



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 22, Shaw Crescent
West End, Southampton, SO30 3LH

Contact: Tobias Whiting
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Report Issue Date: 29/05/2024

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0943 Plot 24			Issued on Date	29/05/2024
Assessment Reference	As Built	Prop Type Ref	Block J Mid Terrace		
Property	22, Shaw Crescent, West End, Southampton, SO30 3LH				
SAP Rating	89 B	DER	11.67	TER	16.79
Environmental	91 B	% DER<TER	30.49		
CO ₂ Emissions (t/year)	0.70	DFEE	35.80	TFEE	44.32
General Requirements Compliance	Pass	% DFEE<TFEE	19.23		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com			Assessor ID	E477-0001
Client	Foreman Homes, FORE				

SUMMARY FOR INPUT DATA FOR New Build (As Built)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	16.79	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	11.67	kgCO ₂ /m ²	Pass
	-5.12 (-30.5%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	44.32	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	35.80	kWh/m ² /yr	
	-8.5 (-19.2%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	Pass
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	Pass
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.04 (measured in this dwelling)	m ³ /(h.m ²) @ 50 Pa	
Maximum	10.0	m ³ /(h.m ²) @ 50 Pa	Pass

Limiting System Efficiencies

4 Heating efficiency

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

BUILDING REGULATION COMPLIANCE

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Main heating system

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

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Programmer, room thermostat and TRVs

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100 %

Minimum

75 %

Pass

8 Mechanical ventilation

Continuous extract system

Specific fan power

0.17

Maximum

0.7

Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Southern England)

Slight

Pass

Based on:

Overshading

Average

Windows facing East

4.31 m², No overhang

Windows facing West

7.00 m², No overhang

Air change rate

4.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

3.04 (measured in this dwelling)

m³/(h.m²) @ 50 Pa

Maximum

10.0

m³/(h.m²) @ 50 Pa

Pass

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BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

10 Key features

Party wall U-value	0.00	W/m ² K
Party wall U-value	0.00	W/m ² K
Roof U-value	0.10	W/m ² K
Floor U-value	0.12	W/m ² K
Door U-value	1.10	W/m ² K
Air permeability	3.0	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	Block J Mid Terrace
Property	22, Shaw Crescent, West End, Southampton, SO30 3LH		
SAP Rating	89 B	DER	11.67
Environmental	91 B	TER	16.79
CO ₂ Emissions (t/year)	0.70	% DER<TER	30.49
General Requirements Compliance	Pass	DFEE	35.80
		TFEE	44.32
		% DFEE<TFEE	19.23
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com		Assessor ID
			E477-0001
Client	Foreman Homes, FORE		

	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.071	1.02	0.07	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.064	4.99	0.32	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.067	1.59	0.11	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.061	1.81	0.11	Birtley Supatherm
External wall	E3 Sill	Independently assessed	0.021	6.80	0.14	Knauf P5
External wall	E4 Jamb	Independently assessed	0.016	20.10	0.32	Knauf P6
External wall	E5 Ground floor (normal)	Table K1 - Default	0.320	9.73	3.11	
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	9.73	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	9.73	0.58	
External wall	E18 Party wall between dwellings	Independently assessed	0.036	10.00	0.36	Knauf P25 Halved
External wall	E18 Party wall between dwellings	Independently assessed	0.024	2.39	0.06	Knauf P25 divided by three
External wall	E25 Staggered party wall between dwellings	Independently assessed	0.055	10.00	0.55	Knauf P27 Halved
Party wall	P1 Party wall - Ground floor	Table K1 - Default	0.160	17.70	2.83	
Party wall	P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	0.000	17.70	0.00	
Party wall	P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	0.035	17.70	0.62	Knauf P29 Halved

Total: **9.19** W/mK:
Y-Value: **0.069** W/m²K:

FULL SAP CALCULATION PRINTOUT

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FULL SAP CALCULATION PRINTOUT

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

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DWELLING AS BUILT

Mid-Terrace House, total floor area 85 m²

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

1a TER and DER

Fuel for main heating:Mains gas

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 16.79 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 11.67 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 44.3 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE) 35.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.04 (measured in this dwelling)
Maximum 10.0 OK

4 Heating efficiency

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

Data from database

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

Combi boiler

Efficiency: 89.3% SEDBUK2009

Minimum: 88.0% OK

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls:

No cylinder

Boiler interlock

Yes

OK

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system

Specific fan power: 0.17
Maximum 0.7 OK

9 Summertime temperature

Overheating risk (Southern England): Slight OK

Based on:

Overshading: Average

Windows facing East: 4.31 m², No overhang

Windows facing West: 7.00 m², No overhang

Air change rate: 4.00 ach

Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K

Party wall U-value 0.00 W/m²K

Roof U-value 0.10 W/m²K

Floor U-value 0.12 W/m²K

Door U-value 1.10 W/m²K

Air permeability 3.0 m³/m²h

Photovoltaic array 0.80 kW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.5400 (1b)	x 2.6100 (2b)	= 111.0294 (1b) - (3b)
First floor	42.5400 (1c)	x 2.3900 (2c)	= 101.6706 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.0800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.7000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0400
Infiltration rate					0.1520 (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)	=	0.1292 (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	0.1647	0.1615	0.1583	0.1421	0.1389	0.1227	0.1227	0.1195	0.1292	0.1389	0.1454	0.1518 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Front Door			2.1500	1.1000	2.3650		(26)					
Windows (Uw = 1.20)			11.3100	1.1450	12.9504		(27)					
Ground Floor			42.5400	0.1200	5.1048	84.0000	3573.3600 (28a)					
Brick and Block	48.6500	13.4600	35.1900	0.2400	8.4456	42.2200	1485.7218 (29a)					
Pitched Roof	42.5400		42.5400	0.1000	4.2540	9.1000	387.1140 (30)					
Total net area of external elements Aum(A, m2)			133.7300				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.1198		(33)					
Party Wall 1			44.0000	0.0000	0.0000	58.0600	2554.6400 (32)					
Party Wall 2			44.0000	0.0000	0.0000	58.0600	2554.6400 (32)					
Ground Floor Stud			72.3100			9.0000	650.7900 (32c)					
First Floor Stud			108.0200			9.0000	972.1800 (32c)					
Internal Floor 1			42.5400			18.0000	765.7200 (32d)					
Internal Ceiling 1			42.5400			18.0000	765.7200 (32e)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		13709.8858 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							161.1411 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.1894 (36)					
Total fabric heat loss						(33) + (36) =	42.3092 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 35.0955	Feb 35.0955	Mar 35.0955	Apr 35.0955	May 35.0955	Jun 35.0955	Jul 35.0955	Aug 35.0955	Sep 35.0955	Oct 35.0955	Nov 35.0955	Dec 35.0955 (38)
Heat transfer coeff	77.4047	77.4047	77.4047	77.4047	77.4047	77.4047	77.4047	77.4047	77.4047	77.4047	77.4047	77.4047 (39)
Average = Sum(39)m / 12 =												77.4047 (39)
HLP	Jan 0.9098	Feb 0.9098	Mar 0.9098	Apr 0.9098	May 0.9098	Jun 0.9098	Jul 0.9098	Aug 0.9098	Sep 0.9098	Oct 0.9098	Nov 0.9098	Dec 0.9098 (40)
HLP (average)												0.9098 (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												2.5522 (42)
Average daily hot water use (litres/day)												94.8152 (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	104.2967	100.5041	96.7115	92.9189	89.1263	85.3337	85.3337	89.1263	92.9189	96.7115	100.5041	104.2967 (44)
Energy conte	154.6691	135.2746	139.5912	121.6990	116.7731	100.7663	93.3748	107.1489	108.4286	126.3631	137.9352	149.7887 (45)
Energy content (annual)										Total = Sum (45)m =		1491.8127 (45)
Distribution loss (46)m = 0.15 x (45)m	23.2004	20.2912	20.9387	18.2549	17.5160	15.1149	14.0062	16.0723	16.2643	18.9545	20.6903	22.4683 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.6707	0.6071	0.6075	0.5089	0.4683	0.3869	0.3586	0.4297	0.4534	0.5499	0.6190	0.6495 (61)
Total heat required for water heating calculated for each month	155.3397	135.8816	140.1987	122.2079	117.2414	101.1532	93.7334	107.5787	108.8820	126.9131	138.5543	150.4382 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	155.3397	135.8816	140.1987	122.2079	117.2414	101.1532	93.7334	107.5787	108.8820	126.9131	138.5543	150.4382 (64)
Heat gains from water heating, kWh/month	51.5951	45.1306	46.5660	40.5921	38.9441	33.6015	31.1368	35.7345	36.1659	42.1532	46.0182	49.9671 (65)
										Total per year (kWh/year) = Sum (64)m =		1498.1223 (64)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	127.6110	127.6110	127.6110	127.6110	127.6110	127.6110	127.6110	127.6110	127.6110	127.6110	127.6110	127.6110 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.2229	19.7382	16.0522	12.1525	9.0842	7.6692	8.2869	10.7716	14.4576	18.3572	21.4256	22.8405 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	229.7298	232.1137	226.1064	213.3176	197.1740	182.0013	171.8650	169.4811	175.4884	188.2773	204.4208	219.5935 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7611	35.7611	35.7611	35.7611	35.7611	35.7611	35.7611	35.7611	35.7611	35.7611	35.7611	35.7611 (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)	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888 (71)
Water heating gains (Table 5)	69.3483	67.1586	62.5887	56.3780	52.3443	46.6688	41.8505	48.0302	50.2304	56.6576	63.9142	67.1601 (72)
Total internal gains	385.5843	383.2937	369.0305	346.1314	322.8857	300.6226	286.2857	292.5662	304.4597	327.5753	354.0439	373.8775 (73)

6. Solar gains

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

Solar gains	67.8862	132.7999	218.7025	318.9645	390.9030	400.1588	380.9675	327.2454	254.3600	157.5783	84.6462	55.8263 (83)
Total gains	453.4705	516.0936	587.7330	665.0959	713.7887	700.7814	667.2532	619.8117	558.8198	485.1536	438.6901	429.7038 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	49.1999	49.1999	49.1999	49.1999	49.1999	49.1999	49.1999	49.1999	49.1999	49.1999	49.1999	49.1999
alpha	4.2800	4.2800	4.2800	4.2800	4.2800	4.2800	4.2800	4.2800	4.2800	4.2800	4.2800	4.2800
util living area	0.9926	0.9864	0.9691	0.9199	0.8140	0.6510	0.4960	0.5504	0.7918	0.9511	0.9872	0.9941 (86)
MIT	19.6227	19.7950	20.0963	20.4691	20.7731	20.9360	20.9842	20.9756	20.8503	20.4384	19.9491	19.5725 (87)
Th 2	20.1592	20.1592	20.1592	20.1592	20.1592	20.1592	20.1592	20.1592	20.1592	20.1592	20.1592	20.1592 (88)
util rest of house	0.9911	0.9835	0.9623	0.9020	0.7741	0.5822	0.4073	0.4595	0.7337	0.9366	0.9839	0.9929 (89)
MIT 2	18.8871	19.0581	19.3554	19.7152	19.9920	20.1227	20.1531	20.1491	20.0627	19.6925	19.2123	18.8372 (90)
Living area fraction	19.0529	19.2242	19.5224	19.8851	20.1680	20.3060	20.3404	20.3353	20.2402	19.8605	19.3784	19.0029 (92)
MIT	19.0529	19.2242	19.5224	19.8851	20.1680	20.3060	20.3404	20.3353	20.2402	19.8605	19.3784	19.0029 (93)
Temperature adjustment												0.0000
adjusted MIT	19.0529	19.2242	19.5224	19.8851	20.1680	20.3060	20.3404	20.3353	20.2402	19.8605	19.3784	19.0029 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9883	0.9794	0.9560	0.8953	0.7745	0.5948	0.4269	0.4792	0.7399	0.9303	0.9800	0.9906 (94)
Ext temp.	448.1808	505.4520	561.8830	595.4318	552.8605	416.8584	284.8686	297.0263	413.4554	451.3545	429.9067	425.6446 (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	1141.9412	1108.7571	1007.9911	850.2953	655.4644	441.6690	289.5238	304.6114	475.2781	716.8078	950.4017	1145.8148 (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	516.1577	405.4211	331.9045	183.5017	76.3373	0.0000	0.0000	0.0000	0.0000	197.4972	374.7564	535.8067 (98)
Space heating per m2												2621.3825 (98)
										(98) / (4) =		30.8108 (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	2906.1890 (211)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	516.1577	405.4211	331.9045	183.5017	76.3373	0.0000	0.0000	0.0000	0.0000	197.4972	374.7564	535.8067 (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)	572.2370	449.4690	367.9650	203.4387	84.6311	0.0000	0.0000	0.0000	0.0000	218.9548	415.4727	594.0207 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	155.3397	135.8816	140.1987	122.2079	117.2414	101.1532	93.7334	107.5787	108.8820	126.9131	138.5543	150.4382 (64)
Efficiency of water heater (217)m	86.5821	86.2875	85.6079	84.1256	81.3054	76.4000	76.4000	76.4000	76.4000	84.2468	86.0067	76.4000 (216)
Fuel for water heating, kWh/month	179.4131	157.4755	163.7684	145.2684	144.1989	132.3995	122.6876	140.8098	142.5157	150.6444	161.0971	173.3871 (219)
Water heating fuel used												1813.6655 (219)
Annual totals kWh/year												
Space heating fuel - main system												2906.1890 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.2380)												61.7596 (230a)
mechanical ventilation fans (SFP = 0.2380)												30.0000 (230c)
central heating pump												45.0000 (230e)
main heating flue fan												136.7596 (231)
Total electricity for the above, kWh/year												392.4632 (232)
Electricity for lighting (calculated in Appendix L)												
Energy saving/generation technologies (Appendices M, N and Q)												
PV Unit 0 (0.80 + 0.80 + 908 + 1.00) =												-581.0267 (233)
Total delivered energy for all uses												4668.0506 (238)

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

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Space heating - main system 1	2906.1890	0.2160	627.7368 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1813.6655	0.2160	391.7518 (264)
Space and water heating			1019.4886 (265)
Pumps and fans	136.7596	0.5190	70.9782 (267)
Energy for lighting	392.4632	0.5190	203.6884 (268)
Energy saving/generation technologies			
PV Unit	-581.0267	0.5190	-301.5529 (269)
Total CO ₂ , kg/year			992.6023 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			11.6700 (273)

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

DER	11.6700	ZC1
Total Floor Area	85.0800	
Assumed number of occupants	2.5522	
CO ₂ emission factor in Table 12 for electricity displaced from grid	0.5190	
CO ₂ emissions from appliances, equation (L14)	16.0006	ZC2
CO ₂ emissions from cooking, equation (L16)	2.1186	ZC3
Total CO ₂ emissions	29.7892	ZC4
Residual CO ₂ emissions offset from biofuel CHP	0.0000	ZC5
Additional allowable electricity generation, kWh/m ² /year	0.0000	ZC6
Resulting CO ₂ emissions offset from additional allowable electricity generation	0.0000	ZC7
Net CO ₂ emissions	29.7892	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.5400 (1b)	x 2.6100 (2b)	= 111.0294 (1b) - (3b)
First floor	42.5400 (1c)	x 2.3900 (2c)	= 101.6706 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.0800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.7000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					30.0000 / (5) = 0.1410 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3910 (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) =	0.3324 (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	0.4238	0.4155	0.4072	0.3656	0.3573	0.3158	0.3158	0.3075	0.3324	0.3573	0.3739	0.3906 (22b)
Effective ac	0.5898	0.5863	0.5829	0.5668	0.5638	0.5499	0.5499	0.5473	0.5552	0.5638	0.5699	0.5763 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			2.1500	1.0000	2.1500		(26)					
TER Opening Type (Uw = 1.40)			11.3100	1.3258	14.9943		(27)					
Ground Floor			42.5400	0.1300	5.5302		(28a)					
Brick and Block	48.6500	13.4600	35.1900	0.1800	6.3342		(29a)					
Pitched Roof	42.5400		42.5400	0.1300	5.5302		(30)					
Total net area of external elements Aum(A, m2)			133.7300				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		34.5389		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.8395 (36)					
Total fabric heat loss						(33) + (36) =	43.3784 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 41.3987	Feb 41.1539	Mar 40.9140	Apr 39.7871	May 39.5763	Jun 38.5948	Jul 38.5948	Aug 38.4131	Sep 38.9729	Oct 39.5763	Nov 40.0028	Dec 40.4487 (38)
Heat transfer coeff	84.7771	84.5323	84.2924	83.1656	82.9547	81.9733	81.9733	81.7915	82.3513	82.9547	83.3812	83.8271 (39)
Average = Sum(39)m / 12 =												83.1646 (39)
HLP	Jan 0.9964	Feb 0.9936	Mar 0.9907	Apr 0.9775	May 0.9750	Jun 0.9635	Jul 0.9635	Aug 0.9613	Sep 0.9679	Oct 0.9750	Nov 0.9800	Dec 0.9853 (40)
HLP (average)												0.9775 (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												2.5522 (42)
Average daily hot water use (litres/day)												94.8152 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	104.2967	100.5041	96.7115	92.9189	89.1263	85.3337	85.3337	89.1263	92.9189	96.7115	100.5041	104.2967 (44)
Energy conte	154.6691	135.2746	139.5912	121.6990	116.7731	100.7663	93.3748	107.1489	108.4286	126.3631	137.9352	149.7887 (45)
Energy content (annual)											Total = Sum(45)m =	1491.8127 (45)
Distribution loss	(46)m = 0.15 x (45)m											
	23.2004	20.2912	20.9387	18.2549	17.5160	15.1149	14.0062	16.0723	16.2643	18.9545	20.6903	22.4683 (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												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Total heat required for water heating calculated for each month	50.9589	46.0274	49.2831	45.8230	45.4178	42.0824	43.4851	45.4178	45.8230	49.2831	49.3151	50.9589 (61)
Solar input	205.6280	181.3020	188.8744	167.5220	162.1909	142.8487	136.8599	152.5667	154.2517	175.6463	187.2503	200.7476 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	205.6280	181.3020	188.8744	167.5220	162.1909	142.8487	136.8599	152.5667	154.2517	175.6463	187.2503	200.7476 (64)
	64.1672	56.4856	58.7349	51.9207	50.1815	44.0254	41.9184	46.9815	47.5083	54.3365	58.1922	62.5445 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	127.6110	127.6110	127.6110	127.6110	127.6110	127.6110	127.6110	127.6110	127.6110	127.6110	127.6110	127.6110	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.2229	19.7382	16.0522	12.1525	9.0842	7.6692	8.2869	10.7716	14.4576	18.3572	21.4256	22.8405	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	229.7298	232.1137	226.1064	213.3176	197.1740	182.0013	171.8650	169.4811	175.4884	188.2773	204.4208	219.5935	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7611	35.7611	35.7611	35.7611	35.7611	35.7611	35.7611	35.7611	35.7611	35.7611	35.7611	35.7611	(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)	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	(71)
Water heating gains (Table 5)	86.2462	84.0560	78.9447	72.1121	67.4483	61.1464	56.3419	63.1471	65.9837	73.0330	80.8225	84.0652	(72)
Total internal gains	402.4822	400.1912	385.3866	361.8655	337.9897	315.1002	300.7771	307.6832	320.2131	343.9507	370.9523	390.7825	(73)

6. Solar gains

[Jan]														
	Area m2				Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W	
East	4.3100				19.6403		0.6300		0.7000		0.7700		25.8700 (76)	
West	7.0000				19.6403		0.6300		0.7000		0.7700		42.0162 (80)	
Solar gains	67.8862	132.7999	218.7025	318.9645	390.9030	400.1588	380.9675	327.2454	254.3600	157.5783	84.6462	55.8263 (83)		
Total gains	470.3685	532.9911	604.0891	680.8300	728.8927	715.2590	681.7446	634.9286	574.5731	501.5290	455.5984	446.6089 (84)		

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.6926	69.8943	70.0933	71.0430	71.2236	72.0763	72.0763	72.2365	71.7455	71.2236	70.8593	70.4823	
alpha	5.6462	5.6596	5.6729	5.7362	5.7482	5.8051	5.8051	5.8158	5.7830	5.7482	5.7240	5.6988	
util living area	0.9987	0.9970	0.9906	0.9629	0.8749	0.6967	0.5228	0.5807	0.8478	0.9810	0.9971	0.9990	(86)
MIT	19.9257	20.0574	20.2908	20.6003	20.8475	20.9699	20.9951	20.9914	20.9074	20.5773	20.1972	19.9051	(87)
Th 2	20.0863	20.0887	20.0911	20.1021	20.1042	20.1139	20.1139	20.1157	20.1101	20.1042	20.1000	20.0956	(88)
util rest of house	0.9982	0.9960	0.9873	0.9493	0.8322	0.6150	0.4209	0.4752	0.7823	0.9716	0.9959	0.9987	(89)
MIT 2	18.6413	18.8354	19.1766	19.6259	19.9529	20.0936	20.1120	20.1120	20.0341	19.6014	19.0486	18.6181	(90)
Living area fraction	18.9307	19.1107	19.4276	19.8455	20.1545	20.2910	20.3110	20.3101	20.2309	19.8212	19.3074	18.9081	(91)
MIT	18.9307	19.1107	19.4276	19.8455	20.1545	20.2910	20.3110	20.3101	20.2309	19.8212	19.3074	18.9081	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9307	19.1107	19.4276	19.8455	20.1545	20.2910	20.3110	20.3101	20.2309	19.8212	19.3074	18.9081	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9974	0.9944	0.9840	0.9445	0.8349	0.6322	0.4439	0.4990	0.7923	0.9677	0.9944	0.9980	(94)
Ext temp.	469.1426	529.9947	594.4239	643.0565	608.5624	452.1550	302.6384	316.8468	455.2401	485.3345	453.0603	445.7342	(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	1240.3459	1201.2671	1089.7030	910.2851	701.3402	466.5135	304.2010	319.8160	504.8848	764.9461	1017.8658	1232.9366	(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 per m2	573.7753	451.0950	368.4876	192.4046	69.0267	0.0000	0.0000	0.0000	0.0000	208.0310	406.6599	585.6786	(98)
												2855.1587	(98)
												33.5585	(99)

8c. Space cooling requirement

Not applicable

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3056.9151 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	573.7753	451.0950	368.4876	192.4046	69.0267	0.0000	0.0000	0.0000	0.0000	208.0310	406.6599	585.6786	(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)	614.3204	482.9711	394.5264	206.0006	73.9044	0.0000	0.0000	0.0000	0.0000	222.7313	435.3960	627.0649	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	205.6280	181.3020	188.8744	167.5220	162.1909	142.8487	136.8599	152.5667	154.2517	175.6463	187.2503	200.7476	(64)
Efficiency of water heater	87.4965	87.2537	86.7044	85.4005	83.0707	80.3000	80.3000	80.3000	80.3000	85.4781	86.9518	87.5878	(216)
Fuel for water heating, kWh/month	235.0127	207.7872	217.8371	196.1604	195.2443	177.8937	170.4358	189.9959	192.0942	205.4869	215.3494	229.1958	(219)
Water heating fuel used												2432.4934	(219)
Annual totals kWh/year													
Space heating fuel - main system												3056.9151	(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)												392.4632	(232)
Total delivered energy for all uses												5956.8717	(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	3056.9151	0.2160	660.2937 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2432.4934	0.2160	525.4186 (264)
Space and water heating			1185.7122 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	392.4632	0.5190	203.6884 (268)
Total CO2, kg/m2/year			1428.3256 (272)
Emissions per m2 for space and water heating			13.9364 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3941 (272b)
Emissions per m2 for pumps and fans			0.4575 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.9364 * 1.00) + 2.3941 + 0.4575, rounded to 2 d.p.			16.7900 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.5400 (1b)	x 2.6100 (2b)	= 111.0294 (1b) - (3b)
First floor	42.5400 (1c)	x 2.3900 (2c)	= 101.6706 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.0800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.7000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					30.0000 / (5) = 0.1410 (8)
Pressure test					Yes
Measured/design AP50					3.0400
Infiltration rate					0.2930 (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) =	0.2491 (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	0.3176	0.3114	0.3051	0.2740	0.2678	0.2366	0.2366	0.2304	0.2491	0.2678	0.2802	0.2927 (22b)
Effective ac	0.5504	0.5485	0.5466	0.5375	0.5359	0.5280	0.5280	0.5265	0.5310	0.5359	0.5393	0.5428 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.20)			11.3100	1.1450	12.9504		(27)
Ground Floor			42.5400	0.1200	5.1048	84.0000	3573.3600 (28a)
Brick and Block	48.6500	13.4600	35.1900	0.2400	8.4456	42.2200	1485.7218 (29a)
Pitched Roof	42.5400		42.5400	0.1000	4.2540	9.1000	387.1140 (30)
Total net area of external elements Aum(A, m ²)			133.7300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.1198		(33)
Party Wall 1			44.0000	0.0000	0.0000	58.0600	2554.6400 (32)
Party Wall 2			44.0000	0.0000	0.0000	58.0600	2554.6400 (32)
Ground Floor Stud			72.3100			9.0000	650.7900 (32c)
First Floor Stud			108.0200			9.0000	972.1800 (32c)
Internal Floor 1			42.5400			18.0000	765.7200 (32d)
Internal Ceiling 1			42.5400			9.0000	382.8600 (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) = 13327.0258 (34)
156.6411 (35)
9.1894 (36)
(33) + (36) = 42.3092 (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	38.6353	38.4978	38.3631	37.7303	37.6119	37.0607	37.0607	36.9586	37.2730	37.6119	37.8514	38.1018 (38)
Heat transfer coeff	80.9444	80.8070	80.6722	80.0394	79.9210	79.3698	79.3698	79.2678	79.5821	79.9210	80.1605	80.4109 (39)
Average = Sum(39)m / 12 =												80.0388 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9514	0.9498	0.9482	0.9408	0.9394	0.9329	0.9329	0.9317	0.9354	0.9394	0.9422	0.9451 (40)
HLP (average)												0.9407 (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)
2.5522 (42)
94.8152 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	104.2967	100.5041	96.7115	92.9189	89.1263	85.3337	85.3337	89.1263	92.9189	96.7115	100.5041	104.2967 (44)
Energy conte	154.6691	135.2746	139.5912	121.6990	116.7731	100.7663	93.3748	107.1489	108.4286	126.3631	137.9352	149.7887 (45)

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Energy content (annual)	Total = Sum(45)m = 1491.8127 (45)											
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	32.8672	28.7458	29.6631	25.8610	24.8143	21.4128	19.8421	22.7691	23.0411	26.8522	29.3112	31.8301 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	127.6110	127.6110	127.6110	127.6110	127.6110	127.6110	127.6110	127.6110	127.6110	127.6110	127.6110	127.6110	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.2229	19.7382	16.0522	12.1525	9.0842	7.6692	8.2869	10.7716	14.4576	18.3572	21.4256	22.8405	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	229.7298	232.1137	226.1064	213.3176	197.1740	182.0013	171.8650	169.4811	175.4884	188.2773	204.4208	219.5935	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7611	35.7611	35.7611	35.7611	35.7611	35.7611	35.7611	35.7611	35.7611	35.7611	35.7611	35.7611	(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)	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	(71)
Water heating gains (Table 5)	44.1763	42.7766	39.8698	35.9181	33.3525	29.7401	26.6695	30.6037	32.0015	36.0916	40.7101	42.7824	(72)
Total internal gains	357.4123	355.9117	343.3117	322.6715	300.8940	280.6939	268.1047	272.1397	283.2308	304.0094	327.8398	346.4998	(73)

6. Solar gains

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

Solar gains	67.8862	132.7999	218.7025	318.9645	390.9030	400.1588	380.9675	327.2454	254.3600	157.5783	84.6462	55.8263 (83)
Total gains	425.2985	488.7116	562.0142	641.6361	691.7970	680.8527	649.0722	599.3852	537.5909	461.5877	412.4859	402.3261 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	45.7345	45.8123	45.8888	46.2516	46.3201	46.6418	46.6418	46.7019	46.5174	46.3201	46.1817	46.0379	
alpha	4.0490	4.0542	4.0593	4.0834	4.0880	4.1095	4.1095	4.1135	4.1012	4.0880	4.0788	4.0692	
util living area	0.9936	0.9881	0.9728	0.9283	0.8312	0.6728	0.5177	0.5749	0.8124	0.9577	0.9890	0.9949	(86)
MIT	19.4660	19.6488	19.9705	20.3827	20.7213	20.9173	20.9781	20.9667	20.8137	20.3555	19.8310	19.4279	(87)
Th 2	20.1240	20.1254	20.1267	20.1330	20.1342	20.1396	20.1396	20.1407	20.1375	20.1342	20.1318	20.1293	(88)
util rest of house	0.9923	0.9856	0.9668	0.9119	0.7929	0.6033	0.4249	0.4805	0.7564	0.9449	0.9862	0.9938	(89)
MIT 2	18.7061	18.8889	19.2081	19.6132	19.9262	20.0917	20.1311	20.1265	20.0151	19.5945	19.0761	18.6722	(90)
Living area fraction	18.8773	19.0601	19.3799	19.7866	20.1054	20.2777	20.3219	20.3158	20.1950	19.7659	19.2462	18.8425	(91)
MIT	18.8773	19.0601	19.3799	19.7866	20.1054	20.2777	20.3219	20.3158	20.1950	19.7659	19.2462	18.8425	(92)
Temperature adjustment	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(93)
adjusted MIT	18.8773	19.0601	19.3799	19.7866	20.1054	20.2777	20.3219	20.3158	20.1950	19.7659	19.2462	18.8425	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	420.9060	479.6916	539.7233	580.1855	547.5435	418.8239	288.9558	300.0517	408.8883	433.0204	405.2363	398.9594	(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	1179.9516	1144.2330	1039.0484	871.3534	671.7649	450.6364	295.4074	310.3983	485.0548	732.5515	973.6449	1177.4167	(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	564.7299	446.5718	371.4979	209.6409	92.4207	0.0000	0.0000	0.0000	0.0000	222.8512	409.2542	579.1722	(98)
Space heating													2896.1389 (98)
Space heating per m2													34.0402 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	746.0765	587.3368	602.4350	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8689	0.9211	0.8985	0.0000	0.0000	0.0000	0.0000	(101)

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Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	648.2656	540.9922	541.2954	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	892.1849	853.0983	796.8942	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	175.6219	232.2070	190.1655	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												597.9943 (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	43.9055	58.0517	47.5414	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												149.4986 (107)
Space cooling per m2												1.7572 (108)
Energy for space heating												34.0402 (99)
Energy for space cooling												1.7572 (108)
Total												35.7973 (109)
Dwelling Fabric Energy Efficiency (DFEE)												35.8 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.5400 (1b)	x 2.6100 (2b)	= 111.0294 (1b) - (3b)
First floor	42.5400 (1c)	x 2.3900 (2c)	= 101.6706 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.0800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.7000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1410 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3910 (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) =	0.3324 (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	0.4238	0.4155	0.4072	0.3656	0.3573	0.3158	0.3158	0.3075	0.3324	0.3573	0.3739	0.3906 (22b)
Effective ac	0.5898	0.5863	0.5829	0.5668	0.5638	0.5499	0.5499	0.5473	0.5552	0.5638	0.5699	0.5763 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1500	1.0000	2.1500		(26)
TER Opening Type (Uw = 1.40)			11.3100	1.3258	14.9943		(27)
Ground Floor			42.5400	0.1300	5.5302		(28a)
Brick and Block	48.6500	13.4600	35.1900	0.1800	6.3342		(29a)
Pitched Roof	42.5400		42.5400	0.1300	5.5302		(30)
Total net area of external elements Aum(A, m ²)			133.7300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.5389		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.8395 (36)
Total fabric heat loss						(33) + (36) =	43.3784 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	41.3987	41.1539	40.9140	39.7871	39.5763	38.5948	38.5948	38.4131	38.9729	39.5763	40.0028	40.4487 (38)
Heat transfer coeff	84.7771	84.5323	84.2924	83.1656	82.9547	81.9733	81.9733	81.7915	82.3513	82.9547	83.3812	83.8271 (39)
Average = Sum(39)m / 12 =												83.1646 (39)
HLP	0.9964	0.9936	0.9907	0.9775	0.9750	0.9635	0.9635	0.9613	0.9679	0.9750	0.9800	0.9853 (40)
HLP (average)												0.9775 (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												2.5522 (42)
Average daily hot water use (litres/day)												94.8152 (43)
Daily hot water use	104.2967	100.5041	96.7115	92.9189	89.1263	85.3337	85.3337	89.1263	92.9189	96.7115	100.5041	104.2967 (44)
Energy conte	154.6691	135.2746	139.5912	121.6990	116.7731	100.7663	93.3748	107.1489	108.4286	126.3631	137.9352	149.7887 (45)
Energy content (annual)										Total = Sum(45)m =		1491.8127 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

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Calculation Type: New Build (As Built)

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Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
	32.8672	28.7458	29.6631	25.8610	24.8143	21.4128	19.8421	22.7691	23.0411	26.8522	29.3112	31.8301 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	127.6110	127.6110	127.6110	127.6110	127.6110	127.6110	127.6110	127.6110	127.6110	127.6110	127.6110	127.6110	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.2229	19.7382	16.0522	12.1525	9.0842	7.6692	8.2869	10.7716	14.4576	18.3572	21.4256	22.8405	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	229.7298	232.1137	226.1064	213.3176	197.1740	182.0013	171.8650	169.4811	175.4884	188.2773	204.4208	219.5935	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7611	35.7611	35.7611	35.7611	35.7611	35.7611	35.7611	35.7611	35.7611	35.7611	35.7611	35.7611	(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)	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	(71)
Water heating gains (Table 5)	44.1763	42.7766	39.8698	35.9181	33.3525	29.7401	26.6695	30.6037	32.0015	36.0916	40.7101	42.7824	(72)
Total internal gains	357.4123	355.9117	343.3117	322.6715	300.8940	280.6939	268.1047	272.1397	283.2308	304.0094	327.8398	346.4998	(73)

6. Solar gains

[Jan]			Area	Solar flux	g	FF	Access	Gains				
			m2	Table 6a	Specific data	Specific data	factor	W				
				W/m2	or Table 6b	or Table 6c	Table 6d					
East			4.3100	19.6403	0.6300	0.7000	0.7700	25.8700 (76)				
West			7.0000	19.6403	0.6300	0.7000	0.7700	42.0162 (80)				
Solar gains	67.8862	132.7999	218.7025	318.9645	390.9030	400.1588	380.9675	327.2454	254.3600	157.5783	84.6462	55.8263 (83)
Total gains	425.2985	488.7116	562.0142	641.6361	691.7970	680.8527	649.0722	599.3852	537.5909	461.5877	412.4859	402.3261 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.6926	69.8943	70.0933	71.0430	71.2236	72.0763	72.0763	72.2365	71.7455	71.2236	70.8593	70.4823	
alpha	5.6462	5.6596	5.6729	5.7362	5.7482	5.8051	5.8051	5.8158	5.7830	5.7482	5.7240	5.6988	
util living area	0.9992	0.9981	0.9934	0.9712	0.8940	0.7237	0.5474	0.6115	0.8751	0.9870	0.9983	0.9994	(86)
MIT	19.8748	20.0078	20.2452	20.5633	20.8256	20.9635	20.9938	20.9889	20.8884	20.5358	20.1488	19.8549	(87)
Th 2	20.0863	20.0887	20.0911	20.1021	20.1042	20.1139	20.1139	20.1157	20.1101	20.1042	20.1000	20.0956	(88)
util rest of house	0.9989	0.9974	0.9910	0.9601	0.8551	0.6418	0.4416	0.5022	0.8151	0.9804	0.9975	0.9992	(89)
MIT 2	19.0490	19.1837	19.4218	19.7425	19.9838	20.0967	20.1122	20.1123	20.0454	19.7212	19.3340	19.0368	(90)
Living area fraction	19.2350	19.3694	19.6073	19.9274	20.1734	20.2920	20.3109	20.3098	fLA = Living area / (4) =			0.2253	(91)
MIT	19.2350	19.3694	19.6073	19.9274	20.1734	20.2920	20.3109	20.3098	20.2353	19.9048	19.5176	19.2211	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2350	19.3694	19.6073	19.9274	20.1734	20.2920	20.3109	20.3098	20.2353	19.9048	19.5176	19.2211	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9986	0.9967	0.9893	0.9575	0.8585	0.6593	0.4656	0.5270	0.8249	0.9784	0.9969	0.9990	(94)
Ext temp.	424.7013	487.0764	555.9802	614.3384	593.9184	448.8663	302.1956	315.8741	443.4438	451.6183	411.2043	401.9151	(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	1266.1489	1223.1307	1104.8493	917.1014	702.9120	466.5940	304.1923	319.7912	505.2518	771.8737	1035.3919	1259.1767	(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	626.0370	494.6285	408.3587	217.9893	81.0913	0.0000	0.0000	0.0000	0.0000	238.2701	449.4151	637.8026	(98)
Space heating per m2												3153.5925	(98)
												37.0662	(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	770.5487	606.6022	621.6155	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9078	0.9557	0.9364	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	699.4702	579.7544	582.1024	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	892.1849	853.0983	796.8942	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	138.7546	203.3679	159.8051	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												501.9276	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	34.6886	50.8420	39.9513	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											125.4819 (107)
Space cooling per m2											1.4749 (108)
Energy for space heating											37.0662 (99)
Energy for space cooling											1.4749 (108)
Total											38.5411 (109)
Target Fabric Energy Efficiency (TFEE)											44.3 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.5400 (1b)	x 2.6100 (2b)	= 111.0294 (1b) - (3b)
First floor	42.5400 (1c)	x 2.3900 (2c)	= 101.6706 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.0800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.7000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0400
Infiltration rate					0.1520 (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) =	0.1292 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)
Adj infilt rate	0.1518	0.1421	0.1421	0.1292	0.1324	0.1260	0.1260	0.1227	0.1227	0.1324	0.1292	0.1324 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Front Door			2.1500	1.1000	2.3650		(26)					
Windows (Uw = 1.20)			11.3100	1.1450	12.9504		(27)					
Ground Floor			42.5400	0.1200	5.1048	84.0000	3573.3600 (28a)					
Brick and Block	48.6500	13.4600	35.1900	0.2400	8.4456	42.2200	1485.7218 (29a)					
Pitched Roof	42.5400		42.5400	0.1000	4.2540	9.1000	387.1140 (30)					
Total net area of external elements Aum(A, m2)			133.7300				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.1198		(33)					
Party Wall 1			44.0000	0.0000	0.0000	58.0600	2554.6400 (32)					
Party Wall 2			44.0000	0.0000	0.0000	58.0600	2554.6400 (32)					
Ground Floor Stud			72.3100			9.0000	650.7900 (32c)					
First Floor Stud			108.0200			9.0000	972.1800 (32c)					
Internal Floor 1			42.5400			18.0000	765.7200 (32d)					
Internal Ceiling 1			42.5400			18.0000	765.7200 (32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13709.8858 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							161.1411 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.1894 (36)					
Total fabric heat loss						(33) + (36) =	42.3092 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 35.0955	Feb 35.0955	Mar 35.0955	Apr 35.0955	May 35.0955	Jun 35.0955	Jul 35.0955	Aug 35.0955	Sep 35.0955	Oct 35.0955	Nov 35.0955	Dec 35.0955 (38)
Heat transfer coeff	77.4047	77.4047	77.4047	77.4047	77.4047	77.4047	77.4047	77.4047	77.4047	77.4047	77.4047	77.4047 (39)
Average = Sum(39)m / 12 =												77.4047 (39)
HLP	Jan 0.9098	Feb 0.9098	Mar 0.9098	Apr 0.9098	May 0.9098	Jun 0.9098	Jul 0.9098	Aug 0.9098	Sep 0.9098	Oct 0.9098	Nov 0.9098	Dec 0.9098 (40)
HLP (average)												0.9098 (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												2.5522 (42)
Average daily hot water use (litres/day)												94.8152 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Daily hot water use	104.2967	100.5041	96.7115	92.9189	89.1263	85.3337	85.3337	89.1263	92.9189	96.7115	100.5041	104.2967 (44)
Energy conte	154.6691	135.2746	139.5912	121.6990	116.7731	100.7663	93.3748	107.1489	108.4286	126.3631	137.9352	149.7887 (45)
Energy content (annual)										Total =	Sum (45)m =	1491.8127 (45)
Distribution loss (46)m = 0.15 x (45)m	23.2004	20.2912	20.9387	18.2549	17.5160	15.1149	14.0062	16.0723	16.2643	18.9545	20.6903	22.4683 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.6707	0.6071	0.6075	0.5089	0.4683	0.3869	0.3586	0.4297	0.4534	0.5499	0.6190	0.6495 (61)
Total heat required for water heating calculated for each month	155.3397	135.8816	140.1987	122.2079	117.2414	101.1532	93.7334	107.5787	108.8820	126.9131	138.5543	150.4382 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	155.3397	135.8816	140.1987	122.2079	117.2414	101.1532	93.7334	107.5787	108.8820	126.9131	138.5543	150.4382 (64)
RHI water heating demand												
Heat gains from water heating, kWh/month	51.5951	45.1306	46.5660	40.5921	38.9441	33.6015	31.1368	35.7345	36.1659	42.1532	46.0182	49.9671 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	153.1332	153.1332	153.1332	153.1332	153.1332	153.1332	153.1332	153.1332	153.1332	153.1332	153.1332	153.1332 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.5572	49.3454	40.1304	30.3813	22.7104	19.1731	20.7172	26.9290	36.1440	45.8931	53.5640	57.1013 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	342.8803	346.4383	337.4722	318.3844	294.2896	271.6437	256.5150	252.9569	261.9230	281.0108	305.1057	327.7515 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8655	52.8655	52.8655	52.8655	52.8655	52.8655	52.8655	52.8655	52.8655	52.8655	52.8655	52.8655 (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)	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888 (71)
Water heating gains (Table 5)	69.3483	67.1586	62.5887	56.3780	52.3443	46.6688	41.8505	48.0302	50.2304	56.6576	63.9142	67.1601 (72)
Total internal gains	574.6958	569.8523	547.1012	512.0537	476.2541	444.3955	425.9925	434.8260	455.2073	490.4714	529.4939	558.9229 (73)

6. Solar gains

[Jan]												
Area												
Solar flux												
Specific data												
Specific data												
Access factor												
Gains W												
East	4.3100	25.1733	0.6300	0.7000	0.7700	33.1580 (76)						
West	7.0000	25.1733	0.6300	0.7000	0.7700	53.8529 (80)						
Solar gains	87.0109	144.7926	241.9891	352.4466	404.8311	457.8381	419.0655	376.7535	294.0280	185.2275	108.1372	67.7282 (83)
Total gains	661.7067	714.6449	789.0903	864.5002	881.0853	902.2336	845.0581	811.5795	749.2353	675.6990	637.6311	626.6511 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan	49.1999	49.1999	49.1999	49.1999	49.1999	49.1999	49.1999	49.1999	49.1999	49.1999	49.1999	49.1999
Feb	4.2800	4.2800	4.2800	4.2800	4.2800	4.2800	4.2800	4.2800	4.2800	4.2800	4.2800	4.2800
Mar	0.9625	0.9478	0.9028	0.8006	0.6420	0.4303	0.3010	0.3039	0.5537	0.8184	0.9341	0.9680 (86)
Apr	20.0925	20.2092	20.4690	20.7522	20.9250	20.9893	20.9983	20.9982	20.9696	20.7778	20.4046	20.0556 (87)
May	20.1592	20.1592	20.1592	20.1592	20.1592	20.1592	20.1592	20.1592	20.1592	20.1592	20.1592	20.1592 (88)
Jun	0.9550	0.9377	0.8845	0.7660	0.5870	0.3623	0.2250	0.2247	0.4794	0.7769	0.9191	0.9614 (89)
Jul	19.3500	19.4630	19.7110	19.9688	20.1115	20.1546	20.1588	20.1588	20.1442	19.9976	19.6545	19.3145 (90)
Aug	19.5173	19.6311	19.8818	20.1453	20.2948	20.3426	20.3479	20.3479	20.3302	20.1734	19.8235	19.4815 (92)
Sep	19.5173	19.6311	19.8818	20.1453	20.2948	20.3426	20.3479	20.3479	20.3302	20.1734	19.8235	19.4815 (93)
Oct												
Nov												
Dec												

8. Space heating requirement

Utilisation	0.9481	0.9302	0.8777	0.7653	0.5962	0.3773	0.2421	0.2426	0.4950	0.7777	0.9120	0.9550 (94)
Useful gains	627.3866	664.7513	692.5689	661.6414	525.3458	340.4324	204.6005	196.8719	370.8793	525.4646	581.5297	598.4235 (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	1077.2640	1055.1141	950.6678	777.5554	556.9089	343.8817	204.9620	197.2225	381.6170	624.9156	868.7542	1066.7511 (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	334.7088	262.3239	192.0256	83.4581	23.4829	0.0000	0.0000	0.0000	0.0000	73.9916	206.8016	348.4357 (98)
Space heating												1525.2281 (98)
RHI space heating demand												1525 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.5400 (1b)	x 2.6100 (2b)	= 111.0294 (1b) - (3b)
First floor	42.5400 (1c)	x 2.3900 (2c)	= 101.6706 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.0800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.7000 (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												3.0400
Infiltration rate												0.1520 (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) =	0.1292 (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												
	0.1647	0.1615	0.1583	0.1421	0.1389	0.1227	0.1227	0.1195	0.1292	0.1389	0.1454	0.1518 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Front Door			2.1500	1.1000	2.3650		(26)					
Windows (Uw = 1.20)			11.3100	1.1450	12.9504		(27)					
Ground Floor			42.5400	0.1200	5.1048	84.0000	3573.3600 (28a)					
Brick and Block	48.6500	13.4600	35.1900	0.2400	8.4456	42.2200	1485.7218 (29a)					
Pitched Roof	42.5400		42.5400	0.1000	4.2540	9.1000	387.1140 (30)					
Total net area of external elements Aum(A, m2)			133.7300				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	33.1198		(33)					
Party Wall 1			44.0000	0.0000	0.0000	58.0600	2554.6400 (32)					
Party Wall 2			44.0000	0.0000	0.0000	58.0600	2554.6400 (32)					
Ground Floor Stud			72.3100			9.0000	650.7900 (32c)					
First Floor Stud			108.0200			9.0000	972.1800 (32c)					
Internal Floor 1			42.5400			18.0000	765.7200 (32d)					
Internal Ceiling 1			42.5400			18.0000	765.7200 (32e)					
Heat capacity Cm = Sum(A x k)					(28) ... (30) + (32) + (32a) ... (32e) =		13709.8858 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							161.1411 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.1894 (36)					
Total fabric heat loss						(33) + (36) =	42.3092 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 35.0955	Feb 35.0955	Mar 35.0955	Apr 35.0955	May 35.0955	Jun 35.0955	Jul 35.0955	Aug 35.0955	Sep 35.0955	Oct 35.0955	Nov 35.0955	Dec 35.0955 (38)
Heat transfer coeff	77.4047	77.4047	77.4047	77.4047	77.4047	77.4047	77.4047	77.4047	77.4047	77.4047	77.4047	77.4047 (39)
Average = Sum(39)m / 12 =												77.4047 (39)
HLP	Jan 0.9098	Feb 0.9098	Mar 0.9098	Apr 0.9098	May 0.9098	Jun 0.9098	Jul 0.9098	Aug 0.9098	Sep 0.9098	Oct 0.9098	Nov 0.9098	Dec 0.9098 (40)
HLP (average)												0.9098 (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												2.5522 (42)
Average daily hot water use (litres/day)												94.8152 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Daily hot water use	104.2967	100.5041	96.7115	92.9189	89.1263	85.3337	85.3337	89.1263	92.9189	96.7115	100.5041	104.2967 (44)
Energy conte	154.6691	135.2746	139.5912	121.6990	116.7731	100.7663	93.3748	107.1489	108.4286	126.3631	137.9352	149.7887 (45)
Energy content (annual)										Total = Sum (45)m =		1491.8127 (45)
Distribution loss (46)m = 0.15 x (45)m	23.2004	20.2912	20.9387	18.2549	17.5160	15.1149	14.0062	16.0723	16.2643	18.9545	20.6903	22.4683 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.6707	0.6071	0.6075	0.5089	0.4683	0.3869	0.3586	0.4297	0.4534	0.5499	0.6190	0.6495 (61)
Total heat required for water heating calculated for each month												
Solar input	155.3397	135.8816	140.1987	122.2079	117.2414	101.1532	93.7334	107.5787	108.8820	126.9131	138.5543	150.4382 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	155.3397	135.8816	140.1987	122.2079	117.2414	101.1532	93.7334	107.5787	108.8820	126.9131	138.5543	150.4382 (64)
Heat gains from water heating, kWh/month	51.5951	45.1306	46.5660	40.5921	38.9441	33.6015	31.1368	35.7345	36.1659	42.1532	46.0182	49.9671 (65)
										Total per year (kWh/year) = Sum (64)m =		1498.1223 (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	153.1332	153.1332	153.1332	153.1332	153.1332	153.1332	153.1332	153.1332	153.1332	153.1332	153.1332	153.1332 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.5572	49.3454	40.1304	30.3813	22.7104	19.1731	20.7172	26.9290	36.1440	45.8931	53.5640	57.1013 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	342.8803	346.4383	337.4722	318.3844	294.2896	271.6437	256.5150	252.9569	261.9230	281.0108	305.1057	327.7515 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8655	52.8655	52.8655	52.8655	52.8655	52.8655	52.8655	52.8655	52.8655	52.8655	52.8655	52.8655 (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)	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888 (71)
Water heating gains (Table 5)	69.3483	67.1586	62.5887	56.3780	52.3443	46.6688	41.8505	48.0302	50.2304	56.6576	63.9142	67.1601 (72)
Total internal gains	574.6958	569.8523	547.1012	512.0537	476.2541	444.3955	425.9925	434.8260	455.2073	490.4714	529.4939	558.9229 (73)

6. Solar gains

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

Solar gains	67.8862	132.7999	218.7025	318.9645	390.9030	400.1588	380.9675	327.2454	254.3600	157.5783	84.6462	55.8263 (83)
Total gains	642.5820	702.6522	765.8037	831.0182	867.1572	844.5543	806.9600	762.0715	709.5674	648.0497	614.1400	614.7493 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	49.1999	49.1999	49.1999	49.1999	49.1999	49.1999	49.1999	49.1999	49.1999	49.1999	49.1999	49.1999
alpha	4.2800	4.2800	4.2800	4.2800	4.2800	4.2800	4.2800	4.2800	4.2800	4.2800	4.2800	4.2800
util living area	0.9741	0.9605	0.9287	0.8557	0.7286	0.5603	0.4159	0.4575	0.6817	0.8870	0.9589	0.9782 (86)
MIT	19.9101	20.0661	20.3278	20.6314	20.8560	20.9637	20.9919	20.9878	20.9176	20.6237	20.2039	19.8573 (87)
Th 2	20.1592	20.1592	20.1592	20.1592	20.1592	20.1592	20.1592	20.1592	20.1592	20.1592	20.1592	20.1592 (88)
util rest of house	0.9691	0.9531	0.9152	0.8294	0.6832	0.4952	0.3391	0.3780	0.6181	0.8602	0.9499	0.9740 (89)
MIT 2	19.1705	19.3232	19.5766	19.8612	20.0573	20.1394	20.1562	20.1544	20.1094	19.8609	19.4604	19.1186 (90)
Living area fraction	19.3371	19.4906	19.7459	20.0347	20.2373	20.3251	20.3445	20.3422	20.2915	20.0327	19.6279	19.2851 (92)
MIT	19.3371	19.4906	19.7459	20.0347	20.2373	20.3251	20.3445	20.3422	20.2915	20.0327	19.6279	19.2851 (93)
Temperature adjustment												0.0000
adjusted MIT	19.3371	19.4906	19.7459	20.0347	20.2373	20.3251	20.3445	20.3422	20.2915	20.0327	19.6279	19.2851 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9632	0.9460	0.9076	0.8251	0.6877	0.5084	0.3563	0.3956	0.6286	0.8556	0.9430	0.9685 (94)
Ext temp.	618.9139	664.7270	695.0603	685.6596	596.3162	429.3639	287.5101	301.4738	446.0695	554.4583	579.1219	595.4077 (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	1163.9442	1129.3768	1025.2906	861.8804	660.8238	443.1501	289.8413	305.1429	479.2521	730.1376	969.7185	1167.6538 (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	405.5025	312.2447	245.6913	126.8789	47.9937	0.0000	0.0000	0.0000	0.0000	130.7054	281.2295	425.7511 (98)
Space heating per m2												1975.9972 (98)
										(98) / (4) =		23.2252 (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													2190.6842 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	405.5025	312.2447	245.6913	126.8789	47.9937	0.0000	0.0000	0.0000	0.0000	130.7054	281.2295	425.7511	(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)	449.5593	346.1693	272.3850	140.6640	53.2081	0.0000	0.0000	0.0000	0.0000	144.9062	311.7844	472.0079	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	155.3397	135.8816	140.1987	122.2079	117.2414	101.1532	93.7334	107.5787	108.8820	126.9131	138.5543	150.4382	(64)
Efficiency of water heater (217)m	85.9023	85.5162	84.6452	82.8572	79.9529	76.4000	76.4000	76.4000	76.4000	82.8295	85.1250	86.1377	(216)
Fuel for water heating, kWh/month	180.8330	158.8957	165.6310	147.4922	146.6380	132.3995	122.6876	140.8098	142.5157	153.2221	162.7657	174.6485	(219)
Water heating fuel used												1828.5391	(219)
Annual totals kWh/year													
Space heating fuel - main system												2190.6842	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.2380)													
mechanical ventilation fans (SFP = 0.2380)												61.7596	(230a)
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												136.7596	(231)
Electricity for lighting (calculated in Appendix L)												392.4632	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.80 * 908 * 1.00) =										-581.0267		-581.0267	(233)
Total delivered energy for all uses												3967.4193	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2190.6842	3.4800	76.2358 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1828.5391	3.4800	63.6332 (247)
Mechanical ventilation fans	61.7596	13.1900	8.1461 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	392.4632	13.1900	51.7659 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-581.0267	13.1900	-76.6374 (252)
Total energy cost			253.0360 (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] =	0.8170 (257)
SAP value		88.6029
SAP rating (Section 12)		89 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2190.6842	0.2160	473.1878 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1828.5391	0.2160	394.9644 (264)
Space and water heating			868.1522 (265)
Pumps and fans	136.7596	0.5190	70.9782 (267)
Energy for lighting	392.4632	0.5190	203.6884 (268)
Energy saving/generation technologies			
PV Unit	-581.0267	0.5190	-301.5529 (269)
Total kg/year			841.2660 (272)
CO2 emissions per m2			9.8900 (273)
EI value			91.3338
EI rating			91 (274)
EI band			B

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Calculation Type: New Build (As Built)

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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	$3.48 / 0.8155 = 4.267$, stars = 4
Water heating environmental impact	$0.216 / 0.8155 = 0.2649$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.5400 (1b)	x 2.6100 (2b)	= 111.0294 (1b) - (3b)
First floor	42.5400 (1c)	x 2.3900 (2c)	= 101.6706 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.0800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.7000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0400
Infiltration rate					0.1520 (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) =		0.1292 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)
Adj infilt rate	0.1518	0.1421	0.1421	0.1292	0.1324	0.1260	0.1260	0.1227	0.1227	0.1324	0.1292	0.1324 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Front Door			2.1500	1.1000	2.3650		(26)					
Windows (Uw = 1.20)			11.3100	1.1450	12.9504		(27)					
Ground Floor			42.5400	0.1200	5.1048	84.0000	3573.3600 (28a)					
Brick and Block	48.6500	13.4600	35.1900	0.2400	8.4456	42.2200	1485.7218 (29a)					
Pitched Roof	42.5400		42.5400	0.1000	4.2540	9.1000	387.1140 (30)					
Total net area of external elements Aum(A, m2)			133.7300				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.1198		(33)					
Party Wall 1			44.0000	0.0000	0.0000	58.0600	2554.6400 (32)					
Party Wall 2			44.0000	0.0000	0.0000	58.0600	2554.6400 (32)					
Ground Floor Stud			72.3100			9.0000	650.7900 (32c)					
First Floor Stud			108.0200			9.0000	972.1800 (32c)					
Internal Floor 1			42.5400			18.0000	765.7200 (32d)					
Internal Ceiling 1			42.5400			18.0000	765.7200 (32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13709.8858 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							161.1411 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.1894 (36)					
Total fabric heat loss						(33) + (36) =	42.3092 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 35.0955	Feb 35.0955	Mar 35.0955	Apr 35.0955	May 35.0955	Jun 35.0955	Jul 35.0955	Aug 35.0955	Sep 35.0955	Oct 35.0955	Nov 35.0955	Dec 35.0955 (38)
Heat transfer coeff	77.4047	77.4047	77.4047	77.4047	77.4047	77.4047	77.4047	77.4047	77.4047	77.4047	77.4047	77.4047 (39)
Average = Sum(39)m / 12 =												77.4047 (39)
HLP	Jan 0.9098	Feb 0.9098	Mar 0.9098	Apr 0.9098	May 0.9098	Jun 0.9098	Jul 0.9098	Aug 0.9098	Sep 0.9098	Oct 0.9098	Nov 0.9098	Dec 0.9098 (40)
HLP (average)												0.9098 (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												2.5522 (42)
Average daily hot water use (litres/day)												94.8152 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Daily hot water use	104.2967	100.5041	96.7115	92.9189	89.1263	85.3337	85.3337	89.1263	92.9189	96.7115	100.5041	104.2967 (44)
Energy conte	154.6691	135.2746	139.5912	121.6990	116.7731	100.7663	93.3748	107.1489	108.4286	126.3631	137.9352	149.7887 (45)
Energy content (annual)										Total = Sum (45)m =		1491.8127 (45)
Distribution loss (46)m = 0.15 x (45)m	23.2004	20.2912	20.9387	18.2549	17.5160	15.1149	14.0062	16.0723	16.2643	18.9545	20.6903	22.4683 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.6707	0.6071	0.6075	0.5089	0.4683	0.3869	0.3586	0.4297	0.4534	0.5499	0.6190	0.6495 (61)
Total heat required for water heating calculated for each month	155.3397	135.8816	140.1987	122.2079	117.2414	101.1532	93.7334	107.5787	108.8820	126.9131	138.5543	150.4382 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	155.3397	135.8816	140.1987	122.2079	117.2414	101.1532	93.7334	107.5787	108.8820	126.9131	138.5543	150.4382 (64)
Heat gains from water heating, kWh/month	51.5951	45.1306	46.5660	40.5921	38.9441	33.6015	31.1368	35.7345	36.1659	42.1532	46.0182	49.9671 (65)
										Total per year (kWh/year) = Sum (64)m =		1498.1223 (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	153.1332	153.1332	153.1332	153.1332	153.1332	153.1332	153.1332	153.1332	153.1332	153.1332	153.1332	153.1332 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.5572	49.3454	40.1304	30.3813	22.7104	19.1731	20.7172	26.9290	36.1440	45.8931	53.5640	57.1013 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	342.8803	346.4383	337.4722	318.3844	294.2896	271.6437	256.5150	252.9569	261.9230	281.0108	305.1057	327.7515 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8655	52.8655	52.8655	52.8655	52.8655	52.8655	52.8655	52.8655	52.8655	52.8655	52.8655	52.8655 (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)	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888 (71)
Water heating gains (Table 5)	69.3483	67.1586	62.5887	56.3780	52.3443	46.6688	41.8505	48.0302	50.2304	56.6576	63.9142	67.1601 (72)
Total internal gains	574.6958	569.8523	547.1012	512.0537	476.2541	444.3955	425.9925	434.8260	455.2073	490.4714	529.4939	558.9229 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W	
East				4.3100	25.1733	0.6300	0.7000			0.7700	33.1580 (76)	
West				7.0000	25.1733	0.6300	0.7000			0.7700	53.8529 (80)	
Solar gains	87.0109	144.7926	241.9891	352.4466	404.8311	457.8381	419.0655	376.7535	294.0280	185.2275	108.1372	67.7282 (83)
Total gains	661.7067	714.6449	789.0903	864.5002	881.0853	902.2336	845.0581	811.5795	749.2353	675.6990	637.6311	626.6511 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	49.1999	49.1999	49.1999	49.1999	49.1999	49.1999	49.1999	49.1999	49.1999	49.1999	49.1999	49.1999
alpha	4.2800	4.2800	4.2800	4.2800	4.2800	4.2800	4.2800	4.2800	4.2800	4.2800	4.2800	4.2800
util living area	0.9625	0.9478	0.9028	0.8006	0.6420	0.4303	0.3010	0.3039	0.5537	0.8184	0.9341	0.9680 (86)
MIT	20.0925	20.2092	20.4690	20.7522	20.9250	20.9893	20.9983	20.9982	20.9696	20.7778	20.4046	20.0556 (87)
Th 2	20.1592	20.1592	20.1592	20.1592	20.1592	20.1592	20.1592	20.1592	20.1592	20.1592	20.1592	20.1592 (88)
util rest of house	0.9550	0.9377	0.8845	0.7660	0.5870	0.3623	0.2250	0.2247	0.4794	0.7769	0.9191	0.9614 (89)
MIT 2	19.3500	19.4630	19.7110	19.9688	20.1115	20.1546	20.1588	20.1588	20.1442	19.9976	19.6545	19.3145 (90)
Living area fraction	19.5173	19.6311	19.8818	20.1453	20.2948	20.3426	20.3479	20.3479	20.3302	20.1734	19.8235	19.4815 (92)
MIT	19.5173	19.6311	19.8818	20.1453	20.2948	20.3426	20.3479	20.3479	20.3302	20.1734	19.8235	19.4815 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5173	19.6311	19.8818	20.1453	20.2948	20.3426	20.3479	20.3479	20.3302	20.1734	19.8235	19.4815 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9481	0.9302	0.8777	0.7653	0.5962	0.3773	0.2421	0.2426	0.4950	0.7777	0.9120	0.9550 (94)
Ext temp.	627.3866	664.7513	692.5689	661.6414	525.3458	340.4324	204.6005	196.8719	370.8793	525.4646	581.5297	598.4235 (95)
Heat loss rate W	5.6000	6.0000	7.6000	10.1000	13.1000	15.9000	17.7000	17.8000	15.4000	12.1000	8.6000	5.7000 (96)
Month fracti	1077.2640	1055.1141	950.6678	777.5554	556.9089	343.8817	204.9620	197.2225	381.6170	624.9156	868.7542	1066.7511 (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	334.7088	262.3239	192.0256	83.4581	23.4829	0.0000	0.0000	0.0000	0.0000	73.9916	206.8016	348.4357 (98)
Space heating per m2												1525.2281 (98)
										(98) / (4) =		17.9270 (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													1690.9403 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	334.7088	262.3239	192.0256	83.4581	23.4829	0.0000	0.0000	0.0000	0.0000	73.9916	206.8016	348.4357	(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)	371.0740	290.8247	212.8887	92.5256	26.0343	0.0000	0.0000	0.0000	0.0000	82.0306	229.2701	386.2924	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	155.3397	135.8816	140.1987	122.2079	117.2414	101.1532	93.7334	107.5787	108.8820	126.9131	138.5543	150.4382	(64)
Efficiency of water heater (217)m	85.3151	84.9632	83.8115	81.4572	78.4016	76.4000	76.4000	76.4000	76.4000	80.9619	84.1052	85.5406	(216)
Fuel for water heating, kWh/month	182.0776	159.9301	167.2787	150.0271	149.5396	132.3995	122.6876	140.8098	142.5157	156.7565	164.7393	175.8675	(219)
Water heating fuel used												1844.6292	(219)
Annual totals kWh/year													
Space heating fuel - main system												1690.9403	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.2380)													
mechanical ventilation fans (SFP = 0.2380)												61.7596	(230a)
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												136.7596	(231)
Electricity for lighting (calculated in Appendix L)												392.4632	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.80 * 1030 * 1.00) =										-659.2380		-659.2380	(233)
Total delivered energy for all uses												3405.5542	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1690.9403	7.6100	128.6806 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1844.6292	7.6100	140.3763 (247)
Mechanical ventilation fans	61.7596	31.0800	19.1949 (249)
Pumps and fans for heating	75.0000	31.0800	23.3100 (249)
Energy for lighting	392.4632	31.0800	121.9776 (250)
Additional standing charges			105.0000 (251)
Energy saving/generation technologies			
PV Unit	-659.2380	31.0800	-204.8912 (252)
Total energy cost			333.6481 (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	1690.9403	0.2160	365.2431 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1844.6292	0.2160	398.4399 (264)
Space and water heating			763.6830 (265)
Pumps and fans	136.7596	0.5190	70.9782 (267)
Energy for lighting	392.4632	0.5190	203.6884 (268)
Energy saving/generation technologies			
PV Unit	-659.2380	0.5190	-342.1445 (269)
Total kg/year			696.2051 (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	1690.9403	1.2200	2062.9471 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1844.6292	1.2200	2250.4476 (264)
Space and water heating			4313.3948 (265)
Pumps and fans	136.7596	3.0700	419.8519 (267)
Energy for lighting	392.4632	3.0700	1204.8620 (268)

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Energy saving/generation technologies			
PV Unit	-659.2380	3.0700	-2023.8607 (269)
Primary energy kWh/year			3914.2479 (272)
Primary energy kWh/m2/year			46.0067 (273)

SAP 2012 EPC IMPROVEMENTS

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

(For testing purposes):

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

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.3	-£ 66	-206 kg (29.6%)

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

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

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

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

	Current	Potential	Saving
Electricity	£164	£180	-£16
Mains gas	£374	£292	£82
Space heating	£276	£276	£0
Water heating	£140	£74	£66
Lighting	£122	£122	£0
Generated (PV)	-£205	-£205	£0
Total cost of fuels	£333	£267	£66
Total cost of uses	£333	£267	£66
Delivered energy	40 kWh/m²	28 kWh/m²	12 kWh/m²
Carbon dioxide emissions	0.7 tonnes	0.5 tonnes	0.2 tonnes
CO2 emissions per m²	8 kg/m²	6 kg/m²	2 kg/m²
Primary energy	46 kWh/m²	32 kWh/m²	14 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (Version 9.92, January 2014)
CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.5400 (1b)	x 2.6100 (2b)	= 111.0294 (1b) - (3b)
First floor	42.5400 (1c)	x 2.3900 (2c)	= 101.6706 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.0800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.7000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0400
Infiltration rate					0.1520 (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)	=	0.1292 (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	0.1647	0.1615	0.1583	0.1421	0.1389	0.1227	0.1227	0.1195	0.1292	0.1389	0.1454	0.1518 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Front Door			2.1500	1.1000	2.3650		(26)					
Windows (Uw = 1.20)			11.3100	1.1450	12.9504		(27)					
Ground Floor			42.5400	0.1200	5.1048	84.0000	3573.3600 (28a)					
Brick and Block	48.6500	13.4600	35.1900	0.2400	8.4456	42.2200	1485.7218 (29a)					
Pitched Roof	42.5400		42.5400	0.1000	4.2540	9.1000	387.1140 (30)					
Total net area of external elements Aum(A, m2)			133.7300				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.1198		(33)					
Party Wall 1			44.0000	0.0000	0.0000	58.0600	2554.6400 (32)					
Party Wall 2			44.0000	0.0000	0.0000	58.0600	2554.6400 (32)					
Ground Floor Stud			72.3100			9.0000	650.7900 (32c)					
First Floor Stud			108.0200			9.0000	972.1800 (32c)					
Internal Floor 1			42.5400			18.0000	765.7200 (32d)					
Internal Ceiling 1			42.5400			18.0000	765.7200 (32e)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		13709.8858 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							161.1411 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.1894 (36)					
Total fabric heat loss						(33) + (36) =	42.3092 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 35.0955	Feb 35.0955	Mar 35.0955	Apr 35.0955	May 35.0955	Jun 35.0955	Jul 35.0955	Aug 35.0955	Sep 35.0955	Oct 35.0955	Nov 35.0955	Dec 35.0955 (38)
Heat transfer coeff	77.4047	77.4047	77.4047	77.4047	77.4047	77.4047	77.4047	77.4047	77.4047	77.4047	77.4047	77.4047 (39)
Average = Sum(39)m / 12 =												77.4047 (39)
HLP	Jan 0.9098	Feb 0.9098	Mar 0.9098	Apr 0.9098	May 0.9098	Jun 0.9098	Jul 0.9098	Aug 0.9098	Sep 0.9098	Oct 0.9098	Nov 0.9098	Dec 0.9098 (40)
HLP (average)												0.9098 (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												2.5522 (42)
Average daily hot water use (litres/day)												94.8152 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Daily hot water use	104.2967	100.5041	96.7115	92.9189	89.1263	85.3337	85.3337	89.1263	92.9189	96.7115	100.5041	104.2967 (44)
Energy conte	154.6691	135.2746	139.5912	121.6990	116.7731	100.7663	93.3748	107.1489	108.4286	126.3631	137.9352	149.7887 (45)
Energy content (annual)												1491.8127 (45)
Distribution loss (46)m = 0.15 x (45)m												
	23.2004	20.2912	20.9387	18.2549	17.5160	15.1149	14.0062	16.0723	16.2643	18.9545	20.6903	22.4683 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.6707	0.6071	0.6075	0.5089	0.4683	0.3869	0.3586	0.4297	0.4534	0.5499	0.6190	0.6495 (61)
Total heat required for water heating calculated for each month	155.3397	135.8816	140.1987	122.2079	117.2414	101.1532	93.7334	107.5787	108.8820	126.9131	138.5543	150.4382 (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												1.2157 (H8)
Utilisation factor												0.5607 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												94.8152 (H14)
Volume ratio Veff/V												0.7910 (H15)
Solar storage volume factor												0.9531 (H16)
Solar input												-852.2143 (H17)
Solar input	-24.7125	-41.2381	-70.2332	-94.1263	-116.2851	-114.3268	-112.8159	-98.5678	-77.1984	-52.7174	-29.3126	-20.6802 (63)
Solar input (sum of months) = Sum (63)m =												-852.2143 (63)
Output from w/h	130.6272	94.6436	69.9655	28.0816	0.9563	0.0000	0.0000	9.0108	31.6836	74.1957	109.2417	129.7581 (64)
Total per year (kWh/year) = Sum (64)m =												678.1641 (64)
Heat gains from water heating, kWh/month	51.5951	45.1306	46.5660	40.5921	38.9441	33.6015	31.1368	35.7345	36.1659	42.1532	46.0182	49.9671 (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	153.1332	153.1332	153.1332	153.1332	153.1332	153.1332	153.1332	153.1332	153.1332	153.1332	153.1332	153.1332	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.5572	49.3454	40.1304	30.3813	22.7104	19.1731	20.7172	26.9290	36.1440	45.8931	53.5640	57.1013	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	342.8803	346.4383	337.4722	318.3844	294.2896	271.6437	256.5150	252.9569	261.9230	281.0108	305.1057	327.7515	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8655	52.8655	52.8655	52.8655	52.8655	52.8655	52.8655	52.8655	52.8655	52.8655	52.8655	52.8655	(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)	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	(71)
Water heating gains (Table 5)	69.3483	67.1586	62.5887	56.3780	52.3443	46.6688	41.8505	48.0302	50.2304	56.6576	63.9142	67.1601	(72)
Total internal gains	574.6958	569.8523	547.1012	512.0537	476.2541	444.3955	425.9925	434.8260	455.2073	490.4714	529.4939	558.9229	(73)

6. Solar gains

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

Solar gains	67.8862	132.7999	218.7025	318.9645	390.9030	400.1588	380.9675	327.2454	254.3600	157.5783	84.6462		55.8263	(83)
Total gains	642.5820	702.6522	765.8037	831.0182	867.1572	844.5543	806.9600	762.0715	709.5674	648.0497	614.1400		614.7493	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	49.1999	49.1999	49.1999	49.1999	49.1999	49.1999	49.1999	49.1999	49.1999	49.1999	49.1999	49.1999
alpha	4.2800	4.2800	4.2800	4.2800	4.2800	4.2800	4.2800	4.2800	4.2800	4.2800	4.2800	4.2800
util living area	0.9741	0.9605	0.9287	0.8557	0.7286	0.5603	0.4159	0.4575	0.6817	0.8870	0.9589	0.9782 (86)
MIT	19.9101	20.0661	20.3278	20.6314	20.8560	20.9637	20.9919	20.9878	20.9176	20.6237	20.2039	19.8573 (87)
Th 2	20.1592	20.1592	20.1592	20.1592	20.1592	20.1592	20.1592	20.1592	20.1592	20.1592	20.1592	20.1592 (88)
util rest of house	0.9691	0.9531	0.9152	0.8294	0.6832	0.4952	0.3391	0.3780	0.6181	0.8602	0.9499	0.9740 (89)
MIT 2	19.1705	19.3232	19.5766	19.8612	20.0573	20.1394	20.1562	20.1544	20.1094	19.8609	19.4604	19.1186 (90)
Living area fraction									fLA = Living area / (4) =			0.2253 (91)
MIT	19.3371	19.4906	19.7459	20.0347	20.2373	20.3251	20.3445	20.3422	20.2915	20.0327	19.6279	19.2851 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3371	19.4906	19.7459	20.0347	20.2373	20.3251	20.3445	20.3422	20.2915	20.0327	19.6279	19.2851 (93)

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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	0.9632	0.9460	0.9076	0.8251	0.6877	0.5084	0.3563	0.3956	0.6286	0.8556	0.9430	0.9685	(94)
Useful gains	618.9139	664.7270	695.0603	685.6596	596.3162	429.3639	287.5101	301.4738	446.0695	554.4583	579.1219	595.4077	(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	1163.9442	1129.3768	1025.2906	861.8804	660.8238	443.1501	289.8413	305.1429	479.2521	730.1376	969.7185	1167.6538	(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	405.5025	312.2447	245.6913	126.8789	47.9937	0.0000	0.0000	0.0000	0.0000	130.7054	281.2295	425.7511	(98)
Space heating												1975.9972	(98)
Space heating per m2											(98) / (4) =	23.2252	(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													2190.6842	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	405.5025	312.2447	245.6913	126.8789	47.9937	0.0000	0.0000	0.0000	0.0000	130.7054	281.2295	425.7511	(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)	449.5593	346.1693	272.3850	140.6640	53.2081	0.0000	0.0000	0.0000	0.0000	144.9062	311.7844	472.0079	(211)	
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Water heating														
Water heating requirement	130.6272	94.6436	69.9655	28.0816	0.9563	0.0000	0.0000	9.0108	31.6836	74.1957	109.2417	129.7581	(64)	
Efficiency of water heater	86.3977	86.5631	86.7277	87.3411	89.8828	76.4000	76.4000	76.4000	76.4000	84.6625	85.8611	86.5484	(216)	
Fuel for water heating, kWh/month	151.1930	109.3348	80.6726	32.1516	1.0640	0.0000	0.0000	11.7943	41.4707	87.6369	127.2307	149.9255	(219)	
Water heating fuel used												792.4742	(219)	
Annual totals kWh/year														
Space heating fuel - main system												2190.6842	(211)	
Space heating fuel - secondary												0.0000	(215)	
Electricity for pumps and fans:														
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.2380)														
mechanical ventilation fans (SFP = 0.2380)													61.7596	(230a)
central heating pump													30.0000	(230c)
main heating flue fan													45.0000	(230e)
pump for solar water heating													50.0000	(230g)
Total electricity for the above, kWh/year													186.7596	(231)
Electricity for lighting (calculated in Appendix L)													392.4632	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.80 * 908 * 1.00) =													-581.0267	(233)
Total delivered energy for all uses													2981.3545	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2190.6842	3.4800	76.2358	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	792.4742	3.4800	27.5781	(247)
Mechanical ventilation fans	61.7596	13.1900	8.1461	(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	392.4632	13.1900	51.7659	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	-581.0267	13.1900	-76.6374	(252)
Total energy cost			223.5760	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200	(256)
Energy cost factor (ECF)		0.7219	(257)
SAP value	[(255) x (256)] / [(4) + 45.0] =	89.9298	
SAP rating (Section 12)		90	(258)
SAP band		B	

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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	2190.6842	0.2160	473.1878 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	792.4742	0.2160	171.1744 (264)
Space and water heating			644.3622 (265)
Pumps and fans	186.7596	0.5190	96.9282 (267)
Energy for lighting	392.4632	0.5190	203.6884 (268)
Energy saving/generation technologies			
PV Unit	-581.0267	0.5190	-301.5529 (269)
Total kg/year			643.4260 (272)
CO2 emissions per m2			7.5600 (273)
EI value			93.3718
EI rating			93 (274)
EI band			A

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Calculation Type: New Build (As Built)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.5400 (1b)	x 2.6100 (2b)	= 111.0294 (1b) - (3b)
First floor	42.5400 (1c)	x 2.3900 (2c)	= 101.6706 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.0800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.7000 (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												3.0400
Infiltration rate												0.1520 (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) =	0.1292 (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	0.1518	0.1421	0.1421	0.1292	0.1324	0.1260	0.1260	0.1227	0.1227	0.1324	0.1292	0.1324 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Front Door			2.1500	1.1000	2.3650		(26)					
Windows (Uw = 1.20)			11.3100	1.1450	12.9504		(27)					
Ground Floor			42.5400	0.1200	5.1048	84.0000	3573.3600 (28a)					
Brick and Block	48.6500	13.4600	35.1900	0.2400	8.4456	42.2200	1485.7218 (29a)					
Pitched Roof	42.5400		42.5400	0.1000	4.2540	9.1000	387.1140 (30)					
Total net area of external elements Aum(A, m2)			133.7300				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		33.1198		(33)					
Party Wall 1			44.0000	0.0000	0.0000	58.0600	2554.6400 (32)					
Party Wall 2			44.0000	0.0000	0.0000	58.0600	2554.6400 (32)					
Ground Floor Stud			72.3100			9.0000	650.7900 (32c)					
First Floor Stud			108.0200			9.0000	972.1800 (32c)					
Internal Floor 1			42.5400			18.0000	765.7200 (32d)					
Internal Ceiling 1			42.5400			18.0000	765.7200 (32e)					
Heat capacity Cm = Sum(A x k)					(28) ... (30) + (32) + (32a) ... (32e) =		13709.8858 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							161.1411 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.1894 (36)					
Total fabric heat loss						(33) + (36) =	42.3092 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 35.0955	Feb 35.0955	Mar 35.0955	Apr 35.0955	May 35.0955	Jun 35.0955	Jul 35.0955	Aug 35.0955	Sep 35.0955	Oct 35.0955	Nov 35.0955	Dec 35.0955 (38)
Heat transfer coeff	77.4047	77.4047	77.4047	77.4047	77.4047	77.4047	77.4047	77.4047	77.4047	77.4047	77.4047	77.4047 (39)
Average = Sum(39)m / 12 =												77.4047 (39)
HLP	Jan 0.9098	Feb 0.9098	Mar 0.9098	Apr 0.9098	May 0.9098	Jun 0.9098	Jul 0.9098	Aug 0.9098	Sep 0.9098	Oct 0.9098	Nov 0.9098	Dec 0.9098 (40)
HLP (average)												0.9098 (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												2.5522 (42)
Average daily hot water use (litres/day)												94.8152 (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	104.2967	100.5041	96.7115	92.9189	89.1263	85.3337	85.3337	89.1263	92.9189	96.7115	100.5041	104.2967 (44)
Energy conte	154.6691	135.2746	139.5912	121.6990	116.7731	100.7663	93.3748	107.1489	108.4286	126.3631	137.9352	149.7887 (45)
Energy content (annual)										Total =	Sum (45)m =	1491.8127 (45)
Distribution loss (46)m = 0.15 x (45)m												
	23.2004	20.2912	20.9387	18.2549	17.5160	15.1149	14.0062	16.0723	16.2643	18.9545	20.6903	22.4683 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.6707	0.6071	0.6075	0.5089	0.4683	0.3869	0.3586	0.4297	0.4534	0.5499	0.6190	0.6495 (61)
Total heat required for water heating calculated for each month	155.3397	135.8816	140.1987	122.2079	117.2414	101.1532	93.7334	107.5787	108.8820	126.9131	138.5543	150.4382 (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												1.3581 (H8)
Utilisation factor												0.5211 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												94.8152 (H14)
Volume ratio Veff/V												0.7910 (H15)
Solar storage volume factor												0.9531 (H16)
Solar input												-884.8568 (H17)
Solar input	-28.8740	-41.0621	-71.2533	-95.8477	-111.3815	-121.1507	-114.8694	-104.7497	-81.9874	-56.6667	-34.1514	-22.8629 (63)
Solar input (sum of months) = Sum (63)m =												-884.8568 (63)
Output from w/h	126.4657	94.8196	68.9455	26.3602	5.8599	0.0000	0.0000	2.8289	26.8946	70.2463	104.4029	127.5753 (64)
Total per year (kWh/year) = Sum (64)m =												654.3990 (64)
Heat gains from water heating, kWh/month	51.5951	45.1306	46.5660	40.5921	38.9441	33.6015	31.1368	35.7345	36.1659	42.1532	46.0182	49.9671 (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)
(66)m	153.1332	153.1332	153.1332	153.1332	153.1332	153.1332	153.1332	153.1332	153.1332	153.1332	153.1332	153.1332	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.5572	49.3454	40.1304	30.3813	22.7104	19.1731	20.7172	26.9290	36.1440	45.8931	53.5640	57.1013	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	342.8803	346.4383	337.4722	318.3844	294.2896	271.6437	256.5150	252.9569	261.9230	281.0108	305.1057	327.7515	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8655	52.8655	52.8655	52.8655	52.8655	52.8655	52.8655	52.8655	52.8655	52.8655	52.8655	52.8655	(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)	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	-102.0888	(71)
Water heating gains (Table 5)	69.3483	67.1586	62.5887	56.3780	52.3443	46.6688	41.8505	48.0302	50.2304	56.6576	63.9142	67.1601	(72)
Total internal gains	574.6958	569.8523	547.1012	512.0537	476.2541	444.3955	425.9925	434.8260	455.2073	490.4714	529.4939	558.9229	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c				Access factor Table 6d			Gains W

East				4.3100	25.1733	0.6300	0.7000				0.7700			33.1580 (76)
West				7.0000	25.1733	0.6300	0.7000				0.7700			53.8529 (80)

Solar gains	87.0109	144.7926	241.9891	352.4466	404.8311	457.8381	419.0655	376.7535	294.0280	185.2275	108.1372			67.7282 (83)
Total gains	661.7067	714.6449	789.0903	864.5002	881.0853	902.2336	845.0581	811.5795	749.2353	675.6990	637.6311			626.6511 (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	49.1999	49.1999	49.1999	49.1999	49.1999	49.1999	49.1999	49.1999	49.1999	49.1999	49.1999	49.1999	
alpha	4.2800	4.2800	4.2800	4.2800	4.2800	4.2800	4.2800	4.2800	4.2800	4.2800	4.2800	4.2800	
util living area	0.9625	0.9478	0.9028	0.8006	0.6420	0.4303	0.3010	0.3039	0.5537	0.8184	0.9341	0.9680	(86)
MIT	20.0925	20.2092	20.4690	20.7522	20.9250	20.9893	20.9983	20.9982	20.9696	20.7778	20.4046	20.0556	(87)
Th 2	20.1592	20.1592	20.1592	20.1592	20.1592	20.1592	20.1592	20.1592	20.1592	20.1592	20.1592	20.1592	(88)
util rest of house	0.9550	0.9377	0.8845	0.7660	0.5870	0.3623	0.2250	0.2247	0.4794	0.7769	0.9191	0.9614	(89)
MIT 2	19.3500	19.4630	19.7110	19.9688	20.1115	20.1546	20.1588	20.1588	20.1442	19.9976	19.6545	19.3145	(90)
Living area fraction									fLA = Living area / (4) =			0.2253	(91)
MIT	19.5173	19.6311	19.8818	20.1453	20.2948	20.3426	20.3479	20.3479	20.3302	20.1734	19.8235	19.4815	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5173	19.6311	19.8818	20.1453	20.2948	20.3426	20.3479	20.3479	20.3302	20.1734	19.8235	19.4815	(93)

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

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9481	0.9302	0.8777	0.7653	0.5962	0.3773	0.2421	0.2426	0.4950	0.7777	0.9120	0.9550	(94)
Useful gains	627.3866	664.7513	692.5689	661.6414	525.3458	340.4324	204.6005	196.8719	370.8793	525.4646	581.5297	598.4235	(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	1077.2640	1055.1141	950.6678	777.5554	556.9089	343.8817	204.9620	197.2225	381.6170	624.9156	868.7542	1066.7511	(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	334.7088	262.3239	192.0256	83.4581	23.4829	0.0000	0.0000	0.0000	0.0000	73.9916	206.8016	348.4357	(98)
Space heating												1525.2281	(98)
Space heating per m2											(98) / (4) =	17.9270	(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													1690.9403	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	334.7088	262.3239	192.0256	83.4581	23.4829	0.0000	0.0000	0.0000	0.0000	73.9916	206.8016	348.4357	(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)	371.0740	290.8247	212.8887	92.5256	26.0343	0.0000	0.0000	0.0000	0.0000	82.0306	229.2701	386.2924	(211)	
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Water heating														
Water heating requirement	126.4657	94.8196	68.9455	26.3602	5.8599	0.0000	0.0000	2.8289	26.8946	70.2463	104.4029	127.5753	(64)	
Efficiency of water heater	85.9430	86.0723	86.0917	86.4517	87.0595	76.4000	76.4000	76.4000	76.4000	82.9068	85.0464	86.0350	(216)	
Fuel for water heating, kWh/month	147.1507	110.1626	80.0837	30.4912	6.7310	0.0000	0.0000	3.7028	35.2024	84.7293	122.7599	148.2830	(219)	
Water heating fuel used												769.2966	(219)	
Annual totals kWh/year														
Space heating fuel - main system												1690.9403	(211)	
Space heating fuel - secondary												0.0000	(215)	
Electricity for pumps and fans:														
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.2380)														
mechanical ventilation fans (SFP = 0.2380)													61.7596	(230a)
central heating pump													30.0000	(230c)
main heating flue fan													45.0000	(230e)
pump for solar water heating													50.0000	(230g)
Total electricity for the above, kWh/year													186.7596	(231)
Electricity for lighting (calculated in Appendix L)													392.4632	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.80 * 1030 * 1.00) =										-659.2380			-659.2380	(233)
Total delivered energy for all uses													2380.2216	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1690.9403	7.6100	128.6806	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	769.2966	7.6100	58.5435	(247)
Mechanical ventilation fans	61.7596	31.0800	19.1949	(249)
Pumps and fans for heating	75.0000	31.0800	23.3100	(249)
Pump for solar water heating	50.0000	31.0800	15.5400	(249)
Energy for lighting	392.4632	31.0800	121.9776	(250)
Additional standing charges			105.0000	(251)
Energy saving/generation technologies				
PV Unit	-659.2380	31.0800	-204.8912	(252)
Total energy cost			267.3553	(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	1690.9403	0.2160	365.2431	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	769.2966	0.2160	166.1681	(264)
Space and water heating			531.4112	(265)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Pumps and fans	186.7596	0.5190	96.9282 (267)
Energy for lighting	392.4632	0.5190	203.6884 (268)
Energy saving/generation technologies			
PV Unit	-659.2380	0.5190	-342.1445 (269)
Total kg/year			489.8832 (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	1690.9403	1.2200	2062.9471 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	769.2966	1.2200	938.5419 (264)
Space and water heating			3001.4890 (265)
Pumps and fans	186.7596	3.0700	573.3519 (267)
Energy for lighting	392.4632	3.0700	1204.8620 (268)
Energy saving/generation technologies			
PV Unit	-659.2380	3.0700	-2023.8607 (269)
Primary energy kWh/year			2755.8422 (272)
Primary energy kWh/m2/year			32.3912 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0943 Plot 24	Issued on Date	29/05/2024
Assessment Reference	As Built	Prop Type Ref	Block J Mid Terrace
Project	22, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	89 B	DER	11.67	TER	16.79
Environmental	91 B	% DER<TER	30.49		
CO ₂ Emissions (t/year)	0.70	DFEE	35.80	TFEE	44.32
General Requirements Compliance	Pass	% DFEE<TFEE	19.23		

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 24	Issued on Date	29/05/2024
Assessment Reference	As Built	Prop Type Ref	Block J Mid Terrace
Project	22, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	89 B	DER	11.67	TER	16.79
Environmental	91 B	% DER<TER	30.49		
CO ₂ Emissions (t/year)	0.70	DFEE	35.80	TFEE	44.32
General Requirements Compliance	Pass	% DFEE<TFEE	19.23		

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 24	Issued on Date	29/05/2024
Assessment Reference	As Built	Prop Type Ref	Block J Mid Terrace
Project	22, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	89 B	DER	11.67	TER	16.79
Environmental	91 B	% DER<TER	30.49		
CO ₂ Emissions (t/year)	0.70	DFEE	35.80	TFEE	44.32
General Requirements Compliance	Pass	% DFEE<TFEE	19.23		

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

Building Elements

Floor 000003 - Worst Case Slab

Floor Type: Slab On Ground Floor

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

Horizontal edge insulation: none

Vertical edge insulation: none

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

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

Total correction = 0.0096 m² K/W

U-value (unrounded) = 0.12 W/m² K

Unheated space: None

Total thickness: 321 mm

U-value: 0.12 W/m² K

Kappa: 84.00 kJ/m² K

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Property Reference	SAP 0943 Plot 24	Issued on Date	29/05/2024
Assessment Reference	As Built	Prop Type Ref	Block J Mid Terrace
Property	22, Shaw Crescent, West End, Southampton, SO30 3LH		
SAP Rating	89 B	DER	11.67
Environmental	91 B	TER	16.79
CO ₂ Emissions (t/year)	0.70	% DER<TER	30.49
General Requirements Compliance	Pass	DFEE	35.80
		TFEE	44.32
		% DFEE<TFEE	19.23
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com		Assessor ID
			E477-0001
Client	Foreman Homes, FORE		

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

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

6.0 Measurements		Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	Ground Floor:	9.73 m	42.54 m ²	2.61 m
	1st Storey:	9.73 m	42.54 m ²	2.39 m

7.0 Living Area	19.17	m ²
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8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	161.14	kJ/m ² K

9.0 External Walls			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type	Construction				
Brick and Block	Cavity Wall	Other	0.24	42.22	48.65	35.19

9.1 Party Walls			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)
Description	Type	Construction			
Party Wall 1	Filled Cavity with Edge Sealing	Other	0.00	58.06	44.00
Party Wall 2	Filled Cavity with Edge Sealing	Other	0.00	58.06	44.00

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

10.0 External Roofs

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area (m²)	Nett Area (m²)
Pitched Roof	External Plane Roof	Other	0.10	9.10	42.54	42.54

10.2 Internal Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Ceiling 1	Plasterboard ceiling, carpeted chipboard floor	9.00	42.54

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)
Ground Floor	Ground Floor - Solid	Other	0.12	84.00	42.54

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	42.54

12.0 Opening Types

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

13.0 Openings

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

14.0 Conservatory

None

15.0 Draught Proofing

100 %

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	1.02	0.071	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	4.99	0.064	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.59	0.067	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.81	0.061	No	Birtley Supatherm
Independently assessed	E3 Sill	6.80	0.021	No	Knauf P5
Independently assessed	E4 Jamb	20.10	0.016	No	Knauf P6
Table K1 - Default	E5 Ground floor (normal)	9.73	0.320	No	
Independently assessed	E6 Intermediate floor within a dwelling	9.73	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	9.73	0.060	No	
Independently assessed	E18 Party wall between dwellings	10.00	0.036	No	Knauf P25 Halved
Independently assessed	E18 Party wall between dwellings	2.39	0.024	No	Knauf P25 divided by three
Independently assessed	E25 Staggered party wall between dwellings	10.00	0.055	No	Knauf P27 Halved
Table K1 - Default	P1 Party wall - Ground floor	17.70	0.160	No	
Table K1 - Default	P2 Party wall - Intermediate floor within a dwelling	17.70	0.000	No	
Independently assessed	P4 Party wall - Roof (insulation at ceiling level)	17.70	0.035	No	Knauf P29 Halved

Y-value 0.069 W/m²K

18.0 Pressure Testing

Yes

Designed AP₅₀ 5.00 m³/(h.m²) @ 50 Pa

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Property Tested ? Yes
As Built AP₅₀ 3.04 m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

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

Mechanical Ventilation

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

20.0 Fans, Open Fireplaces, Flues

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

21.0 Fixed Cooling System

No

22.0 Lighting

Internal

Total number of light fittings 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. 17960
Fuel Type Mains gas
Main Heating BGW
SAP Code 104
In Winter 90.2
In Summer 76.4
Controls CBE Programmer, room thermostat and TRVs
PCDF Controls 0

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

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

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

29.0 Hot Water Cylinder	None
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32.0 Photovoltaic Unit		One Dwelling		
PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
0.80	West	30°	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar water heating	£4,000 - £6,000	£66	B 90	