



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 7 , Shaw Crescent
West End, Southampton, SO30 3LH

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

Report Issue Date: 12/06/2024

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0943 Plot 4			Issued on Date	12/06/2024
Assessment Reference	As Built	Prop Type Ref	Type B Terrace		
	Property				
7 , Shaw Crescent, West End, Southampton, SO30 3LH					
SAP Rating	88 B	DER	12.53	TER	18.88
Environmental	91 B	% DER<TER	33.65		
CO ₂ Emissions (t/year)	0.60	DFEE	44.25	TFEE	51.75
General Requirements Compliance	Pass	% DFEE<TFEE	14.49		
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)	18.88	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	12.53	kgCO ₂ /m ²	Pass
	-6.35 (-33.6%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	51.75	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	44.25	kWh/m ² /yr	
	-7.5 (-14.5%)	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	3.40 (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

2.22 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

3.40 (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	3.4	m ³ /m ² h
Photovoltaic array	0.80	kW

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THERMAL BRIDGING

Calculation Type: New Build (As Built)

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Assessment Reference	As Built	Prop Type Ref	Type B Terrace
Property	7, Shaw Crescent, West End, Southampton, SO30 3LH		
SAP Rating	88 B	DER	12.53
Environmental	91 B	TER	18.88
CO ₂ Emissions (t/year)	0.60	% DER<TER	33.65
General Requirements Compliance	Pass	DFEE	44.25
		TFEE	51.75
		% DFEE<TFEE	14.49
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com		Assessor ID
			E477-0001
Client	Foreman Homes, FORE		

	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.077	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	4.99	0.32	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.067	1.59	0.11	Birtley Supatherm
External wall	E3 Sill	Independently assessed	0.021	8.40	0.18	Knauf P5
External wall	E4 Jamb	Independently assessed	0.016	27.00	0.43	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	2.13	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	8.83	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	8.83	1.41	
Party wall	P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	0.000	8.83	0.00	
Party wall	P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	0.035	8.83	0.31	Knauf P29 Halved

Total: **10.88** W/mK:
Y-Value: **0.070** W/m²K:

FULL SAP CALCULATION PRINTOUT

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General Requirements Compliance	Pass	% DFEE<TFEE	14.49		
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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) 18.88 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 12.53 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)51.7 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)44.2 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.12 (max. 0.25)	0.16 (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: 3.40 (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: 2.22 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 3.4 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	=	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												3.4000
Infiltration rate												0.1700 (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) =	0.1445 (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												
	0.1842	0.1806	0.1770	0.1590	0.1553	0.1373	0.1373	0.1337	0.1445	0.1553	0.1626	0.1698 (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)			13.1800	1.1450	15.0916		(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	15.3300	68.7800	0.2400	16.5072	42.2200	2903.8916 (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) =	41.7400		(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) =	13334.9706 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							189.3634 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.8796 (36)					
Total fabric heat loss						(33) + (36) =	52.6196 (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	81.6620	81.6620	81.6620	81.6620	81.6620	81.6620	81.6620	81.6620	81.6620	81.6620	81.6620	81.6620 (39)
Average = Sum(39)m / 12 =												81.6620 (39)
HLP	Jan 1.1596	Feb 1.1596	Mar 1.1596	Apr 1.1596	May 1.1596	Jun 1.1596	Jul 1.1596	Aug 1.1596	Sep 1.1596	Oct 1.1596	Nov 1.1596	Dec 1.1596 (40)
HLP (average)												1.1596 (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	17.9478	15.9411	12.9642	9.8147	7.3366	6.1939	6.6927	8.6994	11.6764	14.8258	17.3039	18.4466 (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	340.6006	338.5877	326.1635	306.1913	286.0209	266.4990	253.7707	259.4718	269.6871	289.8597	313.0315	330.3147 (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				2.2200	19.6403	0.6300	0.7000		0.7700		13.3252 (76)	
South				7.8200	46.7521	0.6300	0.7000		0.7700		111.7325 (78)	
Solar gains	135.2617	228.5563	309.1600	379.2820	422.9577	419.4992	404.5773	371.7749	333.2635	251.5141	161.6440	116.0117 (83)
Total gains	475.8622	567.1440	635.3235	685.4733	708.9786	685.9982	658.3480	631.2467	602.9507	541.3738	474.6755	446.3264 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	45.3597	45.3597	45.3597	45.3597	45.3597	45.3597	45.3597	45.3597	45.3597	45.3597	45.3597	45.3597
alpha	4.0240	4.0240	4.0240	4.0240	4.0240	4.0240	4.0240	4.0240	4.0240	4.0240	4.0240	4.0240
util living area	0.9905	0.9804	0.9604	0.9164	0.8275	0.6803	0.5230	0.5629	0.7730	0.9339	0.9824	0.9926 (86)
MIT	19.5307	19.7508	20.0551	20.4073	20.7155	20.9079	20.9753	20.9665	20.8396	20.4341	19.8988	19.4706 (87)
Th 2	19.9524	19.9524	19.9524	19.9524	19.9524	19.9524	19.9524	19.9524	19.9524	19.9524	19.9524	19.9524 (88)
util rest of house	0.9881	0.9755	0.9503	0.8939	0.7801	0.5951	0.4086	0.4485	0.6990	0.9114	0.9771	0.9907 (89)
MIT 2	18.6221	18.8395	19.1377	19.4752	19.7535	19.9049	19.9446	19.9409	19.8594	19.5073	18.9880	18.5625 (90)
Living area fraction	18.8587	19.0768	19.3766	19.7180	20.0041	20.1661	20.2131	20.2080	20.1147	19.7487	19.2252	18.7990 (91)
MIT	18.8587	19.0768	19.3766	19.7180	20.0041	20.1661	20.2131	20.2080	20.1147	19.7487	19.2252	18.7990 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8587	19.0768	19.3766	19.7180	20.0041	20.1661	20.2131	20.2080	20.1147	19.7487	19.2252	18.7990 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9848	0.9703	0.9434	0.8879	0.7827	0.6138	0.4382	0.4777	0.7117	0.9060	0.9723	0.9879 (94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1188.8949	1157.7090	1051.5307	883.4161	678.1259	454.5417	295.0489	310.9688	491.1734	747.0992	990.1692	1192.1838 (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	535.8818	408.1809	336.4189	197.8236	91.6411	0.0000	0.0000	0.0000	0.0000	190.9100	380.6239	558.9328 (98)
Space heating												2700.4130 (98)
Space heating per m2												(98) / (4) = 38.3472 (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													2993.8059 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	535.8818	408.1809	336.4189	197.8236	91.6411	0.0000	0.0000	0.0000	0.0000	190.9100	380.6239	558.9328	(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)	594.1040	452.5287	372.9700	219.3166	101.5977	0.0000	0.0000	0.0000	0.0000	211.6519	421.9777	619.6594	(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	86.8073	86.4406	85.7927	84.5288	82.0096	76.2000	76.2000	76.2000	76.2000	84.2790	86.1898	76.2000	(216)
Fuel for water heating, kWh/month	166.7990	146.4438	152.1973	134.6195	133.0853	123.5488	114.4862	131.4271	133.0500	140.2493	149.7587	161.1887	(219)
Water heating fuel used												1686.8537	(219)
Annual totals kWh/year													
Space heating fuel - main system												2993.8059	(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)													316.9641 (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													4432.8354 (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	2993.8059	0.2160	646.6621 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1686.8537	0.2160	364.3604 (264)
Space and water heating			1011.0225 (265)
Pumps and fans	126.1074	0.5190	65.4498 (267)
Energy for lighting	316.9641	0.5190	164.5044 (268)
Energy saving/generation technologies			
PV Unit	-690.8958	0.5190	-358.5749 (269)
Total CO2, kg/year			882.4017 (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	secondary	other	total	m3 per hour			
										heating	heating						
Number of chimneys										0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues										0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans																3 * 10 =	30.0000 (7a)
Number of passive vents																0 * 10 =	0.0000 (7b)
Number of flueless gas fires																0 * 40 =	0.0000 (7c)
										Air changes per hour							
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000	/ (5) =	0.1704 (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)			13.1800	1.3258	17.4735			(27)					
Ground Floor			35.1100	0.1300	4.5643			(28a)					
Above Entrance			0.2000	0.1300	0.0260			(28b)					
Brick and Block	84.1100	15.3300	68.7800	0.1800	12.3804			(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) =	41.1845			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.3048	(36)					
Total fabric heat loss						(33) + (36) =	51.4893	(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	86.5613	86.3272	86.0977	85.0197	84.8180	83.8791	83.8791	83.7053	84.2408	84.8180	85.2260	85.6526	(39)
Average = Sum(39)m / 12 =												85.0187	(39)
HLP	Jan 1.2292	Feb 1.2259	Mar 1.2226	Apr 1.2073	May 1.2045	Jun 1.1911	Jul 1.1911	Aug 1.1887	Sep 1.1963	Oct 1.2045	Nov 1.2103	Dec 1.2163	(40)
HLP (average)												1.2073	(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)

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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	17.9478	15.9411	12.9642	9.8147	7.3366	6.1939	6.6927	8.6994	11.6764	14.8258	17.3039	18.4466	(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	356.6013	354.0230	341.0489	320.5355	299.8062	279.7335	267.0356	273.2855	284.0736	304.7875	328.4908	346.3324	(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	2.2200	19.6403	0.6300	0.7000	0.7700	13.3252 (76)
South	7.8200	46.7521	0.6300	0.7000	0.7700	111.7325 (78)

Solar gains	135.2617	228.5563	309.1600	379.2820	422.9577	419.4992	404.5773	371.7749	333.2635	251.5141	161.6440	116.0117	(83)
Total gains	491.8630	582.5793	650.2089	699.8176	722.7639	699.2326	671.6128	645.0604	617.3371	556.3015	490.1348	462.3441	(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	56.4949	56.6482	56.7992	57.5193	57.6561	58.3015	58.3015	58.4226	58.0512	57.6561	57.3801	57.0943	
alpha	4.7663	4.7765	4.7866	4.8346	4.8437	4.8868	4.8868	4.8948	4.8701	4.8437	4.8253	4.8063	
util living area	0.9961	0.9908	0.9784	0.9445	0.8630	0.7056	0.5358	0.5767	0.8037	0.9575	0.9917	0.9971	(86)
MIT	19.7437	19.9310	20.1941	20.5146	20.7820	20.9425	20.9878	20.9827	20.8875	20.5386	20.0784	19.7113	(87)
Th 2	19.8967	19.8993	19.9019	19.9141	19.9164	19.9271	19.9271	19.9291	19.9230	19.9164	19.9118	19.9070	(88)
util rest of house	0.9948	0.9878	0.9709	0.9244	0.8134	0.6112	0.4122	0.4525	0.7227	0.9379	0.9883	0.9961	(89)
MIT 2	18.2393	18.5133	18.8945	19.3544	19.7056	19.8893	19.9228	19.9222	19.8370	19.3973	18.7381	18.1993	(90)
Living area fraction									fLA = Living area / (4) =			0.2604	(91)
MIT	18.6311	18.8825	19.2330	19.6566	19.9860	20.1636	20.2001	20.1984	20.1106	19.6945	19.0872	18.5931	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6311	18.8825	19.2330	19.6566	19.9860	20.1636	20.2001	20.1984	20.1106	19.6945	19.0872	18.5931	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9926	0.9838	0.9649	0.9185	0.8171	0.6335	0.4446	0.4849	0.7385	0.9328	0.9848	0.9944	(94)
Ext temp.	488.2347	573.1502	627.3913	642.7869	590.5440	442.9626	298.6027	312.8156	455.9091	518.9228	482.6630	459.7430	(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	1240.5165	1207.0696	1096.2795	914.5219	702.7998	466.6722	301.9768	317.9478	506.3358	771.3779	1021.6176	1232.8052	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating	559.6977	425.9938	348.8528	195.6492	83.5183	0.0000	0.0000	0.0000	0.0000	187.8266	388.0473	575.1582	(98)
Space heating per m2												2764.7439	(98)
												39.2608	(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													2960.1112 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	559.6977	425.9938	348.8528	195.6492	83.5183	0.0000	0.0000	0.0000	0.0000	187.8266	388.0473	575.1582	(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)	599.2481	456.0961	373.5041	209.4745	89.4200	0.0000	0.0000	0.0000	0.0000	201.0991	415.4682	615.8011	(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	87.5818	87.2936	86.7564	85.6369	83.6398	80.3000	80.3000	80.3000	80.3000	85.4146	87.0170	87.6843	(216)
Fuel for water heating, kWh/month	219.6942	192.5421	201.5680	181.1178	179.5411	164.7065	157.8014	175.9116	177.8544	190.3956	199.5008	214.2842	(219)
Water heating fuel used												2254.9176	(219)
Annual totals kWh/year													
Space heating fuel - main system												2960.1112	(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)												316.9641	(232)
Total delivered energy for all uses												5606.9929	(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	2960.1112	0.2160	639.3840 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2254.9176	0.2160	487.0622 (264)
Space and water heating			1126.4462 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	316.9641	0.5190	164.5044 (268)
Total CO2, kg/m2/year			1329.8756 (272)
Emissions per m2 for space and water heating			15.9961 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3360 (272b)
Emissions per m2 for pumps and fans			0.5528 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.9961 * 1.00) + 2.3360 + 0.5528, rounded to 2 d.p.			18.8800 (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	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					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					30.0000 / (5) = 0.1704 (8)
Pressure test					Yes
Measured/design AP50					3.4000
Infiltration rate					0.3404 (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) =	0.2894 (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	0.3690	0.3617	0.3545	0.3183	0.3111	0.2749	0.2749	0.2677	0.2894	0.3111	0.3255	0.3400 (22b)
	0.5681	0.5654	0.5628	0.5507	0.5484	0.5378	0.5378	0.5358	0.5419	0.5484	0.5530	0.5578 (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)			13.1800	1.1450	15.0916		(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	15.3300	68.7800	0.2400	16.5072	42.2200	2903.8916 (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) =	41.7400		(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) = 13018.9806 (34)
184.8762 (35)
10.8796 (36)
(33) + (36) = 52.6196 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	32.9957	32.8422	32.6917	31.9850	31.8527	31.2371	31.2371	31.1231	31.4742	31.8527	32.1202	32.3999 (38)
Heat transfer coeff	85.6154	85.4619	85.3114	84.6046	84.4724	83.8568	83.8568	83.7428	84.0939	84.4724	84.7399	85.0195 (39)
Average = Sum(39)m / 12 =												84.6040 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2158	1.2136	1.2115	1.2014	1.1996	1.1908	1.1908	1.1892	1.1942	1.1996	1.2033	1.2073 (40)
HLP (average)												1.2014 (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	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	30.4307	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	17.9478	15.9411	12.9642	9.8147	7.3366	6.1939	6.6927	8.6994	11.6764	14.8258	17.3039	18.4466	(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	313.9689	312.7236	301.8706	284.0246	265.2379	247.6553	236.5628	240.1545	249.6104	267.5846	288.2720	304.4287	(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				2.2200	19.6403	0.6300	0.7000	0.7700			13.3252 (76)	
South				7.8200	46.7521	0.6300	0.7000	0.7700			111.7325 (78)	

Solar gains	135.2617	228.5563	309.1600	379.2820	422.9577	419.4992	404.5773	371.7749	333.2635	251.5141	161.6440	116.0117 (83)
Total gains	449.2305	541.2799	611.0306	663.3067	688.1956	667.1544	641.1400	611.9294	582.8740	519.0986	449.9160	420.4404 (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	42.2399	42.3158	42.3904	42.7445	42.8114	43.1257	43.1257	43.1844	43.0041	42.8114	42.6763	42.5359	
alpha	3.8160	3.8211	3.8260	3.8496	3.8541	3.8750	3.8750	3.8790	3.8669	3.8541	3.8451	3.8357	
util living area	0.9917	0.9826	0.9648	0.9246	0.8430	0.7009	0.5447	0.5863	0.7927	0.9416	0.9846	0.9935	(86)
MIT	19.3715	19.6028	19.9276	20.3187	20.6588	20.8851	20.9671	20.9559	20.8035	20.3528	19.7806	19.3247	(87)
Th 2	19.9074	19.9091	19.9108	19.9189	19.9204	19.9274	19.9274	19.9287	19.9247	19.9204	19.9173	19.9141	(88)
util rest of house	0.9896	0.9783	0.9556	0.9037	0.7975	0.6151	0.4252	0.4676	0.7205	0.9211	0.9799	0.9918	(89)
MIT 2	18.4321	18.6623	18.9830	19.3664	19.6787	19.8669	19.9167	19.9131	19.8085	19.4070	18.8467	18.3907	(90)
Living area fraction	18.6767	18.9073	19.2290	19.6144	19.9339	20.1321	20.1903	20.1847	20.0676	19.6533	19.0899	18.6339	(91)
MIT	18.6767	18.9073	19.2290	19.6144	19.9339	20.1321	20.1903	20.1847	20.0676	19.6533	19.0899	18.6339	(92)
Temperature adjustment	18.6767	18.9073	19.2290	19.6144	19.9339	20.1321	20.1903	20.1847	20.0676	19.6533	19.0899	18.6339	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9863	0.9730	0.9483	0.8967	0.7982	0.6329	0.4559	0.4977	0.7313	0.9149	0.9752	0.9891	(94)
Ext temp.	443.0895	526.6747	579.4582	594.7707	549.3049	422.2402	292.3174	304.5341	426.2508	474.9045	438.7651	415.8737	(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	1230.8675	1197.0860	1085.9312	906.4885	695.5400	463.9007	301.0714	316.9412	501.8396	764.7540	1016.0267	1227.1671	(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	586.1069	450.5164	376.8159	224.4368	108.7990	0.0000	0.0000	0.0000	0.0000	215.6480	415.6283	603.6023	(98)
Space heating per m2	(98) / (4) =												42.3396 (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	788.2537	620.5402	636.4451	0.0000	0.0000	0.0000	0.0000	(100)

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Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8295	0.8926	0.8744	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	653.8774	553.9030	556.4831	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	863.7138	831.6194	798.8674	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	151.0822	206.6210	180.3340	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												538.0371 (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	37.7706	51.6552	45.0835	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												134.5093 (107)
Space cooling per m2												1.9101 (108)
Energy for space heating												42.3396 (99)
Energy for space cooling												1.9101 (108)
Total												44.2497 (109)
Dwelling Fabric Energy Efficiency (DFEE)												44.2 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	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)			13.1800	1.3258	17.4735			(27)					
Ground Floor			35.1100	0.1300	4.5643			(28a)					
Above Entrance			0.2000	0.1300	0.0260			(28b)					
Brick and Block	84.1100	15.3300	68.7800	0.1800	12.3804			(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) =	41.1845		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.3048	(36)					
Total fabric heat loss						(33) + (36) =	51.4893	(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	86.5613	86.3272	86.0977	85.0197	84.8180	83.8791	83.8791	83.7053	84.2408	84.8180	85.2260	85.6526	(39)
Average = Sum(39)m / 12 =												85.0187	(39)
HLP	Jan 1.2292	Feb 1.2259	Mar 1.2226	Apr 1.2073	May 1.2045	Jun 1.1911	Jul 1.1911	Aug 1.1887	Sep 1.1963	Oct 1.2045	Nov 1.2103	Dec 1.2163	(40)
HLP (average)												1.2073	(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	17.9478	15.9411	12.9642	9.8147	7.3366	6.1939	6.6927	8.6994	11.6764	14.8258	17.3039	18.4466	(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	313.9689	312.7236	301.8706	284.0246	265.2379	247.6553	236.5628	240.1545	249.6104	267.5846	288.2720	304.4287	(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				2.2200	19.6403	0.6300	0.7000	0.7700	13.3252 (76)			
South				7.8200	46.7521	0.6300	0.7000	0.7700	111.7325 (78)			
Solar gains	135.2617	228.5563	309.1600	379.2820	422.9577	419.4992	404.5773	371.7749	333.2635	251.5141	161.6440	116.0117 (83)
Total gains	449.2305	541.2799	611.0306	663.3067	688.1956	667.1544	641.1400	611.9294	582.8740	519.0986	449.9160	420.4404 (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	56.4949	56.6482	56.7992	57.5193	57.6561	58.3015	58.3015	58.4226	58.0512	57.6561	57.3801	57.0943	
alpha	4.7663	4.7765	4.7866	4.8346	4.8437	4.8868	4.8868	4.8948	4.8701	4.8437	4.8253	4.8063	
util living area	0.9974	0.9932	0.9830	0.9539	0.8801	0.7294	0.5585	0.6034	0.8285	0.9670	0.9942	0.9981	(86)
MIT	19.6886	19.8789	20.1474	20.4773	20.7582	20.9335	20.9855	20.9791	20.8699	20.4980	20.0273	19.6568	(87)
Th 2	19.8967	19.8993	19.9019	19.9141	19.9164	19.9271	19.9271	19.9291	19.9230	19.9164	19.9118	19.9070	(88)
util rest of house	0.9965	0.9909	0.9770	0.9364	0.8340	0.6353	0.4310	0.4756	0.7512	0.9510	0.9918	0.9974	(89)
MIT 2	18.7103	18.9016	19.1689	19.4980	19.7541	19.8967	19.9235	19.9233	19.8533	19.5248	19.0600	18.6868	(90)
Living area fraction													
MIT	18.9651	19.1561	19.4237	19.7531	20.0156	20.1667	20.2001	20.1982	20.1181	19.7783	19.3120	18.9394	(91)
Temperature adjustment													
adjusted MIT	18.9651	19.1561	19.4237	19.7531	20.0156	20.1667	20.2001	20.1982	20.1181	19.7783	19.3120	18.9394	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	447.1718	535.2317	594.8938	619.0509	577.3253	439.0111	297.8910	311.6044	447.1167	492.2974	445.4178	419.0165	(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	1269.4284	1230.6891	1112.7045	922.7241	705.3144	466.9311	301.9715	317.9329	506.9668	778.4824	1040.7769	1262.4677	(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	611.7589	467.3474	385.2512	218.6447	95.2239	0.0000	0.0000	0.0000	0.0000	212.9216	428.6586	627.5277	(98)
Space heating													
Space heating per m2													

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	788.4639	620.7056	636.1601	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8656	0.9261	0.9096	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	682.5072	574.8111	578.6394	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	863.7138	831.6194	798.8674	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	130.4688	191.0653	163.8497	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												485.3838 (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	32.6172	47.7663	40.9624	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												121.3459 (107)
Space cooling per m2												1.7232 (108)
Energy for space heating												43.2737 (99)
Energy for space cooling												1.7232 (108)
Total												44.9969 (109)
Target Fabric Energy Efficiency (TFEE)												51.7 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	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											3.4000	
Infiltration rate											0.1700	(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) =	0.1445 (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												
	0.1698	0.1590	0.1590	0.1445	0.1481	0.1409	0.1409	0.1373	0.1373	0.1481	0.1445	0.1481 (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)			13.1800	1.1450	15.0916		(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	15.3300	68.7800	0.2400	16.5072	42.2200	2903.8916 (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) =	41.7400		(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) =	13334.9706 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							189.3634 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.8796 (36)					
Total fabric heat loss						(33) + (36) =	52.6196 (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	81.6620	81.6620	81.6620	81.6620	81.6620	81.6620	81.6620	81.6620	81.6620	81.6620	81.6620	81.6620 (39)
Average = Sum(39)m / 12 =												81.6620 (39)
HLP	Jan 1.1596	Feb 1.1596	Mar 1.1596	Apr 1.1596	May 1.1596	Jun 1.1596	Jul 1.1596	Aug 1.1596	Sep 1.1596	Oct 1.1596	Nov 1.1596	Dec 1.1596 (40)
HLP (average)												1.1596 (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												
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)
												1395 (64)
												1395 (64)

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	44.8695	39.8527	32.4104	24.5368	18.3415	15.4847	16.7318	21.7486	29.1909	37.0645	43.2598	46.1166 (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	504.2556	500.2461	480.8028	450.6699	419.9197	392.2338	375.9448	383.6427	400.8770	431.2103	464.9619	490.4091 (73)

6. Solar gains

[Jan]		Area	Solar flux	g	FF	Access	Gains
		m2	Table 6a	W/m2	Specific data	factor	W
					or Table 6b	Table 6d	
North		3.1400	13.4684	0.6300	0.7000	0.7700	12.9246 (74)
East		2.2200	25.1733	0.6300	0.7000	0.7700	17.0791 (76)
South		7.8200	56.5862	0.6300	0.7000	0.7700	135.2350 (78)

Solar gains	165.2387	237.5269	327.7228	406.2199	429.3024	472.7449	437.4073	416.8610	370.5759	282.1280	196.7729	134.2041 (83)
Total gains	669.4944	737.7730	808.5256	856.8898	849.2221	864.9787	813.3521	800.5036	771.4529	713.3383	661.7348	624.6131 (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	45.3597	45.3597	45.3597	45.3597	45.3597	45.3597	45.3597	45.3597	45.3597	45.3597	45.3597	45.3597 (86)
alpha	4.0240	4.0240	4.0240	4.0240	4.0240	4.0240	4.0240	4.0240	4.0240	4.0240	4.0240	4.0240 (86)
util living area	0.9614	0.9439	0.9011	0.8159	0.6790	0.4680	0.3287	0.3240	0.5611	0.8084	0.9291	0.9683 (86)
MIT	19.9891	20.1298	20.3979	20.6855	20.8872	20.9807	20.9965	20.9968	20.9597	20.7528	20.3450	19.9387 (87)
Th 2	19.9524	19.9524	19.9524	19.9524	19.9524	19.9524	19.9524	19.9524	19.9524	19.9524	19.9524	19.9524 (88)
util rest of house	0.9521	0.9309	0.8785	0.7750	0.6111	0.3776	0.2257	0.2192	0.4683	0.7562	0.9097	0.9604 (89)
MIT 2	19.0722	19.2072	19.4611	19.7211	19.8855	19.9453	19.9518	19.9519	19.9352	19.7848	19.4172	19.0238 (90)
Living area fraction	19.3110	19.4475	19.7051	19.9723	20.1464	20.2150	20.2239	20.2240	20.2020	20.0369	19.6588	0.2604 (91)
MIT	19.3110	19.4475	19.7051	19.9723	20.1464	20.2150	20.2239	20.2240	20.2020	20.0369	19.6588	19.2621 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3110	19.4475	19.7051	19.9723	20.1464	20.2150	20.2239	20.2240	20.2020	20.0369	19.6588	19.2621 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	632.7316	681.2544	705.3819	664.7833	530.2928	346.6788	205.4923	197.4125	379.0380	542.7383	597.7058	595.8147 (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	1119.6658	1098.1495	988.5261	806.1877	575.4236	352.3699	206.1068	197.9517	392.1408	648.1396	903.0863	1107.5058 (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	362.2790	280.1535	210.6593	101.8111	33.5774	0.0000	0.0000	0.0000	0.0000	78.4186	219.8740	380.6982 (98)
Space heating												1667.4710 (98)
RHI space heating demand												1667 (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												3.4000
Infiltration rate												0.1700 (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) =	0.1445 (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												
	0.1842	0.1806	0.1770	0.1590	0.1553	0.1373	0.1373	0.1337	0.1445	0.1553	0.1626	0.1698 (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)			13.1800	1.1450	15.0916		(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	15.3300	68.7800	0.2400	16.5072	42.2200	2903.8916 (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) =	41.7400		(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) =	13334.9706 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							189.3634 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.8796 (36)					
Total fabric heat loss						(33) + (36) =	52.6196 (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	81.6620	81.6620	81.6620	81.6620	81.6620	81.6620	81.6620	81.6620	81.6620	81.6620	81.6620	81.6620 (39)
Average = Sum(39)m / 12 =												81.6620 (39)
HLP	Jan 1.1596	Feb 1.1596	Mar 1.1596	Apr 1.1596	May 1.1596	Jun 1.1596	Jul 1.1596	Aug 1.1596	Sep 1.1596	Oct 1.1596	Nov 1.1596	Dec 1.1596 (40)
HLP (average)												1.1596 (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												
Solar input	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)
	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)

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	44.8695	39.8527	32.4104	24.5368	18.3415	15.4847	16.7318	21.7486	29.1909	37.0645	43.2598	46.1166 (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	504.2556	500.2461	480.8028	450.6699	419.9197	392.2338	375.9448	383.6427	400.8770	431.2103	464.9619	490.4091 (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				2.2200	19.6403		0.6300	0.7000	0.7700		13.3252 (76)	
South				7.8200	46.7521		0.6300	0.7000	0.7700		111.7325 (78)	
Solar gains	135.2617	228.5563	309.1600	379.2820	422.9577	419.4992	404.5773	371.7749	333.2635	251.5141	161.6440	116.0117 (83)
Total gains	639.5173	728.8024	789.9628	829.9519	842.8774	811.7330	780.5221	755.4175	734.1405	682.7244	626.6059	606.4208 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	45.3597	45.3597	45.3597	45.3597	45.3597	45.3597	45.3597	45.3597	45.3597	45.3597	45.3597	45.3597
alpha	4.0240	4.0240	4.0240	4.0240	4.0240	4.0240	4.0240	4.0240	4.0240	4.0240	4.0240	4.0240
util living area	0.9742	0.9563	0.9249	0.8641	0.7572	0.6001	0.4492	0.4818	0.6838	0.8777	0.9568	0.9788 (86)
MIT	19.7804	19.9828	20.2533	20.5539	20.8004	20.9415	20.9856	20.9807	20.8989	20.5883	20.1182	19.7184 (87)
Th 2	19.9524	19.9524	19.9524	19.9524	19.9524	19.9524	19.9524	19.9524	19.9524	19.9524	19.9524	19.9524 (88)
util rest of house	0.9682	0.9464	0.9079	0.8331	0.7030	0.5169	0.3474	0.3790	0.6053	0.8432	0.9453	0.9738 (89)
MIT 2	18.8674	19.0643	19.3246	19.6047	19.8185	19.9236	19.9481	19.9461	19.8972	19.6427	19.1997	18.8067 (90)
Living area fraction									fLA = Living area / (4) =			0.2604 (91)
MIT	19.1052	19.3035	19.5665	19.8519	20.0742	20.1887	20.2183	20.2156	20.1581	19.8890	19.4389	19.0442 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1052	19.3035	19.5665	19.8519	20.0742	20.1887	20.2183	20.2156	20.1581	19.8890	19.4389	19.0442 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9621	0.9391	0.9006	0.8297	0.7098	0.5366	0.3738	0.4055	0.6218	0.8408	0.9384	0.9682 (94)
Useful gains	615.3047	684.3970	711.4467	688.6154	598.3021	435.5401	291.7648	306.3380	456.4980	574.0043	588.0247	587.1592 (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	1209.0194	1176.2153	1067.0327	894.3557	683.8544	456.3853	295.4773	311.5868	494.7148	758.5566	1007.6177	1212.2026 (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	441.7237	330.5019	264.5559	148.1330	63.6509	0.0000	0.0000	0.0000	0.0000	137.3069	302.1069	465.0323 (98)
Space heating												2153.0117 (98)
Space heating per m2										(98) / (4) =		30.5739 (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													2386.9309 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	441.7237	330.5019	264.5559	148.1330	63.6509	0.0000	0.0000	0.0000	0.0000	137.3069	302.1069	465.0323	(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)	489.7159	366.4101	293.2993	164.2273	70.5664	0.0000	0.0000	0.0000	0.0000	152.2250	334.9301	515.5569	(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	86.2863	85.8327	85.0370	83.5325	80.8208	76.2000	76.2000	76.2000	76.2000	83.1341	85.4977	76.2000	(216)
Fuel for water heating, kWh/month	167.8062	147.4811	153.5498	136.2252	135.0428	123.5488	114.4862	131.4271	133.0500	142.1807	150.9711	162.0774	(219)
Water heating fuel used												1697.8464	(219)
Annual totals kWh/year													
Space heating fuel - main system												2386.9309	(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)													316.9641 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.80 * 1080 * 1.00) =													-690.8958 (233)
Total delivered energy for all uses													3836.9531 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2386.9309	3.4800	83.0652 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1697.8464	3.4800	59.0851 (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	316.9641	13.1900	41.8076 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-690.8958	13.1900	-91.1292 (252)
Total energy cost			229.4622 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.4200 (256)
SAP value		0.8350 (257)
SAP rating (Section 12)		88.3519
SAP band		88 (258)
		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2386.9309	0.2160	515.5771 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1697.8464	0.2160	366.7348 (264)
Space and water heating			882.3119 (265)
Pumps and fans	126.1074	0.5190	65.4498 (267)
Energy for lighting	316.9641	0.5190	164.5044 (268)
Energy saving/generation technologies			
PV Unit	-690.8958	0.5190	-358.5749 (269)
Total kg/year			753.6911 (272)
CO2 emissions per m2			10.7000 (273)
EI value			91.2498
EI rating			91 (274)

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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	$3.48 / 0.8179 = 4.255$, stars = 4
Water heating environmental impact	$0.216 / 0.8179 = 0.2641$, 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											3.4000	
Infiltration rate											0.1700	(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) =	0.1445 (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												
	0.1698	0.1590	0.1590	0.1445	0.1481	0.1409	0.1409	0.1373	0.1373	0.1481	0.1445	0.1481 (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)			13.1800	1.1450	15.0916		(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	15.3300	68.7800	0.2400	16.5072	42.2200	2903.8916 (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) =	41.7400		(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) =	13334.9706 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							189.3634 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.8796 (36)					
Total fabric heat loss						(33) + (36) =	52.6196 (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	81.6620	81.6620	81.6620	81.6620	81.6620	81.6620	81.6620	81.6620	81.6620	81.6620	81.6620	81.6620 (39)
Average = Sum(39)m / 12 =												81.6620 (39)
HLP	Jan 1.1596	Feb 1.1596	Mar 1.1596	Apr 1.1596	May 1.1596	Jun 1.1596	Jul 1.1596	Aug 1.1596	Sep 1.1596	Oct 1.1596	Nov 1.1596	Dec 1.1596 (40)
HLP (average)												1.1596 (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	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)
	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)
								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	44.8695	39.8527	32.4104	24.5368	18.3415	15.4847	16.7318	21.7486	29.1909	37.0645	43.2598	46.1166 (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	504.2556	500.2461	480.8028	450.6699	419.9197	392.2338	375.9448	383.6427	400.8770	431.2103	464.9619	490.4091 (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				2.2200	25.1733		0.6300	0.7000	0.7700		17.0791 (76)	
South				7.8200	56.5862		0.6300	0.7000	0.7700		135.2350 (78)	

Solar gains	165.2387	237.5269	327.7228	406.2199	429.3024	472.7449	437.4073	416.8610	370.5759	282.1280	196.7729	134.2041 (83)
Total gains	669.4944	737.7730	808.5256	856.8898	849.2221	864.9787	813.3521	800.5036	771.4529	713.3383	661.7348	624.6131 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	45.3597	45.3597	45.3597	45.3597	45.3597	45.3597	45.3597	45.3597	45.3597	45.3597	45.3597	45.3597
alpha	4.0240	4.0240	4.0240	4.0240	4.0240	4.0240	4.0240	4.0240	4.0240	4.0240	4.0240	4.0240
util living area	0.9614	0.9439	0.9011	0.8159	0.6790	0.4680	0.3287	0.3240	0.5611	0.8084	0.9291	0.9683 (86)
MIT	19.9891	20.1298	20.3979	20.6855	20.8872	20.9807	20.9965	20.9968	20.9597	20.7528	20.3450	19.9387 (87)
Th 2	19.9524	19.9524	19.9524	19.9524	19.9524	19.9524	19.9524	19.9524	19.9524	19.9524	19.9524	19.9524 (88)
util rest of house	0.9521	0.9309	0.8785	0.7750	0.6111	0.3776	0.2257	0.2192	0.4683	0.7562	0.9097	0.9604 (89)
MIT 2	19.0722	19.2072	19.4611	19.7211	19.8855	19.9453	19.9518	19.9519	19.9352	19.7848	19.4172	19.0238 (90)
Living area fraction									fLA = Living area / (4) =			0.2604 (91)
MIT	19.3110	19.4475	19.7051	19.9723	20.1464	20.2150	20.2239	20.2240	20.2020	20.0369	19.6588	19.2621 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3110	19.4475	19.7051	19.9723	20.1464	20.2150	20.2239	20.2240	20.2020	20.0369	19.6588	19.2621 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9451	0.9234	0.8724	0.7758	0.6244	0.4008	0.2526	0.2466	0.4913	0.7608	0.9032	0.9539 (94)
Useful gains	632.7316	681.2544	705.3819	664.7833	530.2928	346.6788	205.4923	197.4125	379.0380	542.7383	597.7058	595.8147 (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	1119.6658	1098.1495	988.5261	806.1877	575.4236	352.3699	206.1068	197.9517	392.1408	648.1396	903.0863	1107.5058 (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	362.2790	280.1535	210.6593	101.8111	33.5774	0.0000	0.0000	0.0000	0.0000	78.4186	219.8740	380.6982 (98)
Space heating												1667.4710 (98)
Space heating per m2										(98) / (4) =		23.6789 (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													1848.6375 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	362.2790	280.1535	210.6593	101.8111	33.5774	0.0000	0.0000	0.0000	0.0000	78.4186	219.8740	380.6982	(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)	401.6397	310.5915	233.5469	112.8727	37.2255	0.0000	0.0000	0.0000	0.0000	86.9385	243.7627	422.0601	(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	85.7037	85.3213	84.2751	82.2266	79.0880	76.2000	76.2000	76.2000	76.2000	81.2283	84.4600	76.2000	(216)
Fuel for water heating, kWh/month	168.9469	148.3650	154.9380	138.3886	138.0017	123.5488	114.4862	131.4271	133.0500	145.5165	152.8259	163.1487	(219)
Water heating fuel used												1712.6434	(219)
Annual totals kWh/year													
Space heating fuel - main system												1848.6375	(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)													316.9641 (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													3232.5059 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1848.6375	7.3800	136.4294 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1712.6434	7.3800	126.3931 (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	316.9641	28.6600	90.8419 (250)
Additional standing charges			107.0000 (251)
Energy saving/generation technologies			
PV Unit	-771.8465	28.6600	-221.2112 (252)
Total energy cost			275.5956 (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	1848.6375	0.2160	399.3057 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1712.6434	0.2160	369.9310 (264)
Space and water heating			769.2367 (265)
Pumps and fans	126.1074	0.5190	65.4498 (267)
Energy for lighting	316.9641	0.5190	164.5044 (268)
Energy saving/generation technologies			
PV Unit	-771.8465	0.5190	-400.5884 (269)
Total kg/year			598.6024 (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	1848.6375	1.2200	2255.3378 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1712.6434	1.2200	2089.4250 (264)
Space and water heating			4344.7628 (265)
Pumps and fans	126.1074	3.0700	387.1498 (267)
Energy for lighting	316.9641	3.0700	973.0797 (268)

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Energy saving/generation technologies			
PV Unit	-771.8465	3.0700	-2369.5689 (269)
Primary energy kWh/year			3335.4234 (272)
Primary energy kWh/m ² /year			47.3647 (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/m ²	B 90	A 93
Total Savings	£61 2.77 kg/m ²		

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	£127	£141	-£14
Mains gas	£370	£294	£76
Space heating	£280	£280	£0
Water heating	£126	£65	£61
Lighting	£91	£91	£0
Generated (PV)	-£221	-£221	£0
Total cost of fuels	£276	£214	£62
Total cost of uses	£276	£215	£61
Delivered energy	46 kWh/m ²	32 kWh/m ²	14 kWh/m ²
Carbon dioxide emissions	0.6 tonnes	0.4 tonnes	0.2 tonnes
CO2 emissions per m ²	9 kg/m ²	6 kg/m ²	3 kg/m ²
Primary energy	47 kWh/m ²	32 kWh/m ²	16 kWh/m ²

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	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												3.4000
Infiltration rate												0.1700 (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) =	0.1445 (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												
	0.1842	0.1806	0.1770	0.1590	0.1553	0.1373	0.1373	0.1337	0.1445	0.1553	0.1626	0.1698 (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)			13.1800	1.1450	15.0916		(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	15.3300	68.7800	0.2400	16.5072	42.2200	2903.8916 (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) =	41.7400		(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) =	13334.9706 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							189.3634 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.8796 (36)					
Total fabric heat loss						(33) + (36) =	52.6196 (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	81.6620	81.6620	81.6620	81.6620	81.6620	81.6620	81.6620	81.6620	81.6620	81.6620	81.6620	81.6620 (39)
Average = Sum(39)m / 12 =												81.6620 (39)
HLP	Jan 1.1596	Feb 1.1596	Mar 1.1596	Apr 1.1596	May 1.1596	Jun 1.1596	Jul 1.1596	Aug 1.1596	Sep 1.1596	Oct 1.1596	Nov 1.1596	Dec 1.1596 (40)
HLP (average)												1.1596 (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	44.8695	39.8527	32.4104	24.5368	18.3415	15.4847	16.7318	21.7486	29.1909	37.0645	43.2598	46.1166	(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	504.2556	500.2461	480.8028	450.6699	419.9197	392.2338	375.9448	383.6427	400.8770	431.2103	464.9619	490.4091	(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				2.2200	19.6403	0.6300	0.7000	0.7700	13.3252 (76)			
South				7.8200	46.7521	0.6300	0.7000	0.7700	111.7325 (78)			
Solar gains	135.2617	228.5563	309.1600	379.2820	422.9577	419.4992	404.5773	371.7749	333.2635	251.5141	161.6440	116.0117 (83)
Total gains	639.5173	728.8024	789.9628	829.9519	842.8774	811.7330	780.5221	755.4175	734.1405	682.7244	626.6059	606.4208 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	45.3597	45.3597	45.3597	45.3597	45.3597	45.3597	45.3597	45.3597	45.3597	45.3597	45.3597	45.3597	
alpha	4.0240	4.0240	4.0240	4.0240	4.0240	4.0240	4.0240	4.0240	4.0240	4.0240	4.0240	4.0240	
util living area	0.9742	0.9563	0.9249	0.8641	0.7572	0.6001	0.4492	0.4818	0.6838	0.8777	0.9568	0.9788	(86)
MIT	19.7804	19.9828	20.2533	20.5539	20.8004	20.9415	20.9856	20.9807	20.8989	20.5883	20.1182	19.7184	(87)
Th 2	19.9524	19.9524	19.9524	19.9524	19.9524	19.9524	19.9524	19.9524	19.9524	19.9524	19.9524	19.9524	(88)
util rest of house	0.9682	0.9464	0.9079	0.8331	0.7030	0.5169	0.3474	0.3790	0.6053	0.8432	0.9453	0.9738	(89)
MIT 2	18.8674	19.0643	19.3246	19.6047	19.8185	19.9236	19.9481	19.9461	19.8972	19.6427	19.1997	18.8067	(90)
Living area fraction									fLA = Living area / (4) =			0.2604	(91)
MIT	19.1052	19.3035	19.5665	19.8519	20.0742	20.1887	20.2183	20.2156	20.1581	19.8890	19.4389	19.0442	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1052	19.3035	19.5665	19.8519	20.0742	20.1887	20.2183	20.2156	20.1581	19.8890	19.4389	19.0442	(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	0.9621	0.9391	0.9006	0.8297	0.7098	0.5366	0.3738	0.4055	0.6218	0.8408	0.9384	0.9682	(94)
Useful gains	615.3047	684.3970	711.4467	688.6154	598.3021	435.5401	291.7648	306.3380	456.4980	574.0043	588.0247	587.1592	(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	1209.0194	1176.2153	1067.0327	894.3557	683.8544	456.3853	295.4773	311.5868	494.7148	758.5566	1007.6177	1212.2026	(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	441.7237	330.5019	264.5559	148.1330	63.6509	0.0000	0.0000	0.0000	0.0000	137.3069	302.1069	465.0323	(98)
Space heating												2153.0117	(98)
Space heating per m2												30.5739	(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													2386.9309 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	441.7237	330.5019	264.5559	148.1330	63.6509	0.0000	0.0000	0.0000	0.0000	137.3069	302.1069	465.0323	(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)	489.7159	366.4101	293.2993	164.2273	70.5664	0.0000	0.0000	0.0000	0.0000	152.2250	334.9301	515.5569	(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	86.7737	86.8814	87.1320	88.0379	90.2000	76.2000	76.2000	76.2000	76.2000	85.0611	86.2373	76.2000	(216)
Fuel for water heating, kWh/month	139.3497	99.8450	71.9846	25.9621	0.0000	0.0000	0.0000	6.4575	35.1737	79.0844	116.8377	138.3423	(219)
Water heating fuel used												713.0370	(219)
Annual totals kWh/year													
Space heating fuel - main system												2386.9309	(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)													316.9641 (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												2902.1437	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2386.9309	3.4800	83.0652	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	713.0370	3.4800	24.8137	(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	316.9641	13.1900	41.8076	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	-690.8958	13.1900	-91.1292	(252)
Total energy cost			201.7859	(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] =	0.7343 (257)
SAP value		89.7569
SAP rating (Section 12)		90 (258)
SAP band		B

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2386.9309	0.2160	515.5771 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	713.0370	0.2160	154.0160 (264)
Space and water heating			669.5931 (265)
Pumps and fans	176.1074	0.5190	91.3998 (267)
Energy for lighting	316.9641	0.5190	164.5044 (268)
Energy saving/generation technologies			
PV Unit	-690.8958	0.5190	-358.5749 (269)
Total kg/year			566.9223 (272)
CO2 emissions per m2			8.0500 (273)
EI value			93.4182
EI rating			93 (274)
EI band			A

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	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) =											Air changes per hour		
Pressure test											0.0000 / (5) =		0.0000 (8)
Measured/design AP50											Yes		
Infiltration rate											3.4000		
Number of sides sheltered											0.1700 (18)		
											2 (19)		
Shelter factor											(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =		0.1445 (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													
	0.1698	0.1590	0.1590	0.1445	0.1481	0.1409	0.1409	0.1373	0.1373	0.1481	0.1445	0.1481 (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)			13.1800	1.1450	15.0916		(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	15.3300	68.7800	0.2400	16.5072	42.2200	2903.8916 (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) =	41.7400		(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) =	13334.9706 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							189.3634 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.8796 (36)					
Total fabric heat loss						(33) + (36) =	52.6196 (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	81.6620	81.6620	81.6620	81.6620	81.6620	81.6620	81.6620	81.6620	81.6620	81.6620	81.6620	81.6620 (39)
Average = Sum(39)m / 12 =												81.6620 (39)
HLP	Jan 1.1596	Feb 1.1596	Mar 1.1596	Apr 1.1596	May 1.1596	Jun 1.1596	Jul 1.1596	Aug 1.1596	Sep 1.1596	Oct 1.1596	Nov 1.1596	Dec 1.1596 (40)
HLP (average)												1.1596 (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	44.8695	39.8527	32.4104	24.5368	18.3415	15.4847	16.7318	21.7486	29.1909	37.0645	43.2598	46.1166	(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	504.2556	500.2461	480.8028	450.6699	419.9197	392.2338	375.9448	383.6427	400.8770	431.2103	464.9619	490.4091	(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				2.2200	25.1733	0.6300	0.7000	0.7700	17.0791 (76)			
South				7.8200	56.5862	0.6300	0.7000	0.7700	135.2350 (78)			
Solar gains	165.2387	237.5269	327.7228	406.2199	429.3024	472.7449	437.4073	416.8610	370.5759	282.1280	196.7729	134.2041 (83)
Total gains	669.4944	737.7730	808.5256	856.8898	849.2221	864.9787	813.3521	800.5036	771.4529	713.3383	661.7348	624.6131 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	45.3597	45.3597	45.3597	45.3597	45.3597	45.3597	45.3597	45.3597	45.3597	45.3597	45.3597	45.3597
alpha	4.0240	4.0240	4.0240	4.0240	4.0240	4.0240	4.0240	4.0240	4.0240	4.0240	4.0240	4.0240
util living area	0.9614	0.9439	0.9011	0.8159	0.6790	0.4680	0.3287	0.3240	0.5611	0.8084	0.9291	0.9683 (86)
MIT	19.9891	20.1298	20.3979	20.6855	20.8872	20.9807	20.9965	20.9968	20.9597	20.7528	20.3450	19.9387 (87)
Th 2	19.9524	19.9524	19.9524	19.9524	19.9524	19.9524	19.9524	19.9524	19.9524	19.9524	19.9524	19.9524 (88)
util rest of house	0.9521	0.9309	0.8785	0.7750	0.6111	0.3776	0.2257	0.2192	0.4683	0.7562	0.9097	0.9604 (89)
MIT 2	19.0722	19.2072	19.4611	19.7211	19.8855	19.9453	19.9518	19.9519	19.9352	19.7848	19.4172	19.0238 (90)
Living area fraction									fLA = Living area / (4) =			0.2604 (91)
MIT	19.3110	19.4475	19.7051	19.9723	20.1464	20.2150	20.2239	20.2240	20.2020	20.0369	19.6588	19.2621 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3110	19.4475	19.7051	19.9723	20.1464	20.2150	20.2239	20.2240	20.2020	20.0369	19.6588	19.2621 (93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9451	0.9234	0.8724	0.7758	0.6244	0.4008	0.2526	0.2466	0.4913	0.7608	0.9032	0.9539	(94)
Useful gains	632.7316	681.2544	705.3819	664.7833	530.2928	346.6788	205.4923	197.4125	379.0380	542.7383	597.7058	595.8147	(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	1119.6658	1098.1495	988.5261	806.1877	575.4236	352.3699	206.1068	197.9517	392.1408	648.1396	903.0863	1107.5058	(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	362.2790	280.1535	210.6593	101.8111	33.5774	0.0000	0.0000	0.0000	0.0000	78.4186	219.8740	380.6982	(98)
Space heating												1667.4710	(98)
Space heating per m2											(98) / (4) =	23.6789	(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													1848.6375 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	362.2790	280.1535	210.6593	101.8111	33.5774	0.0000	0.0000	0.0000	0.0000	78.4186	219.8740	380.6982	(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)	401.6397	310.5915	233.5469	112.8727	37.2255	0.0000	0.0000	0.0000	0.0000	86.9385	243.7627	422.0601	(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	86.3289	86.4365	86.5870	87.4089	89.3664	76.2000	76.2000	76.2000	76.2000	83.3434	85.4244	76.2000	(216)
Fuel for water heating, kWh/month	135.4884	100.6661	71.4911	24.5015	2.0096	0.0000	0.0000	0.0000	29.3524	76.2946	112.5702	136.7347	(219)
Water heating fuel used												689.1086	(219)
Annual totals kWh/year													
Space heating fuel - main system												1848.6375	(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)													316.9641 (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												2258.9711	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1848.6375	7.3800	136.4294 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	689.1086	7.3800	50.8562 (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	316.9641	28.6600	90.8419 (250)
Additional standing charges			107.0000 (251)
Energy saving/generation technologies			
PV Unit	-771.8465	28.6600	-221.2112 (252)
Total energy cost			214.3887 (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	1848.6375	0.2160	399.3057 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	689.1086	0.2160	148.8475 (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			548.1532 (265)
Pumps and fans	176.1074	0.5190	91.3998 (267)
Energy for lighting	316.9641	0.5190	164.5044 (268)
Energy saving/generation technologies			
PV Unit	-771.8465	0.5190	-400.5884 (269)
Total kg/year			403.4689 (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	1848.6375	1.2200	2255.3378 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	689.1086	1.2200	840.7125 (264)
Space and water heating			3096.0502 (265)
Pumps and fans	176.1074	3.0700	540.6498 (267)
Energy for lighting	316.9641	3.0700	973.0797 (268)
Energy saving/generation technologies			
PV Unit	-771.8465	3.0700	-2369.5689 (269)
Primary energy kWh/year			2240.2108 (272)
Primary energy kWh/m2/year			31.8121 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0943 Plot 4	Issued on Date	12/06/2024
Assessment Reference	As Built	Prop Type Ref	Type B Terrace
Project	7, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	12.53	TER	18.88
Environmental	91 B	% DER<TER	33.65		
CO ₂ Emissions (t/year)	0.60	DFEE	44.25	TFEE	51.75
General Requirements Compliance	Pass	% DFEE<TFEE	14.49		

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 4	Issued on Date	12/06/2024
Assessment Reference	As Built	Prop Type Ref	Type B Terrace
Project	7, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	12.53	TER	18.88
Environmental	91 B	% DER<TER	33.65		
CO ₂ Emissions (t/year)	0.60	DFEE	44.25	TFEE	51.75
General Requirements Compliance	Pass	% DFEE<TFEE	14.49		

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 4	Issued on Date	12/06/2024
Assessment Reference	As Built	Prop Type Ref	Type B Terrace
Project	7, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	12.53	TER	18.88
Environmental	91 B	% DER<TER	33.65		
CO ₂ Emissions (t/year)	0.60	DFEE	44.25	TFEE	51.75
General Requirements Compliance	Pass	% DFEE<TFEE	14.49		

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 4	Issued on Date	12/06/2024
Assessment Reference	As Built	Prop Type Ref	Type B Terrace
Project	7, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	12.53	TER	18.88
Environmental	91 B	% DER<TER	33.65		
CO ₂ Emissions (t/year)	0.60	DFEE	44.25	TFEE	51.75
General Requirements Compliance	Pass	% DFEE<TFEE	14.49		

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 4			Issued on Date	12/06/2024
Assessment Reference	As Built	Prop Type Ref	Type B Terrace		
Property	7 , Shaw Crescent, West End, Southampton, SO30 3LH				
SAP Rating	88 B	DER	12.53	TER	18.88
Environmental	91 B	% DER<TER	33.65		
CO ₂ Emissions (t/year)	0.60	DFEE	44.25	TFEE	51.75
General Requirements Compliance	Pass	% DFEE<TFEE	14.49		
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	189.36	kJ/m ² K

9.0 External Walls			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type	Construction				
Brick and Block	Cavity Wall	Other	0.24	42.22	84.11	68.78

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

9.2 Internal Walls			Kappa (kJ/m ² K)	Area (m ²)
Description	Construction			
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			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type	Construction				
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					2.22	
Rear Elevation	Window	[1] Brick and Block	South	None	0.00					7.82	

14.0 Conservatory

15.0 Draught Proofing

 %

16.0 Draught Lobby

17.0 Thermal Bridging

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	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)	4.99	0.064	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.59	0.067	No	Birtley Supatherm
Independently assessed	E3 Sill	8.40	0.021	No	Knauf P5
Independently assessed	E4 Jamb	27.00	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)	2.13	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)	8.83	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	8.83	0.160	No	
Table K1 - Default	P2 Party wall - Intermediate floor within a dwelling	8.83	0.000	No	
Independently assessed	P4 Party wall - Roof (insulation at ceiling level)	8.83	0.035	No	Knauf P29 Halved

Y-value	0.070	W/m²K
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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	3.40	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	16	
Total number of L.E.L. fittings	16	
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	