)			10.9600	1.1450	12.5496		(27)
Ground Floor			34.8800	0.1200	4.1856	84.0000	2929.9200 (28a)
Above Entrance			0.2000	0.1600	0.0320	22.4400	4.4880 (28b)
Brick and Block	40.7400	13.1100	27.6300	0.2400	6.6312	42.2200	1166.5386 (29a)
Pitched Roof	35.1800		35.1800	0.1000	3.5180	9.1000	320.1380 (30)
Total net area of external elements Aum(A, m ²)			111.0000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.2814		(33)
Party Wall 1			44.0300	0.0000	0.0000	110.0000	4843.3000 (32)
Party Wall 2			44.0300	0.0000	0.0000	110.0000	4843.3000 (32)
Ground Floor Stud			56.8600			9.0000	511.7400 (32c)
First Floor Stud			59.2300			9.0000	533.0700 (32c)
Internal Floor 1			34.8800			18.0000	627.8400 (32d)
Internal Ceiling 1			34.8800			9.0000	313.9200 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	16094.2546 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							229.7210 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.3897 (36)
Total fabric heat loss						(33) + (36) =	38.6711 (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	33.0437	32.8824	32.7243	31.9819	31.8430	31.1964	31.1964	31.0766	31.4454	31.8430	32.1240	32.4178 (38)
Heat transfer coeff	71.7147	71.5535	71.3954	70.6530	70.5141	69.8674	69.8674	69.7477	70.1165	70.5141	70.7951	71.0889 (39)
Average = Sum(39)m / 12 =												70.6523 (39)
HLP	1.0236	1.0213	1.0191	1.0085	1.0065	0.9973	0.9973	0.9955	1.0008	1.0065	1.0105	1.0147 (40)
HLP (average)												1.0085 (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												2.2476 (42)
Average daily hot water use (litres/day)												87.5800 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.3380	92.8348	89.3316	85.8284	82.3252	78.8220	78.8220	82.3252	85.8284	89.3316	92.8348	96.3380 (44)

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Energy conte	142.8665	124.9520	128.9393	112.4124	107.8623	93.0770	86.2495	98.9726	100.1546	116.7206	127.4096	138.3586 (45)
Energy content (annual)	Total = Sum (45)m =											1377.9751 (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	30.3591	26.5523	27.3996	23.8876	22.9207	19.7789	18.3280	21.0317	21.2829	24.8031	27.0745	29.4012 (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	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4463	16.3838	13.3242	10.0873	7.5404	6.3659	6.8786	8.9410	12.0006	15.2375	17.7845	18.9589 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.4371	199.4858	194.3230	183.3319	169.4576	156.4177	147.7062	145.6575	150.8203	161.8114	175.6857	188.7256 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379 (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)	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032 (71)
Water heating gains (Table 5)	40.8053	39.5123	36.8274	33.1773	30.8075	27.4706	24.6344	28.2684	29.5595	33.3375	37.6035	39.5177 (72)
Total internal gains	313.4023	312.0957	301.1883	283.3101	264.5191	246.9679	235.9330	239.5806	249.0942	267.1002	287.7874	303.9160 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W
North					3.1400	10.6334	0.6300	0.7000			0.7700	10.2041 (74)
South					7.8200	46.7521	0.6300	0.7000			0.7700	111.7325 (78)

Solar gains	121.9365	202.4895	266.2316	316.6736	346.2287	340.9534	329.7985	307.5410	283.3361	220.5836	145.0291	105.0537 (83)
Total gains	435.3389	514.5852	567.4199	599.9837	610.7478	587.9213	565.7314	547.1216	532.4303	487.6838	432.8165	408.9698 (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	62.3390	62.4795	62.6178	63.2758	63.4005	63.9873	63.9873	64.0971	63.7600	63.4005	63.1488	62.8879
alpha	5.1559	5.1653	5.1745	5.2184	5.2267	5.2658	5.2658	5.2731	5.2507	5.2267	5.2099	5.1925
util living area	0.9965	0.9913	0.9794	0.9472	0.8677	0.7080	0.5332	0.5713	0.7972	0.9569	0.9922	0.9975 (86)
MIT	19.8784	20.0570	20.2952	20.5778	20.8146	20.9544	20.9915	20.9878	20.9125	20.6070	20.1834	19.8432 (87)
Th 2	20.0637	20.0656	20.0675	20.0763	20.0779	20.0856	20.0856	20.0870	20.0827	20.0779	20.0746	20.0711 (88)
util rest of house	0.9955	0.9887	0.9730	0.9300	0.8251	0.6263	0.4276	0.4653	0.7262	0.9394	0.9894	0.9967 (89)
MIT 2	19.0400	19.2188	19.4552	19.7351	19.9500	20.0634	20.0832	20.0833	20.0342	19.7682	19.3527	19.0110 (90)
Living area fraction	19.2595	19.4382	19.6751	19.9557	20.1763	20.2966	20.3210	20.3201	20.2641	19.9878	19.5702	19.2288 (92)
MIT	19.2595	19.4382	19.6751	19.9557	20.1763	20.2966	20.3210	20.3201	20.2641	19.9878	19.5702	19.2288 (93)
Temperature adjustment	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
adjusted MIT	19.2595	19.4382	19.6751	19.9557	20.1763	20.2966	20.3210	20.3201	20.2641	19.9878	19.5702	19.2288 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	432.8564	507.6385	550.1960	556.4216	507.0441	379.9638	257.6139	269.8415	394.8431	457.1248	427.3711	407.2408 (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	1072.8147	1040.2622	940.6413	781.1192	597.7004	398.0100	259.9737	273.4147	432.2064	661.9720	882.8267	1068.3832 (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	476.1290	357.9231	290.4913	161.7822	67.4483	0.0000	0.0000	0.0000	0.0000	152.4063	327.9280	491.8899 (98)
Space heating												2325.9982 (98)
Space heating per m2												33.2001 (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	656.7540	517.0191	530.0825	0.0000	0.0000	0.0000	0.0000 (100)

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Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8996	0.9499	0.9395	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	590.7911	491.1015	497.9985	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	771.0462	743.4514	723.1683	0.0000	0.0000	0.0000	0.0000 (103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	129.7837	187.7483	167.5264	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												485.0584 (104)
Cooled fraction									FC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)												
Intermittency factor	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	32.4459	46.9371	41.8816	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												121.2646 (107)
Space cooling per m2												1.7309 (108)
Energy for space heating												33.2001 (99)
Energy for space cooling												1.7309 (108)
Total												34.9310 (109)
Dwelling Fabric Energy Efficiency (DFEE)												34.9 (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	34.8800 (1b)	x 2.6800 (2b)	= 93.4784 (1b) - (3b)
First floor	35.1800 (1c)	x 2.3200 (2c)	= 81.6176 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.0600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 175.0960 (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) =	0.1713 (8)
Pressure test										Yes							
Measured/design AP50										5.0000							
Infiltration rate										0.4213 (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) =					0.3581	(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	0.4566	0.4477	0.4387	0.3939	0.3850	0.3402	0.3402	0.3313	0.3581	0.3850	0.4029	0.4208	(22b)				
Effective ac	0.6043	0.6002	0.5962	0.5776	0.5741	0.5579	0.5579	0.5549	0.5641	0.5741	0.5812	0.5885	(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)			10.9600	1.3258	14.5303		(27)					
Ground Floor			34.8800	0.1300	4.5344		(28a)					
Above Entrance			0.2000	0.1300	0.0260		(28b)					
Brick and Block	40.7400	13.1100	27.6300	0.1800	4.9734		(29a)					
Pitched Roof	35.1800		35.1800	0.1300	4.5734		(30)					
Total net area of external elements Aum(A, m2)			111.0000				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.7875		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.4309 (36)					
Total fabric heat loss						(33) + (36) =	40.2184 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 34.9147	Feb 34.6808	Mar 34.4515	Apr 33.3746	May 33.1731	Jun 32.2351	Jul 32.2351	Aug 32.0614	Sep 32.5964	Oct 33.1731	Nov 33.5807	Dec 34.0068 (38)
Heat transfer coeff	75.1331	74.8992	74.6699	73.5930	73.3915	72.4535	72.4535	72.2798	72.8148	73.3915	73.7991	74.2252 (39)
Average = Sum(39)m / 12 =												73.5920 (39)
HLP	Jan 1.0724	Feb 1.0691	Mar 1.0658	Apr 1.0504	May 1.0476	Jun 1.0342	Jul 1.0342	Aug 1.0317	Sep 1.0393	Oct 1.0476	Nov 1.0534	Dec 1.0595 (40)
HLP (average)												1.0504 (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												2.2476 (42)
Average daily hot water use (litres/day)												87.5800 (43)
Daily hot water use	Jan 96.3380	Feb 92.8348	Mar 89.3316	Apr 85.8284	May 82.3252	Jun 78.8220	Jul 78.8220	Aug 82.3252	Sep 85.8284	Oct 89.3316	Nov 92.8348	Dec 96.3380 (44)
Energy conte	142.8665	124.9520	128.9393	112.4124	107.8623	93.0770	86.2495	98.9726	100.1546	116.7206	127.4096	138.3586 (45)
Energy content (annual)										Total = Sum(45)m =		1377.9751 (45)
Distribution loss (46)m = 0.15 x (45)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

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Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

cylinder contains dedicated solar storage												
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)
	30.3591	26.5523	27.3996	23.8876	22.9207	19.7789	18.3280	21.0317	21.2829	24.8031	27.0745	29.4012 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790 (66)
Appliances gains	18.4463	16.3838	13.3242	10.0873	7.5404	6.3659	6.8786	8.9410	12.0006	15.2375	17.7845	18.9589 (67)
Cooking gains	197.4371	199.4858	194.3230	183.3319	169.4576	156.4177	147.7062	145.6575	150.8203	161.8114	175.6857	188.7256 (68)
Pumps, fans	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379 (69)
Losses e.g. evaporation	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)
(negative values) (Table 5)												
Water heating gains	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032 (71)
Total internal gains	40.8053	39.5123	36.8274	33.1773	30.8075	27.4706	24.6344	28.2684	29.5595	33.3375	37.6035	39.5177 (72)
	313.4023	312.0957	301.1883	283.3101	264.5191	246.9679	235.9330	239.5806	249.0942	267.1002	287.7874	303.9160 (73)

6. Solar gains												

[Jan]	Area			Solar flux		g		FF		Access		Gains
	m2			Table 6a		Specific data		Specific data		factor		W
				W/m2		or Table 6b		or Table 6c		Table 6d		
North	3.1400			10.6334		0.6300		0.7000		0.7700		10.2041 (74)
South	7.8200			46.7521		0.6300		0.7000		0.7700		111.7325 (78)

Solar gains	121.9365	202.4895	266.2316	316.6736	346.2287	340.9534	329.7985	307.5410	283.3361	220.5836	145.0291	105.0537 (83)
Total gains	435.3389	514.5852	567.4199	599.9837	610.7478	587.9213	565.7314	547.1216	532.4303	487.6838	432.8165	408.9698 (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	64.7555	64.9577	65.1572	66.1106	66.2921	67.1503	67.1503	67.3117	66.8172	66.2921	65.9260	65.5475
util living area	5.3170	5.3305	5.3438	5.4074	5.4195	5.4767	5.4767	5.4874	5.4545	5.4195	5.3951	5.3698
	0.9976	0.9939	0.9847	0.9581	0.8871	0.7309	0.5526	0.5916	0.8195	0.9662	0.9945	0.9983 (86)
MIT	19.8845	20.0551	20.2867	20.5691	20.8077	20.9534	20.9916	20.9879	20.9096	20.6011	20.1876	19.8569 (87)
Th 2	20.0234	20.0262	20.0289	20.0415	20.0439	20.0550	20.0550	20.0570	20.0507	20.0439	20.0391	20.0341 (88)
util rest of house	0.9969	0.9918	0.9794	0.9427	0.8453	0.6451	0.4396	0.4785	0.7468	0.9507	0.9923	0.9977 (89)
MIT 2	19.0072	19.1791	19.4101	19.6943	19.9127	20.0331	20.0528	20.0535	20.0019	19.7305	19.3222	18.9883 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.2369	19.4085	19.6396	19.9233	20.1470	20.2740	20.2985	20.2981	20.2395	19.9584	19.5487	19.2157 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.2369	19.4085	19.6396	19.9233	20.1470	20.2740	20.2985	20.2981	20.2395	19.9584	19.5487	19.2157 (93)

8. Space heating requirement												

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9960	0.9901	0.9767	0.9404	0.8505	0.6664	0.4695	0.5083	0.7629	0.9490	0.9908	0.9971 (94)
Ext temp.	433.6009	509.5017	554.1865	564.2329	519.4143	391.7703	265.5959	278.1249	406.1943	462.8158	428.8381	407.7790 (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	1122.2516	1086.6709	981.1312	811.2362	619.9347	411.1045	267.9699	281.7556	447.0483	686.8246	918.7033	1114.5436 (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	512.3561	387.8577	317.6468	177.8424	74.7872	0.0000	0.0000	0.0000	0.0000	166.6626	352.7029	525.8328 (98)
Space heating per m2												2515.6885 (98)
												(98) / (4) = 35.9076 (99)

8c. Space cooling requirement												

Calculated for June, July and August. See Table 10b												
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	681.0629	536.1559	549.3265	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.8929	0.9471	0.9361	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	608.1326	507.7862	514.2207	0.0000	0.0000	0.0000	0.0000 (102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	771.0462	743.4514	723.1683	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	117.2978	175.3349	155.4570	0.0000	0.0000	0.0000	0.0000 (104)
												448.0897 (104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Cooled fraction											FC = cooled area / (4) =	1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	29.3245	43.8337	38.8643	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												112.0224 (107)
Space cooling per m2												1.5989 (108)
Energy for space heating												35.9076 (99)
Energy for space cooling												1.5989 (108)
Total												37.5066 (109)
Target Fabric Energy Efficiency (TFEE)												43.1 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	34.8800 (1b)	x 2.6800 (2b)	= 93.4784 (1b) - (3b)
First floor	35.1800 (1c)	x 2.3200 (2c)	= 81.6176 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.0600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 175.0960 (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					3.5700							
Infiltration rate					0.1785 (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) =				0.1517 (21)							
Wind speed	Jan 4.7000	Feb 4.4000	Mar 4.4000	Apr 4.0000	May 4.1000	Jun 3.9000	Jul 3.9000	Aug 3.8000	Sep 3.8000	Oct 4.1000	Nov 4.0000	Dec 4.1000 (22)
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)
Adj infilt rate	0.1783	0.1669	0.1669	0.1517	0.1555	0.1479	0.1479	0.1441	0.1441	0.1555	0.1517	0.1555 (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)			10.9600	1.1450	12.5496		(27)					
Ground Floor			34.8800	0.1200	4.1856	84.0000	2929.9200 (28a)					
Above Entrance			0.2000	0.1600	0.0320	22.4400	4.4880 (28b)					
Brick and Block	40.7400	13.1100	27.6300	0.2400	6.6312	42.2200	1166.5386 (29a)					
Pitched Roof	35.1800		35.1800	0.1000	3.5180	9.1000	320.1380 (30)					
Total net area of external elements Aum(A, m2)			111.0000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.2814		(33)					
Party Wall 1			44.0300	0.0000	0.0000	110.0000	4843.3000 (32)					
Party Wall 2			44.0300	0.0000	0.0000	110.0000	4843.3000 (32)					
Ground Floor Stud			56.8600			9.0000	511.7400 (32c)					
First Floor Stud			59.2300			9.0000	533.0700 (32c)					
Internal Floor 1			34.8800			18.0000	627.8400 (32d)					
Internal Ceiling 1			34.8800			18.0000	627.8400 (32e)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		16408.1746 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							234.2017 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.3897 (36)					
Total fabric heat loss						(33) + (36) =	38.6711 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 28.8908	Feb 28.8908	Mar 28.8908	Apr 28.8908	May 28.8908	Jun 28.8908	Jul 28.8908	Aug 28.8908	Sep 28.8908	Oct 28.8908	Nov 28.8908	Dec 28.8908 (38)
Heat transfer coeff	67.5619	67.5619	67.5619	67.5619	67.5619	67.5619	67.5619	67.5619	67.5619	67.5619	67.5619	67.5619 (39)
Average = Sum(39)m / 12 =												67.5619 (39)
HLP	Jan 0.9643	Feb 0.9643	Mar 0.9643	Apr 0.9643	May 0.9643	Jun 0.9643	Jul 0.9643	Aug 0.9643	Sep 0.9643	Oct 0.9643	Nov 0.9643	Dec 0.9643 (40)
HLP (average)												0.9643 (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	2.2476 (42)
Average daily hot water use (litres/day)	87.5800 (43)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	96.3380	92.8348	89.3316	85.8284	82.3252	78.8220	78.8220	82.3252	85.8284	89.3316	92.8348	96.3380	(44)
Energy conte	142.8665	124.9520	128.9393	112.4124	107.8623	93.0770	86.2495	98.9726	100.1546	116.7206	127.4096	138.3586	(45)
Energy content (annual)	Total = Sum (45)m = 1377.9751												(45)
Distribution loss (46)m = 0.15 x (45)m	21.4300	18.7428	19.3409	16.8619	16.1794	13.9616	12.9374	14.8459	15.0232	17.5081	19.1114	20.7538	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	1.5828	1.3340	1.3246	1.1095	1.0212	0.8437	0.7818	0.9370	0.9886	1.1991	1.3602	1.5329	(61)
Total heat required for water heating calculated for each month	144.4493	126.2860	130.2639	113.5219	108.8835	93.9207	87.0313	99.9096	101.1432	117.9197	128.7699	139.8915	(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	144.4493	126.2860	130.2639	113.5219	108.8835	93.9207	87.0313	99.9096	101.1432	117.9197	128.7699	139.8915	(64)
RHI water heating demand	47.8988	41.8800	43.2035	37.6545	36.1195	31.1590	28.8734	33.1426	33.5486	39.1094	42.7038	46.3875	(65)
Heat gains from water heating, kWh/month	Total per year (kWh/year) = Sum (64)m = 1391.9904												(64)
	1392 (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	134.8548	134.8548	134.8548	134.8548	134.8548	134.8548	134.8548	134.8548	134.8548	134.8548	134.8548	134.8548	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	46.1156	40.9595	33.3105	25.2182	18.8509	15.9147	17.1964	22.3526	30.0016	38.0939	44.4612	47.3973	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	294.6822	297.7401	290.0343	273.6297	252.9217	233.4592	220.4571	217.3992	225.1049	241.5096	262.2175	281.6800	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7331	50.7331	50.7331	50.7331	50.7331	50.7331	50.7331	50.7331	50.7331	50.7331	50.7331	50.7331	(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)	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	(71)
Water heating gains (Table 5)	64.3801	62.3215	58.0692	52.2979	48.5477	43.2764	38.8084	44.5466	46.5952	52.5663	59.3108	62.3487	(72)
Total internal gains	503.8626	499.7057	480.0986	449.8304	419.0051	391.3351	375.1465	382.9830	400.3864	430.8545	464.6741	490.1108	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d	Gains W	
North				3.1400	13.4684	0.6300		0.7000		0.7700	12.9246 (74)	
South				7.8200	56.5862	0.6300		0.7000		0.7700	135.2350 (78)	
Solar gains	148.1597	209.1061	280.2236	337.0394	349.8395	382.8775	355.1504	342.9093	312.8622	245.7704	175.5470	120.9099 (83)
Total gains	652.0223	708.8118	760.3223	786.8699	768.8446	774.2125	730.2969	725.8923	713.2486	676.6248	640.2212	611.0207 (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	67.4615	67.4615	67.4615	67.4615	67.4615	67.4615	67.4615	67.4615	67.4615	67.4615	67.4615	67.4615	
alpha	5.4974	5.4974	5.4974	5.4974	5.4974	5.4974	5.4974	5.4974	5.4974	5.4974	5.4974	5.4974	
util living area	0.9700	0.9533	0.9096	0.8167	0.6627	0.4422	0.3050	0.2976	0.5227	0.7921	0.9349	0.9765	(86)
MIT	20.4030	20.5059	20.6872	20.8628	20.9646	20.9967	20.9997	20.9997	20.9919	20.9044	20.6500	20.3606	(87)
Th 2	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	(88)
util rest of house	0.9617	0.9412	0.8872	0.7757	0.5990	0.3667	0.2232	0.2153	0.4435	0.7388	0.9155	0.9698	(89)
MIT 2	19.5960	19.6941	19.8632	20.0164	20.0937	20.1121	20.1131	20.1131	20.1101	20.0524	19.8326	19.5554	(90)
Living area fraction	19.8073	19.9066	20.0789	20.2380	20.3217	20.3437	20.3452	20.3452	20.3409	20.2755	20.0466	0.2618	(91)
MIT	19.8073	19.9066	20.0789	20.2380	20.3217	20.3437	20.3452	20.3452	20.3409	20.2755	20.0466	19.7662	(92)
Temperature adjustment													0.0000
adjusted MIT	19.8073	19.9066	20.0789	20.2380	20.3217	20.3437	20.3452	20.3452	20.3409	20.2755	20.0466	19.7662	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9584	0.9379	0.8862	0.7819	0.6145	0.3865	0.2446	0.2368	0.4642	0.7492	0.9138	0.9666	(94)
Useful gains	624.8704	664.7828	673.8341	615.2719	472.4731	299.2136	178.6549	171.9111	331.0644	506.9611	585.0421	590.6218	(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	959.8708	939.5588	843.0988	684.9426	487.9118	300.2217	178.7137	171.9589	333.8178	552.3494	773.3540	950.3387	(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	249.2403	184.6494	125.9329	50.1629	11.4864	0.0000	0.0000	0.0000	0.0000	33.7689	135.5846	267.6294	(98)
Space heating													1058.4549 (98)
RHI space heating demand													1058 (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	34.8800 (1b)	x 2.6800 (2b)	= 93.4784 (1b) - (3b)
First floor	35.1800 (1c)	x 2.3200 (2c)	= 81.6176 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.0600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 175.0960 (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					3.5700
Infiltration rate					0.1785 (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) =		0.1517 (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	0.1934	0.1897	0.1859	0.1669	0.1631	0.1441	0.1441	0.1403	0.1517	0.1631	0.1707	0.1783 (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)			10.9600	1.1450	12.5496		(27)
Ground Floor			34.8800	0.1200	4.1856	84.0000	2929.9200 (28a)
Above Entrance			0.2000	0.1600	0.0320	22.4400	4.4880 (28b)
Brick and Block	40.7400	13.1100	27.6300	0.2400	6.6312	42.2200	1166.5386 (29a)
Pitched Roof	35.1800		35.1800	0.1000	3.5180	9.1000	320.1380 (30)
Total net area of external elements Aum(A, m2)			111.0000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.2814		(33)
Party Wall 1			44.0300	0.0000	0.0000	110.0000	4843.3000 (32)
Party Wall 2			44.0300	0.0000	0.0000	110.0000	4843.3000 (32)
Ground Floor Stud			56.8600			9.0000	511.7400 (32c)
First Floor Stud			59.2300			9.0000	533.0700 (32c)
Internal Floor 1			34.8800			18.0000	627.8400 (32d)
Internal Ceiling 1			34.8800			18.0000	627.8400 (32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		16408.1746 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							234.2017 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.3897 (36)
Total fabric heat loss						(33) + (36) =	38.6711 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	28.8908	28.8908	28.8908	28.8908	28.8908	28.8908	28.8908	28.8908	28.8908	28.8908	28.8908	28.8908 (38)
Average = Sum(39)m / 12 =	67.5619	67.5619	67.5619	67.5619	67.5619	67.5619	67.5619	67.5619	67.5619	67.5619	67.5619	67.5619 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9643	0.9643	0.9643	0.9643	0.9643	0.9643	0.9643	0.9643	0.9643	0.9643	0.9643	0.9643 (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	2.2476 (42)
Average daily hot water use (litres/day)	87.5800 (43)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	96.3380	92.8348	89.3316	85.8284	82.3252	78.8220	78.8220	82.3252	85.8284	89.3316	92.8348	96.3380	(44)
Energy conte	142.8665	124.9520	128.9393	112.4124	107.8623	93.0770	86.2495	98.9726	100.1546	116.7206	127.4096	138.3586	(45)
Energy content (annual)										Total =	Sum (45)m =	1377.9751	(45)
Distribution loss (46)m = 0.15 x (45)m	21.4300	18.7428	19.3409	16.8619	16.1794	13.9616	12.9374	14.8459	15.0232	17.5081	19.1114	20.7538	(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													
Combi loss	1.5828	1.3340	1.3246	1.1095	1.0212	0.8437	0.7818	0.9370	0.9886	1.1991	1.3602	1.5329	(61)
Total heat required for water heating calculated for each month	144.4493	126.2860	130.2639	113.5219	108.8835	93.9207	87.0313	99.9096	101.1432	117.9197	128.7699	139.8915	(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	144.4493	126.2860	130.2639	113.5219	108.8835	93.9207	87.0313	99.9096	101.1432	117.9197	128.7699	139.8915	(64)
Heat gains from water heating, kWh/month	47.8988	41.8800	43.2035	37.6545	36.1195	31.1590	28.8734	33.1426	33.5486	39.1094	42.7038	46.3875	(65)
										Total per year (kWh/year) =	Sum (64)m =	1391.9904	(64)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	134.8548	134.8548	134.8548	134.8548	134.8548	134.8548	134.8548	134.8548	134.8548	134.8548	134.8548	134.8548	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	46.1156	40.9595	33.3105	25.2182	18.8509	15.9147	17.1964	22.3526	30.0016	38.0939	44.4612	47.3973	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	294.6822	297.7401	290.0343	273.6297	252.9217	233.4592	220.4571	217.3992	225.1049	241.5096	262.2175	281.6800	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7331	50.7331	50.7331	50.7331	50.7331	50.7331	50.7331	50.7331	50.7331	50.7331	50.7331	50.7331	(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)	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	(71)
Water heating gains (Table 5)	64.3801	62.3215	58.0692	52.2979	48.5477	43.2764	38.8084	44.5466	46.5952	52.5663	59.3108	62.3487	(72)
Total internal gains	503.8626	499.7057	480.0986	449.8304	419.0051	391.3351	375.1465	382.9830	400.3864	430.8545	464.6741	490.1108	(73)

6. Solar gains

[Jan]						Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North						3.1400	10.6334	0.6300	0.7000	0.7700	10.2041 (74)	
South						7.8200	46.7521	0.6300	0.7000	0.7700	111.7325 (78)	
Solar gains	121.9365	202.4895	266.2316	316.6736	346.2287	340.9534	329.7985	307.5410	283.3361	220.5836	145.0291	105.0537 (83)
Total gains	625.7992	702.1952	746.3303	766.5041	765.2338	732.2885	704.9450	690.5240	683.7225	651.4381	609.7032	595.1645 (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	67.4615	67.4615	67.4615	67.4615	67.4615	67.4615	67.4615	67.4615	67.4615	67.4615	67.4615	67.4615	
alpha	5.4974	5.4974	5.4974	5.4974	5.4974	5.4974	5.4974	5.4974	5.4974	5.4974	5.4974	5.4974	
util living area	0.9822	0.9661	0.9356	0.8720	0.7523	0.5767	0.4196	0.4470	0.6530	0.8762	0.9653	0.9861	(86)
MIT	20.2485	20.4010	20.5883	20.7818	20.9229	20.9852	20.9978	20.9969	20.9712	20.8071	20.4871	20.1980	(87)
Th 2	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	(88)
util rest of house	0.9774	0.9574	0.9195	0.8411	0.6992	0.5025	0.3361	0.3624	0.5799	0.8403	0.9548	0.9823	(89)
MIT 2	19.4450	19.5930	19.7716	19.9480	20.0644	20.1066	20.1126	20.1123	20.0989	19.9737	19.6786	19.3955	(90)
Living area fraction									fLA = Living area / (4) =			0.2618	(91)
MIT	19.6553	19.8045	19.9854	20.1663	20.2891	20.3366	20.3443	20.3438	20.3272	20.1919	19.8902	19.6056	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6553	19.8045	19.9854	20.1663	20.2891	20.3366	20.3443	20.3438	20.3272	20.1919	19.8902	19.6056	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9744	0.9539	0.9169	0.8431	0.7103	0.5216	0.3580	0.3846	0.5982	0.8439	0.9517	0.9796	(94)
Useful gains	609.7761	669.7894	684.2729	646.2581	543.5620	381.9624	252.3920	265.5792	409.0100	549.7329	580.2580	583.0460	(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	1037.4342	1006.9767	911.0973	761.1713	580.2976	387.5735	252.9725	266.4527	420.7232	648.0461	864.1319	1040.8332	(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	318.1776	226.5899	168.7573	82.7375	27.3313	0.0000	0.0000	0.0000	0.0000	73.1450	204.3892	340.5937	(98)
Space heating												1441.7215	(98)
Space heating per m2												(98) / (4) =	20.5784 (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													1598.3609 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	318.1776	226.5899	168.7573	82.7375	27.3313	0.0000	0.0000	0.0000	0.0000	73.1450	204.3892	340.5937	(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)	352.7467	251.2083	187.0924	91.7268	30.3008	0.0000	0.0000	0.0000	0.0000	81.0921	226.5956	377.5984	(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	144.4493	126.2860	130.2639	113.5219	108.8835	93.9207	87.0313	99.9096	101.1432	117.9197	128.7699	139.8915	(64)
Efficiency of water heater	85.3063	84.6351	83.5156	81.5350	78.6494	76.2000	76.2000	76.2000	76.2000	81.0138	84.2194	76.2000	(216)
Fuel for water heating, kWh/month	169.3302	149.2123	155.9755	139.2308	138.4417	123.2555	114.2144	131.1150	132.7338	145.5551	152.8982	163.3863	(219)
Water heating fuel used												1715.3488	(219)
Annual totals kWh/year													
Space heating fuel - main system												1598.3609	(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)													50.8409 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													125.8409 (231)
Electricity for lighting (calculated in Appendix L)													325.7666 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.80 * 1080 * 1.00) =										-690.8958			-690.8958 (233)
Total delivered energy for all uses													3074.4215 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1598.3609	3.4800	55.6230 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1715.3488	3.4800	59.6941 (247)
Mechanical ventilation fans	50.8409	13.1900	6.7059 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	325.7666	13.1900	42.9686 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-690.8958	13.1900	-91.1292 (252)
Total energy cost			203.7550 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.4200 (256)
SAP value		0.7438 (257)
SAP rating (Section 12)		89.6245
SAP band		90 (258)
		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1598.3609	0.2160	345.2460 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1715.3488	0.2160	370.5153 (264)
Space and water heating			715.7613 (265)
Pumps and fans	125.8409	0.5190	65.3114 (267)
Energy for lighting	325.7666	0.5190	169.0729 (268)
Energy saving/generation technologies			
PV Unit	-690.8958	0.5190	-358.5749 (269)
Total kg/year			591.5707 (272)
CO2 emissions per m2			8.4400 (273)
EI value			93.1105
EI rating			93 (274)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

EI band A

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	$3.48 / 0.8077 = 4.308$, stars = 4
Water heating environmental impact	$0.216 / 0.8077 = 0.2674$, 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	34.8800 (1b)	x 2.6800 (2b)	= 93.4784 (1b) - (3b)
First floor	35.1800 (1c)	x 2.3200 (2c)	= 81.6176 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.0600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 175.0960 (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												3.5700	
Infiltration rate												0.1785 (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) =			0.1517 (21)	
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)	
Adj infilt rate	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)	
	0.1783	0.1669	0.1669	0.1517	0.1555	0.1479	0.1479	0.1441	0.1441	0.1555	0.1517	0.1555 (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)			10.9600	1.1450	12.5496		(27)					
Ground Floor			34.8800	0.1200	4.1856	84.0000	2929.9200 (28a)					
Above Entrance			0.2000	0.1600	0.0320	22.4400	4.4880 (28b)					
Brick and Block	40.7400	13.1100	27.6300	0.2400	6.6312	42.2200	1166.5386 (29a)					
Pitched Roof	35.1800		35.1800	0.1000	3.5180	9.1000	320.1380 (30)					
Total net area of external elements Aum(A, m2)			111.0000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.2814		(33)					
Party Wall 1			44.0300	0.0000	0.0000	110.0000	4843.3000 (32)					
Party Wall 2			44.0300	0.0000	0.0000	110.0000	4843.3000 (32)					
Ground Floor Stud			56.8600			9.0000	511.7400 (32c)					
First Floor Stud			59.2300			9.0000	533.0700 (32c)					
Internal Floor 1			34.8800			18.0000	627.8400 (32d)					
Internal Ceiling 1			34.8800			18.0000	627.8400 (32e)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		16408.1746 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							234.2017 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.3897 (36)					
Total fabric heat loss						(33) + (36) =	38.6711 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 28.8908	Feb 28.8908	Mar 28.8908	Apr 28.8908	May 28.8908	Jun 28.8908	Jul 28.8908	Aug 28.8908	Sep 28.8908	Oct 28.8908	Nov 28.8908	Dec 28.8908 (38)
Heat transfer coeff	67.5619	67.5619	67.5619	67.5619	67.5619	67.5619	67.5619	67.5619	67.5619	67.5619	67.5619	67.5619 (39)
Average = Sum(39)m / 12 =												67.5619 (39)
HLP	Jan 0.9643	Feb 0.9643	Mar 0.9643	Apr 0.9643	May 0.9643	Jun 0.9643	Jul 0.9643	Aug 0.9643	Sep 0.9643	Oct 0.9643	Nov 0.9643	Dec 0.9643 (40)
HLP (average)												0.9643 (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	2.2476 (42)
Average daily hot water use (litres/day)	87.5800 (43)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	96.3380	92.8348	89.3316	85.8284	82.3252	78.8220	78.8220	82.3252	85.8284	89.3316	92.8348	96.3380	(44)
Energy conte	142.8665	124.9520	128.9393	112.4124	107.8623	93.0770	86.2495	98.9726	100.1546	116.7206	127.4096	138.3586	(45)
Energy content (annual)	Total = Sum (45)m = 1377.9751												(45)
Distribution loss (46)m = 0.15 x (45)m	21.4300	18.7428	19.3409	16.8619	16.1794	13.9616	12.9374	14.8459	15.0232	17.5081	19.1114	20.7538	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	1.5828	1.3340	1.3246	1.1095	1.0212	0.8437	0.7818	0.9370	0.9886	1.1991	1.3602	1.5329	(61)
Total heat required for water heating calculated for each month	144.4493	126.2860	130.2639	113.5219	108.8835	93.9207	87.0313	99.9096	101.1432	117.9197	128.7699	139.8915	(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	144.4493	126.2860	130.2639	113.5219	108.8835	93.9207	87.0313	99.9096	101.1432	117.9197	128.7699	139.8915	(64)
Heat gains from water heating, kWh/month	47.8988	41.8800	43.2035	37.6545	36.1195	31.1590	28.8734	33.1426	33.5486	39.1094	42.7038	46.3875	(65)
Total per year (kWh/year) = Sum (64)m = 1391.9904													(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	134.8548	134.8548	134.8548	134.8548	134.8548	134.8548	134.8548	134.8548	134.8548	134.8548	134.8548	134.8548	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	46.1156	40.9595	33.3105	25.2182	18.8509	15.9147	17.1964	22.3526	30.0016	38.0939	44.4612	47.3973	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	294.6822	297.7401	290.0343	273.6297	252.9217	233.4592	220.4571	217.3992	225.1049	241.5096	262.2175	281.6800	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7331	50.7331	50.7331	50.7331	50.7331	50.7331	50.7331	50.7331	50.7331	50.7331	50.7331	50.7331	(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)	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	(71)
Water heating gains (Table 5)	64.3801	62.3215	58.0692	52.2979	48.5477	43.2764	38.8084	44.5466	46.5952	52.5663	59.3108	62.3487	(72)
Total internal gains	503.8626	499.7057	480.0986	449.8304	419.0051	391.3351	375.1465	382.9830	400.3864	430.8545	464.6741	490.1108	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W		
North					3.1400	13.4684	0.6300	0.7000	0.7700	12.9246 (74)		
South					7.8200	56.5862	0.6300	0.7000	0.7700	135.2350 (78)		
Solar gains	148.1597	209.1061	280.2236	337.0394	349.8395	382.8775	355.1504	342.9093	312.8622	245.7704	175.5470	120.9099 (83)
Total gains	652.0223	708.8118	760.3223	786.8699	768.8446	774.2125	730.2969	725.8923	713.2486	676.6248	640.2212	611.0207 (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	67.4615	67.4615	67.4615	67.4615	67.4615	67.4615	67.4615	67.4615	67.4615	67.4615	67.4615	67.4615
alpha	5.4974	5.4974	5.4974	5.4974	5.4974	5.4974	5.4974	5.4974	5.4974	5.4974	5.4974	5.4974
util living area	0.9700	0.9533	0.9096	0.8167	0.6627	0.4422	0.3050	0.2976	0.5227	0.7921	0.9349	0.9765 (86)
MIT	20.4030	20.5059	20.6872	20.8628	20.9646	20.9967	20.9997	20.9997	20.9919	20.9044	20.6500	20.3606 (87)
Th 2	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132 (88)
util rest of house	0.9617	0.9412	0.8872	0.7757	0.5990	0.3667	0.2232	0.2153	0.4435	0.7388	0.9155	0.9698 (89)
MIT 2	19.5960	19.6941	19.8632	20.0164	20.0937	20.1121	20.1131	20.1131	20.1101	20.0524	19.8326	19.5554 (90)
Living area fraction									fLA = Living area / (4) =			0.2618 (91)
MIT	19.8073	19.9066	20.0789	20.2380	20.3217	20.3437	20.3452	20.3452	20.3409	20.2755	20.0466	19.7662 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8073	19.9066	20.0789	20.2380	20.3217	20.3437	20.3452	20.3452	20.3409	20.2755	20.0466	19.7662 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9584	0.9379	0.8862	0.7819	0.6145	0.3865	0.2446	0.2368	0.4642	0.7492	0.9138	0.9666	(94)
Useful gains	624.8704	664.7828	673.8341	615.2719	472.4731	299.2136	178.6549	171.9111	331.0644	506.9611	585.0421	590.6218	(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	959.8708	939.5588	843.0988	684.9426	487.9118	300.2217	178.7137	171.9589	333.8178	552.3494	773.3540	950.3387	(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	249.2403	184.6494	125.9329	50.1629	11.4864	0.0000	0.0000	0.0000	0.0000	33.7689	135.5846	267.6294	(98)
Space heating													1058.4549 (98)
Space heating per m2	(98) / (4) =												15.1078 (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													1173.4533 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	249.2403	184.6494	125.9329	50.1629	11.4864	0.0000	0.0000	0.0000	0.0000	33.7689	135.5846	267.6294	(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)	276.3196	204.7111	139.6152	55.6130	12.7344	0.0000	0.0000	0.0000	0.0000	37.4378	150.3155	296.7067	(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	144.4493	126.2860	130.2639	113.5219	108.8835	93.9207	87.0313	99.9096	101.1432	117.9197	128.7699	139.8915	(64)
Efficiency of water heater (217)m	84.5035	83.9366	82.4937	80.0055	77.3456	76.2000	76.2000	76.2000	76.2000	78.9272	82.7906	76.2000	(216)
Fuel for water heating, kWh/month	170.9389	150.4540	157.9076	141.8926	140.7754	123.2555	114.2144	131.1150	132.7338	149.4031	155.5368	164.8717	(219)
Water heating fuel used													(219)
Annual totals kWh/year													
Space heating fuel - main system													1173.4533 (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)													50.8409 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													125.8409 (231)
Electricity for lighting (calculated in Appendix L)													325.7666 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.80 * 1206 * 1.00) =													-771.8465 (233)
Total delivered energy for all uses													2586.3130 (238)

10a. Fuel costs - using BEDF prices (548)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1173.4533	7.3800	86.6009 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1733.0987	7.3800	127.9027 (247)
Mechanical ventilation fans	50.8409	28.6600	14.5710 (249)
Pumps and fans for heating	75.0000	28.6600	21.4950 (249)
Energy for lighting	325.7666	28.6600	93.3647 (250)
Additional standing charges			107.0000 (251)
Energy saving/generation technologies			
PV Unit	-771.8465	28.6600	-221.2112 (252)
Total energy cost			229.7230 (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	1173.4533	0.2160	253.4659 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1733.0987	0.2160	374.3493 (264)
Space and water heating			627.8152 (265)
Pumps and fans	125.8409	0.5190	65.3114 (267)
Energy for lighting	325.7666	0.5190	169.0729 (268)
Energy saving/generation technologies			
PV Unit	-771.8465	0.5190	-400.5884 (269)
Total kg/year			461.6112 (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	1173.4533	1.2200	1431.6130 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1733.0987	1.2200	2114.3804 (264)
Space and water heating			3545.9934 (265)
Pumps and fans	125.8409	3.0700	386.3315 (267)
Energy for lighting	325.7666	3.0700	1000.1036 (268)

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Energy saving/generation technologies			
PV Unit	-771.8465	3.0700	-2369.5689 (269)
Primary energy kWh/year			2562.8596 (272)
Primary energy kWh/m2/year			36.5809 (273)

SAP 2012 EPC IMPROVEMENTS

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

(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	+ 1.4	-£ 62	-198 kg (42.8%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£62 2.82 kg/m²	B 91	A 95
Total Savings	£62 2.82 kg/m²		

Potential energy efficiency rating:	B 91
Potential environmental impact rating:	A 95

Fuel prices for cost data on this page from database revision number 548 TEST (07 Jun 2024)
Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£129	£144	-£14
Mains gas	£322	£245	£76
Space heating	£230	£230	£0
Water heating	£128	£66	£62
Lighting	£93	£93	£0
Generated (PV)	-£221	-£221	£0
Total cost of fuels	£230	£168	£62
Total cost of uses	£230	£168	£62
Delivered energy	37 kWh/m²	23 kWh/m²	14 kWh/m²
Carbon dioxide emissions	0.5 tonnes	0.3 tonnes	0.2 tonnes
CO2 emissions per m²	7 kg/m²	4 kg/m²	3 kg/m²
Primary energy	37 kWh/m²	21 kWh/m²	16 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	34.8800 (1b)	x 2.6800 (2b)	= 93.4784 (1b) - (3b)
First floor	35.1800 (1c)	x 2.3200 (2c)	= 81.6176 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.0600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 175.0960 (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												3.5700
Infiltration rate												0.1785 (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) =	0.1517 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
	0.1934	0.1897	0.1859	0.1669	0.1631	0.1441	0.1441	0.1403	0.1517	0.1631	0.1707	0.1783 (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)			10.9600	1.1450	12.5496		(27)					
Ground Floor			34.8800	0.1200	4.1856	84.0000	2929.9200 (28a)					
Above Entrance			0.2000	0.1600	0.0320	22.4400	4.4880 (28b)					
Brick and Block	40.7400	13.1100	27.6300	0.2400	6.6312	42.2200	1166.5386 (29a)					
Pitched Roof	35.1800		35.1800	0.1000	3.5180	9.1000	320.1380 (30)					
Total net area of external elements Aum(A, m2)			111.0000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.2814		(33)					
Party Wall 1			44.0300	0.0000	0.0000	110.0000	4843.3000 (32)					
Party Wall 2			44.0300	0.0000	0.0000	110.0000	4843.3000 (32)					
Ground Floor Stud			56.8600			9.0000	511.7400 (32c)					
First Floor Stud			59.2300			9.0000	533.0700 (32c)					
Internal Floor 1			34.8800			18.0000	627.8400 (32d)					
Internal Ceiling 1			34.8800			18.0000	627.8400 (32e)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		16408.1746 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							234.2017 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.3897 (36)					
Total fabric heat loss						(33) + (36) =	38.6711 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 28.8908	Feb 28.8908	Mar 28.8908	Apr 28.8908	May 28.8908	Jun 28.8908	Jul 28.8908	Aug 28.8908	Sep 28.8908	Oct 28.8908	Nov 28.8908	Dec 28.8908 (38)
Heat transfer coeff	67.5619	67.5619	67.5619	67.5619	67.5619	67.5619	67.5619	67.5619	67.5619	67.5619	67.5619	67.5619 (39)
Average = Sum(39)m / 12 =												67.5619 (39)
HLP	Jan 0.9643	Feb 0.9643	Mar 0.9643	Apr 0.9643	May 0.9643	Jun 0.9643	Jul 0.9643	Aug 0.9643	Sep 0.9643	Oct 0.9643	Nov 0.9643	Dec 0.9643 (40)
HLP (average)												0.9643 (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	2.2476 (42)
Average daily hot water use (litres/day)	87.5800 (43)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	96.3380	92.8348	89.3316	85.8284	82.3252	78.8220	78.8220	82.3252	85.8284	89.3316	92.8348	96.3380	(44)
Energy content (annual)	142.8665	124.9520	128.9393	112.4124	107.8623	93.0770	86.2495	98.9726	100.1546	116.7206	127.4096	138.3586	(45)
Distribution loss (46)m = 0.15 x (45)m	21.4300	18.7428	19.3409	16.8619	16.1794	13.9616	12.9374	14.8459	15.0232	17.5081	19.1114	20.7538	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	1.5828	1.3340	1.3246	1.1095	1.0212	0.8437	0.7818	0.9370	0.9886	1.1991	1.3602	1.5329	(61)
Total heat required for water heating calculated for each month	144.4493	126.2860	130.2639	113.5219	108.8835	93.9207	87.0313	99.9096	101.1432	117.9197	128.7699	139.8915	(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												1.3161	(H8)
Utilisation factor												0.5322	(H9)
Collector performance factor												0.8793	(H10)
Dedicated solar storage volume												75.0000	(H11)
Effective solar volume												75.0000	(H13)
Daily hot water demand												87.5800	(H14)
Volume ratio Veff/V												0.8564	(H15)
Solar storage volume factor												0.9690	(H16)
Solar input	-23.8490	-39.7971	-67.7789	-90.8371	-112.2216	-110.3318	-108.8737	-95.1235	-74.5008	-50.8752	-28.2883	-822.4345	(H17)
Solar input (sum of months) = Sum(63)m =												-19.9575	(63)
Output from w/h	120.6004	86.4889	62.4849	22.6848	0.0000	0.0000	0.0000	4.7861	26.6424	67.0444	100.4816	119.9340	(64)
Total per year (kWh/year) = Sum(64)m =												611.1475	(64)
Heat gains from water heating, kWh/month	47.8988	41.8800	43.2035	37.6545	36.1195	31.1590	28.8734	33.1426	33.5486	39.1094	42.7038	46.3875	(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	134.8548	134.8548	134.8548	134.8548	134.8548	134.8548	134.8548	134.8548	134.8548	134.8548	134.8548	134.8548	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	46.1156	40.9595	33.3105	25.2182	18.8509	15.9147	17.1964	22.3526	30.0016	38.0939	44.4612	47.3973	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	294.6822	297.7401	290.0343	273.6297	252.9217	233.4592	220.4571	217.3992	225.1049	241.5096	262.2175	281.6800	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7331	50.7331	50.7331	50.7331	50.7331	50.7331	50.7331	50.7331	50.7331	50.7331	50.7331	50.7331	(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)	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	(71)
Water heating gains (Table 5)	64.3801	62.3215	58.0692	52.2979	48.5477	43.2764	38.8084	44.5466	46.5952	52.5663	59.3108	62.3487	(72)
Total internal gains	503.8626	499.7057	480.0986	449.8304	419.0051	391.3351	375.1465	382.9830	400.3864	430.8545	464.6741	490.1108	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
North					3.1400	10.6334	0.6300	0.7000			0.7700			10.2041 (74)
South					7.8200	46.7521	0.6300	0.7000			0.7700			111.7325 (78)
Solar gains	121.9365	202.4895	266.2316	316.6736	346.2287	340.9534	329.7985	307.5410	283.3361	220.5836	145.0291	105.0537 (83)		
Total gains	625.7992	702.1952	746.3303	766.5041	765.2338	732.2885	704.9450	690.5240	683.7225	651.4381	609.7032	595.1645 (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	67.4615	67.4615	67.4615	67.4615	67.4615	67.4615	67.4615	67.4615	67.4615	67.4615	67.4615	67.4615
alpha	5.4974	5.4974	5.4974	5.4974	5.4974	5.4974	5.4974	5.4974	5.4974	5.4974	5.4974	5.4974
util living area	0.9822	0.9661	0.9356	0.8720	0.7523	0.5767	0.4196	0.4470	0.6530	0.8762	0.9653	0.9861 (86)
MIT	20.2485	20.4010	20.5883	20.7818	20.9229	20.9852	20.9978	20.9969	20.9712	20.8071	20.4871	20.1980 (87)
Th 2	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132 (88)
util rest of house	0.9774	0.9574	0.9195	0.8411	0.6992	0.5025	0.3361	0.3624	0.5799	0.8403	0.9548	0.9823 (89)
MIT 2	19.4450	19.5930	19.7716	19.9480	20.0644	20.1066	20.1126	20.1123	20.0989	19.9737	19.6786	19.3955 (90)
Living area fraction									fLA = Living area / (4) =			0.2618 (91)
MIT	19.6553	19.8045	19.9854	20.1663	20.2891	20.3366	20.3443	20.3438	20.3272	20.1919	19.8902	19.6056 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6553	19.8045	19.9854	20.1663	20.2891	20.3366	20.3443	20.3438	20.3272	20.1919	19.8902	19.6056 (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	0.9744	0.9539	0.9169	0.8431	0.7103	0.5216	0.3580	0.3846	0.5982	0.8439	0.9517	0.9796	(94)
Useful gains	609.7761	669.7894	684.2729	646.2581	543.5620	381.9624	252.3920	265.5792	409.0100	549.7329	580.2580	583.0460	(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	1037.4342	1006.9767	911.0973	761.1713	580.2976	387.5735	252.9725	266.4527	420.7232	648.0461	864.1319	1040.8332	(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	318.1776	226.5899	168.7573	82.7375	27.3313	0.0000	0.0000	0.0000	0.0000	73.1450	204.3892	340.5937	(98)
Space heating												1441.7215	(98)
Space heating per m2											(98) / (4) =	20.5784	(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													1598.3609 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	318.1776	226.5899	168.7573	82.7375	27.3313	0.0000	0.0000	0.0000	0.0000	73.1450	204.3892	340.5937	(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)	352.7467	251.2083	187.0924	91.7268	30.3008	0.0000	0.0000	0.0000	0.0000	81.0921	226.5956	377.5984	(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	120.6004	86.4889	62.4849	22.6848	0.0000	0.0000	0.0000	4.7861	26.6424	67.0444	100.4816	119.9340	(64)
Efficiency of water heater (217)m	85.8640	85.8430	85.9338	86.7696	90.2000	76.2000	76.2000	76.2000	76.2000	82.9146	85.0499	76.2000	(216)
Fuel for water heating, kWh/month	140.4551	100.7524	72.7129	26.1437	0.0000	0.0000	0.0000	6.2810	34.9638	80.8596	118.1443	139.3265	(219)
Water heating fuel used												719.6392	(219)
Annual totals kWh/year													
Space heating fuel - main system												1598.3609	(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)													50.8409 (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													175.8409 (231)
Electricity for lighting (calculated in Appendix L)													325.7666 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.80 * 1080 * 1.00) =										-690.8958		-690.8958	(233)
Total delivered energy for all uses												2128.7119	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1598.3609	3.4800	55.6230 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	719.6392	3.4800	25.0434 (247)
Mechanical ventilation fans	50.8409	13.1900	6.7059 (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	325.7666	13.1900	42.9686 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-690.8958	13.1900	-91.1292 (252)
Total energy cost			175.6993 (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] =	0.6413 (257)
SAP value		91.0532
SAP rating (Section 12)		91 (258)
SAP band		B

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CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1598.3609	0.2160	345.2460 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	719.6392	0.2160	155.4421 (264)
Space and water heating			500.6880 (265)
Pumps and fans	175.8409	0.5190	91.2614 (267)
Energy for lighting	325.7666	0.5190	169.0729 (268)
Energy saving/generation technologies			
PV Unit	-690.8958	0.5190	-358.5749 (269)
Total kg/year			402.4474 (272)
CO2 emissions per m2			5.7400 (273)
EI value			95.3131
EI rating			95 (274)
EI band			A

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Calculation Type: New Build (As Built)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	34.8800 (1b)	x 2.6800 (2b)	= 93.4784 (1b) - (3b)
First floor	35.1800 (1c)	x 2.3200 (2c)	= 81.6176 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.0600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 175.0960 (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												3.5700
Infiltration rate												0.1785 (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) =	0.1517 (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	0.1783	0.1669	0.1669	0.1517	0.1555	0.1479	0.1479	0.1441	0.1441	0.1555	0.1517	0.1555 (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)			10.9600	1.1450	12.5496		(27)					
Ground Floor			34.8800	0.1200	4.1856	84.0000	2929.9200 (28a)					
Above Entrance			0.2000	0.1600	0.0320	22.4400	4.4880 (28b)					
Brick and Block	40.7400	13.1100	27.6300	0.2400	6.6312	42.2200	1166.5386 (29a)					
Pitched Roof	35.1800		35.1800	0.1000	3.5180	9.1000	320.1380 (30)					
Total net area of external elements Aum(A, m2)			111.0000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.2814		(33)					
Party Wall 1			44.0300	0.0000	0.0000	110.0000	4843.3000 (32)					
Party Wall 2			44.0300	0.0000	0.0000	110.0000	4843.3000 (32)					
Ground Floor Stud			56.8600			9.0000	511.7400 (32c)					
First Floor Stud			59.2300			9.0000	533.0700 (32c)					
Internal Floor 1			34.8800			18.0000	627.8400 (32d)					
Internal Ceiling 1			34.8800			18.0000	627.8400 (32e)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		16408.1746 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							234.2017 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.3897 (36)					
Total fabric heat loss						(33) + (36) =	38.6711 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 28.8908	Feb 28.8908	Mar 28.8908	Apr 28.8908	May 28.8908	Jun 28.8908	Jul 28.8908	Aug 28.8908	Sep 28.8908	Oct 28.8908	Nov 28.8908	Dec 28.8908 (38)
Heat transfer coeff	67.5619	67.5619	67.5619	67.5619	67.5619	67.5619	67.5619	67.5619	67.5619	67.5619	67.5619	67.5619 (39)
Average = Sum(39)m / 12 =												67.5619 (39)
HLP	Jan 0.9643	Feb 0.9643	Mar 0.9643	Apr 0.9643	May 0.9643	Jun 0.9643	Jul 0.9643	Aug 0.9643	Sep 0.9643	Oct 0.9643	Nov 0.9643	Dec 0.9643 (40)
HLP (average)												0.9643 (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	2.2476 (42)
Average daily hot water use (litres/day)	87.5800 (43)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	96.3380	92.8348	89.3316	85.8284	82.3252	78.8220	78.8220	82.3252	85.8284	89.3316	92.8348	96.3380	(44)
Energy content (annual)	142.8665	124.9520	128.9393	112.4124	107.8623	93.0770	86.2495	98.9726	100.1546	116.7206	127.4096	138.3586	(45)
Distribution loss (46)m = 0.15 x (45)m	21.4300	18.7428	19.3409	16.8619	16.1794	13.9616	12.9374	14.8459	15.0232	17.5081	19.1114	20.7538	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	1.5828	1.3340	1.3246	1.1095	1.0212	0.8437	0.7818	0.9370	0.9886	1.1991	1.3602	1.5329	(61)
Total heat required for water heating calculated for each month	144.4493	126.2860	130.2639	113.5219	108.8835	93.9207	87.0313	99.9096	101.1432	117.9197	128.7699	139.8915	(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													1.4703 (H8)
Utilisation factor													0.4934 (H9)
Collector performance factor													0.8793 (H10)
Dedicated solar storage volume													75.0000 (H11)
Effective solar volume													75.0000 (H13)
Daily hot water demand													87.5800 (H14)
Volume ratio Veff/V													0.8564 (H15)
Solar storage volume factor													0.9690 (H16)
Solar input	-27.7959	-39.5289	-68.5928	-92.2689	-107.2227	-116.6272	-110.5803	-100.8386	-78.9261	-54.5509	-32.8762	-851.8177	(H17)
Solar input (sum of months) = Sum(63)m =													-22.0092 (63)
Output from w/h	116.6534	86.7571	61.6711	21.2530	1.6608	0.0000	0.0000	0.0000	22.2171	63.3688	95.8936	117.8822	(64)
Total per year (kWh/year) = Sum(64)m =													587.3572 (64)
Heat gains from water heating, kWh/month	47.8988	41.8800	43.2035	37.6545	36.1195	31.1590	28.8734	33.1426	33.5486	39.1094	42.7038	46.3875	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	134.8548	134.8548	134.8548	134.8548	134.8548	134.8548	134.8548	134.8548	134.8548	134.8548	134.8548	134.8548	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	46.1156	40.9595	33.3105	25.2182	18.8509	15.9147	17.1964	22.3526	30.0016	38.0939	44.4612	47.3973	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	294.6822	297.7401	290.0343	273.6297	252.9217	233.4592	220.4571	217.3992	225.1049	241.5096	262.2175	281.6800	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7331	50.7331	50.7331	50.7331	50.7331	50.7331	50.7331	50.7331	50.7331	50.7331	50.7331	50.7331	(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)	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	(71)
Water heating gains (Table 5)	64.3801	62.3215	58.0692	52.2979	48.5477	43.2764	38.8084	44.5466	46.5952	52.5663	59.3108	62.3487	(72)
Total internal gains	503.8626	499.7057	480.0986	449.8304	419.0051	391.3351	375.1465	382.9830	400.3864	430.8545	464.6741	490.1108	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				3.1400	13.4684	0.6300	0.7000	0.7700	12.9246 (74)			
South				7.8200	56.5862	0.6300	0.7000	0.7700	135.2350 (78)			

Solar gains	148.1597	209.1061	280.2236	337.0394	349.8395	382.8775	355.1504	342.9093	312.8622	245.7704	175.5470	120.9099 (83)
Total gains	652.0223	708.8118	760.3223	786.8699	768.8446	774.2125	730.2969	725.8923	713.2486	676.6248	640.2212	611.0207 (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	67.4615	67.4615	67.4615	67.4615	67.4615	67.4615	67.4615	67.4615	67.4615	67.4615	67.4615	67.4615	
alpha	5.4974	5.4974	5.4974	5.4974	5.4974	5.4974	5.4974	5.4974	5.4974	5.4974	5.4974	5.4974	
util living area													
	0.9700	0.9533	0.9096	0.8167	0.6627	0.4422	0.3050	0.2976	0.5227	0.7921	0.9349	0.9765 (86)	
MIT	20.4030	20.5059	20.6872	20.8628	20.9646	20.9967	20.9997	20.9997	20.9919	20.9044	20.6500	20.3606 (87)	
Th 2	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132	20.1132 (88)	
util rest of house													
	0.9617	0.9412	0.8872	0.7757	0.5990	0.3667	0.2232	0.2153	0.4435	0.7388	0.9155	0.9698 (89)	
MIT 2	19.5960	19.6941	19.8632	20.0164	20.0937	20.1121	20.1131	20.1131	20.1101	20.0524	19.8326	19.5554 (90)	
Living area fraction									fLA = Living area / (4) =				0.2618 (91)
MIT	19.8073	19.9066	20.0789	20.2380	20.3217	20.3437	20.3452	20.3452	20.3409	20.2755	20.0466	19.7662 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.8073	19.9066	20.0789	20.2380	20.3217	20.3437	20.3452	20.3452	20.3409	20.2755	20.0466	19.7662 (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	0.9584	0.9379	0.8862	0.7819	0.6145	0.3865	0.2446	0.2368	0.4642	0.7492	0.9138	0.9666	(94)
Useful gains	624.8704	664.7828	673.8341	615.2719	472.4731	299.2136	178.6549	171.9111	331.0644	506.9611	585.0421	590.6218	(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	959.8708	939.5588	843.0988	684.9426	487.9118	300.2217	178.7137	171.9589	333.8178	552.3494	773.3540	950.3387	(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	249.2403	184.6494	125.9329	50.1629	11.4864	0.0000	0.0000	0.0000	0.0000	33.7689	135.5846	267.6294	(98)
Space heating												1058.4549	(98)
Space heating per m2											(98) / (4) =	15.1078	(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													1173.4533 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	249.2403	184.6494	125.9329	50.1629	11.4864	0.0000	0.0000	0.0000	0.0000	33.7689	135.5846	267.6294	(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)	276.3196	204.7111	139.6152	55.6130	12.7344	0.0000	0.0000	0.0000	0.0000	37.4378	150.3155	296.7067	(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	116.6534	86.7571	61.6711	21.2530	1.6608	0.0000	0.0000	0.0000	22.2171	63.3688	95.8936	117.8822	(64)
Efficiency of water heater (217)m	85.2089	85.1964	85.0625	85.5239	88.1540	76.2000	76.2000	76.2000	76.2000	80.5461	83.8203	76.2000	(216)
Fuel for water heating, kWh/month	136.9030	101.8318	72.5009	24.8504	1.8840	0.0000	0.0000	0.0000	29.1563	78.6740	114.4039	138.0320	(219)
Water heating fuel used												698.2362	(219)
Annual totals kWh/year													
Space heating fuel - main system												1173.4533	(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)													50.8409 (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													175.8409 (231)
Electricity for lighting (calculated in Appendix L)													325.7666 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.80 * 1206 * 1.00) =									-771.8465			-771.8465	(233)
Total delivered energy for all uses												1601.4505	(238)

10a. Fuel costs - using BEDF prices (548)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1173.4533	7.3800	86.6009 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	698.2362	7.3800	51.5298 (247)
Mechanical ventilation fans	50.8409	28.6600	14.5710 (249)
Pumps and fans for heating	75.0000	28.6600	21.4950 (249)
Pump for solar water heating	50.0000	28.6600	14.3300 (249)
Energy for lighting	325.7666	28.6600	93.3647 (250)
Additional standing charges			107.0000 (251)
Energy saving/generation technologies			
PV Unit	-771.8465	28.6600	-221.2112 (252)
Total energy cost			167.6802 (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	1173.4533	0.2160	253.4659 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	698.2362	0.2160	150.8190 (264)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Space and water heating			404.2849 (265)
Pumps and fans	175.8409	0.5190	91.2614 (267)
Energy for lighting	325.7666	0.5190	169.0729 (268)
Energy saving/generation technologies			
PV Unit	-771.8465	0.5190	-400.5884 (269)
Total kg/year			264.0309 (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	1173.4533	1.2200	1431.6130 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	698.2362	1.2200	851.8482 (264)
Space and water heating			2283.4612 (265)
Pumps and fans	175.8409	3.0700	539.8315 (267)
Energy for lighting	325.7666	3.0700	1000.1036 (268)
Energy saving/generation technologies			
PV Unit	-771.8465	3.0700	-2369.5689 (269)
Primary energy kWh/year			1453.8274 (272)
Primary energy kWh/m2/year			20.7512 (273)

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Property Reference	SAP 0943 Plot 2			Issued on Date	13/06/2024
Assessment Reference	As Built	Prop Type Ref	Type B Terrace		
Property	3, Shaw Crescent, West End, Southampton, SO30 3LH				
SAP Rating	90 B	DER	10.34	TER	17.40
Environmental	93 A	% DER<TER	40.59		
CO ₂ Emissions (t/year)	0.46	DFEE	34.93	TFEE	43.13
General Requirements Compliance	Pass	% DFEE<TFEE	19.01		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com			Assessor ID	E477-0001
Client	Foreman Homes, FORE				

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

Orientation	North
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	House, 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:	8.26 m	34.88 m ²	2.68 m
	1st Storey:	8.02 m	35.18 m ²	2.32 m

7.0 Living Area	18.34	m ²
8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	234.2	kJ/m ² K

9.0 External Walls						
Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area (m²)	Nett Area (m²)
Brick and Block	Cavity Wall	Other	0.24	42.22	40.74	27.63

9.1 Party Walls					
Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	44.03
Party Wall 2	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	44.03

9.2 Internal Walls			
Description	Construction	Kappa (kJ/m²K)	Area (m²)
Ground Floor Stud	Plasterboard on timber frame	9.00	56.86
First Floor Stud	Plasterboard on timber frame	9.00	59.23

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	35.18	35.18

10.2 Internal Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Ceiling 1	Plasterboard ceiling, carpeted chipboard floor	9.00	34.88

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	34.88
Above Entrance	Exposed Floor - Timber	Other	0.16	22.44	0.20

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	34.88

12.0 Opening Types

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

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
Front Door	Solid Door	[1] Brick and Block	North							2.15	
Front Elevation	Window	[1] Brick and Block	North	None	0.00					3.14	
Rear Elevation	Window	[1] Brick and Block	South	None	0.00					7.82	

14.0 Conservatory

15.0 Draught Proofing

 %

16.0 Draught Lobby

17.0 Thermal Bridging

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	3.75	0.071	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	3.74	0.064	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.59	0.067	No	Birtley Supatherm
Independently assessed	E3 Sill	6.47	0.021	No	Knauf P5
Independently assessed	E4 Jamb	22.50	0.016	No	Knauf P6
Table K1 - Default	E5 Ground floor (normal)	8.26	0.320	No	
Table K1 - Default	E20 Exposed floor (normal)	1.01	0.320	No	
Table K1 - Default	E21 Exposed floor (inverted)	2.07	0.320	No	
Independently assessed	E6 Intermediate floor within a dwelling	6.26	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	8.12	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	17.67	0.160	No	
Table K1 - Default	P2 Party wall - Intermediate floor within a dwelling	17.67	0.000	No	
Independently assessed	P4 Party wall - Roof (insulation at ceiling level)	17.67	0.035	No	Knauf P29 Halved

Y-value W/m²K

18.0 Pressure Testing

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Designed AP ₅₀	5.00	m ³ /(h.m ²) @ 50 Pa
Property Tested ?	Yes	
As Built AP ₅₀	3.57	m ³ /(h.m ²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

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

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - centralised
MV Reference Number	500107
Configuration	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	13	
Total number of L.E.L. fittings	13	
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.	17959	
Fuel Type	Mains gas	
Main Heating	BGW	
SAP Code	104	
In Winter	90.2	
In Summer	76.2	
Controls	CBE Programmer, room thermostat and TRVs	
PCDF Controls	0	

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Delayed Start Stat	No
Sap Code	2106
Flue Type	Balanced
Fan Assisted Flue	Yes
Is MHS Pumped	Pump in heated space
Heat Emitter	Radiators
Flow Temperature	Normal (> 45°C)
Combi boiler type	Standard Combi
Combi keep hot type	None
25.0 Main Heating 2	None

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	South	30°	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar water heating	£4,000 - £6,000	£62	B 91	