



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 9, Shaw Crescent
West End, Southampton, SO30 3LH

Contact: Tobias Whiting
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Report Issue Date: 13/06/2024

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0943 Plot 5	Issued on Date	13/06/2024
Assessment Reference	As Built	Prop Type Ref	Type B Terrace
Property	9, Shaw Crescent, West End, Southampton, SO30 3LH		
SAP Rating	90 B	DER	10.30
Environmental	93 A	% DER<TER	40.82
CO ₂ Emissions (t/year)	0.46	DFEE	34.57
General Requirements Compliance	Pass	% DFEE<TFEE	19.86
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 TFE 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)	10.30	kgCO ₂ /m ²	Pass
	-7.10 (-40.8%)	kgCO ₂ /m ²	

1b TFE and DFEE

Target Fabric Energy Efficiency (TFEE)	43.13	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	34.57	kWh/m ² /yr	
	-8.5 (-19.7%)	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	3.34 (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

3.34 (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	3.3	m ³ /m ² h
Photovoltaic array	0.80	kW

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THERMAL BRIDGING

Calculation Type: New Build (As Built)

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SAP Rating	90 B	DER	10.30
Environmental	93 A	TER	17.40
CO ₂ Emissions (t/year)	0.46	% DER<TER	40.82
General Requirements Compliance	Pass	DFEE	34.57
		TFEE	43.13
		% DFEE<TFEE	19.86
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	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.071	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	6.24	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	8.12	0.49	
External wall	E16 Corner (normal)	Independently assessed	0.039	4.20	0.16	Knauf P23
External wall	E17 Corner (inverted – internal area greater than external area)	Independently assessed	-0.091	4.20	-0.38	Knauf P24
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: **9.17** W/mK:
Y-Value: **0.083** W/m²K:

FULL SAP CALCULATION PRINTOUT

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CO ₂ Emissions (t/year)	0.46	DFEE	34.57	TFEE	43.13
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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) 10.30 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)43.1 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)34.6 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.12 (max. 0.25)	0.16 (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: 3.34 (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 3.3 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	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					3.3400
Infiltration rate					0.1670 (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)	=	0.1420 (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	0.1810	0.1774	0.1739	0.1561	0.1526	0.1349	0.1349	0.1313	0.1420	0.1526	0.1597	0.1668 (22b)
Mechanical extract ventilation - centralised												0.5000 (23a)
If mechanical ventilation:												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross 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			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/m ² K							234.2017 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.1713 (36)
Total fabric heat loss						(33) + (36) =	38.4527 (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 =	67.3435	67.3435	67.3435	67.3435	67.3435	67.3435	67.3435	67.3435	67.3435	67.3435	67.3435	67.3435 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9612	0.9612	0.9612	0.9612	0.9612	0.9612	0.9612	0.9612	0.9612	0.9612	0.9612	0.9612 (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	67.6803	67.6803	67.6803	67.6803	67.6803	67.6803	67.6803	67.6803	67.6803	67.6803	67.6803	67.6803		
alpha	5.5120	5.5120	5.5120	5.5120	5.5120	5.5120	5.5120	5.5120	5.5120	5.5120	5.5120	5.5120		
util living area	0.9956	0.9891	0.9741	0.9354	0.8429	0.6754	0.5023	0.5378	0.7649	0.9459	0.9900	0.9968	(86)	
MIT	20.0268	20.1952	20.4142	20.6590	20.8624	20.9689	20.9948	20.9925	20.9384	20.6808	20.2927	19.9782	(87)	
Th 2	20.1158	20.1158	20.1158	20.1158	20.1158	20.1158	20.1158	20.1158	20.1158	20.1158	20.1158	20.1158	(88)	
util rest of house	0.9943	0.9859	0.9664	0.9156	0.7972	0.5957	0.4045	0.4391	0.6925	0.9251	0.9865	0.9959	(89)	
MIT 2	19.2289	19.3956	19.6104	19.8439	20.0231	20.1011	20.1143	20.1135	20.0828	19.8682	19.4933	19.1806	(90)	
Living area fraction									fLA =	Living area / (4) =				0.2618 (91)
MIT	19.4378	19.6049	19.8208	20.0573	20.2428	20.3282	20.3448	20.3436	20.3068	20.0809	19.7026	19.3894	(92)	
Temperature adjustment												0.0000		
adjusted MIT	19.4378	19.6049	19.8208	20.0573	20.2428	20.3282	20.3448	20.3436	20.3068	20.0809	19.7026	19.3894	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	458.6781	531.5100	569.8994	568.6713	507.9793	373.5435	250.7711	263.3902	391.8738	471.2364	450.3991	432.5537	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1019.4304	990.2815	897.0722	751.3709	575.3017	385.7597	252.1894	265.5751	417.9850	638.4786	848.7030	1022.9052	(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	417.1998	308.2944	243.4166	131.5437	50.0879	0.0000	0.0000	0.0000	0.0000	124.4282	286.7788	439.2215	(98)
Space heating												2000.9709	(98)
Space heating per m2												28.5608	(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	2218.3713 (211)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	417.1998	308.2944	243.4166	131.5437	50.0879	0.0000	0.0000	0.0000	0.0000	124.4282	286.7788	439.2215 (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)	462.5275	341.7898	269.8632	145.8356	55.5298	0.0000	0.0000	0.0000	0.0000	137.9470	317.9366	486.9418 (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	86.1301	85.6283	84.7707	83.1254	80.1180	76.2000	76.2000	76.2000	76.2000	82.7981	85.3413	76.2000 (216)
Fuel for water heating, kWh/month	167.7105	147.4815	153.6661	136.5671	135.9039	123.2555	114.2144	131.1150	132.7338	142.4182	150.8882	161.9734 (219)
Water heating fuel used	1697.9278 (219)											
Annual totals kWh/year												
Space heating fuel - main system	2218.3713 (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											
Total delivered energy for all uses	3677.0108 (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	2218.3713	0.2160	479.1682 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1697.9278	0.2160	366.7524 (264)
Space and water heating			845.9206 (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			721.7300 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			10.3000 (273)

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

DER	10.3000	ZC1
Total Floor Area	70.0600	
Assumed number of occupants	2.2476	
CO2 emission factor in Table 12 for electricity displaced from grid	0.5190	
CO2 emissions from appliances, equation (L14)	16.6996	ZC2
CO2 emissions from cooking, equation (L16)	2.4685	ZC3
Total CO2 emissions	29.4680	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	29.4680	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	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		Table 6b		Specific data		factor		W
					W/m2		or Table 6b		Specific data		Table 6d		
									or Table 6c				
North	3.1400				10.6334		0.6300		0.7000		0.7700		10.2041
South	7.8200				46.7521		0.6300		0.7000		0.7700		111.7325 (74)
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	(91)
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	(92)
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	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	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					3.3400
Infiltration rate					0.3383 (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) =	0.2876 (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	0.3667	0.3595	0.3523	0.3163	0.3092	0.2732	0.2732	0.2660	0.2876	0.3092	0.3235	0.3379 (22b)
Effective ac	0.5672	0.5646	0.5621	0.5500	0.5478	0.5373	0.5373	0.5354	0.5414	0.5478	0.5523	0.5571 (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)							9.1713 (36)
Total fabric heat loss						(33) + (36) =	38.4527 (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	32.7751	32.6243	32.4764	31.7820	31.6521	31.0473	31.0473	30.9353	31.2803	31.6521	31.9149	Dec 32.1897 (38)
Heat transfer coeff	71.2278	71.0770	70.9291	70.2347	70.1048	69.5000	69.5000	69.3880	69.7329	70.1048	70.3676	70.6424 (39)
Average = Sum(39)m / 12 =												70.2341 (39)
HLP	1.0167	1.0145	1.0124	1.0025	1.0006	0.9920	0.9920	0.9904	0.9953	1.0006	1.0044	Dec 1.0083 (40)
HLP (average)												1.0025 (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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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	62.7652	62.8984	63.0295	63.6527	63.7706	64.3256	64.3256	64.4294	64.1107	63.7706	63.5324	63.2853
alpha	5.1843	5.1932	5.2020	5.2435	5.2514	5.2884	5.2884	5.2953	5.2740	5.2514	5.2355	5.2190
util living area	0.9965	0.9913	0.9792	0.9465	0.8662	0.7056	0.5307	0.5689	0.7952	0.9564	0.9921	0.9975 (86)
MIT	19.8888	20.0669	20.3040	20.5842	20.8186	20.9557	20.9918	20.9883	20.9147	20.6125	20.1912	19.8528 (87)
Th 2	20.0695	20.0713	20.0730	20.0813	20.0828	20.0900	20.0900	20.0913	20.0872	20.0828	20.0797	20.0764 (88)
util rest of house	0.9955	0.9887	0.9727	0.9293	0.8234	0.6242	0.4260	0.4636	0.7242	0.9388	0.9894	0.9967 (89)
MIT 2	19.0550	19.2333	19.4684	19.7454	19.9577	20.0685	20.0877	20.0877	20.0400	19.7775	19.3645	19.0248 (90)
Living area fraction	19.2733	19.4515	19.6872	19.9650	20.1831	20.3007	20.3243	20.3234	20.2690	19.9961	19.5809	19.2416 (92)
MIT	19.2733	19.4515	19.6872	19.9650	20.1831	20.3007	20.3243	20.3234	20.2690	19.9961	19.5809	19.2416 (93)
Temperature adjustment												0.0000
adjusted MIT	19.2733	19.4515	19.6872	19.9650	20.1831	20.3007	20.3243	20.3234	20.2690	19.9961	19.5809	19.2416 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9943	0.9864	0.9694	0.9267	0.8286	0.6442	0.4535	0.4913	0.7396	0.9368	0.9874	0.9958 (94)
Ext temp.	4.3000	5.0760	5.5000	5.5619	5.0609	3.7813	2.5678	2.6801	3.9308	4.5611	4.2734	4.0724 (95)
Heat loss rate W	1066.5141	1034.2797	935.3549	777.1460	594.7056	396.2007	258.8420	272.2393	430.1831	658.7108	878.2518	1062.5715 (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	471.4430	353.9255	286.6585	159.2112	65.9263	0.0000	0.0000	0.0000	0.0000	150.1762	324.6503	487.5656 (98)
Space heating												2299.5566 (98)
Space heating per m2												(98) / (4) = 32.8227 (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	653.2996	514.2997	527.3485	0.0000	0.0000	0.0000	0.0000 (100)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9018	0.9513	0.9411	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	589.1345	489.2495	496.2680	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	130.9764	189.1262	168.8139	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												488.9165 (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	32.7441	47.2815	42.2035	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												122.2291 (107)
Space cooling per m2												1.7446 (108)
Energy for space heating												32.8227 (99)
Energy for space cooling												1.7446 (108)
Total												34.5673 (109)
Dwelling Fabric Energy Efficiency (DFEE)												34.6 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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	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	0.9976	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) =			0.2618 (91)
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												

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	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)
Useful gains	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)
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	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)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	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												2515.6885 (98)
Space heating per m2										(98) / (4) =		35.9076 (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	681.0629	536.1559	549.3265	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	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)
Useful loss	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)
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	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)
Space cooling												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	=	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												3.3400	
Infiltration rate												0.1670 (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) =			0.1420 (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)	
	0.1668	0.1561	0.1561	0.1420	0.1455	0.1384	0.1384	0.1349	0.1349	0.1455	0.1420	0.1455 (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)							9.1713 (36)					
Total fabric heat loss						(33) + (36) =	38.4527 (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	67.3435	67.3435	67.3435	67.3435	67.3435	67.3435	67.3435	67.3435	67.3435	67.3435	67.3435	67.3435 (39)
Average = Sum(39)m / 12 =												67.3435 (39)
HLP	Jan 0.9612	Feb 0.9612	Mar 0.9612	Apr 0.9612	May 0.9612	Jun 0.9612	Jul 0.9612	Aug 0.9612	Sep 0.9612	Oct 0.9612	Nov 0.9612	Dec 0.9612 (40)
HLP (average)												0.9612 (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													
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										Total per year (kWh/year) =	Sum (64)m =	1391.9904	(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)
												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)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	67.6803	67.6803	67.6803	67.6803	67.6803	67.6803	67.6803	67.6803	67.6803	67.6803	67.6803	67.6803
alpha	5.5120	5.5120	5.5120	5.5120	5.5120	5.5120	5.5120	5.5120	5.5120	5.5120	5.5120	5.5120
util living area	0.9698	0.9530	0.9089	0.8156	0.6612	0.4408	0.3040	0.2966	0.5212	0.7908	0.9344	0.9764 (86)
MIT	20.4074	20.5101	20.6906	20.8649	20.9653	20.9968	20.9997	20.9997	20.9921	20.9059	20.6533	20.3650 (87)
Th 2	20.1158	20.1158	20.1158	20.1158	20.1158	20.1158	20.1158	20.1158	20.1158	20.1158	20.1158	20.1158 (88)
util rest of house	0.9615	0.9408	0.8865	0.7745	0.5976	0.3658	0.2227	0.2148	0.4424	0.7375	0.9150	0.9696 (89)
MIT 2	19.6025	19.7004	19.8686	20.0206	20.0968	20.1147	20.1157	20.1157	20.1128	20.0560	19.8380	19.5619 (90)
Living area fraction										fLA = Living area / (4) =		0.2618 (91)
MIT	19.8132	19.9123	20.0838	20.2416	20.3241	20.3456	20.3471	20.3471	20.3430	20.2785	20.0514	19.7721 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8132	19.9123	20.0838	20.2416	20.3241	20.3456	20.3471	20.3471	20.3430	20.2785	20.0514	19.7721 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9581	0.9375	0.8856	0.7808	0.6131	0.3854	0.2440	0.2362	0.4629	0.7480	0.9133	0.9665	(94)
Useful gains	624.7332	664.5401	673.3344	614.3782	471.3940	298.4065	178.2097	171.4873	330.1970	506.1364	584.7298	590.5254	(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	957.1663	936.9045	840.7018	682.9693	486.4984	299.3846	178.2664	171.5334	332.8765	550.7710	771.1793	947.6654	(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	247.3302	183.0288	124.5213	49.3856	11.2377	0.0000	0.0000	0.0000	0.0000	33.2081	134.2436	265.7122	(98)
Space heating												1048.6676	(98)
RHI space heating demand												1049	(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					3.3400
Infiltration rate					0.1670 (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)	=	0.1420 (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	0.1810	0.1774	0.1739	0.1561	0.1526	0.1349	0.1349	0.1313	0.1420	0.1526	0.1597	0.1668 (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)							9.1713	(36)
Total fabric heat loss					(33) + (36) =		38.4527	(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 =	67.3435	67.3435	67.3435	67.3435	67.3435	67.3435	67.3435	67.3435	67.3435	67.3435	67.3435	67.3435 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9612	0.9612	0.9612	0.9612	0.9612	0.9612	0.9612	0.9612	0.9612	0.9612	0.9612	0.9612 (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)

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	67.6803	67.6803	67.6803	67.6803	67.6803	67.6803	67.6803	67.6803	67.6803	67.6803	67.6803	67.6803		
Feb	5.5120	5.5120	5.5120	5.5120	5.5120	5.5120	5.5120	5.5120	5.5120	5.5120	5.5120	5.5120		
util living area	0.9821	0.9658	0.9352	0.8711	0.7509	0.5751	0.4183	0.4456	0.6514	0.8754	0.9650	0.9860	(86)	
MIT	20.2533	20.4056	20.5922	20.7846	20.9243	20.9856	20.9979	20.9970	20.9718	20.8095	20.4910	20.2028	(87)	
Th 2	20.1158	20.1158	20.1158	20.1158	20.1158	20.1158	20.1158	20.1158	20.1158	20.1158	20.1158	20.1158	(88)	
util rest of house	0.9773	0.9571	0.9190	0.8401	0.6979	0.5012	0.3353	0.3615	0.5786	0.8394	0.9546	0.9822	(89)	
MIT 2	19.4519	19.5996	19.7775	19.9528	20.0679	20.1093	20.1152	20.1149	20.1018	19.9781	19.6846	19.4025	(90)	
Living area fraction	19.6617	19.8106	19.9908	20.1705	20.2921	20.3387	20.3463	20.3458	20.3295	20.1958	19.8957	19.6120	(91)	
MIT	19.6617	19.8106	19.9908	20.1705	20.2921	20.3387	20.3463	20.3458	20.3295	20.1958	19.8957	19.6120	(92)	
Temperature adjustment												0.0000		
adjusted MIT	19.6617	19.8106	19.9908	20.1705	20.2921	20.3387	20.3463	20.3458	20.3295	20.1958	19.8957	19.6120	(93)	

8. Space heating requirement

Utilisation	0.9743	0.9536	0.9164	0.8422	0.7090	0.5203	0.3571	0.3836	0.5968	0.8430	0.9515	0.9796	(94)	
Useful gains	609.7068	669.7065	683.9179	645.5814	542.5518	380.9934	251.7242	264.8767	408.0647	549.1681	580.1051	582.9985	(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	1034.5076	1004.1316	908.5156	758.9963	578.6196	386.4650	252.2869	265.7244	419.5196	646.2130	861.7064	1037.8980	(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	316.0518	224.7915	167.1006	81.6587	26.8345	0.0000	0.0000	0.0000	0.0000	72.2014	202.7529	338.4452	(98)	
Space heating												1429.8367	(98)	
Space heating per m2												20.4087	(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													1585.1848 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	316.0518	224.7915	167.1006	81.6587	26.8345	0.0000	0.0000	0.0000	0.0000	72.2014	202.7529	338.4452	(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)	350.3900	249.2145	185.2557	90.5308	29.7499	0.0000	0.0000	0.0000	0.0000	80.0459	224.7815	375.2164	(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	85.2849	84.6084	83.4811	81.4918	78.6125	76.2000	76.2000	76.2000	76.2000	80.9728	84.1918	76.2000	(216)
Fuel for water heating, kWh/month	169.3727	149.2594	156.0399	139.3047	138.5066	123.2555	114.2144	131.1150	132.7338	145.6287	152.9482	163.4236	(219)
Water heating fuel used												1715.8025	(219)
Annual totals kWh/year													
Space heating fuel - main system												1585.1848	(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													3061.6990 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1585.1848	3.4800	55.1644 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1715.8025	3.4800	59.7099 (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			203.3122 (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		0.7421 (257)
SAP rating (Section 12)		89.6471
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	1585.1848	0.2160	342.3999 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1715.8025	0.2160	370.6133 (264)
Space and water heating			713.0133 (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			588.8227 (272)
CO2 emissions per m2			8.4000 (273)
EI value			93.1425
EI rating			93 (274)

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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	$3.48 / 0.8075 = 4.309$, stars = 4
Water heating environmental impact	$0.216 / 0.8075 = 0.2675$, 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												3.3400
Infiltration rate												0.1670 (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) =	0.1420 (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												
	0.1668	0.1561	0.1561	0.1420	0.1455	0.1384	0.1384	0.1349	0.1349	0.1455	0.1420	0.1455 (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)							9.1713 (36)					
Total fabric heat loss						(33) + (36) =	38.4527 (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	67.3435	67.3435	67.3435	67.3435	67.3435	67.3435	67.3435	67.3435	67.3435	67.3435	67.3435	67.3435 (39)
Average = Sum(39)m / 12 =												67.3435 (39)
HLP	Jan 0.9612	Feb 0.9612	Mar 0.9612	Apr 0.9612	May 0.9612	Jun 0.9612	Jul 0.9612	Aug 0.9612	Sep 0.9612	Oct 0.9612	Nov 0.9612	Dec 0.9612 (40)
HLP (average)												0.9612 (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	67.6803	67.6803	67.6803	67.6803	67.6803	67.6803	67.6803	67.6803	67.6803	67.6803	67.6803	67.6803		
alpha	5.5120	5.5120	5.5120	5.5120	5.5120	5.5120	5.5120	5.5120	5.5120	5.5120	5.5120	5.5120		
util living area	0.9698	0.9530	0.9089	0.8156	0.6612	0.4408	0.3040	0.2966	0.5212	0.7908	0.9344	0.9764	(86)	
MIT	20.4074	20.5101	20.6906	20.8649	20.9653	20.9968	20.9997	20.9997	20.9921	20.9059	20.6533	20.3650	(87)	
Th 2	20.1158	20.1158	20.1158	20.1158	20.1158	20.1158	20.1158	20.1158	20.1158	20.1158	20.1158	20.1158	(88)	
util rest of house	0.9615	0.9408	0.8865	0.7745	0.5976	0.3658	0.2227	0.2148	0.4424	0.7375	0.9150	0.9696	(89)	
MIT 2	19.6025	19.7004	19.8686	20.0206	20.0968	20.1147	20.1157	20.1157	20.1128	20.0560	19.8380	19.5619	(90)	
Living area fraction	19.8132	19.9123	20.0838	20.2416	20.3241	20.3456	20.3471	20.3471	20.3430	20.2785	20.0514	19.7721	(91)	
MIT	19.8132	19.9123	20.0838	20.2416	20.3241	20.3456	20.3471	20.3471	20.3430	20.2785	20.0514	19.7721	(92)	
Temperature adjustment	19.8132	19.9123	20.0838	20.2416	20.3241	20.3456	20.3471	20.3471	20.3430	20.2785	20.0514	19.7721	(93)	
adjusted MIT	19.8132	19.9123	20.0838	20.2416	20.3241	20.3456	20.3471	20.3471	20.3430	20.2785	20.0514	19.7721	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	624.7332	664.5401	673.3344	614.3782	471.3940	298.4065	178.2097	171.4873	330.1970	506.1364	584.7298	590.5254	(94)
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	957.1663	936.9045	840.7018	682.9693	486.4984	299.3846	178.2664	171.5334	332.8765	550.7710	771.1793	947.6654	(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	247.3302	183.0288	124.5213	49.3856	11.2377	0.0000	0.0000	0.0000	0.0000	33.2081	134.2436	265.7122	(98)
Space heating													
Space heating per m2	(98) / (4) = 14.9681												(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													1162.6026 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	247.3302	183.0288	124.5213	49.3856	11.2377	0.0000	0.0000	0.0000	0.0000	33.2081	134.2436	265.7122	(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)	274.2020	202.9144	138.0503	54.7512	12.4587	0.0000	0.0000	0.0000	0.0000	36.8161	148.8289	294.5811	(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	84.4775	83.9061	82.4547	79.9624	77.3228	76.2000	76.2000	76.2000	76.2000	78.8906	82.7560	76.2000	(216)
Fuel for water heating, kWh/month	170.9915	150.5087	157.9823	141.9691	140.8169	123.2555	114.2144	131.1150	132.7338	149.4724	155.6019	164.9179	(219)
Water heating fuel used												1733.5795	(219)
Annual totals kWh/year													
Space heating fuel - main system												1162.6026	(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			-771.8465 (233)
Total delivered energy for all uses													2575.9431 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1162.6026	7.3800	85.8001 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1733.5795	7.3800	127.9382 (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			228.9577 (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	1162.6026	0.2160	251.1222 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1733.5795	0.2160	374.4532 (264)
Space and water heating			625.5753 (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			459.3713 (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	1162.6026	1.2200	1418.3752 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1733.5795	1.2200	2114.9670 (264)
Space and water heating			3533.3422 (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 2550.2084 (272)
Primary energy kWh/m2/year 36.4003 (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 (43.0%)

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	£321	£244	£76
Space heating	£229	£229	£0
Water heating	£128	£66	£62
Lighting	£93	£93	£0
Generated (PV)	-£221	-£221	£0
Total cost of fuels	£229	£167	£62
Total cost of uses	£229	£167	£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	36 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												3.3400
Infiltration rate												0.1670 (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) =	0.1420 (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	0.1810	0.1774	0.1739	0.1561	0.1526	0.1349	0.1349	0.1313	0.1420	0.1526	0.1597	0.1668 (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)							9.1713 (36)					
Total fabric heat loss						(33) + (36) =	38.4527 (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	67.3435	67.3435	67.3435	67.3435	67.3435	67.3435	67.3435	67.3435	67.3435	67.3435	67.3435	67.3435 (39)
Average = Sum(39)m / 12 =												67.3435 (39)
HLP	Jan 0.9612	Feb 0.9612	Mar 0.9612	Apr 0.9612	May 0.9612	Jun 0.9612	Jul 0.9612	Aug 0.9612	Sep 0.9612	Oct 0.9612	Nov 0.9612	Dec 0.9612 (40)
HLP (average)												0.9612 (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	67.6803	67.6803	67.6803	67.6803	67.6803	67.6803	67.6803	67.6803	67.6803	67.6803	67.6803	67.6803
alpha	5.5120	5.5120	5.5120	5.5120	5.5120	5.5120	5.5120	5.5120	5.5120	5.5120	5.5120	5.5120
util living area	0.9821	0.9658	0.9352	0.8711	0.7509	0.5751	0.4183	0.4456	0.6514	0.8754	0.9650	0.9860 (86)
MIT	20.2533	20.4056	20.5922	20.7846	20.9243	20.9856	20.9979	20.9970	20.9718	20.8095	20.4910	20.2028 (87)
Th 2	20.1158	20.1158	20.1158	20.1158	20.1158	20.1158	20.1158	20.1158	20.1158	20.1158	20.1158	20.1158 (88)
util rest of house	0.9773	0.9571	0.9190	0.8401	0.6979	0.5012	0.3353	0.3615	0.5786	0.8394	0.9546	0.9822 (89)
MIT 2	19.4519	19.5996	19.7775	19.9528	20.0679	20.1093	20.1152	20.1149	20.1018	19.9781	19.6846	19.4025 (90)
Living area fraction									fLA = Living area / (4) =			0.2618 (91)
MIT	19.6617	19.8106	19.9908	20.1705	20.2921	20.3387	20.3463	20.3458	20.3295	20.1958	19.8957	19.6120 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6617	19.8106	19.9908	20.1705	20.2921	20.3387	20.3463	20.3458	20.3295	20.1958	19.8957	19.6120 (93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9743	0.9536	0.9164	0.8422	0.7090	0.5203	0.3571	0.3836	0.5968	0.8430	0.9515	0.9796	(94)
Useful gains	609.7068	669.6205	683.9179	645.5814	542.5518	380.9934	251.7242	264.8767	408.0647	549.1681	580.1051	582.9985	(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	1034.5076	1004.1316	908.5156	758.9963	578.6196	386.4650	252.2869	265.7244	419.5196	646.2130	861.7064	1037.8980	(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	316.0518	224.7915	167.1006	81.6587	26.8345	0.0000	0.0000	0.0000	0.0000	72.2014	202.7529	338.4452	(98)
Space heating												1429.8367	(98)
Space heating per m2											(98) / (4) =	20.4087	(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													1585.1848	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	316.0518	224.7915	167.1006	81.6587	26.8345	0.0000	0.0000	0.0000	0.0000	72.2014	202.7529	338.4452	(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)	350.3900	249.2145	185.2557	90.5308	29.7499	0.0000	0.0000	0.0000	0.0000	80.0459	224.7815	375.2164	(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	85.8439	85.8191	85.9044	86.7355	90.2000	76.2000	76.2000	76.2000	76.2000	82.8693	85.0237	76.2000	(216)	
Fuel for water heating, kWh/month	140.4880	100.7805	72.7377	26.1539	0.0000	0.0000	0.0000	6.2810	34.9638	80.9038	118.1807	139.3563	(219)	
Water heating fuel used												719.8458	(219)	
Annual totals kWh/year														
Space heating fuel - main system												1585.1848	(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												2115.7423	(238)	

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1585.1848	3.4800	55.1644 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	719.8458	3.4800	25.0506 (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			175.2479 (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] =	0.6397 (257)
SAP value		91.0762
SAP rating (Section 12)		91 (258)
SAP band		B

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1585.1848	0.2160	342.3999 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	719.8458	0.2160	155.4867 (264)
Space and water heating			497.8866 (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			399.6460 (272)
CO2 emissions per m2			5.7000 (273)
EI value			95.3457
EI rating			95 (274)
EI band			A

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	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																0 * 10 =	0.0000 (7a)
Number of passive vents																0 * 10 =	0.0000 (7b)
Number of flueless gas fires																0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour		
Pressure test															0.0000 / (5) =		0.0000 (8)
Measured/design AP50															Yes		
Infiltration rate															3.3400		
Number of sides sheltered															0.1670 (18)		
															2 (19)		
Shelter factor										(20) = 1 - [0.075 x (19)] =					0.8500 (20)		
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =					0.1420 (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																	
	0.1668	0.1561	0.1561	0.1420	0.1455	0.1384	0.1384	0.1349	0.1349	0.1455	0.1420	0.1455	(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)							9.1713 (36)					
Total fabric heat loss						(33) + (36) =	38.4527 (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	67.3435	67.3435	67.3435	67.3435	67.3435	67.3435	67.3435	67.3435	67.3435	67.3435	67.3435	67.3435 (39)
Average = Sum(39)m / 12 =												67.3435 (39)
HLP	Jan 0.9612	Feb 0.9612	Mar 0.9612	Apr 0.9612	May 0.9612	Jun 0.9612	Jul 0.9612	Aug 0.9612	Sep 0.9612	Oct 0.9612	Nov 0.9612	Dec 0.9612 (40)
HLP (average)												0.9612 (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	67.6803	67.6803	67.6803	67.6803	67.6803	67.6803	67.6803	67.6803	67.6803	67.6803	67.6803	67.6803
alpha	5.5120	5.5120	5.5120	5.5120	5.5120	5.5120	5.5120	5.5120	5.5120	5.5120	5.5120	5.5120
util living area	0.9698	0.9530	0.9089	0.8156	0.6612	0.4408	0.3040	0.2966	0.5212	0.7908	0.9344	0.9764 (86)
MIT	20.4074	20.5101	20.6906	20.8649	20.9653	20.9968	20.9997	20.9997	20.9921	20.9059	20.6533	20.3650 (87)
Th 2	20.1158	20.1158	20.1158	20.1158	20.1158	20.1158	20.1158	20.1158	20.1158	20.1158	20.1158	20.1158 (88)
util rest of house	0.9615	0.9408	0.8865	0.7745	0.5976	0.3658	0.2227	0.2148	0.4424	0.7375	0.9150	0.9696 (89)
MIT 2	19.6025	19.7004	19.8686	20.0206	20.0968	20.1147	20.1157	20.1157	20.1128	20.0560	19.8380	19.5619 (90)
Living area fraction									fLA = Living area / (4) =			0.2618 (91)
MIT	19.8132	19.9123	20.0838	20.2416	20.3241	20.3456	20.3471	20.3471	20.3430	20.2785	20.0514	19.7721 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8132	19.9123	20.0838	20.2416	20.3241	20.3456	20.3471	20.3471	20.3430	20.2785	20.0514	19.7721 (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	0.9581	0.9375	0.8856	0.7808	0.6131	0.3854	0.2440	0.2362	0.4629	0.7480	0.9133	0.9665	(94)
Useful gains	624.7332	664.5401	673.3344	614.3782	471.3940	298.4065	178.2097	171.4873	330.1970	506.1364	584.7298	590.5254	(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	957.1663	936.9045	840.7018	682.9693	486.4984	299.3846	178.2664	171.5334	332.8765	550.7710	771.1793	947.6654	(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	247.3302	183.0288	124.5213	49.3856	11.2377	0.0000	0.0000	0.0000	0.0000	33.2081	134.2436	265.7122	(98)
Space heating												1048.6676	(98)
Space heating per m2											(98) / (4) =	14.9681	(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													1162.6026	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	247.3302	183.0288	124.5213	49.3856	11.2377	0.0000	0.0000	0.0000	0.0000	33.2081	134.2436	265.7122	(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)	274.2020	202.9144	138.0503	54.7512	12.4587	0.0000	0.0000	0.0000	0.0000	36.8161	148.8289	294.5811	(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	85.1841	85.1681	85.0258	85.4751	88.1154	76.2000	76.2000	76.2000	76.2000	80.4960	83.7857	76.2000	(216)	
Fuel for water heating, kWh/month	136.9427	101.8658	72.5322	24.8646	1.8848	0.0000	0.0000	0.0000	29.1563	78.7228	114.4510	138.0687	(219)	
Water heating fuel used												698.4890	(219)	
Annual totals kWh/year														
Space heating fuel - main system												1162.6026	(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													1590.8526	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1162.6026	7.3800	85.8001	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	698.4890	7.3800	51.5485	(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			166.8981	(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	1162.6026	0.2160	251.1222 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	698.4890	0.2160	150.8736 (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			401.9958 (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			261.7417 (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	1162.6026	1.2200	1418.3752 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	698.4890	1.2200	852.1565 (264)
Space and water heating			2270.5317 (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			1440.8979 (272)
Primary energy kWh/m2/year			20.5666 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0943 Plot 5	Issued on Date	13/06/2024
Assessment Reference	As Built	Prop Type Ref	Type B Terrace
Project	9, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	90 B	DER	10.30	TER	17.40
Environmental	93 A	% DER<TER	40.82		
CO ₂ Emissions (t/year)	0.46	DFEE	34.57	TFEE	43.13
General Requirements Compliance	Pass	% DFEE<TFEE	19.86		

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

Building Elements

Roof 000002 - Mineral Wool between and above

Roof Type: Pitched Roof, insulated flat ceiling

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	Mineral wool batt						
	Main construction	350	0.0380	9.2105	100.00		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 2	Mineral wool batt						
	Main construction	100	0.0380	2.6316	87.50		
	Main construction	100	0.1300	0.7692	12.50		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 3	Plasterboard, standard						
	Main construction	12.5	0.2100	0.0595	100.00	700	1000
Int surface				0.1000			

Total resistance: Upper limit = 11.772 m² K/W Lower limit = 11.430 m² K/W Average = 11.601 m² K/W
Total correction = 0.0096 m² K/W U-value (unrounded) = 0.1 W/m² K

Unheated space: None

Total thickness: 463 mm

U-value: 0.10 W/m² K

Kappa: 9.10 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0943 Plot 5	Issued on Date	13/06/2024
Assessment Reference	As Built	Prop Type Ref	Type B Terrace
Project	9, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	90 B	DER	10.30	TER	17.40
Environmental	93 A	% DER<TER	40.82		
CO ₂ Emissions (t/year)	0.46	DFEE	34.57	TFEE	43.13
General Requirements Compliance	Pass	% DFEE<TFEE	19.86		

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

Wall 000001

Wall Type: Standard Wall

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

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

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

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0943 Plot 5	Issued on Date	13/06/2024
Assessment Reference	As Built	Prop Type Ref	Type B Terrace
Project	9, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	90 B	DER	10.30	TER	17.40
Environmental	93 A	% DER<TER	40.82		
CO ₂ Emissions (t/year)	0.46	DFEE	34.57	TFEE	43.13
General Requirements Compliance	Pass	% DFEE<TFEE	19.86		

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

Building Elements

Floor 000003 - Worst Case Slab

Floor Type: Slab On Ground Floor

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

Horizontal edge insulation: none

Vertical edge insulation: none

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

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

Total correction = 0.0096 m² K/W

U-value (unrounded) = 0.12 W/m² K

Unheated space: None

Total thickness: 321 mm

U-value: 0.12 W/m² K

Kappa: 84.00 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0943 Plot 5	Issued on Date	13/06/2024
Assessment Reference	As Built	Prop Type Ref	Type B Terrace
Project	9, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	90 B	DER	10.30	TER	17.40
Environmental	93 A	% DER<TER	40.82		
CO ₂ Emissions (t/year)	0.46	DFEE	34.57	TFEE	43.13
General Requirements Compliance	Pass	% DFEE<TFEE	19.86		

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

Floor 000004

Floor Type: Exposed Floor

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	Plasterboard, high density						
	Main construction	12.5	0.2500	0.0500	100.00		
Layer 2	Mineral wool						
	Main construction	190	0.0400	4.7500	87.50		
	Main construction	190	0.1300	1.4615	12.50		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 3	Mineral wool						
	Main construction	100	0.0400	2.5000	87.50		
	Main construction	100	0.1300	0.7692	12.50		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 4	Chipboard						
	Main construction	22	0.1300	0.1692	100.00	600	1700
Int surface				0.1700			

Total resistance:	Upper limit = 6.717 m ² K/W	Lower limit = 6.088 m ² K/W	Average = 6.402 m ² K/W
	Total correction = 0.0043 m ² K/W	U-value (unrounded) = 0.16 W/m ² K	

Unheated space: None		
Total thickness: 325 mm	U-value: 0.16 W/m² K	Kappa: 22.44 kJ/m² K

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Property Reference	SAP 0943 Plot 5			Issued on Date	13/06/2024
Assessment Reference	As Built	Prop Type Ref	Type B Terrace		
Property	9, Shaw Crescent, West End, Southampton, SO30 3LH				
SAP Rating	90 B	DER	10.30	TER	17.40
Environmental	93 A	% DER<TER	40.82		
CO ₂ Emissions (t/year)	0.46	DFEE	34.57	TFEE	43.13
General Requirements Compliance	Pass	% DFEE<TFEE	19.86		
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			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type	Construction				
Brick and Block	Cavity Wall	Other	0.24	42.22	40.74	27.63

9.1 Party Walls			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)
Description	Type	Construction			
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	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		Kappa (kJ/m ² K)	Area (m ²)
Description	Construction		
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	6.24	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	8.12	0.060	No	
Independently assessed	E16 Corner (normal)	4.20	0.039	No	Knauf P23
Independently assessed	E17 Corner (inverted – internal area greater than external area)	4.20	-0.091	No	Knauf P24
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

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Y-value	0.083	W/m²K
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18.0 Pressure Testing	Yes	
Designed AP ₅₀	5.00	m³/(h.m²) @ 50 Pa
Property Tested ?	Yes	
As Built AP ₅₀	3.34	m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation	
Summer Overheating	
Windows open in hot weather	Windows half open
Cross ventilation possible	Yes
Night Ventilation	No
Air change rate	4.00
Mechanical Ventilation	
Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - centralised
MV Reference Number	500107
Configuration	3
Manufacturer SFP	0.17
Duct Type	Rigid
Wet Rooms	3

20.0 Fans, Open Fireplaces, Flues				
	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				0
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System	No
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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
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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

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

In Summer	76.2
Controls	CBE Programmer, room thermostat and TRVs
PCDF Controls	0
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

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	