



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 13 Fieldfare Crescent
BOTLEY, SO32 2TW

Contact: Tobias Whiting
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Report Issue Date: 11/04/2024

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0645 Plot 39				Issued on Date	11/04/2024
Assessment Reference	As Built	Prop Type Ref	Block I			
Property	13 Fieldfare Crescent, BOTLEY, SO32 2TW					
SAP Rating	88 B	DER	13.90	TER	18.51	
Environmental	90 B	% DER<TER	24.89			
CO ₂ Emissions (t/year)	0.86	DFEE	43.21	TFEE	53.33	
General Requirements Compliance	Pass	% DFEE<TFEE	18.97			
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com				Assessor ID	E477-0001
Client	Foreman Homes, FORE					

SUMMARY FOR INPUT DATA FOR New Build (As Built)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	18.51	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	13.90	kgCO ₂ /m ²	Pass
	-4.61 (-24.9%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	53.33	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	43.21	kWh/m ² /yr	
	-10.1 (-18.9%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.11 (max. 0.25)	0.11 (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	4.67 (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 East

0.99 m², No overhang

Windows facing South East

3.53 m², No overhang

Windows facing North 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

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

Maximum

10.0 m³/(h.m²) @ 50 Pa

Pass

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BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

10 Key features

Party wall U-value	0.00	W/m ² K
Roof U-value	0.10	W/m ² K
Floor U-value	0.11	W/m ² K
Door U-value	1.10	W/m ² K
Thermal bridging ψ -value	0.034	W/m ² K
Photovoltaic array	0.76	kW

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THERMAL BRIDGING

Calculation Type: New Build (As Built)

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Assessment Reference	As Built	Prop Type Ref	Block I
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SAP Rating	88 B	DER	13.90
Environmental	90 B	TER	18.51
CO ₂ Emissions (t/year)	0.86	% DER<TER	24.89
General Requirements Compliance	Pass	DFEE	43.21
		TFEE	53.33
		% DFEE<TFEE	18.97
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com		Assessor ID
			E477-0001
Client	Foreman Homes, FORE		

	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.093	0.49	0.05	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.077	1.26	0.10	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.070	2.75	0.19	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.071	1.01	0.07	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.067	2.40	0.16	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.070	1.51	0.11	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.064	1.77	0.11	Birtley Supatherm
External wall	E3 Sill	Independently assessed	0.021	8.66	0.18	Knauf P5
External wall	E4 Jamb	Independently assessed	0.016	27.45	0.44	Knauf P6
External wall	E5 Ground floor (normal)	Independently assessed	0.062	18.34	1.14	BE-E5-23902
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	18.34	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	0.044	8.78	0.39	Knauf P 21
External wall	E16 Corner (normal)	Independently assessed	0.039	10.10	0.39	Knauf P23
External wall	E18 Party wall between dwellings	Independently assessed	0.036	10.10	0.36	Knauf P25
Party wall	P1 Party wall - Ground floor	Table K1 - Default	0.160	8.78	1.40	
Party wall	P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	0.000	8.78	0.00	
Party wall	P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	0.035	8.78	0.31	Knauf P29

Total: **5.98** W/mK:
Y-Value: **0.034** W/m²K:

FULL SAP CALCULATION PRINTOUT

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CO ₂ Emissions (t/year)	0.86	DFEE	43.21	TFEE	53.33
General Requirements Compliance	Pass	% DFEE<TFEE	18.97		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com			Assessor ID	E477-0001
Client	Foreman Homes, FORE				

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

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

DWELLING AS BUILT

Semi-Detached House, total floor area 84 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) 18.51 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 13.90 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)53.3 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)43.2 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.11 (max. 0.25)	0.11 (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: 4.67 (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 East: 0.99 m², No overhang
Windows facing South East: 3.53 m², No overhang
Windows facing North 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 0.11 W/m²K
Door U-value 1.10 W/m²K
Thermal bridging y-value 0.034 W/m²K
Photovoltaic array 0.76 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	42.0700 (1b)	x 2.3900 (2b)	= 100.5473 (1b) - (3b)
First floor	42.0700 (1c)	x 2.6700 (2c)	= 112.3269 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.1400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.8742 (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) = 0.1879 (8)
Pressure test					Yes
Measured/design AP50					4.6700
Infiltration rate					0.4214 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3582 (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	0.4567	0.4477	0.4388	0.3940	0.3851	0.3403	0.3403	0.3313	0.3582	0.3851	0.4030	0.4209 (22b)
Effective ac	0.6043	0.6002	0.5963	0.5776	0.5741	0.5579	0.5579	0.5549	0.5642	0.5741	0.5812	0.5886 (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		(26a)
Windows (Uw = 1.20)			12.7000	1.1450	14.5420		(27)
Ground Floor			42.0700	0.1100	4.6277	140.0000	5889.8000 (28a)
Brick and Block	92.7000	14.8200	77.8800	0.2400	18.6912	42.2200	3288.0936 (29a)
Pitched Roof	42.0700		42.0700	0.1000	4.2070	9.0000	378.6300 (30)
Total net area of external elements Aum(A, m ²)			176.8400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.3999		(33)
Party Wall 1			44.3400	0.0000	0.0000	110.0000	4877.4000 (32)
Ground Floor Stud			65.9200			9.0000	593.2800 (32c)
First Floor Stud			91.4400			9.0000	822.9600 (32c)
Internal Floor 1			42.0700			18.0000	757.2600 (32d)
Internal Ceiling 1			42.0700			18.0000	757.2600 (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) =	17364.6836 (34)
206.3785 (35)	
5.9826 (36)	
(33) + (36) =	50.3825 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	
(38)m	Jan 42.4502 Feb 42.1657 Mar 41.8869 Apr 40.5772 May 40.3321 Jun 39.1914 Jul 39.1914 Aug 38.9801 Sep 39.6308 Oct 40.3321 Nov 40.8278 Dec 41.3461 (38)
Heat transfer coeff	92.8327 92.5482 92.2694 90.9597 90.7146 89.5739 89.5739 89.3627 90.0133 90.7146 91.2104 91.7286 (39)
Average = Sum(39)m / 12 =	90.9585 (39)
HLP	Jan 1.1033 Feb 1.0999 Mar 1.0966 Apr 1.0811 May 1.0781 Jun 1.0646 Jul 1.0646 Aug 1.0621 Sep 1.0698 Oct 1.0781 Nov 1.0840 Dec 1.0902 (40)
HLP (average)	1.0810 (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												2.5367 (42)
Average daily hot water use (litres/day)												94.4475 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	103.8923	100.1144	96.3365	92.5586	88.7807	85.0028	85.0028	88.7807	92.5586	96.3365	100.1144	103.8923 (44)
Energy content	154.0692	134.7499	139.0498	121.2270	116.3202	100.3755	93.0127	106.7334	108.0081	125.8730	137.4003	149.2078 (45)
Energy content (annual)										Total = Sum(45)m =		1486.0270 (45)

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	23.1104	20.2125	20.8575	18.1841	17.4480	15.0563	13.9519	16.0100	16.2012	18.8810	20.6100	22.3812 (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	27.5592	24.8898	27.5307	26.6130	27.4785	26.5672	27.4373	27.4640	26.5922	27.5091	26.6558	27.5511 (61)
Total heat required for water heating calculated for each month	181.6284	159.6397	166.5805	147.8400	143.7987	126.9427	120.4500	134.1974	134.6003	153.3821	164.0561	176.7589 (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	181.6284	159.6397	166.5805	147.8400	143.7987	126.9427	120.4500	134.1974	134.6003	153.3821	164.0561	176.7589 (64)
Heat gains from water heating, kWh/month	58.1178	51.0268	53.1167	46.9612	45.5461	40.0167	37.7860	42.3549	42.5607	48.7301	52.3495	56.4994 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1809.8748 (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	126.8368	126.8368	126.8368	126.8368	126.8368	126.8368	126.8368	126.8368	126.8368	126.8368	126.8368	126.8368 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.4472	19.0492	15.4918	11.7283	8.7671	7.4015	7.9976	10.3956	13.9529	17.7165	20.6777	22.0433 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	227.8752	230.2398	224.2811	211.5955	195.5822	180.5320	170.4776	168.1129	174.0717	186.7573	202.7706	217.8208 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6837	35.6837	35.6837	35.6837	35.6837	35.6837	35.6837	35.6837	35.6837	35.6837	35.6837	35.6837 (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)	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695 (71)
Water heating gains (Table 5)	78.1153	75.9327	71.3935	65.2239	61.2179	55.5787	50.7877	56.9286	59.1121	65.4974	72.7077	75.9400 (72)
Total internal gains	391.4888	389.2728	375.2174	352.5988	329.6182	307.5633	293.3139	299.4881	311.1879	334.0222	360.2070	379.8551 (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	
Northeast				0.9900	11.2829		0.6300	0.7000		0.7700	3.4137 (75)	
Southeast				3.5300	36.7938		0.6300	0.7000		0.7700	39.6937 (77)	
Northwest				8.1800	11.2829		0.6300	0.7000		0.7700	28.2064 (81)	
Solar gains	71.3138	131.9767	208.4740	305.0701	384.3849	400.3792	378.1954	316.1528	241.4725	153.3843	87.3302	59.7921 (83)
Total gains	462.8026	521.2495	583.6914	657.6689	714.0032	707.9425	671.5094	615.6409	552.6604	487.4065	447.5372	439.6472 (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	51.9593	52.1190	52.2765	53.0292	53.1725	53.8496	53.8496	53.9769	53.5868	53.1725	52.8835	52.5847
alpha	4.4640	4.4746	4.4851	4.5353	4.5448	4.5900	4.5900	4.5985	4.5725	4.5448	4.5256	4.5056
util living area	0.9968	0.9941	0.9862	0.9587	0.8807	0.7253	0.5648	0.6290	0.8649	0.9753	0.9942	0.9975 (86)
MIT	19.5760	19.7282	20.0018	20.3823	20.7176	20.9212	20.9804	20.9686	20.8115	20.3846	19.9195	19.5542 (87)
Th 2	19.9981	20.0009	20.0036	20.0163	20.0187	20.0299	20.0299	20.0319	20.0256	20.0187	20.0139	20.0089 (88)
util rest of house	0.9959	0.9924	0.9820	0.9452	0.8416	0.6433	0.4506	0.5137	0.8057	0.9649	0.9922	0.9968 (89)
MIT 2	18.6952	18.8489	19.1225	19.5046	19.8166	19.9890	20.0237	20.0210	19.9095	19.5137	19.0503	18.6819 (90)
Living area fraction									fLA = Living area / (4) =			0.2144 (91)
MIT	18.8840	19.0374	19.3111	19.6928	20.0098	20.1889	20.2288	20.2241	20.1029	19.7005	19.2367	18.8689 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8840	19.0374	19.3111	19.6928	20.0098	20.1889	20.2288	20.2241	20.1029	19.7005	19.2367	18.8689 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	460.2678	516.1124	570.9516	618.0713	600.5865	465.7038	318.9418	331.1959	448.3043	468.1669	443.0825	437.7269 (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	1353.8733	1308.3944	1182.0681	981.7065	753.8169	500.6176	325.0487	341.7354	540.3417	825.5447	1106.9884	1345.5603 (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	664.8425	532.4135	454.6707	261.8173	114.0034	0.0000	0.0000	0.0000	0.0000	265.8891	478.0123	675.4280 (98)
Space heating												3447.0769 (98)
Space heating per m2												(98) / (4) = 40.9683 (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													3800.5258 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	664.8425	532.4135	454.6707	261.8173	114.0034	0.0000	0.0000	0.0000	0.0000	265.8891	478.0123	675.4280	(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)	733.0127	587.0050	501.2908	288.6630	125.6929	0.0000	0.0000	0.0000	0.0000	293.1522	527.0257	744.6836	(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	181.6284	159.6397	166.5805	147.8400	143.7987	126.9427	120.4500	134.1974	134.6003	153.3821	164.0561	176.7589	(64)
Efficiency of water heater (217)m	90.0843	90.0384	89.9319	89.6692	89.1166	87.9000	87.9000	87.9000	87.9000	89.6552	89.9677	87.9000	(216)
Fuel for water heating, kWh/month	201.6205	177.3018	185.2297	164.8727	161.3602	144.4172	137.0307	152.6705	153.1289	171.0800	182.3499	196.1706	(219)
Water heating fuel used												2027.2328	(219)
Annual totals kWh/year													
Space heating fuel - main system												3800.5258	(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)												378.7637	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.76 * 1029 * 1.00) =										-625.7455		-625.7455	(233)
Total delivered energy for all uses												5655.7767	(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	3800.5258	0.2160	820.9136 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2027.2328	0.2160	437.8823 (264)
Space and water heating			1258.7958 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	378.7637	0.5190	196.5784 (268)
Energy saving/generation technologies			
PV Unit	-625.7455	0.5190	-324.7619 (269)
Total CO2, kg/year			1169.5373 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			13.9000 (273)

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

DER		13.9000 ZC1
Total Floor Area	TFA	84.1400
Assumed number of occupants	N	2.5367
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.0487 ZC2
CO2 emissions from cooking, equation (L16)		2.1379 ZC3
Total CO2 emissions		32.0866 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		32.0866 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.0700 (1b)	x 2.3900 (2b)	= 100.5473 (1b) - (3b)
First floor	42.0700 (1c)	x 2.6700 (2c)	= 112.3269 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.1400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.8742 (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) = 0.1409 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3909 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3323 (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	0.4237	0.4154	0.4071	0.3655	0.3572	0.3157	0.3157	0.3074	0.3323	0.3572	0.3738	0.3904 (22b)
Effective ac	0.5897	0.5863	0.5828	0.5668	0.5638	0.5498	0.5498	0.5472	0.5552	0.5638	0.5699	0.5762 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Semi-glazed door			2.1200	1.2000	2.5440		(26a)
TER Opening Type (Uw = 1.40)			12.7000	1.3258	16.8371		(27)
Ground Floor			42.0700	0.1300	5.4691		(28a)
Brick and Block	92.7000	14.8200	77.8800	0.1800	14.0184		(29a)
Pitched Roof	42.0700		42.0700	0.1300	5.4691		(30)
Total net area of external elements Aum(A, m ²)			176.8400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.3377		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss

250.0000 (35)
9.6792 (36)
(33) + (36) = 54.0169 (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	41.4289	41.1841	40.9441	39.8170	39.6061	38.6244	38.6244	38.4426	39.0025	39.6061	40.0327	40.4787 (38)
Heat transfer coeff	95.4458	95.2010	94.9610	93.8339	93.6230	92.6413	92.6413	92.4595	93.0194	93.6230	94.0496	94.4956 (39)
Average = Sum(39)m / 12 =												93.8329 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1344	1.1315	1.1286	1.1152	1.1127	1.1010	1.1010	1.0989	1.1055	1.1127	1.1178	1.1231 (40)
HLP (average)												1.1152 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy
Average daily hot water use (litres/day)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	103.8923	100.1144	96.3365	92.5586	88.7807	85.0028	85.0028	88.7807	92.5586	96.3365	100.1144	103.8923 (44)
Energy conte	154.0692	134.7499	139.0498	121.2270	116.3202	100.3755	93.0127	106.7334	108.0081	125.8730	137.4003	149.2078 (45)
Energy content (annual)												Total = Sum(45)m = 1486.0270 (45)
Distribution loss (46)m = 0.15 x (45)m	23.1104	20.2125	20.8575	18.1841	17.4480	15.0563	13.9519	16.0100	16.2012	18.8810	20.6100	22.3812 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Total heat required for water heating calculated for each month	50.9589	46.0274	49.0920	45.6453	45.2416	41.9192	43.3165	45.2416	45.6453	49.0920	49.3151	50.9589 (61)
Solar input	205.0281	180.7773	188.1418	166.8723	161.5619	142.2947	136.3291	151.9750	153.6534	174.9651	186.7153	200.1667 (62)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	205.0281	180.7773	188.1418	166.8723	161.5619	142.2947	136.3291	151.9750	153.6534	174.9651	186.7153	200.1667 (64)
Heat gains from water heating, kWh/month	63.9677	56.3112	58.5071	51.7193	49.9869	43.8546	41.7558	46.7993	47.3240	54.1258	58.0144	62.3513 (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	126.8368	126.8368	126.8368	126.8368	126.8368	126.8368	126.8368	126.8368	126.8368	126.8368	126.8368	126.8368	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.4472	19.0492	15.4918	11.7283	8.7671	7.4015	7.9976	10.3956	13.9529	17.7165	20.6777	22.0433	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	227.8752	230.2398	224.2811	211.5955	195.5822	180.5320	170.4776	168.1129	174.0717	186.7573	202.7706	217.8208	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6837	35.6837	35.6837	35.6837	35.6837	35.6837	35.6837	35.6837	35.6837	35.6837	35.6837	35.6837	(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)	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	(71)
Water heating gains (Table 5)	85.9781	83.7964	78.6385	71.8324	67.1867	60.9092	56.1234	62.9022	65.7278	72.7497	80.5755	83.8055	(72)
Total internal gains	399.3516	397.1365	382.4625	359.2072	335.5870	312.8938	298.6496	305.4618	317.8035	341.2745	368.0748	387.7206	(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				
Northeast				0.9900	11.2829	0.6300	0.7000	0.7700	3.4137 (75)				
Southeast				3.5300	36.7938	0.6300	0.7000	0.7700	39.6937 (77)				
Northwest				8.1800	11.2829	0.6300	0.7000	0.7700	28.2064 (81)				
Solar gains	71.3138	131.9767	208.4740	305.0701	384.3849	400.3792	378.1954	316.1528	241.4725	153.3843	87.3302	59.7921	(83)
Total gains	470.6654	529.1132	590.9365	664.2773	719.9720	713.2731	676.8451	621.6146	559.2761	494.6589	455.4050	447.5127	(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	61.2186	61.3760	61.5311	62.2702	62.4105	63.0718	63.0718	63.1958	62.8154	62.4105	62.1274	61.8341	
alpha	5.0812	5.0917	5.1021	5.1513	5.1607	5.2048	5.2048	5.2131	5.1877	5.1607	5.1418	5.1223	
util living area	0.9986	0.9971	0.9923	0.9728	0.9059	0.7527	0.5844	0.6512	0.8902	0.9848	0.9971	0.9989	(86)
MIT	19.7419	19.8742	20.1142	20.4505	20.7545	20.9369	20.9864	20.9769	20.8380	20.4532	20.0420	19.7207	(87)
Th 2	19.9729	19.9752	19.9775	19.9884	19.9905	20.0000	20.0000	20.0018	19.9963	19.9905	19.9863	19.9820	(88)
util rest of house	0.9981	0.9961	0.9895	0.9617	0.8675	0.6642	0.4607	0.5259	0.8301	0.9768	0.9959	0.9985	(89)
MIT 2	18.2905	18.4855	18.8367	19.3277	19.7409	19.9563	19.9948	19.9917	19.8575	19.3387	18.7392	18.2661	(90)
Living area fraction	18.6017	18.7833	19.1106	19.5684	19.9582	20.1665	20.2074	20.2029	20.0677	19.5777	19.0185	18.5780	(91)
MIT	18.6017	18.7833	19.1106	19.5684	19.9582	20.1665	20.2074	20.2029	20.0677	19.5777	19.0185	18.5780	(92)
Temperature adjustment	18.6017	18.7833	19.1106	19.5684	19.9582	20.1665	20.2074	20.2029	20.0677	19.5777	19.0185	18.5780	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	469.2849	526.1022	582.6758	634.8972	623.4945	485.2098	329.8398	343.5489	467.1311	480.9390	452.7607	446.4958	(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	1365.0356	1321.7024	1197.5136	1001.0595	773.1578	515.6885	334.1910	351.6158	555.1152	840.5173	1120.9309	1358.6543	(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	666.4385	534.6433	457.4393	263.6369	111.3496	0.0000	0.0000	0.0000	0.0000	267.5262	481.0826	678.6459	(98)
Space heating												3460.7622	(98)
Space heating per m2												41.1310	(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												3705.3129 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	666.4385	534.6433	457.4393	263.6369	111.3496	0.0000	0.0000	0.0000	0.0000	267.5262	481.0826	678.6459 (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)	713.5316	572.4232	489.7637	282.2665	119.2179	0.0000	0.0000	0.0000	0.0000	286.4307	515.0777	726.6016 (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	205.0281	180.7773	188.1418	166.8723	161.5619	142.2947	136.3291	151.9750	153.6534	174.9651	186.7153	200.1667 (64)
Efficiency of water heater (217)m	87.8018	87.6154	87.2035	86.1975	84.1353	80.3000	80.3000	80.3000	80.3000	86.1171	87.3289	80.3000 (216)
Fuel for water heating, kWh/month	233.5124	206.3306	215.7503	193.5929	192.0263	177.2038	169.7748	189.2591	191.3492	203.1712	213.8071	227.7668 (219)
Water heating fuel used												2413.5445 (219)
Annual totals kWh/year												
Space heating fuel - main system												3705.3129 (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)												378.7637 (232)
Total delivered energy for all uses												6572.6211 (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	3705.3129	0.2160	800.3476 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2413.5445	0.2160	521.3256 (264)
Space and water heating			1321.6732 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	378.7637	0.5190	196.5784 (268)
Total CO2, kg/m2/year			1557.1766 (272)
Emissions per m2 for space and water heating			15.7080 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3363 (272b)
Emissions per m2 for pumps and fans			0.4626 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.7080 * 1.00) + 2.3363 + 0.4626, rounded to 2 d.p.			18.5100 (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	42.0700 (1b)	x 2.3900 (2b)	= 100.5473 (1b) - (3b)
First floor	42.0700 (1c)	x 2.6700 (2c)	= 112.3269 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.1400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.8742 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) = 0.1409 (8)
Pressure test					Yes
Measured/design AP50					4.6700
Infiltration rate					0.3744 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3183 (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	0.4058	0.3978	0.3899	0.3501	0.3421	0.3024	0.3024	0.2944	0.3183	0.3421	0.3580	0.3740 (22b)
Effective ac	0.5823	0.5791	0.5760	0.5613	0.5585	0.5457	0.5457	0.5433	0.5506	0.5585	0.5641	0.5699 (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		(26a)
Windows (Uw = 1.20)			12.7000	1.1450	14.5420		(27)
Ground Floor			42.0700	0.1100	4.6277	140.0000	5889.8000 (28a)
Brick and Block	92.7000	14.8200	77.8800	0.2400	18.6912	42.2200	3288.0936 (29a)
Pitched Roof	42.0700		42.0700	0.1000	4.2070	9.0000	378.6300 (30)
Total net area of external elements Aum(A, m ²)			176.8400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.3999		(33)
Party Wall 1			44.3400	0.0000	0.0000	110.0000	4877.4000 (32)
Ground Floor Stud			65.9200			9.0000	593.2800 (32c)
First Floor Stud			91.4400			9.0000	822.9600 (32c)
Internal Floor 1			42.0700			18.0000	757.2600 (32d)
Internal Ceiling 1			42.0700			9.0000	378.6300 (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) = 16986.0536 (34)
201.8785 (35)
5.9826 (36)
(33) + (36) = 50.3825 (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	40.9079	40.6833	40.4632	39.4292	39.2357	38.3352	38.3352	38.1684	38.6820	39.2357	39.6271	40.0362 (38)
Heat transfer coeff	91.2904	91.0658	90.8457	89.8117	89.6183	88.7177	88.7177	88.5509	89.0646	89.6183	90.0096	90.4188 (39)
Average = Sum(39)m / 12 =												89.8108 (39)
HLP	1.0850	1.0823	1.0797	1.0674	1.0651	1.0544	1.0544	1.0524	1.0585	1.0651	1.0698	1.0746 (40)
HLP (average)												1.0674 (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												2.5367 (42)
Average daily hot water use (litres/day)												94.4475 (43)
Daily hot water use	103.8923	100.1144	96.3365	92.5586	88.7807	85.0028	85.0028	88.7807	92.5586	96.3365	100.1144	103.8923 (44)
Energy conte	154.0692	134.7499	139.0498	121.2270	116.3202	100.3755	93.0127	106.7334	108.0081	125.8730	137.4003	149.2078 (45)
Energy content (annual)										Total = Sum(45)m =		1486.0270 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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	32.7397	28.6344	29.5481	25.7607	24.7180	21.3298	19.7652	22.6808	22.9517	26.7480	29.1976	31.7067 (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	126.8368	126.8368	126.8368	126.8368	126.8368	126.8368	126.8368	126.8368	126.8368	126.8368	126.8368	126.8368	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.4472	19.0492	15.4918	11.7283	8.7671	7.4015	7.9976	10.3956	13.9529	17.7165	20.6777	22.0433	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	227.8752	230.2398	224.2811	211.5955	195.5822	180.5320	170.4776	168.1129	174.0717	186.7573	202.7706	217.8208	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6837	35.6837	35.6837	35.6837	35.6837	35.6837	35.6837	35.6837	35.6837	35.6837	35.6837	35.6837	(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)	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	(71)
Water heating gains (Table 5)	44.0050	42.6107	39.7152	35.7788	33.2232	29.6247	26.5661	30.4850	31.8774	35.9516	40.5522	42.6165	(72)
Total internal gains	354.3784	352.9507	340.5391	320.1537	298.6235	278.6093	266.0923	270.0446	280.9531	301.4765	325.0515	343.5315	(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			
Northeast				0.9900	11.2829	0.6300	0.7000	0.7700	3.4137 (75)			
Southeast				3.5300	36.7938	0.6300	0.7000	0.7700	39.6937 (77)			
Northwest				8.1800	11.2829	0.6300	0.7000	0.7700	28.2064 (81)			
Solar gains	71.3138	131.9767	208.4740	305.0701	384.3849	400.3792	378.1954	316.1528	241.4725	153.3843	87.3302	59.7921 (83)
Total gains	425.6922	484.9275	549.0131	625.2238	683.0085	678.9885	644.2878	586.1974	522.4257	454.8608	412.3817	403.3237 (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	51.6850	51.8125	51.9380	52.5360	52.6494	53.1839	53.1839	53.2840	52.9767	52.6494	52.4205	52.1833	
alpha	4.4457	4.4542	4.4625	4.5024	4.5100	4.5456	4.5456	4.5523	4.5318	4.5100	4.4947	4.4789	
util living area	0.9975	0.9951	0.9882	0.9630	0.8896	0.7397	0.5798	0.6483	0.8789	0.9795	0.9954	0.9981	(86)
MIT	19.5314	19.6860	19.9644	20.3504	20.6971	20.9119	20.9774	20.9633	20.7913	20.3476	19.8739	19.5059	(87)
Th 2	20.0131	20.0153	20.0174	20.0275	20.0294	20.0382	20.0382	20.0399	20.0348	20.0294	20.0256	20.0216	(88)
util rest of house	0.9968	0.9938	0.9846	0.9510	0.8529	0.6594	0.4650	0.5330	0.8240	0.9708	0.9939	0.9975	(89)
MIT 2	18.6644	18.8202	19.0985	19.4850	19.8096	19.9915	20.0309	20.0266	19.9031	19.4884	19.0161	18.6456	(90)
Living area fraction	18.8503	19.0058	19.2842	19.6705	19.9999	20.1888	20.2338	20.2274	20.0935	19.6726	19.2000	18.8301	(91)
Temperature adjustment	18.8503	19.0058	19.2842	19.6705	19.9999	20.1888	20.2338	20.2274	20.0935	19.6726	19.2000	18.8301	(92)
adjusted MIT	18.8503	19.0058	19.2842	19.6705	19.9999	20.1888	20.2338	20.2274	20.0935	19.6726	19.2000	18.8301	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	423.8509	480.9692	538.6175	591.1441	581.6429	456.9963	315.3135	326.5244	432.5391	439.6441	409.1084	401.9499	(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	1328.3054	1284.5582	1161.3870	967.3199	743.8208	495.8287	322.3862	338.9206	533.8112	813.0700	1089.1181	1322.8334	(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	672.9141	540.0118	463.3405	270.8466	120.6604	0.0000	0.0000	0.0000	0.0000	277.8289	489.6070	685.1373	(98)
Space heating												3520.3466	(98)
Space heating per m2												41.8392	(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	833.9463	656.5109	672.9870	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8449	0.9065	0.8749	0.0000	0.0000	0.0000	0.0000	(101)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	704.5757	595.1146	588.7748	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	889.0469	846.5428	780.4099	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	132.8193	187.0626	142.5765	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												462.4583 (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	33.2048	46.7656	35.6441	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												115.6146 (107)
Space cooling per m2												1.3741 (108)
Energy for space heating												41.8392 (99)
Energy for space cooling												1.3741 (108)
Total												43.2132 (109)
Dwelling Fabric Energy Efficiency (DFEE)												43.2 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.0700 (1b)	x 2.3900 (2b)	= 100.5473 (1b) - (3b)
First floor	42.0700 (1c)	x 2.6700 (2c)	= 112.3269 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.1400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.8742 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1409 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3909 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3323 (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	0.4237	0.4154	0.4071	0.3655	0.3572	0.3157	0.3157	0.3074	0.3323	0.3572	0.3738	0.3904 (22b)
Effective ac	0.5897	0.5863	0.5828	0.5668	0.5638	0.5498	0.5498	0.5472	0.5552	0.5638	0.5699	0.5762 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Semi-glazed door			2.1200	1.2000	2.5440		(26a)
TER Opening Type (Uw = 1.40)			12.7000	1.3258	16.8371		(27)
Ground Floor			42.0700	0.1300	5.4691		(28a)
Brick and Block	92.7000	14.8200	77.8800	0.1800	14.0184		(29a)
Pitched Roof	42.0700		42.0700	0.1300	5.4691		(30)
Total net area of external elements Aum(A, m ²)			176.8400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.3377		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss

250.0000 (35)
9.6792 (36)
(33) + (36) = 54.0169 (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	41.4289	41.1841	40.9441	39.8170	39.6061	38.6244	38.6244	38.4426	39.0025	39.6061	40.0327	40.4787 (38)
Heat transfer coeff	95.4458	95.2010	94.9610	93.8339	93.6230	92.6413	92.6413	92.4595	93.0194	93.6230	94.0496	94.4956 (39)
Average = Sum(39)m / 12 =												93.8329 (39)
HLP	1.1344	1.1315	1.1286	1.1152	1.1127	1.1010	1.1010	1.0989	1.1055	1.1127	1.1178	1.1231 (40)
HLP (average)												1.1152 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy
Average daily hot water use (litres/day)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	103.8923	100.1144	96.3365	92.5586	88.7807	85.0028	85.0028	88.7807	92.5586	96.3365	100.1144	103.8923 (44)
Energy conte	154.0692	134.7499	139.0498	121.2270	116.3202	100.3755	93.0127	106.7334	108.0081	125.8730	137.4003	149.2078 (45)
Energy content (annual)										Total = Sum(45)m =		1486.0270 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

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)
	32.7397	28.6344	29.5481	25.7607	24.7180	21.3298	19.7652	22.6808	22.9517	26.7480	29.1976	31.7067 (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	126.8368	126.8368	126.8368	126.8368	126.8368	126.8368	126.8368	126.8368	126.8368	126.8368	126.8368	126.8368	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.4472	19.0492	15.4918	11.7283	8.7671	7.4015	7.9976	10.3956	13.9529	17.7165	20.6777	22.0433	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	227.8752	230.2398	224.2811	211.5955	195.5822	180.5320	170.4776	168.1129	174.0717	186.7573	202.7706	217.8208	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6837	35.6837	35.6837	35.6837	35.6837	35.6837	35.6837	35.6837	35.6837	35.6837	35.6837	35.6837	(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)	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	(71)
Water heating gains (Table 5)	44.0050	42.6107	39.7152	35.7788	33.2232	29.6247	26.5661	30.4850	31.8774	35.9516	40.5522	42.6165	(72)
Total internal gains	354.3784	352.9507	340.5391	320.1537	298.6235	278.6093	266.0923	270.0446	280.9531	301.4765	325.0515	343.5315	(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			
Northeast				0.9900	11.2829	0.6300	0.7000	0.7700	3.4137 (75)			
Southeast				3.5300	36.7938	0.6300	0.7000	0.7700	39.6937 (77)			
Northwest				8.1800	11.2829	0.6300	0.7000	0.7700	28.2064 (81)			
Solar gains	71.3138	131.9767	208.4740	305.0701	384.3849	400.3792	378.1954	316.1528	241.4725	153.3843	87.3302	59.7921 (83)
Total gains	425.6922	484.9275	549.0131	625.2238	683.0085	678.9885	644.2878	586.1974	522.4257	454.8608	412.3817	403.3237 (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 _l m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.2186	61.3760	61.5311	62.2702	62.4105	63.0718	63.0718	63.1958	62.8154	62.4105	62.1274	61.8341	
alpha	5.0812	5.0917	5.1021	5.1513	5.1607	5.2048	5.2048	5.2131	5.1877	5.1607	5.1418	5.1223	
util living area	0.9991	0.9980	0.9945	0.9787	0.9206	0.7771	0.6099	0.6823	0.9112	0.9894	0.9982	0.9993	(86)
MIT	19.6919	19.8254	20.0689	20.4119	20.7282	20.9265	20.9835	20.9714	20.8134	20.4115	19.9944	19.6714	(87)
Th 2	19.9729	19.9752	19.9775	19.9884	19.9905	20.0000	20.0000	20.0018	19.9963	19.9905	19.9863	19.9820	(88)
util rest of house	0.9988	0.9974	0.9923	0.9697	0.8862	0.6902	0.4828	0.5548	0.8581	0.9836	0.9974	0.9991	(89)
MIT 2	18.7743	18.9095	19.1539	19.5007	19.7984	19.9644	19.9956	19.9930	19.8836	19.5053	19.0874	18.7612	(90)
Living area fraction									fLA = Living area / (4) =			0.2144	(91)
MIT	18.9710	19.1059	19.3501	19.6961	19.9977	20.1707	20.2074	20.2028	20.0829	19.6996	19.2819	18.9564	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9710	19.1059	19.3501	19.6961	19.9977	20.1707	20.2074	20.2028	20.0829	19.6996	19.2819	18.9564	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	424.9934	483.2462	543.8418	604.2216	605.4757	479.7630	328.8206	341.3786	451.2118	446.3667	410.9996	402.8247	(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	1400.2892	1352.4164	1220.2558	1013.0394	776.8600	516.0745	334.1918	351.6020	556.5294	851.9288	1145.6994	1394.4116	(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	725.6201	584.0824	503.2520	294.3488	127.5099	0.0000	0.0000	0.0000	0.0000	301.7381	528.9838	737.7406	(98)
Space heating												3803.2759	(98)
Space heating per m2										(98) / (4) =		45.2018	(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	870.8283	685.5457	702.6923	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8474	0.9131	0.8796	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	737.9318	625.9612	618.1153	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	889.0469	846.5428	780.4099	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	108.8029	164.1127	120.7472	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												393.6628	(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	27.2007	41.0282	30.1868	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												98.4157 (107)
Space cooling per m2												1.1697 (108)
Energy for space heating												45.2018 (99)
Energy for space cooling												1.1697 (108)
Total												46.3714 (109)
Target Fabric Energy Efficiency (TFEE)												53.3 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.0700 (1b)	x 2.3900 (2b)	= 100.5473 (1b) - (3b)
First floor	42.0700 (1c)	x 2.6700 (2c)	= 112.3269 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.1400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.8742 (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) = 0.1879 (8)
Pressure test					Yes
Measured/design AP50					4.6700
Infiltration rate					0.4214 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3582 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	3.9000	4.0000	3.8000	3.8000	3.7000	3.6000	3.5000	3.4000	3.7000	3.5000	3.7000 (22)
Wind factor	1.0500	0.9750	1.0000	0.9500	0.9500	0.9250	0.9000	0.8750	0.8500	0.9250	0.8750	0.9250 (22a)
Adj infilt rate	0.3761	0.3492	0.3582	0.3403	0.3403	0.3313	0.3224	0.3134	0.3045	0.3313	0.3134	0.3313 (22b)
Effective ac	0.5707	0.5610	0.5642	0.5579	0.5579	0.5549	0.5520	0.5491	0.5463	0.5549	0.5491	0.5549 (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		(26a)
Windows (Uw = 1.20)			12.7000	1.1450	14.5420		(27)
Ground Floor			42.0700	0.1100	4.6277	140.0000	5889.8000 (28a)
Brick and Block	92.7000	14.8200	77.8800	0.2400	18.6912	42.2200	3288.0936 (29a)
Pitched Roof	42.0700		42.0700	0.1000	4.2070	9.0000	378.6300 (30)
Total net area of external elements Aum(A, m ²)			176.8400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.3999		(33)
Party Wall 1			44.3400	0.0000	0.0000	110.0000	4877.4000 (32)
Ground Floor Stud			65.9200			9.0000	593.2800 (32c)
First Floor Stud			91.4400			9.0000	822.9600 (32c)
Internal Floor 1			42.0700			18.0000	757.2600 (32d)
Internal Ceiling 1			42.0700			18.0000	757.2600 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 17364.6836 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 206.3785 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.9826 (36)
Total fabric heat loss (33) + (36) = 50.3825 (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	40.0927	39.4083	39.6308	39.1914	39.1914	38.9801	38.7745	38.5746	38.3802	38.9801	38.5746	38.9801 (38)
Heat transfer coeff	90.4752	89.7908	90.0133	89.5739	89.5739	89.3627	89.1571	88.9571	88.7627	89.3627	88.9571	89.3627 (39)
Average = Sum(39)m / 12 =												89.4458 (39)
HLP	1.0753	1.0672	1.0698	1.0646	1.0646	1.0621	1.0596	1.0573	1.0549	1.0621	1.0573	1.0621 (40)
HLP (average)												1.0631 (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												2.5367 (42)
Average daily hot water use (litres/day)												94.4475 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	103.8923	100.1144	96.3365	92.5586	88.7807	85.0028	85.0028	88.7807	92.5586	96.3365	100.1144	103.8923 (44)
Energy conte	154.0692	134.7499	139.0498	121.2270	116.3202	100.3755	93.0127	106.7334	108.0081	125.8730	137.4003	149.2078 (45)
Energy content (annual)										Total = Sum(45)m =		1486.0270 (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	23.1104	20.2125	20.8575	18.1841	17.4480	15.0563	13.9519	16.0100	16.2012	18.8810	20.6100	22.3812 (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	27.5592	24.8898	27.5307	26.6130	27.4785	26.5672	27.4373	27.4640	26.5922	27.5091	26.6558	27.5511 (61)
Total heat required for water heating calculated for each month	181.6284	159.6397	166.5805	147.8400	143.7987	126.9427	120.4500	134.1974	134.6003	153.3821	164.0561	176.7589 (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	181.6284	159.6397	166.5805	147.8400	143.7987	126.9427	120.4500	134.1974	134.6003	153.3821	164.0561	176.7589 (64)
RHI water heating demand												
Heat gains from water heating, kWh/month	58.1178	51.0268	53.1167	46.9612	45.5461	40.0167	37.7860	42.3549	42.5607	48.7301	52.3495	56.4994 (65)
												1810 (64)
												1809.8748 (64)
												1810 (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	152.2042	152.2042	152.2042	152.2042	152.2042	152.2042	152.2042	152.2042	152.2042	152.2042	152.2042	152.2042	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	53.6179	47.6230	38.7296	29.3208	21.9176	18.5038	19.9940	25.9890	34.8823	44.2911	51.6943	55.1081	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	340.1123	343.6416	334.7478	315.8142	291.9138	269.4508	254.4441	250.9148	259.8086	278.7422	302.6426	325.1056	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7572	52.7572	52.7572	52.7572	52.7572	52.7572	52.7572	52.7572	52.7572	52.7572	52.7572	52.7572	(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)	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	(71)
Water heating gains (Table 5)	78.1153	75.9327	71.3935	65.2239	61.2179	55.5787	50.7877	56.9286	59.1121	65.4974	72.7077	75.9400	(72)
Total internal gains	578.3374	573.6892	551.3628	516.8508	481.5412	450.0252	431.7177	440.3243	460.2949	495.0227	533.5365	562.6456	(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		
Northeast				0.9900	14.6176	0.6300	0.7000	0.7700	4.4227 (75)			
Southeast				3.5300	45.1778	0.6300	0.7000	0.7700	48.7385 (77)			
Northwest				8.1800	14.6176	0.6300	0.7000	0.7700	36.5429 (81)			
Solar gains	89.7040	142.0860	227.9539	337.2869	404.2113	457.0995	428.5196	367.1255	279.5659	178.6890	109.6674	73.8217 (83)
Total gains	668.0414	715.7751	779.3168	854.1377	885.7525	907.1247	860.2373	807.4497	739.8608	673.7116	643.2039	636.4673 (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	53.3132	53.7196	53.5868	53.8496	53.8496	53.9769	54.1014	54.2230	54.3418	53.9769	54.2230	53.9769	
alpha	4.5542	4.5813	4.5725	4.5900	4.5900	4.5985	4.6068	4.6149	4.6228	4.5985	4.6149	4.5985	
util living area	0.9842	0.9774	0.9545	0.8886	0.7540	0.5435	0.4005	0.4247	0.6920	0.9047	0.9701	0.9864 (86)	
MIT	19.9487	20.0642	20.3199	20.6425	20.8767	20.9784	20.9958	20.9947	20.9376	20.6723	20.2850	19.9420 (87)	
Th 2	20.0211	20.0277	20.0256	20.0299	20.0299	20.0319	20.0339	20.0359	20.0378	20.0319	20.0359	20.0319 (88)	
util rest of house	0.9801	0.9715	0.9423	0.8593	0.6950	0.4586	0.3032	0.3223	0.6084	0.8721	0.9608	0.9828 (89)	
MIT 2	19.0826	19.2014	19.4485	19.7539	19.9522	20.0229	20.0329	20.0346	20.0066	19.7894	19.4263	19.0850 (90)	
Living area fraction													0.2144 (91)
MIT	19.2683	19.3864	19.6353	19.9445	20.1504	20.2278	20.2394	20.2405	20.2062	19.9787	19.6104	19.2687 (92)	
Temperature adjustment													0.0000
adjusted MIT	19.2683	19.3864	19.6353	19.9445	20.1504	20.2278	20.2394	20.2405	20.2062	19.9787	19.6104	19.2687 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9760	0.9666	0.9364	0.8563	0.7029	0.4763	0.3241	0.3443	0.6241	0.8700	0.9557	0.9791 (94)
Useful gains	651.9842	691.8915	729.7291	731.4365	622.5780	432.0476	278.8246	277.9990	461.7183	586.1561	614.7161	623.1383 (95)
Ext temp.	4.9000	5.3000	7.0000	9.5000	12.5000	15.3000	17.1000	17.1000	14.7000	11.4000	7.9000	5.0000 (96)
Heat loss rate W	1299.9754	1264.8287	1137.3472	935.5506	685.2775	440.3580	279.8974	279.3658	488.7443	766.6185	1041.7252	1275.0891 (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	482.1054	385.0138	303.2679	146.9622	46.6484	0.0000	0.0000	0.0000	0.0000	134.2640	307.4465	485.0514 (98)
Space heating												2290.7595 (98)
RHI space heating demand												2291 (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	42.0700 (1b)	x 2.3900 (2b)	= 100.5473 (1b) - (3b)
First floor	42.0700 (1c)	x 2.6700 (2c)	= 112.3269 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.1400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.8742 (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											4 * 10 =	40.0000 (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) =										40.0000	/ (5) =	0.1879 (8)	
Pressure test												Yes		
Measured/design AP50													4.6700	
Infiltration rate													0.4214 (18)	
Number of sides sheltered													2 (19)	
Shelter factor											(20) = 1 - [0.075 x (19)] =		0.8500 (20)	
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =		0.3582 (21)	
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Wind factor	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)		
Adj infilt rate	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)		
	0.4567	0.4477	0.4388	0.3940	0.3851	0.3403	0.3403	0.3313	0.3582	0.3851	0.4030	0.4209 (22b)		
Effective ac	0.6043	0.6002	0.5963	0.5776	0.5741	0.5579	0.5579	0.5549	0.5642	0.5741	0.5812	0.5886 (25)		

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
Front Door			2.1200	1.1000	2.3320			(26a)					
Windows (Uw = 1.20)			12.7000	1.1450	14.5420			(27)					
Ground Floor			42.0700	0.1100	4.6277	140.0000	5889.8000	(28a)					
Brick and Block	92.7000	14.8200	77.8800	0.2400	18.6912	42.2200	3288.0936	(29a)					
Pitched Roof	42.0700		42.0700	0.1000	4.2070	9.0000	378.6300	(30)					
Total net area of external elements Aum(A, m2)			176.8400					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.3999			(33)					
Party Wall 1			44.3400	0.0000	0.0000	110.0000	4877.4000	(32)					
Ground Floor Stud			65.9200			9.0000	593.2800	(32c)					
First Floor Stud			91.4400			9.0000	822.9600	(32c)					
Internal Floor 1			42.0700			18.0000	757.2600	(32d)					
Internal Ceiling 1			42.0700			18.0000	757.2600	(32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	17364.6836	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							206.3785	(35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.9826	(36)					
Total fabric heat loss						(33) + (36) =	50.3825	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 42.4502	Feb 42.1657	Mar 41.8869	Apr 40.5772	May 40.3321	Jun 39.1914	Jul 39.1914	Aug 38.9801	Sep 39.6308	Oct 40.3321	Nov 40.8278	Dec 41.3461	(38)
Heat transfer coeff	92.8327	92.5482	92.2694	90.9597	90.7146	89.5739	89.5739	89.3627	90.0133	90.7146	91.2104	91.7286	(39)
Average = Sum(39)m / 12 =												90.9585	(39)
HLP	Jan 1.1033	Feb 1.0999	Mar 1.0966	Apr 1.0811	May 1.0781	Jun 1.0646	Jul 1.0646	Aug 1.0621	Sep 1.0698	Oct 1.0781	Nov 1.0840	Dec 1.0902	(40)
HLP (average)												1.0810	(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												2.5367 (42)
Average daily hot water use (litres/day)												94.4475 (43)
Daily hot water use	Jan 103.8923	Feb 100.1144	Mar 96.3365	Apr 92.5586	May 88.7807	Jun 85.0028	Jul 85.0028	Aug 88.7807	Sep 92.5586	Oct 96.3365	Nov 100.1144	Dec 103.8923 (44)
Energy conte	154.0692	134.7499	139.0498	121.2270	116.3202	100.3755	93.0127	106.7334	108.0081	125.8730	137.4003	149.2078 (45)
Energy content (annual)										Total = Sum(45)m =		1486.0270 (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	23.1104	20.2125	20.8575	18.1841	17.4480	15.0563	13.9519	16.0100	16.2012	18.8810	20.6100	22.3812 (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	27.5592	24.8898	27.5307	26.6130	27.4785	26.5672	27.4373	27.4640	26.5922	27.5091	26.6558	27.5511 (61)
Total heat required for water heating calculated for each month	181.6284	159.6397	166.5805	147.8400	143.7987	126.9427	120.4500	134.1974	134.6003	153.3821	164.0561	176.7589 (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	181.6284	159.6397	166.5805	147.8400	143.7987	126.9427	120.4500	134.1974	134.6003	153.3821	164.0561	176.7589 (64)
Heat gains from water heating, kWh/month	58.1178	51.0268	53.1167	46.9612	45.5461	40.0167	37.7860	42.3549	42.5607	48.7301	52.3495	56.4994 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1809.8748 (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	152.2042	152.2042	152.2042	152.2042	152.2042	152.2042	152.2042	152.2042	152.2042	152.2042	152.2042	152.2042 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	53.6179	47.6230	38.7296	29.3208	21.9176	18.5038	19.9940	25.9890	34.8823	44.2911	51.6943	55.1081 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	340.1123	343.6416	334.7478	315.8142	291.9138	269.4508	254.4441	250.9148	259.8086	278.7422	302.6426	325.1056 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7572	52.7572	52.7572	52.7572	52.7572	52.7572	52.7572	52.7572	52.7572	52.7572	52.7572	52.7572 (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)	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695 (71)
Water heating gains (Table 5)	78.1153	75.9327	71.3935	65.2239	61.2179	55.5787	50.7877	56.9286	59.1121	65.4974	72.7077	75.9400 (72)
Total internal gains	578.3374	573.6892	551.3628	516.8508	481.5412	450.0252	431.7177	440.3243	460.2949	495.0227	533.5365	562.6456 (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	
Northeast	0.9900				11.2829		0.6300		0.7000		0.7700		3.4137 (75)	
Southeast	3.5300				36.7938		0.6300		0.7000		0.7700		39.6937 (77)	
Northwest	8.1800				11.2829		0.6300		0.7000		0.7700		28.2064 (81)	
Solar gains	71.3138	131.9767	208.4740	305.0701	384.3849	400.3792	378.1954	316.1528	241.4725	153.3843	87.3302	59.7921	(83)	
Total gains	649.6512	705.6659	759.8368	821.9209	865.9261	850.4044	809.9132	756.4771	701.7675	648.4070	620.8667	622.4378	(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	51.9593	52.1190	52.2765	53.0292	53.1725	53.8496	53.8496	53.9769	53.5868	53.1725	52.8835	52.5847
alpha	4.4640	4.4746	4.4851	4.5353	4.5448	4.5900	4.5900	4.5985	4.5725	4.5448	4.5256	4.5056
util living area	0.9879	0.9811	0.9642	0.9159	0.8088	0.6337	0.4773	0.5279	0.7671	0.9350	0.9794	0.9899 (86)
MIT	19.8120	19.9561	20.2074	20.5430	20.8116	20.9547	20.9900	20.9845	20.8910	20.5567	20.1337	19.7871 (87)
Th 2	19.9981	20.0009	20.0036	20.0163	20.0187	20.0299	20.0299	20.0319	20.0256	20.0187	20.0139	20.0089 (88)
util rest of house	0.9848	0.9762	0.9545	0.8928	0.7592	0.5522	0.3766	0.4240	0.6936	0.9122	0.9731	0.9872 (89)
MIT 2	18.9290	19.0734	19.3217	19.6520	19.8909	20.0078	20.0269	20.0269	19.9642	19.6730	19.2606	18.9130 (90)
Living area fraction									fLA = Living area / (4) =			0.2144 (91)
MIT	19.1183	19.2627	19.5116	19.8430	20.0883	20.2108	20.2334	20.2322	20.1629	19.8625	19.4478	19.1005 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1183	19.2627	19.5116	19.8430	20.0883	20.2108	20.2334	20.2322	20.1629	19.8625	19.4478	19.1005 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	637.4074	685.5693	720.8152	729.9514	660.7184	483.1678	322.4761	337.4990	494.7560	588.6138	601.3238	612.5121 (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	1375.6269	1329.2420	1200.5745	995.3749	760.9388	502.5804	325.4588	342.4564	545.7418	840.2415	1126.2469	1366.7981 (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	549.2353	432.5481	356.9409	191.1049	74.5640	0.0000	0.0000	0.0000	0.0000	187.2110	377.9446	561.1888 (98)
Space heating												2730.7377 (98)
Space heating per m2												(98) / (4) = 32.4547 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 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													3010.7361 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	549.2353	432.5481	356.9409	191.1049	74.5640	0.0000	0.0000	0.0000	0.0000	187.2110	377.9446	561.1888	(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)	605.5516	476.8998	393.5402	210.7000	82.2094	0.0000	0.0000	0.0000	0.0000	206.4068	416.6975	618.7308	(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	181.6284	159.6397	166.5805	147.8400	143.7987	126.9427	120.4500	134.1974	134.6003	153.3821	164.0561	176.7589	(64)
Efficiency of water heater (217)m	89.9876	89.9278	89.7899	89.4571	88.8365	87.9000	87.9000	87.9000	87.9000	89.4173	89.8338	87.9000	(216)
Fuel for water heating, kWh/month	201.8370	177.5199	185.5225	165.2636	161.8690	144.4172	137.0307	152.6705	153.1289	171.5352	182.6217	196.3700	(219)
Water heating fuel used												2029.7863	(219)
Annual totals kWh/year													
Space heating fuel - main system												3010.7361	(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)												378.7637	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.76 * 1029 * 1.00) =										-625.7455		-625.7455	(233)
Total delivered energy for all uses												4868.5406	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3010.7361	3.4800	104.7736 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2029.7863	3.4800	70.6366 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	378.7637	13.1900	49.9589 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-625.7455	13.1900	-82.5358 (252)
Total energy cost			272.7258 (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] =	0.8870 (257)
SAP value		87.6266
SAP rating (Section 12)		88 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3010.7361	0.2160	650.3190 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2029.7863	0.2160	438.4338 (264)
Space and water heating			1088.7528 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	378.7637	0.5190	196.5784 (268)
Energy saving/generation technologies			
PV Unit	-625.7455	0.5190	-324.7619 (269)
Total kg/year			999.4943 (272)
CO2 emissions per m2			11.8800 (273)
EI value			89.6289
EI rating			90 (274)
EI band			B

Calculation of stars for heating and DHW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

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	$3.48 / 0.8907 = 3.907$, stars = 4
Water heating environmental impact	$0.216 / 0.8907 = 0.2425$, 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	42.0700 (1b)	x 2.3900 (2b)	= 100.5473 (1b) - (3b)
First floor	42.0700 (1c)	x 2.6700 (2c)	= 112.3269 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.1400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.8742 (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) = 0.1879 (8)
Pressure test					Yes
Measured/design AP50					4.6700
Infiltration rate					0.4214 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3582 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	3.9000	4.0000	3.8000	3.8000	3.7000	3.6000	3.5000	3.4000	3.7000	3.5000	3.7000 (22)
Wind factor	1.0500	0.9750	1.0000	0.9500	0.9500	0.9250	0.9000	0.8750	0.8500	0.9250	0.8750	0.9250 (22a)
Adj infilt rate	0.3761	0.3492	0.3582	0.3403	0.3403	0.3313	0.3224	0.3134	0.3045	0.3313	0.3134	0.3313 (22b)
Effective ac	0.5707	0.5610	0.5642	0.5579	0.5579	0.5549	0.5520	0.5491	0.5463	0.5549	0.5491	0.5549 (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		(26a)
Windows (Uw = 1.20)			12.7000	1.1450	14.5420		(27)
Ground Floor			42.0700	0.1100	4.6277	140.0000	5889.8000 (28a)
Brick and Block	92.7000	14.8200	77.8800	0.2400	18.6912	42.2200	3288.0936 (29a)
Pitched Roof	42.0700		42.0700	0.1000	4.2070	9.0000	378.6300 (30)
Total net area of external elements Aum(A, m ²)			176.8400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.3999		(33)
Party Wall 1			44.3400	0.0000	0.0000	110.0000	4877.4000 (32)
Ground Floor Stud			65.9200			9.0000	593.2800 (32c)
First Floor Stud			91.4400			9.0000	822.9600 (32c)
Internal Floor 1			42.0700			18.0000	757.2600 (32d)
Internal Ceiling 1			42.0700			18.0000	757.2600 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 17364.6836 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 206.3785 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.9826 (36)
Total fabric heat loss (33) + (36) = 50.3825 (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	40.0927	39.4083	39.6308	39.1914	39.1914	38.9801	38.7745	38.5746	38.3802	38.9801	38.5746	38.9801 (38)
Heat transfer coeff	90.4752	89.7908	90.0133	89.5739	89.5739	89.3627	89.1571	88.9571	88.7627	89.3627	88.9571	89.3627 (39)
Average = Sum(39)m / 12 =												89.4458 (39)
HLP	1.0753	1.0672	1.0698	1.0646	1.0646	1.0621	1.0596	1.0573	1.0549	1.0621	1.0573	1.0621 (40)
HLP (average)												1.0631 (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												2.5367 (42)
Average daily hot water use (litres/day)												94.4475 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	103.8923	100.1144	96.3365	92.5586	88.7807	85.0028	85.0028	88.7807	92.5586	96.3365	100.1144	103.8923 (44)
Energy conte	154.0692	134.7499	139.0498	121.2270	116.3202	100.3755	93.0127	106.7334	108.0081	125.8730	137.4003	149.2078 (45)
Energy content (annual)										Total = Sum(45)m =		1486.0270 (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	23.1104	20.2125	20.8575	18.1841	17.4480	15.0563	13.9519	16.0100	16.2012	18.8810	20.6100	22.3812 (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	27.5592	24.8898	27.5307	26.6130	27.4785	26.5672	27.4373	27.4640	26.5922	27.5091	26.6558	27.5511 (61)
Total heat required for water heating calculated for each month	181.6284	159.6397	166.5805	147.8400	143.7987	126.9427	120.4500	134.1974	134.6003	153.3821	164.0561	176.7589 (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	181.6284	159.6397	166.5805	147.8400	143.7987	126.9427	120.4500	134.1974	134.6003	153.3821	164.0561	176.7589 (64)
Heat gains from water heating, kWh/month	58.1178	51.0268	53.1167	46.9612	45.5461	40.0167	37.7860	42.3549	42.5607	48.7301	52.3495	56.4994 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1809.8748 (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	152.2042	152.2042	152.2042	152.2042	152.2042	152.2042	152.2042	152.2042	152.2042	152.2042	152.2042	152.2042 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	53.6179	47.6230	38.7296	29.3208	21.9176	18.5038	19.9940	25.9890	34.8823	44.2911	51.6943	55.1081 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	340.1123	343.6416	334.7478	315.8142	291.9138	269.4508	254.4441	250.9148	259.8086	278.7422	302.6426	325.1056 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7572	52.7572	52.7572	52.7572	52.7572	52.7572	52.7572	52.7572	52.7572	52.7572	52.7572	52.7572 (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)	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695 (71)
Water heating gains (Table 5)	78.1153	75.9327	71.3935	65.2239	61.2179	55.5787	50.7877	56.9286	59.1121	65.4974	72.7077	75.9400 (72)
Total internal gains	578.3374	573.6892	551.3628	516.8508	481.5412	450.0252	431.7177	440.3243	460.2949	495.0227	533.5365	562.6456 (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	
Northeast				0.9900	14.6176	0.6300	0.7000	0.7700			4.4227 (75)	
Southeast				3.5300	45.1778	0.6300	0.7000	0.7700			48.7385 (77)	
Northwest				8.1800	14.6176	0.6300	0.7000	0.7700			36.5429 (81)	
Solar gains	89.7040	142.0860	227.9539	337.2869	404.2113	457.0995	428.5196	367.1255	279.5659	178.6890	109.6674	73.8217 (83)
Total gains	668.0414	715.7751	779.3168	854.1377	885.7525	907.1247	860.2373	807.4497	739.8608	673.7116	643.2039	636.4673 (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	53.3132	53.7196	53.5868	53.8496	53.8496	53.9769	54.1014	54.2230	54.3418	53.9769	54.2230	53.9769
alpha	4.5542	4.5813	4.5725	4.5900	4.5900	4.5985	4.6068	4.6149	4.6228	4.5985	4.6149	4.5985
util living area	0.9842	0.9774	0.9545	0.8886	0.7540	0.5435	0.4005	0.4247	0.6920	0.9047	0.9701	0.9864 (86)
MIT	19.9487	20.0642	20.3199	20.6425	20.8767	20.9784	20.9958	20.9947	20.9376	20.6723	20.2850	19.9420 (87)
Th 2	20.0211	20.0277	20.0256	20.0299	20.0299	20.0319	20.0339	20.0359	20.0378	20.0319	20.0359	20.0319 (88)
util rest of house	0.9801	0.9715	0.9423	0.8593	0.6950	0.4586	0.3032	0.3223	0.6084	0.8721	0.9608	0.9828 (89)
MIT 2	19.0826	19.2014	19.4485	19.7539	19.9522	20.0229	20.0329	20.0346	20.0066	19.7894	19.4263	19.0850 (90)
Living area fraction									fLA = Living area / (4) =			0.2144 (91)
MIT	19.2683	19.3864	19.6353	19.9445	20.1504	20.2278	20.2394	20.2405	20.2062	19.9787	19.6104	19.2687 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2683	19.3864	19.6353	19.9445	20.1504	20.2278	20.2394	20.2405	20.2062	19.9787	19.6104	19.2687 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	651.9842	691.8915	729.7291	731.4365	622.5780	432.0476	278.8246	277.9990	461.7183	586.1561	614.7161	623.1383 (95)
Ext temp.	4.9000	5.3000	7.0000	9.5000	12.5000	15.3000	17.1000	17.1000	14.7000	11.4000	7.9000	5.0000 (96)
Heat loss rate W	1299.9754	1264.8287	1137.3472	935.5506	685.2775	440.3580	279.8974	279.3658	488.7443	766.6185	1041.7252	1275.0891 (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	482.1054	385.0138	303.2679	146.9622	46.6484	0.0000	0.0000	0.0000	0.0000	134.2640	307.4465	485.0514 (98)
Space heating												2290.7595 (98)
Space heating per m2												(98) / (4) = 27.2256 (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												2525.6445	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	482.1054	385.0138	303.2679	146.9622	46.6484	0.0000	0.0000	0.0000	0.0000	134.2640	307.4465	485.0514	(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)	531.5385	424.4915	334.3637	162.0310	51.4315	0.0000	0.0000	0.0000	0.0000	148.0309	338.9708	534.7865	(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	181.6284	159.6397	166.5805	147.8400	143.7987	126.9427	120.4500	134.1974	134.6003	153.3821	164.0561	176.7589	(64)
Efficiency of water heater	89.9162	89.8610	89.6871	89.2739	88.5697	87.9000	87.9000	87.9000	87.9000	89.1851	89.7057	87.9000	(216)
(217)m	89.9162	89.8610	89.6871	89.2739	88.5697	87.9000	87.9000	87.9000	87.9000	89.1851	89.7057	89.9349	(217)
Fuel for water heating, kWh/month	201.9974	177.6518	185.7352	165.6027	162.3565	144.4172	137.0307	152.6705	153.1289	171.9818	182.8824	196.5410	(219)
Water heating fuel used												2031.9962	(219)
Annual totals kWh/year													
Space heating fuel - main system												2525.6445	(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)												378.7637	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.76 * 1156 * 1.00) =										-702.9883		-702.9883	(233)
Total delivered energy for all uses												4308.4161	(238)

10a. Fuel costs - using BEDF prices (540)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2525.6445	7.6100	192.2015 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2031.9962	7.6100	154.6349 (247)
Pumps and fans for heating	75.0000	31.0800	23.3100 (249)
Energy for lighting	378.7637	31.0800	117.7198 (250)
Additional standing charges			105.0000 (251)
Energy saving/generation technologies			
PV Unit	-702.9883	31.0800	-218.4887 (252)
Total energy cost			374.3775 (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	2525.6445	0.2160	545.5392 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2031.9962	0.2160	438.9112 (264)
Space and water heating			984.4504 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	378.7637	0.5190	196.5784 (268)
Energy saving/generation technologies			
PV Unit	-702.9883	0.5190	-364.8509 (269)
Total kg/year			855.1029 (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	2525.6445	1.2200	3081.2863 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2031.9962	1.2200	2479.0353 (264)
Space and water heating			5560.3216 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	378.7637	3.0700	1162.8046 (268)
Energy saving/generation technologies			
PV Unit	-702.9883	3.0700	-2158.1739 (269)
Primary energy kWh/year			4795.2023 (272)
Primary energy kWh/m2/year			56.9908 (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 88
Current environmental impact rating: B 90

(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	-£ 61	-190 kg (22.2%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£61 2.26 kg/m²	B 89	A 92
Total Savings	£61 2.26 kg/m²		

Potential energy efficiency rating: B 89
Potential environmental impact rating: A 92

Fuel prices for cost data on this page from database revision number 540 TEST (28 Mar 2024)
Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£141	£157	-£16
Mains gas	£452	£376	£76
Space heating	£321	£321	£0
Water heating	£155	£94	£61
Lighting	£118	£118	£0
Generated (PV)	-£218	-£218	£0
Total cost of fuels	£375	£315	£60
Total cost of uses	£376	£315	£61
Delivered energy	51 kWh/m²	40 kWh/m²	11 kWh/m²
Carbon dioxide emissions	0.9 tonnes	0.7 tonnes	0.2 tonnes
CO2 emissions per m²	10 kg/m²	8 kg/m²	2 kg/m²
Primary energy	57 kWh/m²	44 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	42.0700 (1b)	x 2.3900 (2b)	= 100.5473 (1b) - (3b)
First floor	42.0700 (1c)	x 2.6700 (2c)	= 112.3269 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.1400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.8742 (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) = 0.1879 (8)
Pressure test					Yes
Measured/design AP50					4.6700
Infiltration rate					0.4214 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3582 (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	0.4567	0.4477	0.4388	0.3940	0.3851	0.3403	0.3403	0.3313	0.3582	0.3851	0.4030	0.4209 (22b)
Effective ac	0.6043	0.6002	0.5963	0.5776	0.5741	0.5579	0.5579	0.5549	0.5642	0.5741	0.5812	0.5886 (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		(26a)
Windows (Uw = 1.20)			12.7000	1.1450	14.5420		(27)
Ground Floor			42.0700	0.1100	4.6277	140.0000	5889.8000 (28a)
Brick and Block	92.7000	14.8200	77.8800	0.2400	18.6912	42.2200	3288.0936 (29a)
Pitched Roof	42.0700		42.0700	0.1000	4.2070	9.0000	378.6300 (30)
Total net area of external elements Aum(A, m ²)			176.8400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.3999		(33)
Party Wall 1			44.3400	0.0000	0.0000	110.0000	4877.4000 (32)
Ground Floor Stud			65.9200			9.0000	593.2800 (32c)
First Floor Stud			91.4400			9.0000	822.9600 (32c)
Internal Floor 1			42.0700			18.0000	757.2600 (32d)
Internal Ceiling 1			42.0700			18.0000	757.2600 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 17364.6836 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 206.3785 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.9826 (36)
Total fabric heat loss (33) + (36) = 50.3825 (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	42.4502	42.1657	41.8869	40.5772	40.3321	39.1914	39.1914	38.9801	39.6308	40.3321	40.8278	41.3461 (38)
Heat transfer coeff	92.8327	92.5482	92.2694	90.9597	90.7146	89.5739	89.5739	89.3627	90.0133	90.7146	91.2104	91.7286 (39)
Average = Sum(39)m / 12 =												90.9585 (39)
HLP	1.1033	1.0999	1.0966	1.0811	1.0781	1.0646	1.0646	1.0621	1.0698	1.0781	1.0840	1.0902 (40)
HLP (average)												1.0810 (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												2.5367 (42)
Average daily hot water use (litres/day)												94.4475 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	103.8923	100.1144	96.3365	92.5586	88.7807	85.0028	85.0028	88.7807	92.5586	96.3365	100.1144	103.8923 (44)
Energy conte	154.0692	134.7499	139.0498	121.2270	116.3202	100.3755	93.0127	106.7334	108.0081	125.8730	137.4003	149.2078 (45)
Energy content (annual)										Total = Sum(45)m =		1486.0270 (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	23.1104	20.2125	20.8575	18.1841	17.4480	15.0563	13.9519	16.0100	16.2012	18.8810	20.6100	22.3812 (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	27.5592	24.8898	27.5307	26.6130	27.4785	26.5672	27.4373	27.4640	26.5922	27.5091	26.6558	27.5511 (61)
Total heat required for water heating calculated for each month	181.6284	159.6397	166.5805	147.8400	143.7987	126.9427	120.4500	134.1974	134.6003	153.3821	164.0561	176.7589 (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												1.2204 (H8)
Utilisation factor												0.5593 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												94.4475 (H14)
Volume ratio Veff/V												0.7941 (H15)
Solar storage volume factor												0.9539 (H16)
Solar input	-24.6708	-41.1684	-70.1145	-93.9672	-116.0886	-114.1336	-112.6252	-98.4012	-77.0679	-52.6283	-29.2631	-850.7739 (H17)
Solar input (sum of months) = Sum (63)m =												-850.7739 (63)
Output from w/h	156.9576	118.4713	96.4660	53.8728	27.7101	12.8092	7.8248	35.7962	57.5324	100.7538	134.7930	156.1137 (64)
Total per year (kWh/year) = Sum (64)m =												959.1009 (64)
Heat gains from water heating, kWh/month	58.1178	51.0268	53.1167	46.9612	45.5461	40.0167	37.7860	42.3549	42.5607	48.7301	52.3495	56.4994 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	152.2042	152.2042	152.2042	152.2042	152.2042	152.2042	152.2042	152.2042	152.2042	152.2042	152.2042	152.2042	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	53.6179	47.6230	38.7296	29.3208	21.9176	18.5038	19.9940	25.9890	34.8823	44.2911	51.6943	55.1081	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	340.1123	343.6416	334.7478	315.8142	291.9138	269.4508	254.4441	250.9148	259.8086	278.7422	302.6426	325.1056	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7572	52.7572	52.7572	52.7572	52.7572	52.7572	52.7572	52.7572	52.7572	52.7572	52.7572	52.7572	(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)	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	(71)
Water heating gains (Table 5)	78.1153	75.9327	71.3935	65.2239	61.2179	55.5787	50.7877	56.9286	59.1121	65.4974	72.7077	75.9400	(72)
Total internal gains	578.3374	573.6892	551.3628	516.8508	481.5412	450.0252	431.7177	440.3243	460.2949	495.0227	533.5365	562.6456	(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				
Northeast				0.9900	11.2829	0.6300	0.7000	0.7700	3.4137 (75)				
Southeast				3.5300	36.7938	0.6300	0.7000	0.7700	39.6937 (77)				
Northwest				8.1800	11.2829	0.6300	0.7000	0.7700	28.2064 (81)				
Solar gains	71.3138	131.9767	208.4740	305.0701	384.3849	400.3792	378.1954	316.1528	241.4725	153.3843	87.3302	59.7921	(83)
Total gains	649.6512	705.6659	759.8368	821.9209	865.9261	850.4044	809.9132	756.4771	701.7675	648.4070	620.8667	622.4378	(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	51.9593	52.1190	52.2765	53.0292	53.1725	53.8496	53.8496	53.9769	53.5868	53.1725	52.8835	52.5847	
alpha	4.4640	4.4746	4.4851	4.5353	4.5448	4.5900	4.5900	4.5985	4.5725	4.5448	4.5256	4.5056	
util living area	0.9879	0.9811	0.9642	0.9159	0.8088	0.6337	0.4773	0.5279	0.7671	0.9350	0.9794	0.9899	(86)
MIT	19.8120	19.9561	20.2074	20.5430	20.8116	20.9547	20.9900	20.9845	20.8910	20.5567	20.1337	19.7871	(87)
Th 2	19.9981	20.0009	20.0036	20.0163	20.0187	20.0299	20.0299	20.0319	20.0256	20.0187	20.0139	20.0089	(88)
util rest of house	0.9848	0.9762	0.9545	0.8928	0.7592	0.5522	0.3766	0.4240	0.6936	0.9122	0.9731	0.9872	(89)
MIT 2	18.9290	19.0734	19.3217	19.6520	19.8909	20.0078	20.0269	20.0269	19.9642	19.6730	19.2606	18.9130	(90)
Living area fraction													(91)
MIT	19.1183	19.2627	19.5116	19.8430	20.0883	20.2108	20.2334	20.2322	20.1629	19.8625	19.4478	19.1005	(92)
Temperature adjustment													(93)
adjusted MIT	19.1183	19.2627	19.5116	19.8430	20.0883	20.2108	20.2334	20.2322	20.1629	19.8625	19.4478	19.1005	(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	0.9812	0.9715	0.9486	0.8881	0.7630	0.5682	0.3982	0.4461	0.7050	0.9078	0.9685	0.9841	(94)
Useful gains	637.4074	685.5693	720.8152	729.9514	660.7184	483.1678	322.4761	337.4990	494.7560	588.6138	601.3238	612.5121	(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	1375.6269	1329.2420	1200.5745	995.3749	760.9388	502.5804	325.4588	342.4564	545.7418	840.2415	1126.2469	1366.7981	(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	549.2353	432.5481	356.9409	191.1049	74.5640	0.0000	0.0000	0.0000	0.0000	187.2110	377.9446	561.1888	(98)
Space heating												2730.7377	(98)
Space heating per m2											(98) / (4) =	32.4547	(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													3010.7361 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	549.2353	432.5481	356.9409	191.1049	74.5640	0.0000	0.0000	0.0000	0.0000	187.2110	377.9446	561.1888	(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)	605.5516	476.8998	393.5402	210.7000	82.2094	0.0000	0.0000	0.0000	0.0000	206.4068	416.6975	618.7308	(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	156.9576	118.4713	96.4660	53.8728	27.7101	12.8092	7.8248	35.7962	57.5324	100.7538	134.7930	156.1137	(64)
Efficiency of water heater	90.0624	90.0830	90.0894	90.0691	89.9239	87.9000	87.9000	87.9000	87.9000	89.7003	89.9468	90.0755	(216)
(217)m	90.0624	90.0830	90.0894	90.0691	89.9239	87.9000	87.9000	87.9000	87.9000	89.7003	89.9468	90.0755	(217)
Fuel for water heating, kWh/month	174.2766	131.5135	107.0781	59.8127	30.8151	14.5724	8.9019	40.7237	65.4521	112.3228	149.8586	173.3142	(219)
Water heating fuel used												1068.6417	(219)
Annual totals kWh/year													
Space heating fuel - main system												3010.7361	(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)												378.7637	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.76 * 1029 * 1.00) =										-625.7455		-625.7455	(233)
Total delivered energy for all uses												3957.3960	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3010.7361	3.4800	104.7736 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1068.6417	3.4800	37.1887 (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	378.7637	13.1900	49.9589 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-625.7455	13.1900	-82.5358 (252)
Total energy cost			245.8729 (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] =	0.7996 (257)
SAP value		88.8449
SAP rating (Section 12)		89 (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	3010.7361	0.2160	650.3190	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1068.6417	0.2160	230.8266	(264)
Space and water heating			881.1456	(265)
Pumps and fans	125.0000	0.5190	64.8750	(267)
Energy for lighting	378.7637	0.5190	196.5784	(268)
Energy saving/generation technologies				
PV Unit	-625.7455	0.5190	-324.7619	(269)
Total kg/year			817.8371	(272)
CO2 emissions per m2			9.7200	(273)
EI value			91.5138	
EI rating			92	(274)
EI band			A	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.0700 (1b)	x 2.3900 (2b)	= 100.5473 (1b) - (3b)
First floor	42.0700 (1c)	x 2.6700 (2c)	= 112.3269 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.1400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.8742 (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) = 0.1879 (8)
Pressure test					Yes
Measured/design AP50					4.6700
Infiltration rate					0.4214 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3582 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	3.9000	4.0000	3.8000	3.8000	3.7000	3.6000	3.5000	3.4000	3.7000	3.5000	3.7000 (22)
Wind factor	1.0500	0.9750	1.0000	0.9500	0.9500	0.9250	0.9000	0.8750	0.8500	0.9250	0.8750	0.9250 (22a)
Adj infilt rate	0.3761	0.3492	0.3582	0.3403	0.3403	0.3313	0.3224	0.3134	0.3045	0.3313	0.3134	0.3313 (22b)
Effective ac	0.5707	0.5610	0.5642	0.5579	0.5579	0.5549	0.5520	0.5491	0.5463	0.5549	0.5491	0.5549 (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		(26a)
Windows (Uw = 1.20)			12.7000	1.1450	14.5420		(27)
Ground Floor			42.0700	0.1100	4.6277	140.0000	5889.8000 (28a)
Brick and Block	92.7000	14.8200	77.8800	0.2400	18.6912	42.2200	3288.0936 (29a)
Pitched Roof	42.0700		42.0700	0.1000	4.2070	9.0000	378.6300 (30)
Total net area of external elements Aum(A, m ²)			176.8400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.3999		(33)
Party Wall 1			44.3400	0.0000	0.0000	110.0000	4877.4000 (32)
Ground Floor Stud			65.9200			9.0000	593.2800 (32c)
First Floor Stud			91.4400			9.0000	822.9600 (32c)
Internal Floor 1			42.0700			18.0000	757.2600 (32d)
Internal Ceiling 1			42.0700			18.0000	757.2600 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 17364.6836 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 206.3785 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.9826 (36)
Total fabric heat loss (33) + (36) = 50.3825 (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	40.0927	39.4083	39.6308	39.1914	39.1914	38.9801	38.7745	38.5746	38.3802	38.9801	38.5746	38.9801 (38)
Heat transfer coeff	90.4752	89.7908	90.0133	89.5739	89.5739	89.3627	89.1571	88.9571	88.7627	89.3627	88.9571	89.3627 (39)
Average = Sum(39)m / 12 =												89.4458 (39)
HLP	1.0753	1.0672	1.0698	1.0646	1.0646	1.0621	1.0596	1.0573	1.0549	1.0621	1.0573	1.0621 (40)
HLP (average)												1.0631 (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												2.5367 (42)
Average daily hot water use (litres/day)												94.4475 (43)
Daily hot water use	103.8923	100.1144	96.3365	92.5586	88.7807	85.0028	85.0028	88.7807	92.5586	96.3365	100.1144	103.8923 (44)
Energy conte	154.0692	134.7499	139.0498	121.2270	116.3202	100.3755	93.0127	106.7334	108.0081	125.8730	137.4003	149.2078 (45)
Energy content (annual)										Total = Sum(45)m =		1486.0270 (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	23.1104	20.2125	20.8575	18.1841	17.4480	15.0563	13.9519	16.0100	16.2012	18.8810	20.6100	22.3812 (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	27.5592	24.8898	27.5307	26.6130	27.4785	26.5672	27.4373	27.4640	26.5922	27.5091	26.6558	27.5511 (61)
Total heat required for water heating calculated for each month	181.6284	159.6397	166.5805	147.8400	143.7987	126.9427	120.4500	134.1974	134.6003	153.3821	164.0561	176.7589 (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												1208.1510 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												2029.6937 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.3659 (H8)
Utilisation factor												0.5191 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												94.4475 (H14)
Volume ratio Veff/V												0.7941 (H15)
Solar storage volume factor												0.9539 (H16)
Solar input	-28.8302	-40.9948	-70.4602	-95.0671	-111.6620	-119.2727	-116.7643	-104.5076	-81.8223	-56.5691	-34.0986	-883.7557 (H17)
Solar input (sum of months) = Sum (63)m =												-883.7557 (63)
Output from w/h	152.7981	118.6449	96.1203	52.7729	32.1367	7.6701	3.6857	29.6898	52.7780	96.8130	129.9575	153.0520 (64)
Total per year (kWh/year) = Sum (64)m =												926.1191 (64)
Heat gains from water heating, kWh/month	58.1178	51.0268	53.1167	46.9612	45.5461	40.0167	37.7860	42.3549	42.5607	48.7301	52.3495	56.4994 (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	152.2042	152.2042	152.2042	152.2042	152.2042	152.2042	152.2042	152.2042	152.2042	152.2042	152.2042	152.2042	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	53.6179	47.6230	38.7296	29.3208	21.9176	18.5038	19.9940	25.9890	34.8823	44.2911	51.6943	55.1081	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	340.1123	343.6416	334.7478	315.8142	291.9138	269.4508	254.4441	250.9148	259.8086	278.7422	302.6426	325.1056	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7572	52.7572	52.7572	52.7572	52.7572	52.7572	52.7572	52.7572	52.7572	52.7572	52.7572	52.7572	(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)	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	-101.4695	(71)
Water heating gains (Table 5)	78.1153	75.9327	71.3935	65.2239	61.2179	55.5787	50.7877	56.9286	59.1121	65.4974	72.7077	75.9400	(72)
Total internal gains	578.3374	573.6892	551.3628	516.8508	481.5412	450.0252	431.7177	440.3243	460.2949	495.0227	533.5365	562.6456	(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	
Northeast				0.9900	14.6176		0.6300	0.7000	0.7700		4.4227 (75)	
Southeast				3.5300	45.1778		0.6300	0.7000	0.7700		48.7385 (77)	
Northwest				8.1800	14.6176		0.6300	0.7000	0.7700		36.5429 (81)	
Solar gains	89.7040	142.0860	227.9539	337.2869	404.2113	457.0995	428.5196	367.1255	279.5659	178.6890	109.6674	73.8217 (83)
Total gains	668.0414	715.7751	779.3168	854.1377	885.7525	907.1247	860.2373	807.4497	739.8608	673.7116	643.2039	636.4673 (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	53.3132	53.7196	53.5868	53.8496	53.8496	53.9769	54.1014	54.2230	54.3418	53.9769	54.2230	53.9769	
alpha	4.5542	4.5813	4.5725	4.5900	4.5900	4.5985	4.6068	4.6149	4.6228	4.5985	4.6149	4.5985	
util living area	0.9842	0.9774	0.9545	0.8886	0.7540	0.5435	0.4005	0.4247	0.6920	0.9047	0.9701	0.9864	(86)
MIT	19.9487	20.0642	20.3199	20.6425	20.8767	20.9784	20.9958	20.9947	20.9376	20.6723	20.2850	19.9420	(87)
Th 2	20.0211	20.0277	20.0256	20.0299	20.0299	20.0319	20.0339	20.0359	20.0378	20.0319	20.0359	20.0319	(88)
util rest of house	0.9801	0.9715	0.9423	0.8593	0.6950	0.4586	0.3032	0.3223	0.6084	0.8721	0.9608	0.9828	(89)
MIT 2	19.0826	19.2014	19.4485	19.7539	19.9522	20.0229	20.0329	20.0346	20.0066	19.7894	19.4263	19.0850	(90)
Living area fraction													(91)
MIT	19.2683	19.3864	19.6353	19.9445	20.1504	20.2278	20.2394	20.2405	20.2062	19.9787	19.6104	19.2687	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2683	19.3864	19.6353	19.9445	20.1504	20.2278	20.2394	20.2405	20.2062	19.9787	19.6104	19.2687	(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	0.9760	0.9666	0.9364	0.8563	0.7029	0.4763	0.3241	0.3443	0.6241	0.8700	0.9557	0.9791	(94)
Useful gains	651.9842	691.8915	729.7291	731.4365	622.5780	432.0476	278.8246	277.9990	461.7183	586.1561	614.7161	623.1383	(95)
Ext temp.	4.9000	5.3000	7.0000	9.5000	12.5000	15.3000	17.1000	17.1000	14.7000	11.4000	7.9000	5.0000	(96)
Heat loss rate W	1299.9754	1264.8287	1137.3472	935.5506	685.2775	440.3580	279.8974	279.3658	488.7443	766.6185	1041.7252	1275.0891	(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	482.1054	385.0138	303.2679	146.9622	46.6484	0.0000	0.0000	0.0000	0.0000	134.2640	307.4465	485.0514	(98)
Space heating												2290.7595	(98)
Space heating per m2											(98) / (4) =	27.2256	(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													2525.6445	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	482.1054	385.0138	303.2679	146.9622	46.6484	0.0000	0.0000	0.0000	0.0000	134.2640	307.4465	485.0514	(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)	531.5385	424.4915	334.3637	162.0310	51.4315	0.0000	0.0000	0.0000	0.0000	148.0309	338.9708	534.7865	(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	152.7981	118.6449	96.1203	52.7729	32.1367	7.6701	3.6857	29.6898	52.7780	96.8130	129.9575	153.0520	(64)	
Efficiency of water heater	90.0100	90.0245	90.0100	89.9430	89.5366	87.9000	87.9000	87.9000	87.9000	89.5055	89.8496	90.0123	(217)	
Fuel for water heating, kWh/month	169.7569	131.7919	106.7886	58.6737	35.8922	8.7259	4.1930	33.7768	60.0432	108.1644	144.6388	170.0346	(219)	
Water heating fuel used												1032.4801	(219)	
Annual totals kWh/year														
Space heating fuel - main system													2525.6445	(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)													378.7637	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.76 * 1156 * 1.00) =										-702.9883			-702.9883	(233)
Total delivered energy for all uses													3358.9000	(238)

10a. Fuel costs - using BEDF prices (540)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2525.6445	7.6100	192.2015	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1032.4801	7.6100	78.5717	(247)
Pumps and fans for heating	75.0000	31.0800	23.3100	(249)
Pump for solar water heating	50.0000	31.0800	15.5400	(249)
Energy for lighting	378.7637	31.0800	117.7198	(250)
Additional standing charges			105.0000	(251)
Energy saving/generation technologies				
PV Unit	-702.9883	31.0800	-218.4887	(252)
Total energy cost			313.8543	(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	2525.6445	0.2160	545.5392	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1032.4801	0.2160	223.0157	(264)
Space and water heating			768.5549	(265)
Pumps and fans	125.0000	0.5190	64.8750	(267)
Energy for lighting	378.7637	0.5190	196.5784	(268)
Energy saving/generation technologies				
PV Unit	-702.9883	0.5190	-364.8509	(269)
Total kg/year			665.1574	(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	2525.6445	1.2200	3081.2863 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1032.4801	1.2200	1259.6257 (264)
Space and water heating			4340.9120 (265)
Pumps and fans	125.0000	3.0700	383.7500 (267)
Energy for lighting	378.7637	3.0700	1162.8046 (268)
Energy saving/generation technologies			
PV Unit	-702.9883	3.0700	-2158.1739 (269)
Primary energy kWh/year			3729.2927 (272)
Primary energy kWh/m2/year			44.3225 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0645 Plot 39	Issued on Date	11/04/2024
Assessment Reference	As Built	Prop Type Ref	Block I
Project	13 Fieldfare Crescent, BOTLEY, SO32 2TW		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	13.90	TER	18.51
Environmental	90 B	% DER<TER	24.89		
CO ₂ Emissions (t/year)	0.86	DFEE	43.21	TFEE	53.33
General Requirements Compliance	Pass	% DFEE<TFEE	18.97		

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

Building Elements

Roof 000002 - Mineral Wool between and above

Roof Type: Pitched Roof, insulated flat ceiling

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

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

Unheated space: None

Total thickness: 463 mm

U-value: 0.10 W/m² K

Kappa: n/a

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0645 Plot 39	Issued on Date	11/04/2024
Assessment Reference	As Built	Prop Type Ref	Block I
Project	13 Fieldfare Crescent, BOTLEY, SO32 2TW		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	13.90	TER	18.51
Environmental	90 B	% DER<TER	24.89		
CO ₂ Emissions (t/year)	0.86	DFEE	43.21	TFEE	53.33
General Requirements Compliance	Pass	% DFEE<TFEE	18.97		

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

Wall 000003

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 0645 Plot 39	Issued on Date	11/04/2024
Assessment Reference	As Built	Prop Type Ref	Block I
Project	13 Fieldfare Crescent, BOTLEY, SO32 2TW		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	13.90	TER	18.51
Environmental	90 B	% DER<TER	24.89		
CO ₂ Emissions (t/year)	0.86	DFEE	43.21	TFEE	53.33
General Requirements Compliance	Pass	% DFEE<TFEE	18.97		

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

Floor 000004 - Floor - suspended beam-and-block floor

Floor Type: Suspended Floor

Area = 42.17 m², Perimeter = 18.32 m, Wall thickness = 300.00 mm, Soil: Clay

Depth of underfloor space below ground: 0.200 m Floor wind shielding: Average (suburban)

Floor height above ground: h = 0.000 m

U-value of walls above ground: U_w = 1.500 m

Ventilation openings per perimeter length: e = 0.0015 %

Mean wind speed: v = 5.000 m/s

Resistance on solum: R_g = 0.000 m²K/W

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				0.1700			
Layer 1	Extruded polystyrene						
	Main construction	100	0.0270	3.7037	100.00		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 2	Extruded polystyrene						
	Main construction	200	0.0270	7.4074	91.67		
	Main construction	200	2.3000	0.0870	8.33		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 3	Concrete, reinforced (1% steel)						
	Main construction	75	2.3000	0.0326	100.00	2000	1000
Layer 4	Screed						
	Main construction	75	1.1500	0.0652	100.00	1200	1000
Int surface				0.1700			

Total resistance: Upper limit = 10.093 m² K/W Lower limit = 5.066 m² K/W Average = 7.579 m² K/W

Total correction = 0.0025 m² K/W

U-value (unrounded) = 0.11 W/m² K

Unheated space: None

Total thickness: 450 mm

U-value: 0.11 W/m² K

Kappa: 140.00 kJ/m² K

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Property Reference	SAP 0645 Plot 39			Issued on Date	11/04/2024
Assessment Reference	As Built	Prop Type Ref	Block I		
Property	13 Fieldfare Crescent, BOTLEY, SO32 2TW				
SAP Rating	88 B	DER	13.90	TER	18.51
Environmental	90 B	% DER<TER	24.89		
CO ₂ Emissions (t/year)	0.86	DFEE	43.21	TFEE	53.33
General Requirements Compliance	Pass	% DFEE<TFEE	18.97		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com			Assessor ID	E477-0001
Client	Foreman Homes, FORE				

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

Orientation	South 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	2019
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements		Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	Ground Floor:	18.32 m	42.07 m ²	2.39 m
	1st Storey:	18.32 m	42.07 m ²	2.67 m

7.0 Living Area	18.04	m ²
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8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	206.38	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	92.70	77.88

9.1 Party Walls			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)
Description	Type	Construction			
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	44.34

9.2 Internal Walls			Kappa (kJ/m ² K)	Area (m ²)
Description	Construction			
Ground Floor Stud	Plasterboard on timber frame		9.00	65.92
First Floor Stud	Plasterboard on timber frame		9.00	91.44

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	Plasterboard, insulated at ceiling level	0.10	9.00	42.07	42.07

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	42.07

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)
Ground Floor	Ground Floor - Solid	Other	0.11	140.00	42.07

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	42.07

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	Half Glazed Door	Double Low-E Soft 0.1			0.63		0.70	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 Elevation	Half Glazed Door	[1] Brick and Block	South East							2.12	
Front Elevation	Window	[1] Brick and Block	South East	None	0.00					1.47	
Rear Elevation	Window	[1] Brick and Block	North West	None	0.00					8.18	
Side Elevation	Window	[1] Brick and Block	North East	None	0.00					0.99	
Front Elevation	Window	[1] Brick and Block	South East	None	0.00					2.06	

14.0 Conservatory

15.0 Draught Proofing

 %

16.0 Draught Lobby

17.0 Thermal Bridging

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	0.49	0.093	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.26	0.077	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	2.75	0.070	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.01	0.071	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	2.40	0.067	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.51	0.070	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.77	0.064	No	Birtley Supatherm
Independently assessed	E3 Sill	8.66	0.021	No	Knauf P5
Independently assessed	E4 Jamb	27.45	0.016	No	Knauf P6
Independently assessed	E5 Ground floor (normal)	18.34	0.062	No	BE-E5-23902
Independently assessed	E6 Intermediate floor within a dwelling	18.34	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)	8.78	0.044	No	Knauf P 21
Independently assessed	E16 Corner (normal)	10.10	0.039	No	Knauf P23
Independently assessed	E18 Party wall between dwellings	10.10	0.036	No	Knauf P25
Table K1 - Default	P1 Party wall - Ground floor	8.78	0.160	No	
Table K1 - Default	P2 Party wall - Intermediate floor within a dwelling	8.78	0.000	No	
Independently assessed	P4 Party wall - Roof (insulation at ceiling level)	8.78	0.035	No	Knauf P29

Y-value W/m²K

18.0 Pressure Testing

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Designed AP ₅₀	5.00	m ³ /(h.m ²) @ 50 Pa
Property Tested ?	Yes	
As Built AP ₅₀	4.67	m ³ /(h.m ²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Windows half open
Cross ventilation possible	Yes
Night Ventilation	Yes
Air change rate	4.00

Mechanical Ventilation

Mechanical Ventilation System Present	No
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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	19	
Total number of L.E.L. fittings	19	
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

Description	Database	
Percentage of Heat	Combi Boiler	%
Database Ref. No.	100	
Fuel Type	17515	
Main Heating	Mains gas	
SAP Code	BGW	
In Winter	104	
In Summer	90.7	
Controls	87.9	
PCDF Controls	CBE Programmer, room thermostat and TRVs	
Delayed Start Stat	0	
Sap Code	No	
Flue Type	2106	
Fan Assisted Flue	Balanced	
Is MHS Pumped	Yes	
Heat Emitter	Pump in heated space	
Flow Temperature	Radiators	
	Normal (> 45°C)	

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Combi boiler type	Standard Combi
Combi keep hot type	Gas/Oil, time clock
25.0 Main Heating 2	None

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

29.0 Hot Water Cylinder	None
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32.0 Photovoltaic Unit	One Dwelling			
PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
0.76	South 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	£61	B 89	