



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 8 Oram Way
WEST END, SO30 3JW

Contact: Tobias Whiting
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Report Issue Date: 16/02/2022

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Plot 8	Issued on Date	16/02/2022
Assessment Reference	As Built	Prop Type Ref	H (HA/SO+)
Property	8 Oram Way, WEST END, SO30 3JW		
SAP Rating	87 B	DER	14.65
Environmental	89 B	% DER<TER	20.33
CO ₂ Emissions (t/year)	0.90	DFEE	44.50
General Requirements Compliance	Pass	% DFEE<TFEE	17.14
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com		Assessor ID
Client	Foreman Homes, FORE		

SUMMARY FOR INPUT DATA FOR New Build (As Built)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	18.39	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.65	kgCO ₂ /m ²	Pass
	-3.74 (-20.3%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	53.70	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	44.50	kWh/m ² /yr	
	-9.2 (-17.1%)	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	1.19 (max. 2.00)	1.20 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.00 (measured in this dwelling)	m ³ /(h.m ²) @ 50 Pa	
Maximum	10.0	m ³ /(h.m ²) @ 50 Pa	Pass

Limiting System Efficiencies

4 Heating efficiency

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

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Main heating system

Boiler system with radiators or underfloor - Mains gas
Data from database
Worcester Greenstar 36CDi Compact ErP
Combi boiler
Efficiency: 89.8% 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

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Southern England)

Slight

Pass

Based on:

Overshading

Average

Windows facing North

1.92 m², No overhang

Windows facing East

4.47 m², No overhang

Windows facing West

8.18 m², No overhang

Air change rate

4.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

4.00 (measured in this dwelling)

m³/(h.m²) @ 50 Pa

Maximum

10.0

m³/(h.m²) @ 50 Pa

Pass

10 Key features

Party wall U-value

0.00

W/m²K

Roof U-value

0.10

W/m²K

Floor U-value

0.12

W/m²K

Door U-value

1.10

W/m²K

Photovoltaic array

0.73

kW

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THERMAL BRIDGING

Calculation Type: New Build (As Built)

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Property	8 Oram Way, WEST END, SO30 3JW		

SAP Rating	87 B	DER	14.65	TER	18.39
Environmental	89 B	% DER<TER	20.33		
CO ₂ Emissions (t/year)	0.90	DFEE	44.50	TFEE	53.70
General Requirements Compliance	Pass	% DFEE<TFEE	17.14		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com	Assessor ID	E477-0001
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Client	Foreman Homes, FORE
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	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.098	1.12	0.11	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.053	1.01	0.05	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.043	7.20	0.31	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.060	3.58	0.21	Birtley Supatherm
External wall	E3 Sill	Independently assessed	0.034	10.39	0.35	CD0027
External wall	E4 Jamb	Independently assessed	0.039	28.50	1.11	CD0028
External wall	E5 Ground floor (normal)	Table K1 - Approved	0.160	18.46	2.95	
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	18.46	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	9.70	0.58	
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.054	8.76	0.47	CD0031
External wall	E16 Corner (normal)	Independently assessed	0.050	10.10	0.51	CD0035
External wall	E18 Party wall between dwellings	Independently assessed	0.041	10.10	0.41	CD0016
Party wall	P1 Party wall - Ground floor	Table K1 - Default	0.160	8.76	1.40	
Party wall	P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	0.000	8.76	0.00	
Party wall	P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	0.049	8.76	0.43	CD0020

Total: **8.91** W/mK:
Y-Value: **0.050** W/m²K:

FULL SAP CALCULATION PRINTOUT

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CO ₂ Emissions (t/year)	0.90	DFEE	44.50	TFEE	53.70
General Requirements Compliance	Pass	% DFEE<TFEE	17.14		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com			Assessor ID	E477-0001
Client	Foreman Homes, FORE				

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

DWELLING AS BUILT

Semi-Detached 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) 18.39 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 14.65 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 53.7 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 44.5 kWh/m²/yr OK

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	1.19 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 4.00 (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
Worcester Greenstar 36CDi Compact ErP
Combi boiler
Efficiency: 89.8% 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

Not applicable

9 Summertime temperature

Overheating risk (Southern England): Slight OK
Based on:
Overshading: Average
Windows facing North: 1.92 m², No overhang
Windows facing East: 4.47 m², No overhang
Windows facing West: 8.18 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.10 W/m²K
Floor U-value 0.12 W/m²K
Door U-value 1.10 W/m²K
Photovoltaic array 0.73 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	42.5500 (1b)	x 2.3900 (2b)	= 101.6945 (1b) - (3b)
First floor	42.5500 (1c)	x 2.6700 (2c)	= 113.6085 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.1000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 215.3030 (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					4 * 10 = 40.0000 (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) =					40.0000 / (5) = 0.1858 (8)
Pressure test					Yes
Measured/design AP50					4.0000
Infiltration rate					0.3858 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3569 (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	0.4550	0.4461	0.4371	0.3925	0.3836	0.3390	0.3390	0.3301	0.3569	0.3836	0.4015	0.4193 (22b)
Effective ac	0.6035	0.5995	0.5955	0.5770	0.5736	0.5575	0.5575	0.5545	0.5637	0.5736	0.5806	0.5879 (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			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			14.5700	1.1450	16.6832		(27)
Ground Floor			42.5500	0.1200	5.1060	84.0000	3574.2000 (28a)
Brick and Block	93.4100	16.6900	76.7200	0.2400	18.4128	42.2200	3239.1184 (29a)
Pitched Roof	42.5500		42.5500	0.1000	4.2550	9.1000	387.2050 (30)
Total net area of external elements Aum(A, m ²)			178.5100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.7890		(33)
Party Wall 1			44.3400	0.0000	0.0000	70.0000	3103.8000 (32)
GF Stud			82.5600			9.0000	743.0400 (32c)
First Floor			95.3800			9.0000	858.4200 (32c)
Internal Floor 1			42.5500			18.0000	765.9000 (32d)
Internal Ceiling 1			42.5500			18.0000	765.9000 (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) =	13437.5834 (34)
	157.9034 (35)
	8.9110 (36)
(33) + (36) =	55.7000 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	
(38)m	Jan 42.8791 Feb 42.5935 Mar 42.3136 Apr 40.9988 May 40.7529 Jun 39.6078 Jul 39.6078 Aug 39.3957 Sep 40.0488 Oct 40.7529 Nov 41.2505 Dec 41.7707 (38)
Heat transfer coeff	Jan 98.5791 Feb 98.2935 Mar 98.0136 Apr 96.6989 May 96.4529 Jun 95.3078 Jul 95.3078 Aug 95.0957 Sep 95.7489 Oct 96.4529 Nov 96.9505 Dec 97.4708 (39)
Average = Sum(39)m / 12 =	96.6977 (39)

HLP	Jan 1.1584 Feb 1.1550 Mar 1.1517 Apr 1.1363 May 1.1334 Jun 1.1200 Jul 1.1200 Aug 1.1175 Sep 1.1251 Oct 1.1334 Nov 1.1393 Dec 1.1454 (40)
HLP (average)	1.1363 (40)
Days in month	31 28 31 30 31 30 31 31 30 31 30 31 31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5525 (42)
Average daily hot water use (litres/day)												94.8229 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	104.3052	100.5123	96.7194	92.9265	89.1336	85.3406	85.3406	89.1336	92.9265	96.7194	100.5123	104.3052 (44)
Energy conte	154.6816	135.2855	139.6026	121.7089	116.7826	100.7745	93.3824	107.1576	108.4374	126.3734	137.9464	149.8009 (45)
Energy content (annual)										Total = Sum(45)m =	1491.9339 (45)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	23.2022	20.2928	20.9404	18.2563	17.5174	15.1162	14.0074	16.0736	16.2656	18.9560	20.6920	22.4701 (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	27.5595	24.8903	27.5325	26.6145	27.4799	26.5684	27.4384	27.4653	26.5935	27.5107	26.6563	27.5515 (61)
Total heat required for water heating calculated for each month	182.2412	160.1758	167.1350	148.3234	144.2625	127.3429	120.8208	134.6230	135.0310	153.8841	164.6027	177.3524 (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	182.2412	160.1758	167.1350	148.3234	144.2625	127.3429	120.8208	134.6230	135.0310	153.8841	164.6027	177.3524 (64)
Heat gains from water heating, kWh/month	58.3215	51.2050	53.3010	47.1218	45.7002	40.1496	37.9092	42.4962	42.7038	48.8968	52.5313	56.6967 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1815.7947 (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	127.6272	127.6272	127.6272	127.6272	127.6272	127.6272	127.6272	127.6272	127.6272	127.6272	127.6272	127.6272 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.0997	18.7406	15.2408	11.5383	8.6250	7.2816	7.8680	10.2272	13.7269	17.4294	20.3427	21.6861 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	229.7690	232.1533	226.1450	213.3540	197.2077	182.0324	171.8944	169.5101	175.5184	188.3094	204.4557	219.6310 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7627	35.7627	35.7627	35.7627	35.7627	35.7627	35.7627	35.7627	35.7627	35.7627	35.7627	35.7627 (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)	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018 (71)
Water heating gains (Table 5)	78.3892	76.1979	71.6411	65.4470	61.4250	55.7634	50.9533	57.1186	59.3109	65.7216	72.9601	76.2052 (72)
Total internal gains	393.5460	391.3800	377.3151	354.6274	331.5458	309.3655	295.0038	301.1440	312.8443	335.7485	362.0467	381.8105 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				1.9200	10.6334	0.6300	0.7000	0.7700	6.2394 (74)			
East				4.4700	19.6403	0.6300	0.7000	0.7700	26.8304 (76)			
West				8.1800	19.6403	0.6300	0.7000	0.7700	49.0990 (80)			
Solar gains	82.1688	160.4578	264.8758	389.3005	481.0584	494.5029	469.9227	400.7816	308.8574	190.4418	102.3721	67.6421 (83)
Total gains	475.7148	551.8378	642.1909	743.9279	812.6042	803.8684	764.9266	701.9256	621.7017	526.1903	464.4188	449.4526 (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	37.8646	37.9746	38.0831	38.6009	38.6993	39.1643	39.1643	39.2516	38.9839	38.6993	38.5007	38.2952
alpha	3.5243	3.5316	3.5389	3.5734	3.5800	3.6110	3.6110	3.6168	3.5989	3.5800	3.5667	3.5530
util living area	0.9910	0.9841	0.9661	0.9174	0.8185	0.6650	0.5181	0.5754	0.8057	0.9502	0.9852	0.9926 (86)
MIT	19.1747	19.3836	19.7537	20.2381	20.6374	20.8816	20.9638	20.9473	20.7496	20.2133	19.6103	19.1428 (87)
Th 2	19.9534	19.9561	19.9588	19.9713	19.9736	19.9846	19.9846	19.9866	19.9804	19.9736	19.9689	19.9640 (88)
util rest of house	0.9890	0.9805	0.9582	0.8975	0.7745	0.5861	0.4107	0.4669	0.7422	0.9343	0.9813	0.9910 (89)
MIT 2	18.2869	18.4962	18.8635	19.3418	19.7099	19.9187	19.9714	19.9656	19.8212	19.3286	18.7324	18.2630 (90)
Living area fraction									fLA = Living area / (4) =			0.2155 (91)
MIT	18.4782	18.6875	19.0553	19.5349	19.9098	20.1262	20.1853	20.1772	20.0213	19.5193	18.9216	18.4526 (92)
Temperature adjustment												0.0000
adjusted MIT	18.4782	18.6875	19.0553	19.5349	19.9098	20.1262	20.1853	20.1772	20.0213	19.5193	18.9216	18.4526 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9851	0.9747	0.9495	0.8874	0.7714	0.5980	0.4329	0.4885	0.7451	0.9253	0.9759	0.9877 (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	1397.6781	1355.2194	1230.5944	1028.3863	791.8618	526.6890	341.7027	359.1928	566.9539	860.2889	1146.1137	1389.2127 (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	691.2125	549.2377	461.9013	265.1053	122.7492	0.0000	0.0000	0.0000	0.0000	277.8050	498.8814	703.3100 (98)
Space heating												3570.2024 (98)
Space heating per m2												(98) / (4) = 41.9530 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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 %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3936.2761 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	691.2125	549.2377	461.9013	265.1053	122.7492	0.0000	0.0000	0.0000	0.0000	277.8050	498.8814	703.3100	(98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)
Space heating fuel (main heating system)	762.0866	605.5543	509.2627	292.2881	135.3354	0.0000	0.0000	0.0000	0.0000	306.2900	550.0346	775.4244	(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	182.2412	160.1758	167.1350	148.3234	144.2625	127.3429	120.8208	134.6230	135.0310	153.8841	164.6027	177.3524	(64)
Efficiency of water heater (217)m	90.1012	90.0523	89.9388	89.6752	89.1654	87.9000	87.9000	87.9000	87.9000	89.6817	89.9888	87.9000	(216)
Fuel for water heating, kWh/month	202.2628	177.8697	185.8320	165.4007	161.7920	144.8725	137.4526	153.1547	153.6188	171.5893	182.9146	196.7917	(219)
Water heating fuel used												2033.5513	(219)
Annual totals kWh/year													
Space heating fuel - main system												3936.2761	(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)												372.6272	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.73 * 908 * 1.00) =													-530.1869
Total delivered energy for all uses													-530.1869 (233)
													5887.2678 (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	3936.2761	0.2160	850.2356 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2033.5513	0.2160	439.2471 (264)
Space and water heating			1289.4827 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	372.6272	0.5190	193.3935 (268)
Energy saving/generation technologies			
PV Unit	-530.1869	0.5190	-275.1670 (269)
Total CO2, kg/year			1246.6343 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			14.6500 (273)

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

DER		14.6500	ZC1
Total Floor Area	TFA	85.1000	
Assumed number of occupants	N	2.5525	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		15.9996	ZC2
CO2 emissions from cooking, equation (L16)		2.1182	ZC3
Total CO2 emissions		32.7678	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		32.7678	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.5500 (1b)	x 2.3900 (2b)	= 101.6945 (1b) - (3b)
First floor	42.5500 (1c)	x 2.6700 (2c)	= 113.6085 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.1000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 215.3030 (5)

2. Ventilation rate

	main heating	+	secondary heating	+	other	=	total	m3 per hour				
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							3 * 10 =	30.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
								Air changes per hour				
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						30.0000 / (5) =	0.1393 (8)				
Pressure test							Yes					
Measured/design AP50							5.0000					
Infiltration rate							0.3893	(18)				
Number of sides sheltered							1	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.9250 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.3601 (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	0.4592	0.4502	0.4412	0.3962	0.3871	0.3421	0.3421	0.3331	0.3601	0.3871	0.4052	0.4232 (22b)
Effective ac	0.6054	0.6013	0.5973	0.5785	0.5749	0.5585	0.5585	0.5555	0.5648	0.5749	0.5821	0.5895 (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			2.1200	1.0000	2.1200		(26)					
TER Opening Type (Uw = 1.40)			14.5700	1.3258	19.3163		(27)					
Ground Floor			42.5500	0.1300	5.5315		(28a)					
Brick and Block	93.4100	16.6900	76.7200	0.1800	13.8096		(29a)					
Pitched Roof	42.5500		42.5500	0.1300	5.5315		(30)					
Total net area of external elements Aum(A, m2)			178.5100				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.3089		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.9182 (36)					
Total fabric heat loss						(33) + (36) =	56.2271 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 43.0152	Feb 42.7243	Mar 42.4392	Apr 41.1002	May 40.8496	Jun 39.6833	Jul 39.6833	Aug 39.4673	Sep 40.1326	Oct 40.8496	Nov 41.3565	Dec 41.8863 (38)
Heat transfer coeff	99.2423	98.9514	98.6663	97.3272	97.0767	95.9104	95.9104	95.6944	96.3597	97.0767	97.5835	98.1134 (39)
Average = Sum(39)m / 12 =												97.3260 (39)
HLP	Jan 1.1662	Feb 1.1628	Mar 1.1594	Apr 1.1437	May 1.1407	Jun 1.1270	Jul 1.1270	Aug 1.1245	Sep 1.1323	Oct 1.1407	Nov 1.1467	Dec 1.1529 (40)
HLP (average)												1.1437 (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												2.5525 (42)
Average daily hot water use (litres/day)												94.8229 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	104.3052	100.5123	96.7194	92.9265	89.1336	85.3406	85.3406	89.1336	92.9265	96.7194	100.5123	104.3052 (44)
Energy conte	154.6816	135.2855	139.6026	121.7089	116.7826	100.7745	93.3824	107.1576	108.4374	126.3734	137.9464	149.8009 (45)
Energy content (annual)												Total = Sum(45)m = 1491.9339 (45)
Distribution loss	(46)m = 0.15 x (45)m											
	23.2022	20.2928	20.9404	18.2563	17.5174	15.1162	14.0074	16.0736	16.2656	18.9560	20.6920	22.4701 (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

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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	49.2871	45.8268	45.4215	42.0858	43.4887	45.4215	45.8268	49.2871	49.3151	50.9589 (61)
Solar input	205.6405	181.3129	188.8897	167.5356	162.2041	142.8603	136.8710	152.5791	154.2642	175.6605	187.2615	200.7598 (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	205.6405	181.3129	188.8897	167.5356	162.2041	142.8603	136.8710	152.5791	154.2642	175.6605	187.2615	200.7598 (64)
	64.1714	56.4893	58.7396	51.9249	50.1856	44.0290	41.9218	46.9853	47.5121	54.3409	58.1960	62.5485 (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	127.6272	127.6272	127.6272	127.6272	127.6272	127.6272	127.6272	127.6272	127.6272	127.6272	127.6272	127.6272	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.0997	18.7406	15.2408	11.5383	8.6250	7.2816	7.8680	10.2272	13.7269	17.4294	20.3427	21.6861	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	229.7690	232.1533	226.1450	213.3540	197.2077	182.0324	171.8944	169.5101	175.5184	188.3094	204.4557	219.6310	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7627	35.7627	35.7627	35.7627	35.7627	35.7627	35.7627	35.7627	35.7627	35.7627	35.7627	35.7627	(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)	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	(71)
Water heating gains (Table 5)	86.2518	84.0614	78.9511	72.1179	67.4537	61.1513	56.3465	63.1523	65.9891	73.0389	80.8277	84.0706	(72)
Total internal gains	401.4087	399.2435	384.6251	361.2984	337.5746	314.7535	300.3971	307.1777	319.5225	343.0659	369.9143	389.6759	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d		Gains W	
North				1.9200	10.6334	0.6300	0.7000		0.7700		6.2394 (74)	
East				4.4700	19.6403	0.6300	0.7000		0.7700		26.8304 (76)	
West				8.1800	19.6403	0.6300	0.7000		0.7700		49.0990 (80)	
Solar gains	82.1688	160.4578	264.8758	389.3005	481.0584	494.5029	469.9227	400.7816	308.8574	190.4418	102.3721	67.6421 (83)
Total gains	483.5775	559.7013	649.5009	750.5989	818.6330	809.2564	770.3198	707.9593	628.3799	533.5077	472.2864	457.3180 (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	59.5484	59.7235	59.8960	60.7201	60.8768	61.6171	61.6171	61.7562	61.3298	60.8768	60.5606	60.2336	
alpha	4.9699	4.9816	4.9931	5.0480	5.0585	5.1078	5.1078	5.1171	5.0887	5.0585	5.0374	5.0156	
util living area	0.9984	0.9965	0.9893	0.9601	0.8730	0.7037	0.5361	0.5999	0.8584	0.9809	0.9968	0.9988 (86)	
MIT	19.7076	19.8600	20.1317	20.4950	20.7920	20.9509	20.9900	20.9828	20.8611	20.4624	20.0220	19.6857 (87)	
Th 2	19.9471	19.9499	19.9526	19.9653	19.9677	19.9788	19.9788	19.9809	19.9745	19.9677	19.9629	19.9578 (88)	
util rest of house	0.9979	0.9952	0.9854	0.9448	0.8266	0.6127	0.4177	0.4779	0.7892	0.9710	0.9955	0.9984 (89)	
MIT 2	18.2222	18.4466	18.8436	19.3701	19.7638	19.9463	19.9751	19.9738	19.8608	19.3341	18.6932	18.1978 (90)	
Living area fraction									fLA = Living area / (4) =			0.2155 (91)	
MIT	18.5424	18.7512	19.1212	19.6126	19.9854	20.1628	20.1938	20.1912	20.0764	19.5772	18.9795	18.5185 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.5424	18.7512	19.1212	19.6126	19.9854	20.1628	20.1938	20.1912	20.0764	19.5772	18.9795	18.5185 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9968	0.9931	0.9811	0.9382	0.8275	0.6303	0.4434	0.5042	0.7973	0.9659	0.9935	0.9976 (94)
Useful gains	482.0348	555.8601	637.2043	704.2270	677.4101	510.0381	341.5316	356.9222	500.9872	515.2888	469.2353	456.2087 (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	1413.4433	1370.5988	1245.2860	1042.6251	804.3172	533.5301	344.6875	362.8015	575.8829	871.4815	1159.2475	1404.8350 (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	692.9679	547.5044	452.4128	243.6466	94.4188	0.0000	0.0000	0.0000	0.0000	265.0074	496.8087	705.7780 (98)
Space heating												3498.5447 (98)
Space heating per m2												41.1110 (99)
										(98) / (4) =		41.1110 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3745.7652 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	692.9679	547.5044	452.4128	243.6466	94.4188	0.0000	0.0000	0.0000	0.0000	265.0074	496.8087	705.7780	(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)	741.9357	586.1932	484.3820	260.8636	101.0908	0.0000	0.0000	0.0000	0.0000	283.7338	531.9151	755.6509	(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	205.6405	181.3129	188.8897	167.5356	162.2041	142.8603	136.8710	152.5791	154.2642	175.6605	187.2615	200.7598	(64)
Efficiency of water heater (217)m	87.8708	87.6571	87.1706	85.9930	83.7424	80.3000	80.3000	80.3000	80.3000	86.0839	87.3910	80.3000	(216)
Fuel for water heating, kWh/month	234.0261	206.8433	216.6897	194.8247	193.6941	177.9082	170.4496	190.0114	192.1098	204.0573	214.2801	228.2654	(219)
Water heating fuel used												2423.1596	(219)
Annual totals kWh/year													
Space heating fuel - main system												3745.7652	(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)												372.6272	(232)
Total delivered energy for all uses												6616.5521	(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	3745.7652	0.2160	809.0853 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2423.1596	0.2160	523.4025 (264)
Space and water heating			1332.4878 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	372.6272	0.5190	193.3935 (268)
Total CO2, kg/m2/year			1564.8063 (272)
Emissions per m2 for space and water heating			15.6579 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.2725 (272b)
Emissions per m2 for pumps and fans			0.4574 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.6579 * 1.00) + 2.2725 + 0.4574, rounded to 2 d.p.			18.3900 (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	42.5500 (1b)	x 2.3900 (2b)	= 101.6945 (1b) - (3b)
First floor	42.5500 (1c)	x 2.6700 (2c)	= 113.6085 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.1000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 215.3030 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1393 (8)
Pressure test					Yes
Measured/design AP50					4.0000
Infiltration rate					0.3393 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3139 (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	0.4002	0.3924	0.3845	0.3453	0.3374	0.2982	0.2982	0.2903	0.3139	0.3374	0.3531	0.3688 (22b)
Effective ac	0.5801	0.5770	0.5739	0.5596	0.5569	0.5445	0.5445	0.5422	0.5493	0.5569	0.5623	0.5680 (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			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			14.5700	1.1450	16.6832		(27)
Ground Floor			42.5500	0.1200	5.1060	84.0000	3574.2000 (28a)
Brick and Block	93.4100	16.6900	76.7200	0.2400	18.4128	42.2200	3239.1184 (29a)
Pitched Roof	42.5500		42.5500	0.1000	4.2550	9.1000	387.2050 (30)
Total net area of external elements Aum(A, m ²)			178.5100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.7890		(33)
Party Wall 1			44.3400	0.0000	0.0000	70.0000	3103.8000 (32)
GF Stud			82.5600			9.0000	743.0400 (32c)
First Floor			95.3800			9.0000	858.4200 (32c)
Internal Floor 1			42.5500			18.0000	765.9000 (32d)
Internal Ceiling 1			42.5500			9.0000	382.9500 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13054.6334 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 153.4034 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.9110 (36)
Total fabric heat loss (33) + (36) = 55.7000 (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	41.2149	40.9939	40.7774	39.7601	39.5698	38.6839	38.6839	38.5198	39.0251	39.5698	39.9548	40.3574 (38)
Heat transfer coeff	96.9149	96.6940	96.4774	95.4602	95.2699	94.3839	94.3839	94.2198	94.7252	95.2699	95.6549	96.0574 (39)
Average = Sum(39)m / 12 =												95.4593 (39)
HLP	1.1388	1.1362	1.1337	1.1217	1.1195	1.1091	1.1091	1.1072	1.1131	1.1195	1.1240	1.1288 (40)
HLP (average)												1.1217 (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												2.5525 (42)
Average daily hot water use (litres/day)												94.8229 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	104.3052	100.5123	96.7194	92.9265	89.1336	85.3406	85.3406	89.1336	92.9265	96.7194	100.5123	104.3052 (44)
Energy conte	154.6816	135.2855	139.6026	121.7089	116.7826	100.7745	93.3824	107.1576	108.4374	126.3734	137.9464	149.8009 (45)
Energy content (annual)										Total = Sum(45)m =		1491.9339 (45)

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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	32.8698	28.7482	29.6655	25.8631	24.8163	21.4146	19.8438	22.7710	23.0430	26.8543	29.3136	31.8327	(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	127.6272	127.6272	127.6272	127.6272	127.6272	127.6272	127.6272	127.6272	127.6272	127.6272	127.6272	127.6272	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.0997	18.7406	15.2408	11.5383	8.6250	7.2816	7.8680	10.2272	13.7269	17.4294	20.3427	21.6861	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	229.7690	232.1533	226.1450	213.3540	197.2077	182.0324	171.8944	169.5101	175.5184	188.3094	204.4557	219.6310	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7627	35.7627	35.7627	35.7627	35.7627	35.7627	35.7627	35.7627	35.7627	35.7627	35.7627	35.7627	(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)	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	(71)
Water heating gains (Table 5)	44.1799	42.7800	39.8730	35.9210	33.3552	29.7425	26.6717	30.6062	32.0041	36.0946	40.7134	42.7859	(72)
Total internal gains	356.3368	354.9621	342.5470	322.1015	300.4761	280.3446	267.7223	271.6316	282.5375	303.1215	326.8000	345.3912	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c	Access factor Table 6d		Gains W	
North				1.9200	10.6334	0.6300		0.7000	0.7700		6.2394 (74)	
East				4.4700	19.6403	0.6300		0.7000	0.7700		26.8304 (76)	
West				8.1800	19.6403	0.6300		0.7000	0.7700		49.0990 (80)	
Solar gains	82.1688	160.4578	264.8758	389.3005	481.0584	494.5029	469.9227	400.7816	308.8574	190.4418	102.3721	67.6421 (83)
Total gains	438.5056	515.4198	607.4228	711.4020	781.5345	774.8475	737.6450	672.4132	591.3949	493.5633	429.1721	413.0333 (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	37.4172	37.5027	37.5869	37.9874	38.0633	38.4206	38.4206	38.4875	38.2822	38.0633	37.9101	37.7513		
alpha	3.4945	3.5002	3.5058	3.5325	3.5376	3.5614	3.5614	3.5658	3.5521	3.5376	3.5273	3.5168		
util living area	0.9924	0.9859	0.9689	0.9220	0.8257	0.6753	0.5287	0.5893	0.8176	0.9555	0.9874	0.9938	(86)	
MIT	19.1143	19.3278	19.7068	20.2010	20.6145	20.8702	20.9594	20.9402	20.7271	20.1683	19.5508	19.0773	(87)	
Th 2	19.9692	19.9713	19.9734	19.9831	19.9849	19.9934	19.9934	19.9950	19.9901	19.9849	19.9813	19.9774	(88)	
util rest of house	0.9907	0.9828	0.9618	0.9034	0.7835	0.5978	0.4213	0.4811	0.7571	0.9413	0.9841	0.9925	(89)	
MIT 2	18.2415	18.4552	18.8313	19.3183	19.7014	19.9198	19.9782	19.9705	19.8133	19.2970	18.6857	18.2108	(90)	
Living area fraction	18.4296	18.6433	19.0200	19.5085	19.8982	20.1246	20.1896	20.1795	20.0102	19.4847	18.8721	18.3976	(92)	
Temperature adjustment												0.0000		
adjusted MIT	18.4296	18.6433	19.0200	19.5085	19.8982	20.1246	20.1896	20.1795	20.0102	19.4847	18.8721	18.3976	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains	432.8981	503.7932	579.0167	635.2374	609.1050	471.6485	326.9941	337.7292	448.5472	460.1461	420.2170	408.6988	(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	1369.3696	1328.8909	1207.8991	1012.6892	781.0409	521.4322	338.8022	356.1024	559.8480	846.4485	1126.0607	1363.7801	(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	696.7348	554.4656	467.8885	271.7653	127.9203	0.0000	0.0000	0.0000	0.0000	287.4090	508.2074	710.5805	(98)	
Space heating												3624.9714	(98)	
Space heating per m2												42.5966	(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	887.2086	698.4408	716.0707	0.0000	0.0000	0.0000	0.0000	(100)	
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8255	0.8843	0.8541	0.0000	0.0000	0.0000	0.0000	(101)	

FULL SAP CALCULATION PRINTOUT

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Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	732.3507	617.6263	611.5835	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1001.5457	956.0796	881.5390	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	193.8204	251.8093	200.8468	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												646.4765 (104)
Cooled fraction									FC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	48.4551	62.9523	50.2117	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												161.6191 (107)
Space cooling per m2												1.8992 (108)
Energy for space heating												42.5966 (99)
Energy for space cooling												1.8992 (108)
Total												44.4958 (109)
Dwelling Fabric Energy Efficiency (DFEE)												44.5 (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	42.5500 (1b)	x 2.3900 (2b)	= 101.6945 (1b) - (3b)
First floor	42.5500 (1c)	x 2.6700 (2c)	= 113.6085 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.1000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 215.3030 (5)

2. Ventilation rate

										main	secondary	other	total	m3 per hour			
										heating	heating						
Number of chimneys										0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues										0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans																3 * 10 =	30.0000 (7a)
Number of passive vents																0 * 10 =	0.0000 (7b)
Number of flueless gas fires																0 * 40 =	0.0000 (7c)
										Air changes per hour							
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000	/ (5) =	0.1393 (8)
Pressure test										Yes							
Measured/design AP50										5.0000							
Infiltration rate										0.3893 (18)							
Number of sides sheltered										1 (19)							
Shelter factor										(20) = 1 - [0.075 x (19)] =					0.9250 (20)		
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =					0.3601 (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	0.4592	0.4502	0.4412	0.3962	0.3871	0.3421	0.3421	0.3331	0.3601	0.3871	0.4052	0.4232	(22b)				
Effective ac	0.6054	0.6013	0.5973	0.5785	0.5749	0.5585	0.5585	0.5555	0.5648	0.5749	0.5821	0.5895	(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			2.1200	1.0000	2.1200		(26)					
TER Opening Type (Uw = 1.40)			14.5700	1.3258	19.3163		(27)					
Ground Floor			42.5500	0.1300	5.5315		(28a)					
Brick and Block	93.4100	16.6900	76.7200	0.1800	13.8096		(29a)					
Pitched Roof	42.5500		42.5500	0.1300	5.5315		(30)					
Total net area of external elements Aum(A, m2)			178.5100				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.3089		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.9182 (36)					
Total fabric heat loss						(33) + (36) =	56.2271 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 43.0152	Feb 42.7243	Mar 42.4392	Apr 41.1002	May 40.8496	Jun 39.6833	Jul 39.6833	Aug 39.4673	Sep 40.1326	Oct 40.8496	Nov 41.3565	Dec 41.8863 (38)
Heat transfer coeff	99.2423	98.9514	98.6663	97.3272	97.0767	95.9104	95.9104	95.6944	96.3597	97.0767	97.5835	98.1134 (39)
Average = Sum(39)m / 12 =												97.3260 (39)
HLP	Jan 1.1662	Feb 1.1628	Mar 1.1594	Apr 1.1437	May 1.1407	Jun 1.1270	Jul 1.1270	Aug 1.1245	Sep 1.1323	Oct 1.1407	Nov 1.1467	Dec 1.1529 (40)
HLP (average)												1.1437 (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												2.5525 (42)
Average daily hot water use (litres/day)												94.8229 (43)
Daily hot water use	Jan 104.3052	Feb 100.5123	Mar 96.7194	Apr 92.9265	May 89.1336	Jun 85.3406	Jul 85.3406	Aug 89.1336	Sep 92.9265	Oct 96.7194	Nov 100.5123	Dec 104.3052 (44)
Energy conte	154.6816	135.2855	139.6026	121.7089	116.7826	100.7745	93.3824	107.1576	108.4374	126.3734	137.9464	149.8009 (45)
Energy content (annual)												Total = Sum(45)m = 1491.9339 (45)
Distribution loss (46)m = 0.15 x (45)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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)
	32.8698	28.7482	29.6655	25.8631	24.8163	21.4146	19.8438	22.7710	23.0430	26.8543	29.3136	31.8327 (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	127.6272	127.6272	127.6272	127.6272	127.6272	127.6272	127.6272	127.6272	127.6272	127.6272	127.6272	127.6272 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.0997	18.7406	15.2408	11.5383	8.6250	7.2816	7.8680	10.2272	13.7269	17.4294	20.3427	21.6861 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	229.7690	232.1533	226.1450	213.3540	197.2077	182.0324	171.8944	169.5101	175.5184	188.3094	204.4557	219.6310 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7627	35.7627	35.7627	35.7627	35.7627	35.7627	35.7627	35.7627	35.7627	35.7627	35.7627	35.7627 (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)	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018 (71)
Water heating gains (Table 5)	44.1799	42.7800	39.8730	35.9210	33.3552	29.7425	26.6717	30.6062	32.0041	36.0946	40.7134	42.7859 (72)
Total internal gains	356.3368	354.9621	342.5470	322.1015	300.4761	280.3446	267.7223	271.6316	282.5375	303.1215	326.8000	345.3912 (73)

6. Solar gains												

[Jan]			Area m2		Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d	Gains W
North			1.9200		10.6334		0.6300		0.7000		0.7700	6.2394 (74)
East			4.4700		19.6403		0.6300		0.7000		0.7700	26.8304 (76)
West			8.1800		19.6403		0.6300		0.7000		0.7700	49.0990 (80)

Solar gains	82.1688	160.4578	264.8758	389.3005	481.0584	494.5029	469.9227	400.7816	308.8574	190.4418	102.3721	67.6421 (83)
Total gains	438.5056	515.4198	607.4228	711.4020	781.5345	774.8475	737.6450	672.4132	591.3949	493.5633	429.1721	413.0333 (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	59.5484	59.7235	59.8960	60.7201	60.8768	61.6171	61.6171	61.7562	61.3298	60.8768	60.5606	60.2336
alpha	4.9699	4.9816	4.9931	5.0480	5.0585	5.1078	5.1078	5.1171	5.0887	5.0585	5.0374	5.0156
util living area	0.9990	0.9975	0.9920	0.9674	0.8889	0.7262	0.5575	0.6267	0.8806	0.9861	0.9979	0.9993 (86)
MIT	19.6584	19.8120	20.0877	20.4592	20.7699	20.9433	20.9881	20.9792	20.8404	20.4220	19.9751	19.6372 (87)
Th 2	19.9471	19.9499	19.9526	19.9653	19.9677	19.9788	19.9788	19.9809	19.9745	19.9677	19.9629	19.9578 (88)
util rest of house	0.9987	0.9967	0.9890	0.9544	0.8458	0.6354	0.4356	0.5015	0.8169	0.9787	0.9970	0.9990 (89)
MIT 2	18.7203	18.8758	19.1521	19.5256	19.8112	19.9527	19.9758	19.9749	19.8827	19.4964	19.0493	18.7077 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.9225	19.0776	19.3537	19.7268	20.0178	20.1662	20.1939	20.1913	20.0891	19.6959	19.2488	18.9080 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9225	19.0776	19.3537	19.7268	20.0178	20.1662	20.1939	20.1913	20.0891	19.6959	19.2488	18.9080 (93)

8. Space heating requirement												

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9982	0.9957	0.9866	0.9507	0.8483	0.6534	0.4621	0.5287	0.8254	0.9760	0.9962	0.9987 (94)
Ext temp.	437.7057	513.1910	599.3066	676.3348	662.9466	506.2577	340.8905	355.5326	488.1220	481.7339	427.5296	412.4776 (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	1451.1681	1402.8937	1268.2293	1053.7441	807.4684	533.8571	344.6962	362.8063	577.1087	882.9976	1185.5267	1443.0504 (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	754.0160	597.8802	497.6785	271.7347	107.5242	0.0000	0.0000	0.0000	0.0000	298.5402	545.7579	766.7462 (98)
Space heating												3839.8779 (98)
Space heating per m2	(98) / (4) =											45.1219 (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	901.5579	709.7371	727.2777	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8769	0.9329	0.9055	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	790.5864	662.0944	658.5218	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1001.5457	956.0796	881.5390	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	151.8907	218.7250	165.9248	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												536.5404 (104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Cooled fraction											FC = cooled area / (4) =	1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	37.9727	54.6812	41.4812	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												134.1351 (107)
Space cooling per m2												1.5762 (108)
Energy for space heating												45.1219 (99)
Energy for space cooling												1.5762 (108)
Total												46.6982 (109)
Target Fabric Energy Efficiency (TFEE)												53.7 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.5500 (1b)	x 2.3900 (2b)	= 101.6945 (1b) - (3b)
First floor	42.5500 (1c)	x 2.6700 (2c)	= 113.6085 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.1000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 215.3030 (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					4 * 10 = 40.0000 (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) =					40.0000 / (5) = 0.1858 (8)
Pressure test					Yes
Measured/design AP50					4.0000
Infiltration rate					0.3858 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3569 (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	0.4193	0.3925	0.3925	0.3569	0.3658	0.3479	0.3479	0.3390	0.3390	0.3658	0.3569	0.3658 (22b)
Effective ac	0.5879	0.5770	0.5770	0.5637	0.5669	0.5605	0.5605	0.5575	0.5575	0.5669	0.5637	0.5669 (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			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			14.5700	1.1450	16.6832		(27)
Ground Floor			42.5500	0.1200	5.1060	84.0000	3574.2000 (28a)
Brick and Block	93.4100	16.6900	76.7200	0.2400	18.4128	42.2200	3239.1184 (29a)
Pitched Roof	42.5500		42.5500	0.1000	4.2550	9.1000	387.2050 (30)
Total net area of external elements Aum(A, m ²)			178.5100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.7890		(33)
Party Wall 1			44.3400	0.0000	0.0000	70.0000	3103.8000 (32)
GF Stud			82.5600			9.0000	743.0400 (32c)
First Floor			95.3800			9.0000	858.4200 (32c)
Internal Floor 1			42.5500			18.0000	765.9000 (32d)
Internal Ceiling 1			42.5500			18.0000	765.9000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13437.5834 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 157.9034 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.9110 (36)
Total fabric heat loss (33) + (36) = 55.7000 (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	41.7707	40.9988	40.9988	40.0488	40.2779	39.8255	39.8255	39.6078	39.6078	40.2779	40.0488	40.2779 (38)
Heat transfer coeff	97.4708	96.6989	96.6989	95.7489	95.9779	95.5255	95.5255	95.3078	95.3078	95.9779	95.7489	95.9779 (39)
Average = Sum(39)m / 12 =												95.9972 (39)
HLP	1.1454	1.1363	1.1363	1.1251	1.1278	1.1225	1.1225	1.1200	1.1200	1.1278	1.1251	1.1278 (40)
HLP (average)												1.1281 (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												2.5525 (42)
Average daily hot water use (litres/day)												94.8229 (43)
Daily hot water use	104.3052	100.5123	96.7194	92.9265	89.1336	85.3406	85.3406	89.1336	92.9265	96.7194	100.5123	104.3052 (44)
Energy conte	154.6816	135.2855	139.6026	121.7089	116.7826	100.7745	93.3824	107.1576	108.4374	126.3734	137.9464	149.8009 (45)
Energy content (annual)										Total = Sum(45)m =		1491.9339 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	23.2022	20.2928	20.9404	18.2563	17.5174	15.1162	14.0074	16.0736	16.2656	18.9560	20.6920	22.4701 (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	27.5595	24.8903	27.5325	26.6145	27.4799	26.5684	27.4384	27.4653	26.5935	27.5107	26.6563	27.5515 (61)
Total heat required for water heating calculated for each month	182.2412	160.1758	167.1350	148.3234	144.2625	127.3429	120.8208	134.6230	135.0310	153.8841	164.6027	177.3524 (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	182.2412	160.1758	167.1350	148.3234	144.2625	127.3429	120.8208	134.6230	135.0310	153.8841	164.6027	177.3524 (64)
RHI water heating demand												
Heat gains from water heating, kWh/month	58.3215	51.2050	53.3010	47.1218	45.7002	40.1496	37.9092	42.4962	42.7038	48.8968	52.5313	56.6967 (65)
												1816 (64)
												0.0000 (63)
												Sum(63)m =
												1815.7947 (64)
												Sum(64)m =
												1816 (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	153.1527	153.1527	153.1527	153.1527	153.1527	153.1527	153.1527	153.1527	153.1527	153.1527	153.1527	153.1527	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	52.7492	46.8514	38.1021	28.8458	21.5625	18.2040	19.6701	25.5679	34.3172	43.5736	50.8568	54.2153	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	342.9388	346.4975	337.5298	318.4388	294.3398	271.6901	256.5587	253.0001	261.9678	281.0588	305.1578	327.8075	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8678	52.8678	52.8678	52.8678	52.8678	52.8678	52.8678	52.8678	52.8678	52.8678	52.8678	52.8678	(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)	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	(71)
Water heating gains (Table 5)	78.3892	76.1979	71.6411	65.4470	61.4250	55.7634	50.9533	57.1186	59.3109	65.7216	72.9601	76.2052	(72)
Total internal gains	580.9959	576.4655	554.1917	519.6502	484.2460	452.5762	434.1008	442.6053	462.5145	497.2726	535.8934	565.1467	(73)

6. Solar gains

[Jan]														
	Area m2				Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W	
North	1.9200				13.4684		0.6300		0.7000		0.7700		7.9030 (74)	
East	4.4700				25.1733		0.6300		0.7000		0.7700		34.3889 (76)	
West	8.1800				25.1733		0.6300		0.7000		0.7700		62.9310 (80)	
Solar gains	105.2229	174.9586	293.4667	431.1380	499.4553	567.1855	518.2157	462.5359	357.6567	223.9813	130.7013	81.9678 (83)		
Total gains	686.2188	751.4241	847.6585	950.7883	983.7013	1019.7617	952.3165	905.1412	820.1712	721.2539	666.5946	647.1144 (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	38.2952	38.6009	38.6009	38.9839	38.8909	39.0750	39.0750	39.1643	39.1643	38.8909	38.9839	38.8909	
alpha	3.5530	3.5734	3.5734	3.5989	3.5927	3.6050	3.6050	3.6110	3.6110	3.5927	3.5989	3.5927	
util living area	0.9654	0.9517	0.9114	0.8175	0.6714	0.4597	0.3269	0.3325	0.5949	0.8431	0.9409	0.9699	(86)
MIT	19.6927	19.8509	20.1824	20.5825	20.8469	20.9712	20.9938	20.9937	20.9281	20.6146	20.1223	19.6832	(87)
Th 2	19.9640	19.9713	19.9713	19.9804	19.9782	19.9825	19.9825	19.9846	19.9846	19.9782	19.9804	19.9782	(88)
util rest of house	0.9579	0.9414	0.8927	0.7806	0.6084	0.3750	0.2281	0.2291	0.5056	0.8003	0.9261	0.9632	(89)
MIT 2	18.8061	18.9657	19.2844	19.6609	19.8816	19.9705	19.9812	19.9833	19.9497	19.6981	19.2402	18.8083	(90)
Living area fraction	18.9972	19.1565	19.4780	19.8595	20.0896	20.1862	20.1994	20.2011	20.1605	19.8956	19.4303	18.9968	(92)
MIT	18.9972	19.1565	19.4780	19.8595	20.0896	20.1862	20.1994	20.2011	20.1605	19.8956	19.4303	18.9968	(93)
Temperature adjustment													
adjusted MIT	18.9972	19.1565	19.4780	19.8595	20.0896	20.1862	20.1994	20.2011	20.1605	19.8956	19.4303	18.9968	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	651.2450	699.9257	747.7686	737.5559	605.6815	400.1706	237.5361	227.6462	428.1460	574.3918	610.7377	618.0224	(94)
Ext temp.	5.6000	6.0000	7.6000	10.1000	13.1000	15.9000	17.7000	17.8000	15.4000	12.1000	8.6000	5.7000	(96)
Heat loss rate W	1305.8325	1272.2145	1148.5859	934.4630	670.8479	409.4413	238.7590	228.8411	453.7171	748.2037	1036.9871	1276.2018	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	487.0131	384.5780	298.2080	141.7731	48.4838	0.0000	0.0000	0.0000	0.0000	129.3160	306.8996	489.6855	(98)
Space heating												2285.9573	(98)
RHI space heating demand												2286	(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	42.5500 (1b)	x 2.3900 (2b)	= 101.6945 (1b) - (3b)
First floor	42.5500 (1c)	x 2.6700 (2c)	= 113.6085 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.1000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 215.3030 (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					4 * 10 = 40.0000 (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) =					40.0000 / (5) = 0.1858 (8)
Pressure test					Yes
Measured/design AP50					4.0000
Infiltration rate					0.3858 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3569 (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	0.4550	0.4461	0.4371	0.3925	0.3836	0.3390	0.3390	0.3301	0.3569	0.3836	0.4015	0.4193 (22b)
Effective ac	0.6035	0.5995	0.5955	0.5770	0.5736	0.5575	0.5575	0.5545	0.5637	0.5736	0.5806	0.5879 (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			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			14.5700	1.1450	16.6832		(27)
Ground Floor			42.5500	0.1200	5.1060	84.0000	3574.2000 (28a)
Brick and Block	93.4100	16.6900	76.7200	0.2400	18.4128	42.2200	3239.1184 (29a)
Pitched Roof	42.5500		42.5500	0.1000	4.2550	9.1000	387.2050 (30)
Total net area of external elements Aum(A, m ²)			178.5100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.7890		(33)
Party Wall 1			44.3400	0.0000	0.0000	70.0000	3103.8000 (32)
GF Stud			82.5600			9.0000	743.0400 (32c)
First Floor			95.3800			9.0000	858.4200 (32c)
Internal Floor 1			42.5500			18.0000	765.9000 (32d)
Internal Ceiling 1			42.5500			18.0000	765.9000 (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) =	13437.5834 (34)
	157.9034 (35)
	8.9110 (36)
(33) + (36) =	55.7000 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	
(38)m	Jan 42.8791 Feb 42.5935 Mar 42.3136 Apr 40.9988 May 40.7529 Jun 39.6078 Jul 39.6078 Aug 39.3957 Sep 40.0488 Oct 40.7529 Nov 41.2505 Dec 41.7707 (38)
Heat transfer coeff	Jan 98.5791 Feb 98.2935 Mar 98.0136 Apr 96.6989 May 96.4529 Jun 95.3078 Jul 95.3078 Aug 95.0957 Sep 95.7489 Oct 96.4529 Nov 96.9505 Dec 97.4708 (39)
Average = Sum(39)m / 12 =	96.6977 (39)
HLP	Jan 1.1584 Feb 1.1550 Mar 1.1517 Apr 1.1363 May 1.1334 Jun 1.1200 Jul 1.1200 Aug 1.1175 Sep 1.1251 Oct 1.1334 Nov 1.1393 Dec 1.1454 (40)
HLP (average)	1.1363 (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												2.5525 (42)
Average daily hot water use (litres/day)												94.8229 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	104.3052	100.5123	96.7194	92.9265	89.1336	85.3406	85.3406	89.1336	92.9265	96.7194	100.5123	104.3052 (44)
Energy conte	154.6816	135.2855	139.6026	121.7089	116.7826	100.7745	93.3824	107.1576	108.4374	126.3734	137.9464	149.8009 (45)
Energy content (annual)										Total = Sum(45)m =	1491.9339 (45)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	23.2022	20.2928	20.9404	18.2563	17.5174	15.1162	14.0074	16.0736	16.2656	18.9560	20.6920	22.4701 (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	27.5595	24.8903	27.5325	26.6145	27.4799	26.5684	27.4384	27.4653	26.5935	27.5107	26.6563	27.5515 (61)
Total heat required for water heating calculated for each month	182.2412	160.1758	167.1350	148.3234	144.2625	127.3429	120.8208	134.6230	135.0310	153.8841	164.6027	177.3524 (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	182.2412	160.1758	167.1350	148.3234	144.2625	127.3429	120.8208	134.6230	135.0310	153.8841	164.6027	177.3524 (64)
Heat gains from water heating, kWh/month	58.3215	51.2050	53.3010	47.1218	45.7002	40.1496	37.9092	42.4962	42.7038	48.8968	52.5313	56.6967 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1815.7947 (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	153.1527	153.1527	153.1527	153.1527	153.1527	153.1527	153.1527	153.1527	153.1527	153.1527	153.1527	153.1527 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	52.7492	46.8514	38.1021	28.8458	21.5625	18.2040	19.6701	25.5679	34.3172	43.5736	50.8568	54.2153 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	342.9388	346.4975	337.5298	318.4388	294.3398	271.6901	256.5587	253.0001	261.9678	281.0588	305.1578	327.8075 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8678	52.8678	52.8678	52.8678	52.8678	52.8678	52.8678	52.8678	52.8678	52.8678	52.8678	52.8678 (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)	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018 (71)
Water heating gains (Table 5)	78.3892	76.1979	71.6411	65.4470	61.4250	55.7634	50.9533	57.1186	59.3109	65.7216	72.9601	76.2052 (72)
Total internal gains	580.9959	576.4655	554.1917	519.6502	484.2460	452.5762	434.1008	442.6053	462.5145	497.2726	535.8934	565.1467 (73)

6. Solar gains

[Jan]												
					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
North					1.9200	10.6334	0.6300	0.7000	0.7700		6.2394 (74)	
East					4.4700	19.6403	0.6300	0.7000	0.7700		26.8304 (76)	
West					8.1800	19.6403	0.6300	0.7000	0.7700		49.0990 (80)	
Solar gains	82.1688	160.4578	264.8758	389.3005	481.0584	494.5029	469.9227	400.7816	308.8574	190.4418	102.3721	67.6421 (83)
Total gains	663.1647	736.9233	819.0675	908.9507	965.3044	947.0791	904.0235	843.3870	771.3719	687.7144	638.2655	632.7888 (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	37.8646	37.9746	38.0831	38.6009	38.6993	39.1643	39.1643	39.2516	38.9839	38.6993	38.5007	38.2952
alpha	3.5243	3.5316	3.5389	3.5734	3.5800	3.6110	3.6110	3.6168	3.5989	3.5800	3.5667	3.5530
util living area	0.9754	0.9629	0.9344	0.8678	0.7521	0.5902	0.4479	0.4943	0.7184	0.9010	0.9621	0.9788 (86)
MIT	19.4472	19.6425	19.9792	20.4043	20.7326	20.9199	20.9773	20.9677	20.8330	20.4004	19.8547	19.4128 (87)
Th 2	19.9534	19.9561	19.9588	19.9713	19.9736	19.9846	19.9846	19.9866	19.9804	19.9736	19.9689	19.9640 (88)
util rest of house	0.9703	0.9553	0.9207	0.8404	0.7021	0.5130	0.3512	0.3951	0.6469	0.8742	0.9531	0.9744 (89)
MIT 2	18.5557	18.7496	19.0794	19.4920	19.7856	19.9417	19.9766	19.9743	19.8800	19.4999	18.9707	18.5299 (90)
Living area fraction									fLA = Living area / (4) =			0.2155 (91)
MIT	18.7478	18.9420	19.2733	19.6886	19.9897	20.1525	20.1923	20.1884	20.0854	19.6940	19.1612	18.7202 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7478	18.9420	19.2733	19.6886	19.9897	20.1525	20.1923	20.1884	20.0854	19.6940	19.1612	18.7202 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	638.4238	697.1628	745.2064	755.9992	678.5569	498.5561	335.9150	350.5521	505.2236	595.1925	602.5678	612.2262 (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	1424.2500	1380.2379	1251.9590	1043.2469	799.5621	529.1949	342.3728	360.2623	573.0965	877.1428	1169.3398	1415.2902 (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	584.6546	459.0265	377.0240	206.8184	90.0278	0.0000	0.0000	0.0000	0.0000	209.7710	408.0758	597.4796 (98)
Space heating												2932.8777 (98)
Space heating per m2										(98) / (4) =		34.4639 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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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 %)												90.7000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												3233.6028	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	584.6546	459.0265	377.0240	206.8184	90.0278	0.0000	0.0000	0.0000	0.0000	209.7710	408.0758	597.4796	(98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)
Space heating fuel (main heating system)	644.6027	506.0932	415.6824	228.0247	99.2589	0.0000	0.0000	0.0000	0.0000	231.2800	449.9182	658.7427	(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	182.2412	160.1758	167.1350	148.3234	144.2625	127.3429	120.8208	134.6230	135.0310	153.8841	164.6027	177.3524	(64)
Efficiency of water heater (217)m	90.0186	89.9587	89.8212	89.5092	88.9552	87.9000	87.9000	87.9000	87.9000	89.4937	89.8771	87.9000	(216)
Fuel for water heating, kWh/month	202.4484	178.0548	186.0753	165.7074	162.1743	144.8725	137.4526	153.1547	153.6188	171.9497	183.1420	196.9630	(219)
Water heating fuel used												2035.6134	(219)
Annual totals kWh/year													
Space heating fuel - main system												3233.6028	(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)												372.6272	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.73 * 908 * 1.00) =										-530.1869		-530.1869	(233)
Total delivered energy for all uses												5186.6565	(238)

10a. Fuel costs - using Table 12 prices

	Fuel	Fuel price	Fuel cost
	kWh/year	p/kWh	£/year
Space heating - main system 1	3233.6028	3.4800	112.5294 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2035.6134	3.4800	70.8393 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	372.6272	13.1900	49.1495 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-530.1869	13.1900	-69.9316 (252)
Total energy cost			292.4791 (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] =	0.9442 (257)
SAP value	86.8283	
SAP rating (Section 12)	87	(258)
SAP band	B	

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

	Energy	Emission factor	Emissions
	kWh/year	kg CO2/kWh	kg CO2/year
Space heating - main system 1	3233.6028	0.2160	698.4582 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2035.6134	0.2160	439.6925 (264)
Space and water heating			1138.1507 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	372.6272	0.5190	193.3935 (268)
Energy saving/generation technologies			
PV Unit	-530.1869	0.5190	-275.1670 (269)
Total kg/year			1095.3022 (272)
CO2 emissions per m2			12.8700 (273)
EI value			88.7186
EI rating			89 (274)
EI band			B

Calculation of stars for heating and DHW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



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Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9070 = 3.837$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9070 = 0.2381$, stars = 4
Water heating energy efficiency	$3.48 / 0.8911 = 3.905$, stars = 4
Water heating environmental impact	$0.216 / 0.8911 = 0.2424$, 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	42.5500 (1b)	x 2.3900 (2b)	= 101.6945 (1b) - (3b)
First floor	42.5500 (1c)	x 2.6700 (2c)	= 113.6085 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.1000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 215.3030 (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					4 * 10 = 40.0000 (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) =					40.0000 / (5) = 0.1858 (8)
Pressure test					Yes
Measured/design AP50					4.0000
Infiltration rate					0.3858 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3569 (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	0.4193	0.3925	0.3925	0.3569	0.3658	0.3479	0.3479	0.3390	0.3390	0.3658	0.3569	0.3658 (22b)
Effective ac	0.5879	0.5770	0.5770	0.5637	0.5669	0.5605	0.5605	0.5575	0.5575	0.5669	0.5637	0.5669 (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			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			14.5700	1.1450	16.6832		(27)
Ground Floor			42.5500	0.1200	5.1060	84.0000	3574.2000 (28a)
Brick and Block	93.4100	16.6900	76.7200	0.2400	18.4128	42.2200	3239.1184 (29a)
Pitched Roof	42.5500		42.5500	0.1000	4.2550	9.1000	387.2050 (30)
Total net area of external elements Aum(A, m ²)			178.5100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.7890		(33)
Party Wall 1			44.3400	0.0000	0.0000	70.0000	3103.8000 (32)
GF Stud			82.5600			9.0000	743.0400 (32c)
First Floor			95.3800			9.0000	858.4200 (32c)
Internal Floor 1			42.5500			18.0000	765.9000 (32d)
Internal Ceiling 1			42.5500			18.0000	765.9000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13437.5834 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 157.9034 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.9110 (36)
Total fabric heat loss (33) + (36) = 55.7000 (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	41.7707	40.9988	40.9988	40.0488	40.2779	39.8255	39.8255	39.6078	39.6078	40.2779	40.0488	40.2779 (38)
Heat transfer coeff	97.4708	96.6989	96.6989	95.7489	95.9779	95.5255	95.5255	95.3078	95.3078	95.9779	95.7489	95.9779 (39)
Average = Sum(39)m / 12 =												95.9972 (39)
HLP	1.1454	1.1363	1.1363	1.1251	1.1278	1.1225	1.1225	1.1200	1.1200	1.1278	1.1251	1.1278 (40)
HLP (average)												1.1281 (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												2.5525 (42)
Average daily hot water use (litres/day)												94.8229 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	104.3052	100.5123	96.7194	92.9265	89.1336	85.3406	85.3406	89.1336	92.9265	96.7194	100.5123	104.3052 (44)
Energy conte	154.6816	135.2855	139.6026	121.7089	116.7826	100.7745	93.3824	107.1576	108.4374	126.3734	137.9464	149.8009 (45)
Energy content (annual)										Total = Sum(45)m =		1491.9339 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Distribution loss (46)m = 0.15 x (45)m	23.2022	20.2928	20.9404	18.2563	17.5174	15.1162	14.0074	16.0736	16.2656	18.9560	20.6920	22.4701 (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	27.5595	24.8903	27.5325	26.6145	27.4799	26.5684	27.4384	27.4653	26.5935	27.5107	26.6563	27.5515 (61)
Total heat required for water heating calculated for each month	182.2412	160.1758	167.1350	148.3234	144.2625	127.3429	120.8208	134.6230	135.0310	153.8841	164.6027	177.3524 (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	182.2412	160.1758	167.1350	148.3234	144.2625	127.3429	120.8208	134.6230	135.0310	153.8841	164.6027	177.3524 (64)
Heat gains from water heating, kWh/month	58.3215	51.2050	53.3010	47.1218	45.7002	40.1496	37.9092	42.4962	42.7038	48.8968	52.5313	56.6967 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1815.7947 (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	153.1527	153.1527	153.1527	153.1527	153.1527	153.1527	153.1527	153.1527	153.1527	153.1527	153.1527	153.1527 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	52.7492	46.8514	38.1021	28.8458	21.5625	18.2040	19.6701	25.5679	34.3172	43.5736	50.8568	54.2153 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	342.9388	346.4975	337.5298	318.4388	294.3398	271.6901	256.5587	253.0001	261.9678	281.0588	305.1578	327.8075 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8678	52.8678	52.8678	52.8678	52.8678	52.8678	52.8678	52.8678	52.8678	52.8678	52.8678	52.8678 (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)	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018 (71)
Water heating gains (Table 5)	78.3892	76.1979	71.6411	65.4470	61.4250	55.7634	50.9533	57.1186	59.3109	65.7216	72.9601	76.2052 (72)
Total internal gains	580.9959	576.4655	554.1917	519.6502	484.2460	452.5762	434.1008	442.6053	462.5145	497.2726	535.8934	565.1467 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d	Gains W	
North				1.9200	13.4684		0.6300	0.7000		0.7700	7.9030 (74)	
East				4.4700	25.1733		0.6300	0.7000		0.7700	34.3889 (76)	
West				8.1800	25.1733		0.6300	0.7000		0.7700	62.9310 (80)	

Solar gains	105.2229	174.9586	293.4667	431.1380	499.4553	567.1855	518.2157	462.5359	357.6567	223.9813	130.7013	81.9678 (83)
Total gains	686.2188	751.4241	847.6585	950.7883	983.7013	1019.7617	952.3165	905.1412	820.1712	721.2539	666.5946	647.1144 (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	38.2952	38.6009	38.6009	38.9839	38.8909	39.0750	39.0750	39.1643	39.1643	38.8909	38.9839	38.8909
alpha	3.5530	3.5734	3.5734	3.5989	3.5927	3.6050	3.6050	3.6110	3.6110	3.5927	3.5989	3.5927
util living area	0.9654	0.9517	0.9114	0.8175	0.6714	0.4597	0.3269	0.3325	0.5949	0.8431	0.9409	0.9699 (86)
MIT	19.6927	19.8509	20.1824	20.5825	20.8469	20.9712	20.9938	20.9937	20.9281	20.6146	20.1223	19.6832 (87)
Th 2	19.9640	19.9713	19.9713	19.9804	19.9782	19.9825	19.9825	19.9846	19.9846	19.9782	19.9804	19.9782 (88)
util rest of house	0.9579	0.9414	0.8927	0.7806	0.6084	0.3750	0.2281	0.2291	0.5056	0.8003	0.9261	0.9632 (89)
MIT 2	18.8061	18.9657	19.2844	19.6609	19.8816	19.9705	19.9812	19.9833	19.9497	19.6981	19.2402	18.8083 (90)
Living area fraction									fLA = Living area / (4) =			0.2155 (91)
MIT	18.9972	19.1565	19.4780	19.8595	20.0896	20.1862	20.1994	20.2011	20.1605	19.8956	19.4303	18.9968 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9972	19.1565	19.4780	19.8595	20.0896	20.1862	20.1994	20.2011	20.1605	19.8956	19.4303	18.9968 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9490	0.9315	0.8822	0.7757	0.6157	0.3924	0.2494	0.2515	0.5220	0.7964	0.9162	0.9550 (94)
Useful gains	651.2450	699.9257	747.7686	737.5559	605.6815	400.1706	237.5361	227.6462	428.1460	574.3918	610.7377	618.0224 (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	1305.8325	1272.2145	1148.5859	934.4630	670.8479	409.4413	238.7590	228.8411	453.7171	748.2037	1036.9871	1276.2018 (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	487.0131	384.5780	298.2080	141.7731	48.4838	0.0000	0.0000	0.0000	0.0000	129.3160	306.8996	489.6855 (98)
Space heating												2285.9573 (98)
Space heating per m2										(98) / (4) =		26.8620 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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 %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2520.3498 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	487.0131	384.5780	298.2080	141.7731	48.4838	0.0000	0.0000	0.0000	0.0000	129.3160	306.8996	489.6855	(98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)
Space heating fuel (main heating system)	536.9494	424.0111	328.7850	156.3099	53.4552	0.0000	0.0000	0.0000	0.0000	142.5756	338.3678	539.8958	(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	182.2412	160.1758	167.1350	148.3234	144.2625	127.3429	120.8208	134.6230	135.0310	153.8841	164.6027	177.3524	(64)
Efficiency of water heater	89.9200	89.8584	89.6740	89.2465	88.5879	87.9000	87.9000	87.9000	87.9000	89.1568	89.7025	87.9000	(216)
(217)m	89.9200	89.8584	89.6740	89.2465	88.5879	87.9000	87.9000	87.9000	87.9000	89.1568	89.7025	89.9383	(217)
Fuel for water heating, kWh/month	202.6703	178.2537	186.3806	166.1952	162.8467	144.8725	137.4526	153.1547	153.6188	172.5994	183.4985	197.1934	(219)
Water heating fuel used												2038.7364	(219)
Annual totals kWh/year													
Space heating fuel - main system												2520.3498	(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)												372.6272	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.73 * 1030 * 1.00) =										-601.5547		-601.5547	(233)
Total delivered energy for all uses												4405.1587	(238)

10a. Fuel costs - using BEDF prices (490)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2520.3498	3.6300	91.4887 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2038.7364	3.6300	74.0061 (247)
Pumps and fans for heating	75.0000	19.4400	14.5800 (249)
Energy for lighting	372.6272	19.4400	72.4387 (250)
Additional standing charges			95.0000 (251)
Energy saving/generation technologies			
PV Unit	-601.5547	19.4400	-116.9422 (252)
Total energy cost			230.5713 (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	2520.3498	0.2160	544.3956 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2038.7364	0.2160	440.3671 (264)
Space and water heating			984.7626 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	372.6272	0.5190	193.3935 (268)
Energy saving/generation technologies			
PV Unit	-601.5547	0.5190	-312.2069 (269)
Total kg/year			904.8743 (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	2520.3498	1.2200	3074.8267 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2038.7364	1.2200	2487.2584 (264)
Space and water heating			5562.0852 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	372.6272	3.0700	1143.9655 (268)
Energy saving/generation technologies			
PV Unit	-601.5547	3.0700	-1846.7729 (269)
Primary energy kWh/year			5089.5278 (272)
Primary energy kWh/m2/year			59.8064 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 87
Current environmental impact rating: B 89

(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	+ 1.2	-£ 27	-190 kg (21.0%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£27 2.24 kg/m²	B 88	B 91
Total Savings	£27 2.24 kg/m²		

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

Fuel prices for cost data on this page from database revision number 490 TEST (31 Jan 2022)
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	£87	£97	-£10
Mains gas	£260	£224	£36
Space heating	£201	£201	£0
Water heating	£74	£47	£27
Lighting	£72	£72	£0
Generated (PV)	-£117	-£117	£0
Total cost of fuels	£230	£204	£26
Total cost of uses	£230	£203	£27
Delivered energy	52 kWh/m²	41 kWh/m²	11 kWh/m²
Carbon dioxide emissions	0.9 tonnes	0.7 tonnes	0.2 tonnes
CO2 emissions per m²	11 kg/m²	8 kg/m²	2 kg/m²
Primary energy	60 kWh/m²	47 kWh/m²	13 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	42.5500 (1b)	x 2.3900 (2b)	= 101.6945 (1b) - (3b)
First floor	42.5500 (1c)	x 2.6700 (2c)	= 113.6085 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.1000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 215.3030 (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					4 * 10 = 40.0000 (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)					40.0000 / (5) = 0.1858 (8)
Pressure test					Yes
Measured/design AP50					4.0000
Infiltration rate					0.3858 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3569 (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	0.4550	0.4461	0.4371	0.3925	0.3836	0.3390	0.3390	0.3301	0.3569	0.3836	0.4015	0.4193 (22b)
Effective ac	0.6035	0.5995	0.5955	0.5770	0.5736	0.5575	0.5575	0.5545	0.5637	0.5736	0.5806	0.5879 (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			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			14.5700	1.1450	16.6832		(27)
Ground Floor			42.5500	0.1200	5.1060	84.0000	3574.2000 (28a)
Brick and Block	93.4100	16.6900	76.7200	0.2400	18.4128	42.2200	3239.1184 (29a)
Pitched Roof	42.5500		42.5500	0.1000	4.2550	9.1000	387.2050 (30)
Total net area of external elements Aum(A, m ²)			178.5100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.7890		(33)
Party Wall 1			44.3400	0.0000	0.0000	70.0000	3103.8000 (32)
GF Stud			82.5600			9.0000	743.0400 (32c)
First Floor			95.3800			9.0000	858.4200 (32c)
Internal Floor 1			42.5500			18.0000	765.9000 (32d)
Internal Ceiling 1			42.5500			18.0000	765.9000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13437.5834 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 157.9034 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.9110 (36)
Total fabric heat loss (33) + (36) = 55.7000 (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	42.8791	42.5935	42.3136	40.9988	40.7529	39.6078	39.6078	39.3957	40.0488	40.7529	41.2505	41.7707 (38)
Heat transfer coeff	98.5791	98.2935	98.0136	96.6989	96.4529	95.3078	95.3078	95.0957	95.7489	96.4529	96.9505	97.4708 (39)
Average = Sum(39)m / 12 =												96.6977 (39)
HLP	1.1584	1.1550	1.1517	1.1363	1.1334	1.1200	1.1200	1.1175	1.1251	1.1334	1.1393	1.1454 (40)
HLP (average)												1.1363 (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												2.5525 (42)
Average daily hot water use (litres/day)												94.8229 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	104.3052	100.5123	96.7194	92.9265	89.1336	85.3406	85.3406	89.1336	92.9265	96.7194	100.5123	104.3052 (44)
Energy conte	154.6816	135.2855	139.6026	121.7089	116.7826	100.7745	93.3824	107.1576	108.4374	126.3734	137.9464	149.8009 (45)
Energy content (annual)										Total = Sum(45)m =		1491.9339 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	23.2022	20.2928	20.9404	18.2563	17.5174	15.1162	14.0074	16.0736	16.2656	18.9560	20.6920	22.4701 (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	27.5595	24.8903	27.5325	26.6145	27.4799	26.5684	27.4384	27.4653	26.5935	27.5107	26.6563	27.5515 (61)
Total heat required for water heating calculated for each month	182.2412	160.1758	167.1350	148.3234	144.2625	127.3429	120.8208	134.6230	135.0310	153.8841	164.6027	177.3524 (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												1.2156 (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												94.8229 (H14)
Volume ratio Veff/V												0.7909 (H15)
Solar storage volume factor												0.9531 (H16)
Solar input	-24.7134	-41.2395	-70.2357	-94.1296	-116.2892	-114.3308	-112.8199	-98.5713	-77.2011	-52.7193	-29.3136	-852.2444 (H17)
Solar input (sum of months) = Sum (63)m =												-852.2444 (63)
Output from w/h	157.5278	118.9363	96.8994	54.1937	27.9733	13.0121	8.0009	36.0516	57.8298	101.1648	135.2891	156.6715 (64)
Total per year (kWh/year) = Sum (64)m =												963.5503 (64)
Heat gains from water heating, kWh/month	58.3215	51.2050	53.3010	47.1218	45.7002	40.1496	37.9092	42.4962	42.7038	48.8968	52.5313	56.6967 (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	153.1527	153.1527	153.1527	153.1527	153.1527	153.1527	153.1527	153.1527	153.1527	153.1527	153.1527	153.1527	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	52.7492	46.8514	38.1021	28.8458	21.5625	18.2040	19.6701	25.5679	34.3172	43.5736	50.8568	54.2153	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	342.9388	346.4975	337.5298	318.4388	294.3398	271.6901	256.5587	253.0001	261.9678	281.0588	305.1578	327.8075	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8678	52.8678	52.8678	52.8678	52.8678	52.8678	52.8678	52.8678	52.8678	52.8678	52.8678	52.8678	(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)	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	(71)
Water heating gains (Table 5)	78.3892	76.1979	71.6411	65.4470	61.4250	55.7634	50.9533	57.1186	59.3109	65.7216	72.9601	76.2052	(72)
Total internal gains	580.9959	576.4655	554.1917	519.6502	484.2460	452.5762	434.1008	442.6053	462.5145	497.2726	535.8934	565.1467	(73)

6. Solar gains

[Jan]						Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W
North						1.9200	10.6334	0.6300	0.7000	0.7700		6.2394 (74)
East						4.4700	19.6403	0.6300	0.7000	0.7700		26.8304 (76)
West						8.1800	19.6403	0.6300	0.7000	0.7700		49.0990 (80)

Solar gains	82.1688	160.4578	264.8758	389.3005	481.0584	494.5029	469.9227	400.7816	308.8574	190.4418	102.3721	67.6421 (83)
Total gains	663.1647	736.9233	819.0675	908.9507	965.3044	947.0791	904.0235	843.3870	771.3719	687.7144	638.2655	632.7888 (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	37.8646	37.9746	38.0831	38.6009	38.6993	39.1643	39.1643	39.2516	38.9839	38.6993	38.5007	38.2952
alpha	3.5243	3.5316	3.5389	3.5734	3.5800	3.6110	3.6110	3.6168	3.5989	3.5800	3.5667	3.5530
util living area	0.9754	0.9629	0.9344	0.8678	0.7521	0.5902	0.4479	0.4943	0.7184	0.9010	0.9621	0.9788 (86)
MIT	19.4472	19.6425	19.9792	20.4043	20.7326	20.9199	20.9773	20.9677	20.8330	20.4004	19.8547	19.4128 (87)
Th 2	19.9534	19.9561	19.9588	19.9713	19.9736	19.9846	19.9846	19.9866	19.9804	19.9736	19.9689	19.9640 (88)
util rest of house	0.9703	0.9553	0.9207	0.8404	0.7021	0.5130	0.3512	0.3951	0.6469	0.8742	0.9531	0.9744 (89)
MIT 2	18.5557	18.7496	19.0794	19.4920	19.7856	19.9417	19.9766	19.9743	19.8800	19.4999	18.9707	18.5299 (90)
Living area fraction									fLA = Living area / (4) =			0.2155 (91)
MIT	18.7478	18.9420	19.2733	19.6886	19.9897	20.1525	20.1923	20.1884	20.0854	19.6940	19.1612	18.7202 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7478	18.9420	19.2733	19.6886	19.9897	20.1525	20.1923	20.1884	20.0854	19.6940	19.1612	18.7202 (93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9627	0.9460	0.9098	0.8317	0.7029	0.5264	0.3716	0.4156	0.6550	0.8655	0.9441	0.9675	(94)
Useful gains	638.4238	697.1628	745.2064	755.9992	678.5569	498.5561	335.9150	350.5521	505.2236	595.1925	602.5678	612.2262	(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	1424.2500	1380.2379	1251.9590	1043.2469	799.5621	529.1949	342.3728	360.2623	573.0965	877.1428	1169.3398	1415.2902	(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	584.6546	459.0265	377.0240	206.8184	90.0278	0.0000	0.0000	0.0000	0.0000	209.7710	408.0758	597.4796	(98)
Space heating												2932.8777	(98)
Space heating per m2											(98) / (4) =	34.4639	(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 %)													90.7000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													3233.6028	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	584.6546	459.0265	377.0240	206.8184	90.0278	0.0000	0.0000	0.0000	0.0000	209.7710	408.0758	597.4796	(98)	
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)	
Space heating fuel (main heating system)	644.6027	506.0932	415.6824	228.0247	99.2589	0.0000	0.0000	0.0000	0.0000	231.2800	449.9182	658.7427	(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	157.5278	118.9363	96.8994	54.1937	27.9733	13.0121	8.0009	36.0516	57.8298	101.1648	135.2891	156.6715	(64)	
Efficiency of water heater	90.0909	90.1093	90.1131	90.1041	90.0202	87.9000	87.9000	87.9000	87.9000	89.7696	89.9863	90.1037	(217)	
Fuel for water heating, kWh/month	174.8543	131.9911	107.5309	60.1457	31.0744	14.8033	9.1023	41.0144	65.7905	112.6939	150.3441	173.8790	(219)	
Water heating fuel used												1073.2238	(219)	
Annual totals kWh/year														
Space heating fuel - main system													3233.6028	(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)
pump for solar water heating													50.0000	(230g)
Total electricity for the above, kWh/year													125.0000	(231)
Electricity for lighting (calculated in Appendix L)													372.6272	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.73 * 908 * 1.00) =										-530.1869			-530.1869	(233)
Total delivered energy for all uses													4274.2669	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3233.6028	3.4800	112.5294	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1073.2238	3.4800	37.3482	(247)
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	372.6272	13.1900	49.1495	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	-530.1869	13.1900	-69.9316	(252)
Total energy cost			265.5829	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):			0.4200	(256)
Energy cost factor (ECF)			0.8574	(257)
SAP value			88.0396	
SAP rating (Section 12)			88	(258)
SAP band			B	

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

Energy	Emission factor	Emissions
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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

	kWh/year	kg CO2/kWh	kg CO2/year	
Space heating - main system 1	3233.6028	0.2160	698.4582	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1073.2238	0.2160	231.8163	(264)
Space and water heating			930.2745	(265)
Pumps and fans	125.0000	0.5190	64.8750	(267)
Energy for lighting	372.6272	0.5190	193.3935	(268)
Energy saving/generation technologies				
PV Unit	-530.1869	0.5190	-275.1670	(269)
Total kg/year			913.3761	(272)
CO2 emissions per m2			10.7300	(273)
EI value			90.5924	
EI rating			91	(274)
EI band			B	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.5500 (1b)	x 2.3900 (2b)	= 101.6945 (1b) - (3b)
First floor	42.5500 (1c)	x 2.6700 (2c)	= 113.6085 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.1000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 215.3030 (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					4 * 10 = 40.0000 (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)					40.0000 / (5) = 0.1858 (8)
Pressure test					Yes
Measured/design AP50					4.0000
Infiltration rate					0.3858 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3569 (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	0.4193	0.3925	0.3925	0.3569	0.3658	0.3479	0.3479	0.3390	0.3390	0.3658	0.3569	0.3658 (22b)
Effective ac	0.5879	0.5770	0.5770	0.5637	0.5669	0.5605	0.5605	0.5575	0.5575	0.5669	0.5637	0.5669 (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			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			14.5700	1.1450	16.6832		(27)
Ground Floor			42.5500	0.1200	5.1060	84.0000	3574.2000 (28a)
Brick and Block	93.4100	16.6900	76.7200	0.2400	18.4128	42.2200	3239.1184 (29a)
Pitched Roof	42.5500		42.5500	0.1000	4.2550	9.1000	387.2050 (30)
Total net area of external elements Aum(A, m ²)			178.5100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.7890		(33)
Party Wall 1			44.3400	0.0000	0.0000	70.0000	3103.8000 (32)
GF Stud			82.5600			9.0000	743.0400 (32c)
First Floor			95.3800			9.0000	858.4200 (32c)
Internal Floor 1			42.5500			18.0000	765.9000 (32d)
Internal Ceiling 1			42.5500			18.0000	765.9000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13437.5834 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 157.9034 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.9110 (36)
Total fabric heat loss (33) + (36) = 55.7000 (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	41.7707	40.9988	40.9988	40.0488	40.2779	39.8255	39.8255	39.6078	39.6078	40.2779	40.0488	40.2779 (38)
Heat transfer coeff	97.4708	96.6989	96.6989	95.7489	95.9779	95.5255	95.5255	95.3078	95.3078	95.9779	95.7489	95.9779 (39)
Average = Sum(39)m / 12 =												95.9972 (39)
HLP	1.1454	1.1363	1.1363	1.1251	1.1278	1.1225	1.1225	1.1200	1.1200	1.1278	1.1251	1.1278 (40)
HLP (average)												1.1281 (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												2.5525 (42)
Average daily hot water use (litres/day)												94.8229 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	104.3052	100.5123	96.7194	92.9265	89.1336	85.3406	85.3406	89.1336	92.9265	96.7194	100.5123	104.3052 (44)
Energy conte	154.6816	135.2855	139.6026	121.7089	116.7826	100.7745	93.3824	107.1576	108.4374	126.3734	137.9464	149.8009 (45)
Energy content (annual)										Total = Sum(45)m =		1491.9339 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Distribution loss (46)m = 0.15 x (45)m	23.2022	20.2928	20.9404	18.2563	17.5174	15.1162	14.0074	16.0736	16.2656	18.9560	20.6920	22.4701 (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	27.5595	24.8903	27.5325	26.6145	27.4799	26.5684	27.4384	27.4653	26.5935	27.5107	26.6563	27.5515 (61)
Total heat required for water heating calculated for each month	182.2412	160.1758	167.1350	148.3234	144.2625	127.3429	120.8208	134.6230	135.0310	153.8841	164.6027	177.3524 (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												1.3580 (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												94.8229 (H14)
Volume ratio Veff/V												0.7909 (H15)
Solar storage volume factor												0.9531 (H16)
Solar input	-28.8751	-41.0636	-71.2560	-95.8513	-111.3857	-121.1553	-114.8737	-104.7537	-81.9905	-56.6689	-34.1527	-884.8904 (H17)
Solar input (sum of months) = Sum (63)m =												-884.8904 (63)
Output from w/h	153.3661	119.1122	95.8791	52.4720	32.8768	6.1876	5.9471	29.8692	53.0405	97.2152	130.4500	154.4886 (64)
Total per year (kWh/year) = Sum (64)m =												930.9043 (64)
Heat gains from water heating, kWh/month	58.3215	51.2050	53.3010	47.1218	45.7002	40.1496	37.9092	42.4962	42.7038	48.8968	52.5313	56.6967 (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	153.1527	153.1527	153.1527	153.1527	153.1527	153.1527	153.1527	153.1527	153.1527	153.1527	153.1527	153.1527	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	52.7492	46.8514	38.1021	28.8458	21.5625	18.2040	19.6701	25.5679	34.3172	43.5736	50.8568	54.2153	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	342.9388	346.4975	337.5298	318.4388	294.3398	271.6901	256.5587	253.0001	261.9678	281.0588	305.1578	327.8075	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8678	52.8678	52.8678	52.8678	52.8678	52.8678	52.8678	52.8678	52.8678	52.8678	52.8678	52.8678	(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)	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	-102.1018	(71)
Water heating gains (Table 5)	78.3892	76.1979	71.6411	65.4470	61.4250	55.7634	50.9533	57.1186	59.3109	65.7216	72.9601	76.2052	(72)
Total internal gains	580.9959	576.4655	554.1917	519.6502	484.2460	452.5762	434.1008	442.6053	462.5145	497.2726	535.8934	565.1467	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d	Gains W	
North				1.9200	13.4684		0.6300	0.7000		0.7700	7.9030 (74)	
East				4.4700	25.1733		0.6300	0.7000		0.7700	34.3889 (76)	
West				8.1800	25.1733		0.6300	0.7000		0.7700	62.9310 (80)	
Solar gains	105.2229	174.9586	293.4667	431.1380	499.4553	567.1855	518.2157	462.5359	357.6567	223.9813	130.7013	81.9678 (83)
Total gains	686.2188	751.4241	847.6585	950.7883	983.7013	1019.7617	952.3165	905.1412	820.1712	721.2539	666.5946	647.1144 (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	38.2952	38.6009	38.6009	38.9839	38.8909	39.0750	39.0750	39.1643	39.1643	38.8909	38.9839	38.8909
alpha	3.5530	3.5734	3.5734	3.5989	3.5927	3.6050	3.6050	3.6110	3.6110	3.5927	3.5989	3.5927
util living area	0.9654	0.9517	0.9114	0.8175	0.6714	0.4597	0.3269	0.3325	0.5949	0.8431	0.9409	0.9699 (86)
MIT	19.6927	19.8509	20.1824	20.5825	20.8469	20.9712	20.9938	20.9937	20.9281	20.6146	20.1223	19.6832 (87)
Th 2	19.9640	19.9713	19.9713	19.9804	19.9782	19.9825	19.9825	19.9846	19.9846	19.9782	19.9804	19.9782 (88)
util rest of house	0.9579	0.9414	0.8927	0.7806	0.6084	0.3750	0.2281	0.2291	0.5056	0.8003	0.9261	0.9632 (89)
MIT 2	18.8061	18.9657	19.2844	19.6609	19.8816	19.9705	19.9812	19.9833	19.9497	19.6981	19.2402	18.8083 (90)
Living area fraction										fLA = Living area / (4) =		0.2155 (91)
MIT	18.9972	19.1565	19.4780	19.8595	20.0896	20.1862	20.1994	20.2011	20.1605	19.8956	19.4303	18.9968 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9972	19.1565	19.4780	19.8595	20.0896	20.1862	20.1994	20.2011	20.1605	19.8956	19.4303	18.9968 (93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9490	0.9315	0.8822	0.7757	0.6157	0.3924	0.2494	0.2515	0.5220	0.7964	0.9162	0.9550	(94)
Useful gains	681.2450	699.9257	747.7686	737.5559	605.6815	400.1706	237.5361	227.6462	428.1460	574.3918	610.7377	618.0224	(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	1305.8325	1272.2145	1148.5859	934.4630	670.8479	409.4413	238.7590	228.8411	453.7171	748.2037	1036.9871	1276.2018	(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	487.0131	384.5780	298.2080	141.7731	48.4838	0.0000	0.0000	0.0000	0.0000	129.3160	306.8996	489.6855	(98)
Space heating												2285.9573	(98)
Space heating per m2											(98) / (4) =	26.8620	(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 %)													90.7000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													2520.3498	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	487.0131	384.5780	298.2080	141.7731	48.4838	0.0000	0.0000	0.0000	0.0000	129.3160	306.8996	489.6855	(98)	
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)	
Space heating fuel (main heating system)	536.9494	424.0111	328.7850	156.3099	53.4552	0.0000	0.0000	0.0000	0.0000	142.5756	338.3678	539.8958	(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	153.3661	119.1122	95.8791	52.4720	32.8768	6.1876	5.9471	29.8692	53.0405	97.2152	130.4500	154.4886	(64)	
Efficiency of water heater	90.0133	90.0219	90.0025	89.9262	89.5474	87.9000	87.9000	87.9000	87.9000	89.4768	89.8463	90.0124	(217)	
Fuel for water heating, kWh/month	170.3816	132.3147	106.5294	58.3501	36.7144	7.0393	6.7657	33.9809	60.3418	108.6485	145.1924	171.6304	(219)	
Water heating fuel used												1037.8892	(219)	
Annual totals kWh/year														
Space heating fuel - main system												2520.3498	(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)
pump for solar water heating													50.0000	(230g)
Total electricity for the above, kWh/year													125.0000	(231)
Electricity for lighting (calculated in Appendix L)													372.6272	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.73 * 1030 * 1.00) =										-601.5547			-601.5547	(233)
Total delivered energy for all uses													3454.3115	(238)

10a. Fuel costs - using BEDF prices (490)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2520.3498	3.6300	91.4887	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1037.8892	3.6300	37.6754	(247)
Pumps and fans for heating	75.0000	19.4400	14.5800	(249)
Pump for solar water heating	50.0000	19.4400	9.7200	(249)
Energy for lighting	372.6272	19.4400	72.4387	(250)
Additional standing charges			95.0000	(251)
Energy saving/generation technologies				
PV Unit	-601.5547	19.4400	-116.9422	(252)
Total energy cost			203.9606	(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	2520.3498	0.2160	544.3956	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1037.8892	0.2160	224.1841	(264)
Space and water heating			768.5796	(265)
Pumps and fans	125.0000	0.5190	64.8750	(267)
Energy for lighting	372.6272	0.5190	193.3935	(268)
Energy saving/generation technologies				
PV Unit	-601.5547	0.5190	-312.2069	(269)
Total kg/year			714.6413	(272)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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	2520.3498	1.2200	3074.8267 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1037.8892	1.2200	1266.2249 (264)
Space and water heating			4341.0516 (265)
Pumps and fans	125.0000	3.0700	383.7500 (267)
Energy for lighting	372.6272	3.0700	1143.9655 (268)
Energy saving/generation technologies			
PV Unit	-601.5547	3.0700	-1846.7729 (269)
Primary energy kWh/year			4021.9943 (272)
Primary energy kWh/m2/year			47.2620 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Plot 8	Issued on Date	16/02/2022
Assessment Reference	As Built	Prop Type Ref	H (HA/SO+)
Project	8 Oram Way, WEST END, SO30 3JW		
Calculation Type	New Build (As Built)		

SAP Rating	87 B	DER	14.65	TER	18.39
Environmental	89 B	% DER<TER	20.33		
CO ₂ Emissions (t/year)	0.90	DFEE	44.50	TREE	53.70
General Requirements Compliance	Pass	% DFEE<TFEE	17.14		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.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	Earthwool Loft Roll 40						
	Main construction	150	0.0400	3.7500	100.00		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 2	Earthwool Loft Roll 40						
	Main construction	200	0.0400	5.0000	100.00		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 3	Earthwool Loft Roll 40						
	Main construction	100	0.0400	2.5000	87.50		
	Main construction	100	0.1300	0.7692	12.50		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 4	Plasterboard, standard						
	Main construction	12.5	0.2100	0.0595	100.00	700	1000
Int surface				0.1000			

Total resistance:	Upper limit = 11.200 m ² K/W	Lower limit = 10.901 m ² K/W	Average = 11.050 m ² K/W
	Total correction = 0.0065 m ² K/W	U-value (unrounded) = 0.1 W/m ² 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 0647 Plot 8	Issued on Date	16/02/2022
Assessment Reference	As Built	Prop Type Ref	H (HA/SO+)
Project	8 Oram Way, WEST END, SO30 3JW		
Calculation Type	New Build (As Built)		

SAP Rating	87 B	DER	14.65	TER	18.39
Environmental	89 B	% DER<TER	20.33		
CO ₂ Emissions (t/year)	0.90	DFEE	44.50	TFEE	53.70
General Requirements Compliance	Pass	% DFEE<TFEE	17.14		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.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 0647 Plot 8	Issued on Date	16/02/2022
Assessment Reference	As Built	Prop Type Ref	H (HA/SO+)
Project	8 Oram Way, WEST END, SO30 3JW		
Calculation Type	New Build (As Built)		

SAP Rating	87 B	DER	14.65	TER	18.39
Environmental	89 B	% DER<TER	20.33		
CO ₂ Emissions (t/year)	0.90	DFEE	44.50	TFEE	53.70
General Requirements Compliance	Pass	% DFEE<TFEE	17.14		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com	Assessor ID	E477-0001
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Client	Foreman Homes, FORE
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Building Elements

Floor 000003 - Worst Case Slab

Floor Type: Slab On Ground Floor

Area = 35.11 m², Perimeter = 16.79 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 0647 Plot 8	Issued on Date	16/02/2022
Assessment Reference	As Built	Prop Type Ref	H (HA/SO+)
Property	8 Oram Way, WEST END, SO30 3JW		
SAP Rating	87 B	DER	14.65
Environmental	89 B	TER	18.39
CO ₂ Emissions (t/year)	0.90	% DER<TER	20.33
General Requirements Compliance	Pass	DfEE	44.50
		TfEE	53.70
		% DfEE<TfEE	17.14
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.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, Semi-Detached
2.0 Number of Storeys	2
3.0 Date Built	2020
4.0 Sheltered Sides	1
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements		Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	Ground Floor:	18.46 m	42.55 m ²	2.39 m
	1st Storey:	18.46 m	42.55 m ²	2.67 m

7.0 Living Area	18.34	m ²
8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	157.9	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	93.41	76.72

9.1 Party Walls			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)
Description	Type	Construction			
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs on both sides, dense blocks, cavity or cavity fill	0.00	70.00	44.34

9.2 Internal Walls			Kappa (kJ/m ² K)	Area (m ²)
Description	Construction			
GF Stud	Plasterboard on timber frame		9.00	82.56
First Floor	Plasterboard on timber frame		9.00	95.38

10.0 External Roofs			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type	Construction				
Pitched Roof	External Plane Roof	Other	0.10	9.10	42.55	42.55

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

10.2 Internal Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Ceiling 1	Plasterboard ceiling, carpeted chipboard floor	9.00	42.55

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	42.55

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	42.55

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							2.12	
Front Elevation	Window	[1] Brick and Block	East	None	0.00					3.96	
Front Elevation	Window	[1] Brick and Block	East	None	0.53	Yes				0.51	
Side Elevation	Window	[1] Brick and Block	North	None	0.00					1.92	
Rear Elevation	Window	[1] Brick and Block	West	None	0.00					8.18	

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)	1.12	0.098	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.01	0.053	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	7.20	0.043	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	3.58	0.060	No	Birtley Supatherm
Independently assessed	E3 Sill	10.39	0.034	No	CD0027
Independently assessed	E4 Jamb	28.50	0.039	No	CD0028
Table K1 - Approved	E5 Ground floor (normal)	18.46	0.160	No	
Independently assessed	E6 Intermediate floor within a dwelling	18.46	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	9.70	0.060	No	
Independently assessed	E12 Gable (insulation at ceiling level)	8.76	0.054	No	CD0031
Independently assessed	E16 Corner (normal)	10.10	0.050	No	CD0035
Independently assessed	E18 Party wall between dwellings	10.10	0.041	No	CD0016
Table K1 - Default	P1 Party wall - Ground floor	8.76	0.160	No	
Table K1 - Default	P2 Party wall - Intermediate floor within a dwelling	8.76	0.000	No	
Independently assessed	P4 Party wall - Roof (insulation at ceiling level)	8.76	0.049	No	CD0020

Y-value	0.050	W/m²K
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18.0 Pressure Testing

Designed AP ₅₀	5.00	m³/(h.m²) @ 50 Pa
Property Tested ?	Yes	

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

As Built AP₅₀

4.00

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

Yes

Air change rate

4.00

Mechanical Ventilation

Mechanical Ventilation System Present

No

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				4
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

20

Total number of L.E.L. fittings

20

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.	17515	
Fuel Type	Mains gas	
Main Heating	BGW	
SAP Code	104	
In Winter	90.7	
In Summer	87.9	
Controls	CBE Programmer, room thermostat and TRVs	
PCDF Controls	0	
Delayed Start Stat	No	
Sap Code	2106	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heat Emitter	Radiators	
Flow Temperature	Normal (> 45°C)	
Combi boiler type	Standard Combi	
Combi keep hot type	Gas/Oil, time clock	

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

25.0 Main Heating 2

Community Heating

28.0 Water Heating

Water Heating

Flue Gas Heat Recovery System

Waste Water Heat Recovery Instantaneous System 1

Waste Water Heat Recovery Instantaneous System 2

Waste Water Heat Recovery Storage System

Solar Panel

Water use <= 125 litres/person/day

SAP Code

29.0 Hot Water Cylinder

32.0 Photovoltaic Unit

PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
0.73	East	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	£27	B 88	