



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 1, Shaw Crescent
West End, Southampton, SO30 3LH

Contact: Tobias Whiting
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Report Issue Date: 12/06/2024

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0943 Plot 1	Issued on Date	12/06/2024
Assessment Reference	As Built	Prop Type Ref	Type B Terrace
Property	1, Shaw Crescent, West End, Southampton, SO30 3LH		
SAP Rating	88 B	DER	12.53
Environmental	91 B	TER	18.94
CO ₂ Emissions (t/year)	0.60	% DER<TER	33.84
General Requirements Compliance	Pass	DfEE	44.74
		TfEE	52.46
		% DfEE<TfEE	14.73
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com		Assessor ID
			E477-0001
Client	Foreman Homes, FORE		

SUMMARY FOR INPUT DATA FOR New Build (As Built)

Criterion 1 – Achieving the TER and TfEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	18.94	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	12.53	kgCO ₂ /m ²	Pass
	-6.41 (-33.8%)	kgCO ₂ /m ²	

1b TfEE and DfEE

Target Fabric Energy Efficiency (TfEE)	52.46	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DfEE)	44.74	kWh/m ² /yr	
	-7.8 (-14.9%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.12 (max. 0.25)	0.16 (max. 0.70)	Pass
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	Pass
Openings	1.19 (max. 2.00)	1.20 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.59 (measured in this dwelling)	m ³ /(h.m ²) @ 50 Pa	
Maximum	10.0	m ³ /(h.m ²) @ 50 Pa	Pass

Limiting System Efficiencies

4 Heating efficiency

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

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Main heating system

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

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Programmer, room thermostat and TRVs

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100 %

Minimum

75 %

Pass

8 Mechanical ventilation

Continuous extract system

Specific fan power

0.17

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 East

3.71 m², No overhang

Windows facing South

7.82 m², No overhang

Air change rate

4.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

3.59 (measured in this dwelling) m³/(h.m²) @ 50 Pa

Maximum

10.0 m³/(h.m²) @ 50 Pa

Pass

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BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

10 Key features

Party wall U-value	0.00	W/m ² K
Roof U-value	0.10	W/m ² K
Floor U-value	0.12	W/m ² K
Door U-value	1.10	W/m ² K
Air permeability	3.6	m ³ /m ² h
Photovoltaic array	0.80	kW

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THERMAL BRIDGING

Calculation Type: New Build (As Built)

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SAP Rating	88 B	DER	12.53	TER	18.94
Environmental	91 B	% DER<TER	33.84		
CO ₂ Emissions (t/year)	0.60	DFEE	44.74	TFEE	52.46
General Requirements Compliance	Pass	% DFEE<TFEE	14.73		

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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	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.077	0.69	0.05	Birtley Supatherm
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	6.24	0.40	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	9.66	0.20	Knauf P5
External wall	E4 Jamb	Independently assessed	0.016	29.40	0.47	Knauf P6
External wall	E5 Ground floor (normal)	Table K1 - Default	0.320	16.85	5.39	
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	2.14	0.68	
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	15.23	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	8.12	0.49	
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.044	8.84	0.39	Knauf P21
External wall	E16 Corner (normal)	Independently assessed	0.039	14.20	0.55	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	10.00	0.36	Knauf P25 Halved
Party wall	P1 Party wall - Ground floor	Table K1 - Default	0.160	8.79	1.41	
Party wall	P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	0.000	8.79	0.00	
Party wall	P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	0.035	8.79	0.31	Knauf P29 Halved

Total: **11.02** W/mK:
Y-Value: **0.071** W/m²K:

FULL SAP CALCULATION PRINTOUT

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General Requirements Compliance	Pass	% DFEE<TFEE	14.73		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com			Assessor ID	E477-0001
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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

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

DWELLING AS BUILT

End-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) 18.94 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 12.53 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)52.5 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)44.7 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	1.19 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.59 (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 East: 3.71 m², No overhang
Windows facing South: 7.82 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.10 W/m²K
Floor U-value 0.12 W/m²K
Door U-value 1.10 W/m²K
Air permeability 3.6 m³/m²h
Photovoltaic array 0.80 kW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	35.1100 (1b)	x 2.6800 (2b)	= 94.0948 (1b) - (3b)
First floor	35.3100 (1c)	x 2.3200 (2c)	= 81.9192 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.0140 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.5900
Infiltration rate					0.1795 (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)	=	0.1526 (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	0.1945	0.1907	0.1869	0.1678	0.1640	0.1449	0.1449	0.1411	0.1526	0.1640	0.1716	0.1793 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.20)			14.6700	1.1450	16.7977		(27)
Ground Floor			35.1100	0.1200	4.2132	84.0000	2949.2400 (28a)
Above Entrance			0.2000	0.1600	0.0320	22.4400	4.4880 (28b)
Brick and Block	84.1100	16.8200	67.2900	0.2400	16.1496	42.2200	2840.9838 (29a)
Pitched Roof	35.3100		35.3100	0.1000	3.5310	9.1000	321.3210 (30)
Total net area of external elements Aum(A, m ²)			154.7300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	43.0885		(33)
Party Wall 1			44.0300	0.0000	0.0000	110.0000	4843.3000 (32)
Ground Floor Stud			57.2900			9.0000	515.6100 (32c)
First Floor Stud			59.2400			9.0000	533.1600 (32c)
Internal Floor 1			35.1100			18.0000	631.9800 (32d)
Internal Ceiling 1			35.1100			18.0000	631.9800 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13272.0628 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 188.4701 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.0203 (36)
Total fabric heat loss (33) + (36) = 54.1088 (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	29.0423	29.0423	29.0423	29.0423	29.0423	29.0423	29.0423	29.0423	29.0423	29.0423	29.0423	29.0423 (38)
Heat transfer coeff	83.1512	83.1512	83.1512	83.1512	83.1512	83.1512	83.1512	83.1512	83.1512	83.1512	83.1512	83.1512 (39)
Average = Sum(39)m / 12 =												83.1512 (39)
HLP	1.1808	1.1808	1.1808	1.1808	1.1808	1.1808	1.1808	1.1808	1.1808	1.1808	1.1808	1.1808 (40)
HLP (average)												1.1808 (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												2.2563 (42)
Average daily hot water use (litres/day)												87.7866 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Daily hot water use	96.5653	93.0538	89.5423	86.0309	82.5194	79.0079	79.0079	82.5194	86.0309	89.5423	93.0538	96.5653 (44)
Energy conte	143.2035	125.2467	129.2434	112.6775	108.1167	93.2965	86.4530	99.2060	100.3909	116.9959	127.7101	138.6849 (45)
Energy content (annual)										Total = Sum (45)m =		1381.2252 (45)
Distribution loss (46)m = 0.15 x (45)m	21.4805	18.7870	19.3865	16.9016	16.2175	13.9945	12.9679	14.8809	15.0586	17.5494	19.1565	20.8027 (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	1.5903	1.3403	1.3309	1.1148	1.0260	0.8477	0.7855	0.9414	0.9932	1.2047	1.3667	1.5401 (61)
Total heat required for water heating calculated for each month	144.7938	126.5870	130.5742	113.7923	109.1427	94.1442	87.2385	100.1475	101.3841	118.2006	129.0768	140.2250 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum (63)m =												0.0000 (63)
Output from w/h	144.7938	126.5870	130.5742	113.7923	109.1427	94.1442	87.2385	100.1475	101.3841	118.2006	129.0768	140.2250 (64)
Heat gains from water heating, kWh/month	48.0127	41.9796	43.3061	37.7440	36.2053	31.2330	28.9420	33.2214	33.6283	39.2023	42.8053	46.4978 (65)
Total per year (kWh/year) = Sum (64)m =												1395.3067 (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	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.7353	15.7523	12.8106	9.6985	7.2497	6.1205	6.6134	8.5964	11.5381	14.6502	17.0990	18.2282 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.2753	200.3328	195.1480	184.1103	170.1770	157.0818	148.3334	146.2759	151.4607	162.4984	176.4316	189.5269 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814 (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)	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511 (71)
Water heating gains (Table 5)	64.5332	62.4696	58.2072	52.4222	48.6631	43.3792	38.9005	44.6524	46.7059	52.6913	59.4518	62.4970 (72)
Total internal gains	340.3880	338.3989	326.0100	306.0751	285.9340	266.4257	253.6915	259.3688	269.5488	289.6841	312.8266	330.0963 (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)			
East				3.7100	19.6403	0.6300	0.7000	0.7700	22.2686 (76)			
South				7.8200	46.7521	0.6300	0.7000	0.7700	111.7325 (78)			
Solar gains	144.2051	246.0516	337.9722	421.3030	474.4560	472.2168	454.7666	414.8868	366.7734	272.2737	172.7954	123.3664 (83)
Total gains	484.5932	584.4505	663.9822	727.3781	760.3900	738.6425	708.4581	674.2556	636.3222	561.9578	485.6220	453.4626 (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	44.3371	44.3371	44.3371	44.3371	44.3371	44.3371	44.3371	44.3371	44.3371	44.3371	44.3371	44.3371
alpha	3.9558	3.9558	3.9558	3.9558	3.9558	3.9558	3.9558	3.9558	3.9558	3.9558	3.9558	3.9558
util living area	0.9898	0.9784	0.9552	0.9040	0.8049	0.6519	0.4974	0.5395	0.7550	0.9278	0.9810	0.9921 (86)
MIT	19.5053	19.7389	20.0604	20.4268	20.7348	20.9167	20.9779	20.9692	20.8465	20.4354	19.8828	19.4427 (87)
Th 2	19.9354	19.9354	19.9354	19.9354	19.9354	19.9354	19.9354	19.9354	19.9354	19.9354	19.9354	19.9354 (88)
util rest of house	0.9873	0.9731	0.9440	0.8791	0.7544	0.5659	0.3856	0.4266	0.6787	0.9037	0.9753	0.9901 (89)
MIT 2	18.5842	18.8148	19.1290	19.4779	19.7527	19.8932	19.9285	19.9250	19.8477	19.4940	18.9592	18.5221 (90)
Living area fraction									fLA = Living area / (4) =			0.2604 (91)
MIT	18.8241	19.0555	19.3716	19.7251	20.0085	20.1598	20.2018	20.1970	20.1078	19.7392	19.1998	18.7619 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8241	19.0555	19.3716	19.7251	20.0085	20.1598	20.2018	20.1970	20.1078	19.7392	19.1998	18.7619 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9837	0.9674	0.9366	0.8733	0.7583	0.5852	0.4145	0.4556	0.6923	0.8982	0.9702	0.9871 (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	1207.6981	1177.0422	1070.2848	900.1160	690.8573	462.3040	299.4956	315.7223	499.5563	759.9319	1006.1084	1210.8366 (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	543.8802	411.0177	333.5983	190.7110	85.0272	0.0000	0.0000	0.0000	0.0000	189.8341	385.1710	567.8551 (98)
Space heating												2707.0946 (98)
Space heating per m2												(98) / (4) = 38.4421 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)											
Fraction of space heat from main system(s)	1.0000 (202)											
Efficiency of main space heating system 1 (in %)	90.2000 (206)											
Efficiency of secondary/supplementary heating system, %	0.0000 (208)											
Space heating requirement	3001.2135 (211)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	543.8802	411.0177	333.5983	190.7110	85.0272	0.0000	0.0000	0.0000	0.0000	189.8341	385.1710	567.8551 (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)	602.9714	455.6737	369.8429	211.4313	94.2652	0.0000	0.0000	0.0000	0.0000	210.4591	427.0188	629.5511 (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	144.7938	126.5870	130.5742	113.7923	109.1427	94.1442	87.2385	100.1475	101.3841	118.2006	129.0768	140.2250 (64)
Efficiency of water heater (217)m	86.8453	86.4596	85.7673	84.4049	81.7568	76.2000	76.2000	76.2000	76.2000	84.2596	86.2237	76.2000 (216)
Fuel for water heating, kWh/month	166.7261	146.4116	152.2425	134.8172	133.4969	123.5488	114.4862	131.4271	133.0500	140.2814	149.6998	161.1165 (219)
Water heating fuel used												1687.3042 (219)
Annual totals kWh/year												3001.2135 (211)
Space heating fuel - main system												0.0000 (215)
Space heating fuel - secondary												
Electricity for pumps and fans:												
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.2380)												
mechanical ventilation fans (SFP = 0.2380)												51.1074 (230a)
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												126.1074 (231)
Electricity for lighting (calculated in Appendix L)												313.2107 (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												4436.9400 (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	3001.2135	0.2160	648.2621 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1687.3042	0.2160	364.4577 (264)
Space and water heating			1012.7198 (265)
Pumps and fans	126.1074	0.5190	65.4498 (267)
Energy for lighting	313.2107	0.5190	162.5563 (268)
Energy saving/generation technologies			
PV Unit	-690.8958	0.5190	-358.5749 (269)
Total CO2, kg/year			882.1510 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			12.5300 (273)

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

DER		12.5300 ZC1
Total Floor Area	TFA	70.4200
Assumed number of occupants	N	2.2563
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.6847 ZC2
CO2 emissions from cooking, equation (L16)		2.4588 ZC3
Total CO2 emissions		31.6735 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		31.6735 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	35.1100 (1b)	x 2.6800 (2b)	= 94.0948 (1b) - (3b)
First floor	35.3100 (1c)	x 2.3200 (2c)	= 81.9192 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.0140 (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) =	0.1704 (8)
Pressure test										Yes							
Measured/design AP50										5.0000							
Infiltration rate										0.4204 (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) =					0.3574 (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	0.4557	0.4467	0.4378	0.3931	0.3842	0.3395	0.3395	0.3306	0.3574	0.3842	0.4020	0.4199	(22b)				
Effective ac	0.6038	0.5998	0.5958	0.5773	0.5738	0.5576	0.5576	0.5546	0.5639	0.5738	0.5808	0.5882	(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)			14.6700	1.3258	19.4489			(27)					
Ground Floor			35.1100	0.1300	4.5643			(28a)					
Above Entrance			0.2000	0.1300	0.0260			(28b)					
Brick and Block	84.1100	16.8200	67.2900	0.1800	12.1122			(29a)					
Pitched Roof	35.3100		35.3100	0.1300	4.5903			(30)					
Total net area of external elements Aum(A, m2)			154.7300					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.8917			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.5461	(36)					
Total fabric heat loss						(33) + (36) =	53.4378	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 35.0721	Feb 34.8379	Mar 34.6084	Apr 33.5304	May 33.3287	Jun 32.3899	Jul 32.3899	Aug 32.2160	Sep 32.7515	Oct 33.3287	Nov 33.7368	Dec 34.1633	(38)
Heat transfer coeff	88.5098	88.2757	88.0462	86.9682	86.7665	85.8276	85.8276	85.6537	86.1893	86.7665	87.1745	87.6011	(39)
Average = Sum(39)m / 12 =												86.9672	(39)
HLP	Jan 1.2569	Feb 1.2536	Mar 1.2503	Apr 1.2350	May 1.2321	Jun 1.2188	Jul 1.2188	Aug 1.2163	Sep 1.2239	Oct 1.2321	Nov 1.2379	Dec 1.2440	(40)
HLP (average)												1.2350	(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												2.2563 (42)
Average daily hot water use (litres/day)												87.7866 (43)
Daily hot water use	Jan 96.5653	Feb 93.0538	Mar 89.5423	Apr 86.0309	May 82.5194	Jun 79.0079	Jul 79.0079	Aug 82.5194	Sep 86.0309	Oct 89.5423	Nov 93.0538	Dec 96.5653 (44)
Energy conte	143.2035	125.2467	129.2434	112.6775	108.1167	93.2965	86.4530	99.2060	100.3909	116.9959	127.7101	138.6849 (45)
Energy content (annual)										Total = Sum(45)m =		1381.2252 (45)
Distribution loss (46)m = 0.15 x (45)m	21.4805	18.7870	19.3865	16.9016	16.2175	13.9945	12.9679	14.8809	15.0586	17.5494	19.1565	20.8027 (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	49.2086	42.8302	45.6298	42.4262	42.0510	38.9628	40.2616	42.0510	42.4262	45.6298	45.8895	49.2086	(61)
Total heat required for water heating calculated for each month	192.4121	168.0769	174.8732	155.1037	150.1677	132.2594	126.7145	141.2570	142.8170	162.6257	173.5997	187.8935	(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	192.4121	168.0769	174.8732	155.1037	150.1677	132.2594	126.7145	141.2570	142.8170	162.6257	173.5997	187.8935	(64)
Heat gains from water heating, kWh/month	59.9173	52.3521	54.3809	48.0718	46.4616	40.7618	38.8110	43.4988	43.9865	50.3086	53.9360	58.4149	(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	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.7353	15.7523	12.8106	9.6985	7.2497	6.1205	6.6134	8.5964	11.5381	14.6502	17.0990	18.2282	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.2753	200.3328	195.1480	184.1103	170.1770	157.0818	148.3334	146.2759	151.4607	162.4984	176.4316	189.5269	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	(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)	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	(71)
Water heating gains (Table 5)	80.5340	77.9049	73.0926	66.7664	62.4483	56.6136	52.1653	58.4661	61.0924	67.6191	74.9111	78.5146	(72)
Total internal gains	356.3888	353.8342	340.8954	320.4193	299.7193	279.6601	266.9563	273.1825	283.9353	304.6119	328.2859	346.1139	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	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)
East	3.7100	19.6403	0.6300	0.7000	0.7700	22.2686	(76)
South	7.8200	46.7521	0.6300	0.7000	0.7700	111.7325	(78)

Solar gains	144.2051	246.0516	337.9722	421.3030	474.4560	472.2168	454.7666	414.8868	366.7734	272.2737	172.7954	123.3664	(83)
Total gains	500.5939	599.8858	678.8676	741.7223	774.1753	751.8769	721.7229	688.0693	650.7087	576.8856	501.0814	469.4803	(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	55.2512	55.3978	55.5422	56.2306	56.3614	56.9779	56.9779	57.0936	56.7388	56.3614	56.0976	55.8244	
alpha	4.6834	4.6932	4.7028	4.7487	4.7574	4.7985	4.7985	4.8062	4.7826	4.7574	4.7398	4.7216	
util living area	0.9958	0.9898	0.9753	0.9353	0.8430	0.6785	0.5118	0.5552	0.7879	0.9535	0.9910	0.9969	(86)
MIT	19.7185	19.9169	20.1951	20.5290	20.7972	20.9484	20.9891	20.9842	20.8921	20.5371	20.0613	19.6840	(87)
Th 2	19.8748	19.8774	19.8800	19.8921	19.8944	19.9050	19.9050	19.9070	19.9009	19.8944	19.8898	19.8850	(88)
util rest of house	0.9944	0.9865	0.9668	0.9125	0.7894	0.5828	0.3903	0.4319	0.7038	0.9323	0.9874	0.9959	(89)
MIT 2	18.1873	18.4771	18.8792	19.3551	19.7022	19.8720	19.9012	19.9008	19.8200	19.3775	18.6975	18.1441	(90)
Living area fraction	18.5861	18.8521	19.2219	19.6609	19.9874	20.1523	20.1846	20.1830	20.0992	19.6795	19.0527	18.5451	(92)
Temperature adjustment	18.5861	18.8521	19.2219	19.6609	19.9874	20.1523	20.1846	20.1830	20.0992	19.6795	19.0527	18.5451	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9921	0.9822	0.9603	0.9067	0.7945	0.6058	0.4222	0.4642	0.7207	0.9271	0.9836	0.9940	(94)
Ext temp.	496.6298	589.1900	651.9416	672.5289	615.0526	455.4806	304.6825	319.3725	468.9688	534.8157	492.8648	466.6549	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	1264.4582	1231.6317	1120.1161	935.8529	719.0646	476.5428	307.6537	324.0254	517.0644	787.7941	1041.9695	1256.6503	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating	571.2643	431.7208	348.3218	189.5933	77.3850	0.0000	0.0000	0.0000	0.0000	188.2159	395.3554	587.7565	(98)
Space heating per m2												2789.6130	(98)
												39.6139	(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													2986.7377 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	571.2643	431.7208	348.3218	189.5933	77.3850	0.0000	0.0000	0.0000	0.0000	188.2159	395.3554	587.7565	(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)	611.6321	462.2278	372.9356	202.9906	82.8533	0.0000	0.0000	0.0000	0.0000	201.5160	423.2927	629.2897	(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	192.4121	168.0769	174.8732	155.1037	150.1677	132.2594	126.7145	141.2570	142.8170	162.6257	173.5997	187.8935	(64)
Efficiency of water heater (217)m	87.6232	87.3222	86.7529	85.5577	83.4715	80.3000	80.3000	80.3000	80.3000	85.4198	87.0589	87.7271	(217)
Fuel for water heating, kWh/month	219.5904	192.4790	201.5762	181.2854	179.9030	164.7065	157.8014	175.9116	177.8544	190.3839	199.4049	214.1796	(219)
Water heating fuel used												2255.0764	(219)
Annual totals kWh/year													
Space heating fuel - main system												2986.7377	(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)												313.2107	(232)
Total delivered energy for all uses												5630.0247	(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	2986.7377	0.2160	645.1353 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2255.0764	0.2160	487.0965 (264)
Space and water heating			1132.2318 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	313.2107	0.5190	162.5563 (268)
Total CO2, kg/m2/year			1333.7132 (272)
Emissions per m2 for space and water heating			16.0783 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3084 (272b)
Emissions per m2 for pumps and fans			0.5528 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.0783 * 1.00) + 2.3084 + 0.5528, rounded to 2 d.p.			18.9400 (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	35.1100 (1b)	x 2.6800 (2b)	= 94.0948 (1b) - (3b)
First floor	35.3100 (1c)	x 2.3200 (2c)	= 81.9192 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.0140 (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)
Air changes per hour					
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					30.0000 / (5) = 0.1704 (8)
Pressure test					Yes
Measured/design AP50					3.5900
Infiltration rate					0.3499 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.2974 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.3792	0.3718	0.3644	0.3272	0.3198	0.2826	0.2826	0.2751	0.2974	0.3198	0.3346	0.3495 (22b)
	0.5719	0.5691	0.5664	0.5535	0.5511	0.5399	0.5399	0.5379	0.5442	0.5511	0.5560	0.5611 (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)			14.6700	1.1450	16.7977		(27)
Ground Floor			35.1100	0.1200	4.2132	84.0000	2949.2400 (28a)
Above Entrance			0.2000	0.1600	0.0320	22.4400	4.4880 (28b)
Brick and Block	84.1100	16.8200	67.2900	0.2400	16.1496	42.2200	2840.9838 (29a)
Pitched Roof	35.3100		35.3100	0.1000	3.5310	9.1000	321.3210 (30)
Total net area of external elements Aum(A, m ²)			154.7300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	43.0885		(33)
Party Wall 1			44.0300	0.0000	0.0000	110.0000	4843.3000 (32)
Ground Floor Stud			57.2900			9.0000	515.6100 (32c)
First Floor Stud			59.2400			9.0000	533.1600 (32c)
Internal Floor 1			35.1100			18.0000	631.9800 (32d)
Internal Ceiling 1			35.1100			9.0000	315.9900 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 12956.0728 (34)
183.9829 (35)
11.0203 (36)
(33) + (36) = 54.1088 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	33.2194	33.0572	32.8983	32.1515	32.0118	31.3613	31.3613	31.2409	31.6119	32.0118	32.2944	32.5899 (38)
Heat transfer coeff	87.3283	87.1661	87.0071	86.2603	86.1206	85.4702	85.4702	85.3497	85.7207	86.1206	86.4033	86.6988 (39)
Average = Sum(39)m / 12 =												86.2597 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2401	1.2378	1.2355	1.2249	1.2230	1.2137	1.2137	1.2120	1.2173	1.2230	1.2270	1.2312 (40)
HLP (average)												1.2249 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy
Average daily hot water use (litres/day)
2.2563 (42)
87.7866 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.5653	93.0538	89.5423	86.0309	82.5194	79.0079	79.0079	82.5194	86.0309	89.5423	93.0538	96.5653 (44)
Energy conte	143.2035	125.2467	129.2434	112.6775	108.1167	93.2965	86.4530	99.2060	100.3909	116.9959	127.7101	138.6849 (45)

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Energy content (annual)	Total = Sum(45)m = 1381.2252 (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 (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 (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 (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 (59)
Heat gains from water heating, kWh/month	30.4307	26.6149	27.4642	23.9440	22.9748	19.8255	18.3713	21.0813	21.3331	24.8616	27.1384 29.4706 (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	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.7353	15.7523	12.8106	9.6985	7.2497	6.1205	6.6134	8.5964	11.5381	14.6502	17.0990	18.2282	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.2753	200.3328	195.1480	184.1103	170.1770	157.0818	148.3334	146.2759	151.4607	162.4984	176.4316	189.5269	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	(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)	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	(71)
Water heating gains (Table 5)	40.9015	39.6055	36.9143	33.2555	30.8801	27.5354	24.6925	28.3351	29.6292	33.4162	37.6922	39.6110	(72)
Total internal gains	313.7563	312.5348	301.7171	283.9084	265.1511	247.5819	236.4835	240.0515	249.4722	267.4090	288.0670	304.2102	(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)	
East				3.7100	19.6403	0.6300	0.7000	0.7700			22.2686 (76)	
South				7.8200	46.7521	0.6300	0.7000	0.7700			111.7325 (78)	

Solar gains	144.2051	246.0516	337.9722	421.3030	474.4560	472.2168	454.7666	414.8868	366.7734	272.2737	172.7954	123.3664 (83)
Total gains	457.9615	558.5864	639.6893	705.2114	739.6070	719.7987	691.2501	654.9383	616.2456	539.6827	460.8625	427.5766 (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	41.2113	41.2879	41.3634	41.7215	41.7892	42.1072	42.1072	42.1666	41.9841	41.7892	41.6525	41.5105	
alpha	3.7474	3.7525	3.7576	3.7814	3.7859	3.8071	3.8071	3.8111	3.7989	3.7859	3.7768	3.7674	
util living area	0.9910	0.9808	0.9600	0.9130	0.8213	0.6724	0.5182	0.5621	0.7751	0.9359	0.9833	0.9930	(86)
MIT	19.3413	19.5866	19.9297	20.3374	20.6793	20.8953	20.9703	20.9594	20.8111	20.3526	19.7614	19.2925	(87)
Th 2	19.8880	19.8899	19.8917	19.9001	19.9017	19.9090	19.9090	19.9104	19.9062	19.9017	19.8985	19.8951	(88)
util rest of house	0.9887	0.9760	0.9497	0.8897	0.7725	0.5853	0.4010	0.4446	0.7000	0.9138	0.9783	0.9912	(89)
MIT 2	18.3879	18.6319	18.9699	19.3675	19.6779	19.8551	19.8997	19.8964	19.7961	19.3913	18.8137	18.3449	(90)
Living area fraction	18.6362	18.8805	19.2199	19.6201	19.9387	20.1260	20.1785	20.1732	20.0605	19.6417	19.0605	18.5917	(91)
MIT	18.6362	18.8805	19.2199	19.6201	19.9387	20.1260	20.1785	20.1732	20.0605	19.6417	19.0605	18.5917	(92)
Temperature adjustment	18.6362	18.8805	19.2199	19.6201	19.9387	20.1260	20.1785	20.1732	20.0605	19.6417	19.0605	18.5917	(93)
adjusted MIT	18.6362	18.8805	19.2199	19.6201	19.9387	20.1260	20.1785	20.1732	20.0605	19.6417	19.0605	18.5917	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	451.2004	541.9792	602.5391	622.4931	572.6936	434.6921	298.0523	310.7283	438.7042	489.6951	448.5082	422.5741	(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	1251.9562	1218.6271	1106.7188	924.7202	709.5208	472.3075	305.8563	322.0424	510.9351	778.6735	1033.4300	1247.7422	(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	595.7624	454.7074	375.1097	217.6035	101.7995	0.0000	0.0000	0.0000	0.0000	214.9999	421.1436	613.9251	(98)
Space heating												2995.0512	(98)
Space heating per m2												42.5313	(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	803.4198	632.4794	648.6580	0.0000	0.0000	0.0000	0.0000	(100)

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Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8438	0.9023	0.8835	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	677.9629	570.6713	573.0781	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	925.1484	890.0841	849.0004	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	177.9736	237.6432	205.2862	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												620.9030 (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	44.4934	59.4108	51.3215	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												155.2257 (107)
Space cooling per m2												2.2043 (108)
Energy for space heating												42.5313 (99)
Energy for space cooling												2.2043 (108)
Total												44.7355 (109)
Dwelling Fabric Energy Efficiency (DFEE)												44.7 (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	35.1100 (1b)	x 2.6800 (2b)	= 94.0948 (1b) - (3b)
First floor	35.3100 (1c)	x 2.3200 (2c)	= 81.9192 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.0140 (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) =	0.1704 (8)	
Pressure test										Yes							
Measured/design AP50										5.0000							
Infiltration rate										0.4204 (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) =				0.3574 (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	0.4557	0.4467	0.4378	0.3931	0.3842	0.3395	0.3395	0.3306	0.3574	0.3842	0.4020	0.4199	(22b)				
Effective ac	0.6038	0.5998	0.5958	0.5773	0.5738	0.5576	0.5576	0.5546	0.5639	0.5738	0.5808	0.5882	(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)			14.6700	1.3258	19.4489			(27)					
Ground Floor			35.1100	0.1300	4.5643			(28a)					
Above Entrance			0.2000	0.1300	0.0260			(28b)					
Brick and Block	84.1100	16.8200	67.2900	0.1800	12.1122			(29a)					
Pitched Roof	35.3100		35.3100	0.1300	4.5903			(30)					
Total net area of external elements Aum(A, m2)			154.7300					(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	42.8917		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.5461	(36)					
Total fabric heat loss						(33) + (36) =	53.4378	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 35.0721	Feb 34.8379	Mar 34.6084	Apr 33.5304	May 33.3287	Jun 32.3899	Jul 32.3899	Aug 32.2160	Sep 32.7515	Oct 33.3287	Nov 33.7368	Dec 34.1633	(38)
Heat transfer coeff	88.5098	88.2757	88.0462	86.9682	86.7665	85.8276	85.8276	85.6537	86.1893	86.7665	87.1745	87.6011	(39)
Average = Sum(39)m / 12 =												86.9672	(39)
HLP	Jan 1.2569	Feb 1.2536	Mar 1.2503	Apr 1.2350	May 1.2321	Jun 1.2188	Jul 1.2188	Aug 1.2163	Sep 1.2239	Oct 1.2321	Nov 1.2379	Dec 1.2440	(40)
HLP (average)												1.2350	(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												2.2563 (42)
Average daily hot water use (litres/day)												87.7866 (43)
Daily hot water use	Jan 96.5653	Feb 93.0538	Mar 89.5423	Apr 86.0309	May 82.5194	Jun 79.0079	Jul 79.0079	Aug 82.5194	Sep 86.0309	Oct 89.5423	Nov 93.0538	Dec 96.5653 (44)
Energy conte	143.2035	125.2467	129.2434	112.6775	108.1167	93.2965	86.4530	99.2060	100.3909	116.9959	127.7101	138.6849 (45)
Energy content (annual)										Total = Sum(45)m =		1381.2252 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water 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 (46)
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

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	30.4307	26.6149	27.4642	23.9440	22.9748	19.8255	18.3713	21.0813	21.3331	24.8616	27.1384	29.4706 (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	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.7353	15.7523	12.8106	9.6985	7.2497	6.1205	6.6134	8.5964	11.5381	14.6502	17.0990	18.2282	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.2753	200.3328	195.1480	184.1103	170.1770	157.0818	148.3334	146.2759	151.4607	162.4984	176.4316	189.5269	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	(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)	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	(71)
Water heating gains (Table 5)	40.9015	39.6055	36.9143	33.2555	30.8801	27.5354	24.6925	28.3351	29.6292	33.4162	37.6922	39.6110	(72)
Total internal gains	313.7563	312.5348	301.7171	283.9084	265.1511	247.5819	236.4835	240.0515	249.4722	267.4090	288.0670	304.2102	(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)				
East				3.7100	19.6403	0.6300	0.7000	0.7700	22.2686 (76)				
South				7.8200	46.7521	0.6300	0.7000	0.7700	111.7325 (78)				
Solar gains	144.2051	246.0516	337.9722	421.3030	474.4560	472.2168	454.7666	414.8868	366.7734	272.2737	172.7954	123.3664	(83)
Total gains	457.9615	558.5864	639.6893	705.2114	739.6070	719.7987	691.2501	654.9383	616.2456	539.6827	460.8625	427.5766	(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	55.2512	55.3978	55.5422	56.2306	56.3614	56.9779	56.9779	57.0936	56.7388	56.3614	56.0976	55.8244	
alpha	4.6834	4.6932	4.7028	4.7487	4.7574	4.7985	4.7985	4.8062	4.7826	4.7574	4.7398	4.7216	
util living area	0.9971	0.9924	0.9803	0.9452	0.8602	0.7007	0.5323	0.5796	0.8120	0.9633	0.9936	0.9979	(86)
MIT	19.6637	19.8652	20.1492	20.4934	20.7757	20.9408	20.9872	20.9810	20.8759	20.4974	20.0105	19.6298	(87)
Th 2	19.8748	19.8774	19.8800	19.8921	19.8944	19.9050	19.9050	19.9070	19.9009	19.8944	19.8898	19.8850	(88)
util rest of house	0.9962	0.9898	0.9733	0.9251	0.8096	0.6048	0.4070	0.4527	0.7310	0.9457	0.9910	0.9972	(89)
MIT 2	18.6682	18.8705	19.1525	19.4934	19.7470	19.8787	19.9019	19.9018	19.8358	19.5053	19.0258	18.6424	(90)
Living area fraction	18.9275	19.1295	19.4121	19.7539	20.0149	20.1553	20.1846	20.1829	20.1067	19.7637	19.2823	18.8996	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9275	19.1295	19.4121	19.7539	20.0149	20.1553	20.1846	20.1829	20.1067	19.7637	19.2823	18.8996	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	455.6777	551.6005	620.2372	650.2656	603.4355	452.2393	304.1122	318.3637	461.0408	508.9412	455.8318	426.0068	(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	1294.6753	1256.1229	1136.8589	943.9406	721.4535	476.7975	307.6543	324.0200	517.7120	795.1024	1061.9822	1287.6981	(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	624.2142	473.4390	384.3665	211.4460	87.8054	0.0000	0.0000	0.0000	0.0000	212.9040	436.4283	641.0983	(98)
Space heating												3071.7017	(98)
Space heating per m2												43.6197	(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	806.7796	635.1244	650.9685	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8789	0.9340	0.9172	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	709.1053	593.1756	597.0753	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	925.1484	890.0841	849.0004	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	155.5511	220.9000	187.4323	0.0000	0.0000	0.0000	0.0000	(104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling												563.8833 (104)
Cooled fraction												1.0000 (105)
Intermittency factor (Table 10b)												
	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)	
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	38.8878	55.2250	46.8581	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												140.9708 (107)
Space cooling per m2												2.0019 (108)
Energy for space heating												43.6197 (99)
Energy for space cooling												2.0019 (108)
Total												45.6216 (109)
Target Fabric Energy Efficiency (TFEE)												52.5 (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	35.1100 (1b)	x 2.6800 (2b)	= 94.0948 (1b) - (3b)
First floor	35.3100 (1c)	x 2.3200 (2c)	= 81.9192 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.0140 (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											3.5900	
Infiltration rate											0.1795	(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) =	0.1526 (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												
	0.1793	0.1678	0.1678	0.1526	0.1564	0.1488	0.1488	0.1449	0.1449	0.1564	0.1526	0.1564 (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)			14.6700	1.1450	16.7977		(27)					
Ground Floor			35.1100	0.1200	4.2132	84.0000	2949.2400 (28a)					
Above Entrance			0.2000	0.1600	0.0320	22.4400	4.4880 (28b)					
Brick and Block	84.1100	16.8200	67.2900	0.2400	16.1496	42.2200	2840.9838 (29a)					
Pitched Roof	35.3100		35.3100	0.1000	3.5310	9.1000	321.3210 (30)					
Total net area of external elements Aum(A, m2)			154.7300				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	43.0885		(33)					
Party Wall 1			44.0300	0.0000	0.0000	110.0000	4843.3000 (32)					
Ground Floor Stud			57.2900			9.0000	515.6100 (32c)					
First Floor Stud			59.2400			9.0000	533.1600 (32c)					
Internal Floor 1			35.1100			18.0000	631.9800 (32d)					
Internal Ceiling 1			35.1100			18.0000	631.9800 (32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13272.0628 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							188.4701 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.0203 (36)					
Total fabric heat loss						(33) + (36) =	54.1088 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 29.0423	Feb 29.0423	Mar 29.0423	Apr 29.0423	May 29.0423	Jun 29.0423	Jul 29.0423	Aug 29.0423	Sep 29.0423	Oct 29.0423	Nov 29.0423	Dec 29.0423 (38)
Heat transfer coeff	83.1512	83.1512	83.1512	83.1512	83.1512	83.1512	83.1512	83.1512	83.1512	83.1512	83.1512	83.1512 (39)
Average = Sum(39)m / 12 =												83.1512 (39)
HLP	Jan 1.1808	Feb 1.1808	Mar 1.1808	Apr 1.1808	May 1.1808	Jun 1.1808	Jul 1.1808	Aug 1.1808	Sep 1.1808	Oct 1.1808	Nov 1.1808	Dec 1.1808 (40)
HLP (average)												1.1808 (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												2.2563 (42)
Average daily hot water use (litres/day)												87.7866 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Daily hot water use	96.5653	93.0538	89.5423	86.0309	82.5194	79.0079	79.0079	82.5194	86.0309	89.5423	93.0538	96.5653 (44)
Energy conte	143.2035	125.2467	129.2434	112.6775	108.1167	93.2965	86.4530	99.2060	100.3909	116.9959	127.7101	138.6849 (45)
Energy content (annual)										Total =	Sum (45)m =	1381.2252 (45)
Distribution loss (46)m = 0.15 x (45)m	21.4805	18.7870	19.3865	16.9016	16.2175	13.9945	12.9679	14.8809	15.0586	17.5494	19.1565	20.8027 (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	1.5903	1.3403	1.3309	1.1148	1.0260	0.8477	0.7855	0.9414	0.9932	1.2047	1.3667	1.5401 (61)
Total heat required for water heating calculated for each month	144.7938	126.5870	130.5742	113.7923	109.1427	94.1442	87.2385	100.1475	101.3841	118.2006	129.0768	140.2250 (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	144.7938	126.5870	130.5742	113.7923	109.1427	94.1442	87.2385	100.1475	101.3841	118.2006	129.0768	140.2250 (64)
RHI water heating demand										Total per year (kWh/year) =	Sum (64)m =	1395.3067 (64)
Heat gains from water heating, kWh/month	48.0127	41.9796	43.3061	37.7440	36.2053	31.2330	28.9420	33.2214	33.6283	39.2023	42.8053	46.4978 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	44.3382	39.3808	32.0266	24.2462	18.1243	15.3013	16.5336	21.4910	28.8452	36.6256	42.7475	45.5705 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	295.9333	299.0042	291.2657	274.7914	253.9956	234.4504	221.3931	218.3222	226.0607	242.5350	263.3308	282.8760 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939 (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)	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511 (71)
Water heating gains (Table 5)	64.5332	62.4696	58.2072	52.4222	48.6631	43.3792	38.9005	44.6524	46.7059	52.6913	59.4518	62.4970 (72)
Total internal gains	503.7243	499.7741	480.4190	450.3793	419.7025	392.0505	375.7467	383.3851	400.5313	430.7714	464.4496	489.8630 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	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)
East	3.7100	25.1733	0.6300	0.7000	0.7700	28.5420 (76)
South	7.8200	56.5862	0.6300	0.7000	0.7700	135.2350 (78)

Solar gains	176.7017	256.6022	359.6029	452.6519	482.6356	533.0613	492.6158	466.4951	409.3117	306.5302	211.0191	143.1267 (83)
Total gains	680.4260	756.3763	840.0219	903.0312	902.3381	925.1118	868.3625	849.8803	809.8430	737.3016	675.4687	632.9897 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	44.3371	44.3371	44.3371	44.3371	44.3371	44.3371	44.3371	44.3371	44.3371	44.3371	44.3371	44.3371
alpha	3.9558	3.9558	3.9558	3.9558	3.9558	3.9558	3.9558	3.9558	3.9558	3.9558	3.9558	3.9558
util living area	0.9598	0.9406	0.8932	0.7997	0.6568	0.4468	0.3137	0.3109	0.5457	0.7997	0.9262	0.9672 (86)
MIT	19.9683	20.1189	20.4015	20.6971	20.8944	20.9824	20.9968	20.9970	20.9610	20.7526	20.3333	19.9147 (87)
Th 2	19.9354	19.9354	19.9354	19.9354	19.9354	19.9354	19.9354	19.9354	19.9354	19.9354	19.9354	19.9354 (88)
util rest of house	0.9502	0.9269	0.8692	0.7569	0.5882	0.3585	0.2137	0.2086	0.4533	0.7461	0.9062	0.9590 (89)
MIT 2	19.0384	19.1829	19.4494	19.7145	19.8736	19.9290	19.9349	19.9349	19.9189	19.7686	19.3920	18.9872 (90)
Living area fraction									fLA =	Living area / (4) =		0.2604 (91)
MIT	19.2806	19.4267	19.6974	19.9704	20.1394	20.2033	20.2114	20.2115	20.1903	20.0249	19.6371	19.2288 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2806	19.4267	19.6974	19.9704	20.1394	20.2033	20.2114	20.2115	20.1903	20.0249	19.6371	19.2288 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	641.5785	695.2116	725.0444	684.8656	543.3002	352.6585	208.2617	200.0141	385.7236	553.7947	607.5622	602.7773 (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	1137.5583	1116.4420	1005.9130	820.7341	585.3370	357.8270	208.8271	200.5205	398.3206	658.9660	917.7499	1124.9336 (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	369.0090	283.0669	208.9663	97.8253	31.2754	0.0000	0.0000	0.0000	0.0000	78.2475	223.3352	388.4843 (98)
Space heating												1680.2098 (98)
RHI space heating demand												1680 (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	35.1100 (1b)	x 2.6800 (2b)	= 94.0948 (1b) - (3b)
First floor	35.3100 (1c)	x 2.3200 (2c)	= 81.9192 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.0140 (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												3.5900
Infiltration rate												0.1795 (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) =	0.1526 (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												
	0.1945	0.1907	0.1869	0.1678	0.1640	0.1449	0.1449	0.1411	0.1526	0.1640	0.1716	0.1793 (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)			14.6700	1.1450	16.7977		(27)					
Ground Floor			35.1100	0.1200	4.2132	84.0000	2949.2400 (28a)					
Above Entrance			0.2000	0.1600	0.0320	22.4400	4.4880 (28b)					
Brick and Block	84.1100	16.8200	67.2900	0.2400	16.1496	42.2200	2840.9838 (29a)					
Pitched Roof	35.3100		35.3100	0.1000	3.5310	9.1000	321.3210 (30)					
Total net area of external elements Aum(A, m2)			154.7300				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	43.0885		(33)					
Party Wall 1			44.0300	0.0000	0.0000	110.0000	4843.3000 (32)					
Ground Floor Stud			57.2900			9.0000	515.6100 (32c)					
First Floor Stud			59.2400			9.0000	533.1600 (32c)					
Internal Floor 1			35.1100			18.0000	631.9800 (32d)					
Internal Ceiling 1			35.1100			18.0000	631.9800 (32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13272.0628 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							188.4701 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.0203 (36)					
Total fabric heat loss						(33) + (36) =	54.1088 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 29.0423	Feb 29.0423	Mar 29.0423	Apr 29.0423	May 29.0423	Jun 29.0423	Jul 29.0423	Aug 29.0423	Sep 29.0423	Oct 29.0423	Nov 29.0423	Dec 29.0423 (38)
Heat transfer coeff	83.1512	83.1512	83.1512	83.1512	83.1512	83.1512	83.1512	83.1512	83.1512	83.1512	83.1512	83.1512 (39)
Average = Sum(39)m / 12 =												83.1512 (39)
HLP	Jan 1.1808	Feb 1.1808	Mar 1.1808	Apr 1.1808	May 1.1808	Jun 1.1808	Jul 1.1808	Aug 1.1808	Sep 1.1808	Oct 1.1808	Nov 1.1808	Dec 1.1808 (40)
HLP (average)												1.1808 (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												2.2563 (42)
Average daily hot water use (litres/day)												87.7866 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Daily hot water use	96.5653	93.0538	89.5423	86.0309	82.5194	79.0079	79.0079	82.5194	86.0309	89.5423	93.0538	96.5653 (44)
Energy conte	143.2035	125.2467	129.2434	112.6775	108.1167	93.2965	86.4530	99.2060	100.3909	116.9959	127.7101	138.6849 (45)
Energy content (annual)										Total =	Sum (45)m =	1381.2252 (45)
Distribution loss (46)m = 0.15 x (45)m	21.4805	18.7870	19.3865	16.9016	16.2175	13.9945	12.9679	14.8809	15.0586	17.5494	19.1565	20.8027 (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	1.5903	1.3403	1.3309	1.1148	1.0260	0.8477	0.7855	0.9414	0.9932	1.2047	1.3667	1.5401 (61)
Total heat required for water heating calculated for each month	144.7938	126.5870	130.5742	113.7923	109.1427	94.1442	87.2385	100.1475	101.3841	118.2006	129.0768	140.2250 (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	144.7938	126.5870	130.5742	113.7923	109.1427	94.1442	87.2385	100.1475	101.3841	118.2006	129.0768	140.2250 (64)
Heat gains from water heating, kWh/month	48.0127	41.9796	43.3061	37.7440	36.2053	31.2330	28.9420	33.2214	33.6283	39.2023	42.8053	46.4978 (65)
										Total per year (kWh/year) =	Sum (64)m =	1395.3067 (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	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	44.3382	39.3808	32.0266	24.2462	18.1243	15.3013	16.5336	21.4910	28.8452	36.6256	42.7475	45.5705 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	295.9333	299.0042	291.2657	274.7914	253.9956	234.4504	221.3931	218.3222	226.0607	242.5350	263.3308	282.8760 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939 (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)	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511 (71)
Water heating gains (Table 5)	64.5332	62.4696	58.2072	52.4222	48.6631	43.3792	38.9005	44.6524	46.7059	52.6913	59.4518	62.4970 (72)
Total internal gains	503.7243	499.7741	480.4190	450.3793	419.7025	392.0505	375.7467	383.3851	400.5313	430.7714	464.4496	489.8630 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
North				3.1400	10.6334		0.6300	0.7000	0.7700		10.2041 (74)	
East				3.7100	19.6403		0.6300	0.7000	0.7700		22.2686 (76)	
South				7.8200	46.7521		0.6300	0.7000	0.7700		111.7325 (78)	

Solar gains	144.2051	246.0516	337.9722	421.3030	474.4560	472.2168	454.7666	414.8868	366.7734	272.2737	172.7954	123.3664 (83)
Total gains	647.9294	745.8257	818.3912	871.6823	894.1585	864.2673	830.5133	798.2719	767.3047	703.0451	637.2450	613.2293 (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	44.3371	44.3371	44.3371	44.3371	44.3371	44.3371	44.3371	44.3371	44.3371	44.3371	44.3371	44.3371
alpha	3.9558	3.9558	3.9558	3.9558	3.9558	3.9558	3.9558	3.9558	3.9558	3.9558	3.9558	3.9558
util living area	0.9732	0.9537	0.9187	0.8511	0.7366	0.5775	0.4307	0.4652	0.6695	0.8715	0.9551	0.9780 (86)
MIT	19.7535	19.9682	20.2538	20.5655	20.8114	20.9457	20.9866	20.9817	20.9013	20.5855	20.1002	19.6891 (87)
Th 2	19.9354	19.9354	19.9354	19.9354	19.9354	19.9354	19.9354	19.9354	19.9354	19.9354	19.9354	19.9354 (88)
util rest of house	0.9670	0.9433	0.9007	0.8182	0.6807	0.4948	0.3310	0.3638	0.5901	0.8357	0.9432	0.9729 (89)
MIT 2	18.8279	19.0365	19.3104	19.5993	19.8103	19.9090	19.9314	19.9295	19.8820	19.6251	19.1687	18.7649 (90)
Living area fraction									fLA = Living area / (4) =			0.2604 (91)
MIT	19.0689	19.2792	19.5561	19.8509	20.0710	20.1790	20.2062	20.2035	20.1475	19.8752	19.4113	19.0056 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0689	19.2792	19.5561	19.8509	20.0710	20.1790	20.2062	20.2035	20.1475	19.8752	19.4113	19.0056 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9607	0.9356	0.8932	0.8153	0.6884	0.5145	0.3569	0.3900	0.6069	0.8334	0.9360	0.9671 (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	1228.0546	1195.6443	1085.6299	910.5796	696.0580	463.9028	299.8624	316.2670	502.8543	771.2448	1023.7023	1231.1017 (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	450.5616	334.5393	263.8698	143.9541	59.9206	0.0000	0.0000	0.0000	0.0000	137.8899	307.6096	474.7094 (98)
Space heating												2173.0543 (98)
Space heating per m2										(98) / (4) =		30.8585 (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													2409.1511 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	450.5616	334.5393	263.8698	143.9541	59.9206	0.0000	0.0000	0.0000	0.0000	137.8899	307.6096	474.7094	(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)	499.5140	370.8862	292.5386	159.5944	66.4308	0.0000	0.0000	0.0000	0.0000	152.8713	341.0306	526.2853	(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	144.7938	126.5870	130.5742	113.7923	109.1427	94.1442	87.2385	100.1475	101.3841	118.2006	129.0768	140.2250	(64)
Efficiency of water heater	86.3419	85.8691	85.0286	83.4325	80.6358	76.2000	76.2000	76.2000	76.2000	83.1489	85.5539	76.2000	(216)
Fuel for water heating, kWh/month	167.6981	147.4186	153.5651	136.3884	135.3526	123.5488	114.4862	131.4271	133.0500	142.1553	150.8719	161.9733	(219)
Water heating fuel used												1697.9355	(219)
Annual totals kWh/year													
Space heating fuel - main system												2409.1511	(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)													51.1074 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													126.1074 (231)
Electricity for lighting (calculated in Appendix L)													313.2107 (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													3855.5090 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2409.1511	3.4800	83.8385 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1697.9355	3.4800	59.0882 (247)
Mechanical ventilation fans	51.1074	13.1900	6.7411 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	313.2107	13.1900	41.3125 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-690.8958	13.1900	-91.1292 (252)
Total energy cost			229.7435 (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] =	0.8360 (257)
SAP value		88.3377
SAP rating (Section 12)		88 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2409.1511	0.2160	520.3766 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1697.9355	0.2160	366.7541 (264)
Space and water heating			887.1307 (265)
Pumps and fans	126.1074	0.5190	65.4498 (267)
Energy for lighting	313.2107	0.5190	162.5563 (268)
Energy saving/generation technologies			
PV Unit	-690.8958	0.5190	-358.5749 (269)
Total kg/year			756.5619 (272)
CO2 emissions per m2			10.7400 (273)
EI value			91.2165
EI rating			91 (274)

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CALCULATION OF ENERGY RATINGS 09 Jan 2014

EI band

B

Calculation of stars for heating and DHW	

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9020 = 3.858$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9020 = 0.2395$, stars = 4
Water heating energy efficiency	$3.48 / 0.8178 = 4.255$, stars = 4
Water heating environmental impact	$0.216 / 0.8178 = 0.2641$, 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	35.1100 (1b)	x 2.6800 (2b)	= 94.0948 (1b) - (3b)
First floor	35.3100 (1c)	x 2.3200 (2c)	= 81.9192 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.0140 (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											3.5900		
Infiltration rate											0.1795	(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) =		0.1526	(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)	
	0.1793	0.1678	0.1678	0.1526	0.1564	0.1488	0.1488	0.1449	0.1449	0.1564	0.1526	0.1564 (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)			14.6700	1.1450	16.7977		(27)					
Ground Floor			35.1100	0.1200	4.2132	84.0000	2949.2400 (28a)					
Above Entrance			0.2000	0.1600	0.0320	22.4400	4.4880 (28b)					
Brick and Block	84.1100	16.8200	67.2900	0.2400	16.1496	42.2200	2840.9838 (29a)					
Pitched Roof	35.3100		35.3100	0.1000	3.5310	9.1000	321.3210 (30)					
Total net area of external elements Aum(A, m2)			154.7300				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	43.0885		(33)					
Party Wall 1			44.0300	0.0000	0.0000	110.0000	4843.3000 (32)					
Ground Floor Stud			57.2900			9.0000	515.6100 (32c)					
First Floor Stud			59.2400			9.0000	533.1600 (32c)					
Internal Floor 1			35.1100			18.0000	631.9800 (32d)					
Internal Ceiling 1			35.1100			18.0000	631.9800 (32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13272.0628 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							188.4701 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.0203 (36)					
Total fabric heat loss						(33) + (36) =	54.1088 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 29.0423	Feb 29.0423	Mar 29.0423	Apr 29.0423	May 29.0423	Jun 29.0423	Jul 29.0423	Aug 29.0423	Sep 29.0423	Oct 29.0423	Nov 29.0423	Dec 29.0423 (38)
Heat transfer coeff	83.1512	83.1512	83.1512	83.1512	83.1512	83.1512	83.1512	83.1512	83.1512	83.1512	83.1512	83.1512 (39)
Average = Sum(39)m / 12 =												83.1512 (39)
HLP	Jan 1.1808	Feb 1.1808	Mar 1.1808	Apr 1.1808	May 1.1808	Jun 1.1808	Jul 1.1808	Aug 1.1808	Sep 1.1808	Oct 1.1808	Nov 1.1808	Dec 1.1808 (40)
HLP (average)												1.1808 (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												2.2563 (42)
Average daily hot water use (litres/day)												87.7866 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Daily hot water use	96.5653	93.0538	89.5423	86.0309	82.5194	79.0079	79.0079	82.5194	86.0309	89.5423	93.0538	96.5653 (44)
Energy conte	143.2035	125.2467	129.2434	112.6775	108.1167	93.2965	86.4530	99.2060	100.3909	116.9959	127.7101	138.6849 (45)
Energy content (annual)										Total = Sum (45)m =		1381.2252 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.4805	18.7870	19.3865	16.9016	16.2175	13.9945	12.9679	14.8809	15.0586	17.5494	19.1565	20.8027 (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	1.5903	1.3403	1.3309	1.1148	1.0260	0.8477	0.7855	0.9414	0.9932	1.2047	1.3667	1.5401 (61)
Total heat required for water heating calculated for each month												
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
								Solar input (sum of months) = Sum (63)m =				0.0000 (63)
Output from w/h	144.7938	126.5870	130.5742	113.7923	109.1427	94.1442	87.2385	100.1475	101.3841	118.2006	129.0768	140.2250 (62)
								Total per year (kWh/year) = Sum (64)m =				1395.3067 (64)
Heat gains from water heating, kWh/month	48.0127	41.9796	43.3061	37.7440	36.2053	31.2330	28.9420	33.2214	33.6283	39.2023	42.8053	46.4978 (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	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	44.3382	39.3808	32.0266	24.2462	18.1243	15.3013	16.5336	21.4910	28.8452	36.6256	42.7475	45.5705 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	295.9333	299.0042	291.2657	274.7914	253.9956	234.4504	221.3931	218.3222	226.0607	242.5350	263.3308	282.8760 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939 (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)	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511 (71)
Water heating gains (Table 5)	64.5332	62.4696	58.2072	52.4222	48.6631	43.3792	38.9005	44.6524	46.7059	52.6913	59.4518	62.4970 (72)
Total internal gains	503.7243	499.7741	480.4190	450.3793	419.7025	392.0505	375.7467	383.3851	400.5313	430.7714	464.4496	489.8630 (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)		
East				3.7100	25.1733	0.6300	0.7000		0.7700	28.5420 (76)		
South				7.8200	56.5862	0.6300	0.7000		0.7700	135.2350 (78)		
Solar gains	176.7017	256.6022	359.6029	452.6519	482.6356	533.0613	492.6158	466.4951	409.3117	306.5302	211.0191	143.1267 (83)
Total gains	680.4260	756.3763	840.0219	903.0312	902.3381	925.1118	868.3625	849.8803	809.8430	737.3016	675.4687	632.9897 (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	44.3371	44.3371	44.3371	44.3371	44.3371	44.3371	44.3371	44.3371	44.3371	44.3371	44.3371	44.3371
alpha	3.9558	3.9558	3.9558	3.9558	3.9558	3.9558	3.9558	3.9558	3.9558	3.9558	3.9558	3.9558
util living area	0.9598	0.9406	0.8932	0.7997	0.6568	0.4468	0.3137	0.3109	0.5457	0.7997	0.9262	0.9672 (86)
MIT	19.9683	20.1189	20.4015	20.6971	20.8944	20.9824	20.9968	20.9970	20.9610	20.7526	20.3333	19.9147 (87)
Th 2	19.9354	19.9354	19.9354	19.9354	19.9354	19.9354	19.9354	19.9354	19.9354	19.9354	19.9354	19.9354 (88)
util rest of house	0.9502	0.9269	0.8692	0.7569	0.5882	0.3585	0.2137	0.2086	0.4533	0.7461	0.9062	0.9590 (89)
MIT 2	19.0384	19.1829	19.4494	19.7145	19.8736	19.9290	19.9349	19.9349	19.9189	19.7686	19.3920	18.9872 (90)
Living area fraction									fLA = Living area / (4) =			0.2604 (91)
MIT	19.2806	19.4267	19.6974	19.9704	20.1394	20.2033	20.2114	20.2115	20.1903	20.0249	19.6371	19.2288 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2806	19.4267	19.6974	19.9704	20.1394	20.2033	20.2114	20.2115	20.1903	20.0249	19.6371	19.2288 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9429	0.9191	0.8631	0.7584	0.6021	0.3812	0.2398	0.2353	0.4763	0.7511	0.8995	0.9523 (94)
Ext temp.	641.5785	695.2116	725.0444	684.8656	543.3002	352.6585	208.2617	200.0141	385.7236	553.7947	607.5622	602.7773 (95)
Heat loss rate W	5.6000	6.0000	7.6000	10.1000	13.1000	15.9000	17.7000	17.8000	15.4000	12.1000	8.6000	5.7000 (96)
Month fracti	1137.5583	1116.4420	1005.9130	820.7341	585.3370	357.8270	208.8271	200.5205	398.3206	658.9660	917.7499	1124.9336 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating	369.0090	283.0669	208.9663	97.8253	31.2754	0.0000	0.0000	0.0000	0.0000	78.2475	223.3352	388.4843 (98)
Space heating per m2												1680.2098 (98)
										(98) / (4) =		23.8598 (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													1862.7603 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	369.0090	283.0669	208.9663	97.8253	31.2754	0.0000	0.0000	0.0000	0.0000	78.2475	223.3352	388.4843	(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)	409.1009	313.8214	231.6699	108.4538	34.6734	0.0000	0.0000	0.0000	0.0000	86.7488	247.6000	430.6921	(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	144.7938	126.5870	130.5742	113.7923	109.1427	94.1442	87.2385	100.1475	101.3841	118.2006	129.0768	140.2250	(64)
Efficiency of water heater (217)m	85.7597	85.3542	84.2475	82.0899	78.9286	76.2000	76.2000	76.2000	76.2000	81.2213	84.5129	76.2000	(216)
Fuel for water heating, kWh/month	168.8366	148.3079	154.9888	138.6190	138.2804	123.5488	114.4862	131.4271	133.0500	145.5291	152.7303	163.0355	(219)
Water heating fuel used												1712.8398	(219)
Annual totals kWh/year													
Space heating fuel - main system												1862.7603	(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)													51.1074 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													126.1074 (231)
Electricity for lighting (calculated in Appendix L)													313.2107 (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													3243.0717 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1862.7603	7.3800	137.4717 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1712.8398	7.3800	126.4076 (247)
Mechanical ventilation fans	51.1074	28.6600	14.6474 (249)
Pumps and fans for heating	75.0000	28.6600	21.4950 (249)
Energy for lighting	313.2107	28.6600	89.7662 (250)
Additional standing charges			107.0000 (251)
Energy saving/generation technologies			
PV Unit	-771.8465	28.6600	-221.2112 (252)
Total energy cost			275.5766 (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	1862.7603	0.2160	402.3562 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1712.8398	0.2160	369.9734 (264)
Space and water heating			772.3296 (265)
Pumps and fans	126.1074	0.5190	65.4498 (267)
Energy for lighting	313.2107	0.5190	162.5563 (268)
Energy saving/generation technologies			
PV Unit	-771.8465	0.5190	-400.5884 (269)
Total kg/year			599.7474 (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	1862.7603	1.2200	2272.5676 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1712.8398	1.2200	2089.6645 (264)
Space and water heating			4362.2322 (265)
Pumps and fans	126.1074	3.0700	387.1498 (267)
Energy for lighting	313.2107	3.0700	961.5567 (268)

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Energy saving/generation technologies
PV Unit -771.8465 3.0700 -2369.5689 (269)
Primary energy kWh/year 3341.3698 (272)
Primary energy kWh/m2/year 47.4492 (273)

SAP 2012 EPC IMPROVEMENTS

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

(For testing purposes):

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

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.4	-£ 61	-195 kg (32.6%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£61 2.77 kg/m²	B 90	A 93
Total Savings	£61 2.77 kg/m²		

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

Fuel prices for cost data on this page from database revision number 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	£126	£140	-£14
Mains gas	£371	£295	£76
Space heating	£281	£281	£0
Water heating	£126	£65	£61
Lighting	£90	£90	£0
Generated (PV)	-£221	-£221	£0
Total cost of fuels	£276	£214	£62
Total cost of uses	£276	£215	£61
Delivered energy	46 kWh/m²	32 kWh/m²	14 kWh/m²
Carbon dioxide emissions	0.6 tonnes	0.4 tonnes	0.2 tonnes
CO2 emissions per m²	9 kg/m²	6 kg/m²	3 kg/m²
Primary energy	47 kWh/m²	32 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	35.1100 (1b)	x 2.6800 (2b)	= 94.0948 (1b) - (3b)
First floor	35.3100 (1c)	x 2.3200 (2c)	= 81.9192 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.0140 (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					3.5900
Infiltration rate					0.1795 (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)	=	0.1526 (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	0.1945	0.1907	0.1869	0.1678	0.1640	0.1449	0.1449	0.1411	0.1526	0.1640	0.1716	0.1793 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.20)			14.6700	1.1450	16.7977		(27)
Ground Floor			35.1100	0.1200	4.2132	84.0000	2949.2400 (28a)
Above Entrance			0.2000	0.1600	0.0320	22.4400	4.4880 (28b)
Brick and Block	84.1100	16.8200	67.2900	0.2400	16.1496	42.2200	2840.9838 (29a)
Pitched Roof	35.3100		35.3100	0.1000	3.5310	9.1000	321.3210 (30)
Total net area of external elements Aum(A, m ²)			154.7300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	43.0885		(33)
Party Wall 1			44.0300	0.0000	0.0000	110.0000	4843.3000 (32)
Ground Floor Stud			57.2900			9.0000	515.6100 (32c)
First Floor Stud			59.2400			9.0000	533.1600 (32c)
Internal Floor 1			35.1100			18.0000	631.9800 (32d)
Internal Ceiling 1			35.1100			18.0000	631.9800 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 13272.0628 (34)
188.4701 (35)
11.0203 (36)
(33) + (36) = 54.1088 (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	29.0423	29.0423	29.0423	29.0423	29.0423	29.0423	29.0423	29.0423	29.0423	29.0423	29.0423	29.0423 (38)
Heat transfer coeff	83.1512	83.1512	83.1512	83.1512	83.1512	83.1512	83.1512	83.1512	83.1512	83.1512	83.1512	83.1512 (39)
Average = Sum(39)m / 12 =												83.1512 (39)
HLP	1.1808	1.1808	1.1808	1.1808	1.1808	1.1808	1.1808	1.1808	1.1808	1.1808	1.1808	1.1808 (40)
HLP (average)												1.1808 (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												2.2563 (42)
Average daily hot water use (litres/day)												87.7866 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Daily hot water use	96.5653	93.0538	89.5423	86.0309	82.5194	79.0079	79.0079	82.5194	86.0309	89.5423	93.0538	96.5653 (44)
Energy conte	143.2035	125.2467	129.2434	112.6775	108.1167	93.2965	86.4530	99.2060	100.3909	116.9959	127.7101	138.6849 (45)
Energy content (annual)												1381.2252 (45)
Distribution loss (46)m = 0.15 x (45)m	21.4805	18.7870	19.3865	16.9016	16.2175	13.9945	12.9679	14.8809	15.0586	17.5494	19.1565	20.8027 (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	1.5903	1.3403	1.3309	1.1148	1.0260	0.8477	0.7855	0.9414	0.9932	1.2047	1.3667	1.5401 (61)
Total heat required for water heating calculated for each month	144.7938	126.5870	130.5742	113.7923	109.1427	94.1442	87.2385	100.1475	101.3841	118.2006	129.0768	140.2250 (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												1.3130 (H8)
Utilisation factor												0.5331 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												87.7866 (H14)
Volume ratio Veff/V												0.8543 (H15)
Solar storage volume factor												0.9685 (H16)
Solar input												-823.3281 (H17)
Solar input	-23.8749	-39.8403	-67.8526	-90.9358	-112.3436	-110.4516	-108.9920	-95.2268	-74.5817	-50.9305	-28.3190	-19.9792 (63)
Solar input (sum of months) = Sum (63)m =												-823.3281 (63)
Output from w/h	120.9189	86.7467	62.7216	22.8564	0.0000	0.0000	0.0000	4.9206	26.8024	67.2701	100.7578	120.2459 (64)
Total per year (kWh/year) = Sum (64)m =												613.2404 (64)
Heat gains from water heating, kWh/month	48.0127	41.9796	43.3061	37.7440	36.2053	31.2330	28.9420	33.2214	33.6283	39.2023	42.8053	46.4978 (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	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	44.3382	39.3808	32.0266	24.2462	18.1243	15.3013	16.5336	21.4910	28.8452	36.6256	42.7475	45.5705	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	295.9333	299.0042	291.2657	274.7914	253.9956	234.4504	221.3931	218.3222	226.0607	242.5350	263.3308	282.8760	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	(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)	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	(71)
Water heating gains (Table 5)	64.5332	62.4696	58.2072	52.4222	48.6631	43.3792	38.9005	44.6524	46.7059	52.6913	59.4518	62.4970	(72)
Total internal gains	503.7243	499.7741	480.4190	450.3793	419.7025	392.0505	375.7467	383.3851	400.5313	430.7714	464.4496	489.8630	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				3.1400	10.6334	0.6300	0.7000	0.7700	10.2041 (74)			
East				3.7100	19.6403	0.6300	0.7000	0.7700	22.2686 (76)			
South				7.8200	46.7521	0.6300	0.7000	0.7700	111.7325 (78)			
Solar gains	144.2051	246.0516	337.9722	421.3030	474.4560	472.2168	454.7666	414.8868	366.7734	272.2737	172.7954	123.3664 (83)
Total gains	647.9294	745.8257	818.3912	871.6823	894.1585	864.2673	830.5133	798.2719	767.3047	703.0451	637.2450	613.2293 (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	44.3371	44.3371	44.3371	44.3371	44.3371	44.3371	44.3371	44.3371	44.3371	44.3371	44.3371	44.3371
alpha	3.9558	3.9558	3.9558	3.9558	3.9558	3.9558	3.9558	3.9558	3.9558	3.9558	3.9558	3.9558
util living area	0.9732	0.9537	0.9187	0.8511	0.7366	0.5775	0.4307	0.4652	0.6695	0.8715	0.9551	0.9780 (86)
MIT	19.7535	19.9682	20.2538	20.5655	20.8114	20.9457	20.9866	20.9817	20.9013	20.5855	20.1002	19.6891 (87)
Th 2	19.9354	19.9354	19.9354	19.9354	19.9354	19.9354	19.9354	19.9354	19.9354	19.9354	19.9354	19.9354 (88)
util rest of house	0.9670	0.9433	0.9007	0.8182	0.6807	0.4948	0.3310	0.3638	0.5901	0.8357	0.9432	0.9729 (89)
MIT 2	18.8279	19.0365	19.3104	19.5993	19.8103	19.9090	19.9314	19.9295	19.8820	19.6251	19.1687	18.7649 (90)
Living area fraction									fLA = Living area / (4) =			0.2604 (91)
MIT	19.0689	19.2792	19.5561	19.8509	20.0710	20.1790	20.2062	20.2035	20.1475	19.8752	19.4113	19.0056 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0689	19.2792	19.5561	19.8509	20.0710	20.1790	20.2062	20.2035	20.1475	19.8752	19.4113	19.0056 (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	0.9607	0.9356	0.8932	0.8153	0.6884	0.5145	0.3569	0.3900	0.6069	0.8334	0.9360	0.9671	(94)
Useful gains	622.4610	697.8179	730.9662	710.6433	615.5196	444.6874	296.4345	311.3151	465.7087	585.9089	596.4668	593.0515	(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	1228.0546	1195.6443	1085.6299	910.5796	696.0580	463.9028	299.8624	316.2670	502.8543	771.2448	1023.7023	1231.1017	(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	450.5616	334.5393	263.8698	143.9541	59.9206	0.0000	0.0000	0.0000	0.0000	137.8899	307.6096	474.7094	(98)
Space heating												2173.0543	(98)
Space heating per m2												30.8585	(99)
												(98) / (4) =	

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2409.1511 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	450.5616	334.5393	263.8698	143.9541	59.9206	0.0000	0.0000	0.0000	0.0000	137.8899	307.6096	474.7094	(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)	499.5140	370.8862	292.5386	159.5944	66.4308	0.0000	0.0000	0.0000	0.0000	152.8713	341.0306	526.2853	(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	120.9189	86.7467	62.7216	22.8564	0.0000	0.0000	0.0000	4.9206	26.8024	67.2701	100.7578	120.2459	(64)
Efficiency of water heater (217)m	86.8247	86.9120	87.1258	87.9850	90.2000	76.2000	76.2000	76.2000	76.2000	85.0749	86.2884	76.2000	(216)
Fuel for water heating, kWh/month	139.2678	99.8098	71.9898	25.9776	0.0000	0.0000	0.0000	6.4575	35.1737	79.0716	116.7686	138.2605	(219)
Water heating fuel used												712.7769	(219)
Annual totals kWh/year													
Space heating fuel - main system												2409.1511	(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)													51.1074 (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													176.1074 (231)
Electricity for lighting (calculated in Appendix L)													313.2107 (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												2920.3504	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2409.1511	3.4800	83.8385 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	712.7769	3.4800	24.8046 (247)
Mechanical ventilation fans	51.1074	13.1900	6.7411 (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	313.2107	13.1900	41.3125 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-690.8958	13.1900	-91.1292 (252)
Total energy cost			202.0550 (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] =	0.7353 (257)
SAP value		89.7432
SAP rating (Section 12)		90 (258)
SAP band		B

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CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2409.1511	0.2160	520.3766 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	712.7769	0.2160	153.9598 (264)
Space and water heating			674.3365 (265)
Pumps and fans	176.1074	0.5190	91.3998 (267)
Energy for lighting	313.2107	0.5190	162.5563 (268)
Energy saving/generation technologies			
PV Unit	-690.8958	0.5190	-358.5749 (269)
Total kg/year			569.7177 (272)
CO2 emissions per m2			8.0900 (273)
EI value			93.3857
EI rating			93 (274)
EI band			A

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Calculation Type: New Build (As Built)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	35.1100 (1b)	x 2.6800 (2b)	= 94.0948 (1b) - (3b)
First floor	35.3100 (1c)	x 2.3200 (2c)	= 81.9192 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.0140 (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											3.5900	
Infiltration rate											0.1795 (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) =	0.1526 (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	0.1793	0.1678	0.1678	0.1526	0.1564	0.1488	0.1488	0.1449	0.1449	0.1564	0.1526	0.1564 (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)			14.6700	1.1450	16.7977		(27)					
Ground Floor			35.1100	0.1200	4.2132	84.0000	2949.2400 (28a)					
Above Entrance			0.2000	0.1600	0.0320	22.4400	4.4880 (28b)					
Brick and Block	84.1100	16.8200	67.2900	0.2400	16.1496	42.2200	2840.9838 (29a)					
Pitched Roof	35.3100		35.3100	0.1000	3.5310	9.1000	321.3210 (30)					
Total net area of external elements Aum(A, m2)			154.7300				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	43.0885		(33)					
Party Wall 1			44.0300	0.0000	0.0000	110.0000	4843.3000 (32)					
Ground Floor Stud			57.2900			9.0000	515.6100 (32c)					
First Floor Stud			59.2400			9.0000	533.1600 (32c)					
Internal Floor 1			35.1100			18.0000	631.9800 (32d)					
Internal Ceiling 1			35.1100			18.0000	631.9800 (32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13272.0628 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							188.4701 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.0203 (36)					
Total fabric heat loss						(33) + (36) =	54.1088 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 29.0423	Feb 29.0423	Mar 29.0423	Apr 29.0423	May 29.0423	Jun 29.0423	Jul 29.0423	Aug 29.0423	Sep 29.0423	Oct 29.0423	Nov 29.0423	Dec 29.0423 (38)
Heat transfer coeff	83.1512	83.1512	83.1512	83.1512	83.1512	83.1512	83.1512	83.1512	83.1512	83.1512	83.1512	83.1512 (39)
Average = Sum(39)m / 12 =												83.1512 (39)
HLP	Jan 1.1808	Feb 1.1808	Mar 1.1808	Apr 1.1808	May 1.1808	Jun 1.1808	Jul 1.1808	Aug 1.1808	Sep 1.1808	Oct 1.1808	Nov 1.1808	Dec 1.1808 (40)
HLP (average)												1.1808 (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												2.2563 (42)
Average daily hot water use (litres/day)												87.7866 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Daily hot water use	96.5653	93.0538	89.5423	86.0309	82.5194	79.0079	79.0079	82.5194	86.0309	89.5423	93.0538	96.5653 (44)
Energy conte	143.2035	125.2467	129.2434	112.6775	108.1167	93.2965	86.4530	99.2060	100.3909	116.9959	127.7101	138.6849 (45)
Energy content (annual)												1381.2252 (45)
Distribution loss (46)m = 0.15 x (45)m	21.4805	18.7870	19.3865	16.9016	16.2175	13.9945	12.9679	14.8809	15.0586	17.5494	19.1565	20.8027 (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	1.5903	1.3403	1.3309	1.1148	1.0260	0.8477	0.7855	0.9414	0.9932	1.2047	1.3667	1.5401 (61)
Total heat required for water heating calculated for each month	144.7938	126.5870	130.5742	113.7923	109.1427	94.1442	87.2385	100.1475	101.3841	118.2006	129.0768	140.2250 (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												1.4669 (H8)
Utilisation factor												0.4943 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												87.7866 (H14)
Volume ratio Veff/V												0.8543 (H15)
Solar storage volume factor												0.9685 (H16)
Solar input												-852.8044 (H17)
Solar input	-27.8281	-39.5747	-68.6722	-92.3758	-107.3469	-116.7623	-110.7084	-100.9554	-79.0175	-54.6141	-32.9143	-22.0347 (63)
Solar input (sum of months) = Sum (63)m =												-852.8044 (63)
Output from w/h	116.9657	87.0123	61.9020	21.4165	1.7959	0.0000	0.0000	0.0000	22.3665	63.5865	96.1625	118.1903 (64)
Total per year (kWh/year) = Sum (64)m =												589.3982 (64)
Heat gains from water heating, kWh/month	48.0127	41.9796	43.3061	37.7440	36.2053	31.2330	28.9420	33.2214	33.6283	39.2023	42.8053	46.4978 (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	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	44.3382	39.3808	32.0266	24.2462	18.1243	15.3013	16.5336	21.4910	28.8452	36.6256	42.7475	45.5705	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	295.9333	299.0042	291.2657	274.7914	253.9956	234.4504	221.3931	218.3222	226.0607	242.5350	263.3308	282.8760	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	(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)	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	(71)
Water heating gains (Table 5)	64.5332	62.4696	58.2072	52.4222	48.6631	43.3792	38.9005	44.6524	46.7059	52.6913	59.4518	62.4970	(72)
Total internal gains	503.7243	499.7741	480.4190	450.3793	419.7025	392.0505	375.7467	383.3851	400.5313	430.7714	464.4496	489.8630	(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)
East				3.7100	25.1733		0.6300		0.7000		0.7700		28.5420 (76)
South				7.8200	56.5862		0.6300		0.7000		0.7700		135.2350 (78)
Solar gains	176.7017	256.6022	359.6029	452.6519	482.6356	533.0613	492.6158	466.4951	409.3117	306.5302	211.0191	143.1267	(83)
Total gains	680.4260	756.3763	840.0219	903.0312	902.3381	925.1118	868.3625	849.8803	809.8430	737.3016	675.4687	632.9897	(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	44.3371	44.3371	44.3371	44.3371	44.3371	44.3371	44.3371	44.3371	44.3371	44.3371	44.3371	44.3371	
alpha	3.9558	3.9558	3.9558	3.9558	3.9558	3.9558	3.9558	3.9558	3.9558	3.9558	3.9558	3.9558	
util living area	0.9598	0.9406	0.8932	0.7997	0.6568	0.4468	0.3137	0.3109	0.5457	0.7997	0.9262	0.9672	(86)
MIT	19.9683	20.1189	20.4015	20.6971	20.8944	20.9824	20.9968	20.9970	20.9610	20.7526	20.3333	19.9147	(87)
Th 2	19.9354	19.9354	19.9354	19.9354	19.9354	19.9354	19.9354	19.9354	19.9354	19.9354	19.9354	19.9354	(88)
util rest of house	0.9502	0.9269	0.8692	0.7569	0.5882	0.3585	0.2137	0.2086	0.4533	0.7461	0.9062	0.9590	(89)
MIT 2	19.0384	19.1829	19.4494	19.7145	19.8736	19.9290	19.9349	19.9349	19.9189	19.7686	19.3920	18.9872	(90)
Living area fraction													(91)
MIT	19.2806	19.4267	19.6974	19.9704	20.1394	20.2033	20.2114	20.2115	20.1903	20.0249	19.6371	19.2288	(92)
Temperature adjustment													(93)
adjusted MIT	19.2806	19.4267	19.6974	19.9704	20.1394	20.2033	20.2114	20.2115	20.1903	20.0249	19.6371	19.2288	(93)

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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	0.9429	0.9191	0.8631	0.7584	0.6021	0.3812	0.2398	0.2353	0.4763	0.7511	0.8995	0.9523	(94)
Useful gains	641.5785	695.2116	725.0444	684.8656	543.3002	352.6585	208.2617	200.0141	385.7236	553.7947	607.5622	602.7773	(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	1137.5583	1116.4420	1005.9130	820.7341	585.3370	357.8270	208.8271	200.5205	398.3206	658.9660	917.7499	1124.9336	(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	369.0090	283.0669	208.9663	97.8253	31.2754	0.0000	0.0000	0.0000	0.0000	78.2475	223.3352	388.4843	(98)
Space heating												1680.2098	(98)
Space heating per m2											(98) / (4) =	23.8598	(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													1862.7603	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	369.0090	283.0669	208.9663	97.8253	31.2754	0.0000	0.0000	0.0000	0.0000	78.2475	223.3352	388.4843	(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)	409.1009	313.8214	231.6699	108.4538	34.6734	0.0000	0.0000	0.0000	0.0000	86.7488	247.6000	430.6921	(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	116.9657	87.0123	61.9020	21.4165	1.7959	0.0000	0.0000	0.0000	22.3665	63.5865	96.1625	118.1903	(64)	
Efficiency of water heater (217)m	86.3803	86.4649	86.5653	87.3186	89.3090	76.2000	76.2000	76.2000	76.2000	83.3358	85.4735	76.2000	(216)	
Fuel for water heating, kWh/month	135.4079	100.6331	71.5090	24.5269	2.0108	0.0000	0.0000	0.0000	29.3524	76.3016	112.5056	136.6471	(219)	
Water heating fuel used												688.8943	(219)	
Annual totals kWh/year														
Space heating fuel - main system												1862.7603	(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)													51.1074	(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													176.1074	(231)
Electricity for lighting (calculated in Appendix L)													313.2107	(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													2269.1262	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1862.7603	7.3800	137.4717	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	688.8943	7.3800	50.8404	(247)
Mechanical ventilation fans	51.1074	28.6600	14.6474	(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	313.2107	28.6600	89.7662	(250)
Additional standing charges			107.0000	(251)
Energy saving/generation technologies				
PV Unit	-771.8465	28.6600	-221.2112	(252)
Total energy cost			214.3395	(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	1862.7603	0.2160	402.3562	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	688.8943	0.2160	148.8012	(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			551.1574 (265)
Pumps and fans	176.1074	0.5190	91.3998 (267)
Energy for lighting	313.2107	0.5190	162.5563 (268)
Energy saving/generation technologies			
PV Unit	-771.8465	0.5190	-400.5884 (269)
Total kg/year			404.5251 (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	1862.7603	1.2200	2272.5676 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	688.8943	1.2200	840.4511 (264)
Space and water heating			3113.0187 (265)
Pumps and fans	176.1074	3.0700	540.6498 (267)
Energy for lighting	313.2107	3.0700	961.5567 (268)
Energy saving/generation technologies			
PV Unit	-771.8465	3.0700	-2369.5689 (269)
Primary energy kWh/year			2245.6564 (272)
Primary energy kWh/m2/year			31.8895 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0943 Plot 1	Issued on Date	12/06/2024
Assessment Reference	As Built	Prop Type Ref	Type B Terrace
Project	1, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	12.53	TER	18.94
Environmental	91 B	% DER<TER	33.84		
CO ₂ Emissions (t/year)	0.60	DFEE	44.74	TFEE	52.46
General Requirements Compliance	Pass	% DFEE<TFEE	14.73		

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 1	Issued on Date	12/06/2024
Assessment Reference	As Built	Prop Type Ref	Type B Terrace
Project	1, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	12.53	TER	18.94
Environmental	91 B	% DER<TER	33.84		
CO ₂ Emissions (t/year)	0.60	DFEE	44.74	TFEE	52.46
General Requirements Compliance	Pass	% DFEE<TFEE	14.73		

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 1	Issued on Date	12/06/2024
Assessment Reference	As Built	Prop Type Ref	Type B Terrace
Project	1, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	12.53	TER	18.94
Environmental	91 B	% DER<TER	33.84		
CO ₂ Emissions (t/year)	0.60	DFEE	44.74	TFEE	52.46
General Requirements Compliance	Pass	% DFEE<TFEE	14.73		

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

Floor 000003 - Worst Case Slab

Floor Type: Slab On Ground Floor

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

Horizontal edge insulation: none

Vertical edge insulation: none

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

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

Total correction = 0.0096 m² K/W

U-value (unrounded) = 0.12 W/m² K

Unheated space: None

Total thickness: 321 mm

U-value: 0.12 W/m² K

Kappa: 84.00 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0943 Plot 1	Issued on Date	12/06/2024
Assessment Reference	As Built	Prop Type Ref	Type B Terrace
Project	1, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	12.53	TER	18.94
Environmental	91 B	% DER<TER	33.84		
CO ₂ Emissions (t/year)	0.60	DFEE	44.74	TFEE	52.46
General Requirements Compliance	Pass	% DFEE<TFEE	14.73		

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 1	Issued on Date	12/06/2024
Assessment Reference	As Built	Prop Type Ref	Type B Terrace
Property	1, Shaw Crescent, West End, Southampton, SO30 3LH		
SAP Rating	88 B	DER	12.53
Environmental	91 B	TER	18.94
CO ₂ Emissions (t/year)	0.60	% DER<TER	33.84
General Requirements Compliance	Pass	DfEE	44.74
		TFEE	52.46
		% DfEE<TFEE	14.73
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com		Assessor ID
			E477-0001
Client	Foreman Homes, FORE		

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

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

6.0 Measurements				
		Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	Ground Floor:	16.85 m	35.11 m ²	2.68 m
	1st Storey:	16.79 m	35.31 m ²	2.32 m

7.0 Living Area	18.34	m ²
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8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	188.47	kJ/m ² K

9.0 External Walls							
Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)	
Brick and Block	Cavity Wall	Other	0.24	42.22	84.11	67.29	

9.1 Party Walls							
Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)		
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		

9.2 Internal Walls							
Description	Construction			Kappa (kJ/m ² K)	Area (m ²)		
Ground Floor Stud	Plasterboard on timber frame			9.00	57.29		
First Floor Stud	Plasterboard on timber frame			9.00	59.24		

10.0 External Roofs							
Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)	
Pitched Roof	External Plane Roof	Other	0.10	9.10	35.31	35.31	

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

10.2 Internal Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Ceiling 1	Plasterboard ceiling, carpeted chipboard floor	9.00	35.11

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	35.11
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	35.11

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	
Side Elevation	Window	[1] Brick and Block	East	None	0.00					3.71	
Rear Elevation	Window	[1] Brick and Block	South	None	0.00					7.82	

14.0 Conservatory

None

15.0 Draught Proofing

100 %

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	0.69	0.077	No	Birtley Supatherm
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)	6.24	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	9.66	0.021	No	Knauf P5
Independently assessed	E4 Jamb	29.40	0.016	No	Knauf P6
Table K1 - Default	E5 Ground floor (normal)	16.85	0.320	No	
Table K1 - Default	E20 Exposed floor (normal)	1.01	0.320	No	
Table K1 - Default	E21 Exposed floor (inverted)	2.14	0.320	No	
Independently assessed	E6 Intermediate floor within a dwelling	15.23	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	8.12	0.060	No	
Independently assessed	E12 Gable (insulation at ceiling level)	8.84	0.044	No	Knauf P21
Independently assessed	E16 Corner (normal)	14.20	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	10.00	0.036	No	Knauf P25 Halved
Table K1 - Default	P1 Party wall - Ground floor	8.79	0.160	No	
Table K1 - Default	P2 Party wall - Intermediate floor within a dwelling	8.79	0.000	No	
Independently assessed	P4 Party wall - Roof (insulation at ceiling level)	8.79	0.035	No	Knauf P29 Halved

Y-value 0.071 W/m²K

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

18.0 Pressure Testing	Yes	
Designed AP ₅₀	5.00	m ³ /(h.m ²) @ 50 Pa
Property Tested ?	Yes	
As Built AP ₅₀	3.59	m ³ /(h.m ²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

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

Mechanical Ventilation

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

20.0 Fans, Open Fireplaces, Flues

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

21.0 Fixed Cooling System

No

22.0 Lighting

Internal

Total number of light fittings	13	
Total number of L.E.L. fittings	13	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	Yes
Light and motion sensor	Yes

23.0 Electricity Tariff

Standard

24.0 Main Heating 1

	Database	
Description	Gas Combi	
Percentage of Heat	100	%
Database Ref. No.	17959	
Fuel Type	Mains gas	
Main Heating	BGW	
SAP Code	104	
In Winter	90.2	
In Summer	76.2	

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

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
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32.0 Photovoltaic Unit		One Dwelling		
PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
0.80	South	30°	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement SAP rating	Environmental Impact
Solar water heating	£4,000 - £6,000	£61	B 90	