



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 10 Shaw Road, West End
Southampton, SO30 3JZ

Contact: Tobias Whiting
Abacus Energy (UK) Ltd
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Report Issue Date: 01/03/2022

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Plot 70	Issued on Date	01/03/2022
Assessment Reference	As Built	Prop Type Ref	H (HA/SO)
Property	10 Shaw Road, West End, Southampton, SO30 3JZ		
SAP Rating	88 B	DER	13.19
Environmental	90 B	TER	17.87
CO ₂ Emissions (t/year)	0.78	% DER<TER	26.17
General Requirements Compliance	Pass	DFEE	40.76
		TFEE	50.41
		% DFEE<TFEE	19.14
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com		Assessor ID
			E477-0001
Client	Foreman Homes, FORE		

SUMMARY FOR INPUT DATA FOR New Build (As Built)

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)	17.87	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	13.19	kgCO ₂ /m ²	Pass
	-4.68 (-26.2%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	50.41	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	40.76	kWh/m ² /yr	
	-9.6 (-19.0%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.03 (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

4.47 m², No overhang

Windows facing East

1.92 m², No overhang

Windows facing South

8.00 m², No overhang

Air change rate

4.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

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

Maximum

10.0 m³/(h.m²) @ 50 Pa

Pass

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BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

10 Key features

Party wall U-value	0.00	W/m ² K
Roof U-value	0.10	W/m ² K
Floor U-value	0.12	W/m ² K
Door U-value	1.10	W/m ² K
Thermal bridging ψ -value	0.038	W/m ² K
Photovoltaic array	0.73	kW

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THERMAL BRIDGING

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Environmental	90 B	% DER<TER	26.17		
CO ₂ Emissions (t/year)	0.78	DFEE	40.76	TFEE	50.41
General Requirements Compliance	Pass	% DFEE<TFEE	19.14		

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Client	Foreman Homes, FORE
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	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.098	1.12	0.11	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.053	1.01	0.05	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.043	7.20	0.31	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.060	3.28	0.20	Birtley Supatherm
External wall	E3 Sill	Independently assessed	0.034	10.09	0.34	CD0027
External wall	E4 Jamb	Independently assessed	0.039	28.50	1.11	CD0028
External wall	E5 Ground floor (normal)	Independently assessed	0.037	18.38	0.68	Knauf P7
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	18.38	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	9.70	0.58	
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.054	8.78	0.47	CD0031
External wall	E16 Corner (normal)	Independently assessed	0.050	10.10	0.51	CD0035
External wall	E18 Party wall between dwellings	Table K1 - Approved	0.060	10.10	0.61	
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	0.049	8.78	0.43	CD0020

Total: **6.81** W/mK:
Y-Value: **0.038** W/m²K:

FULL SAP CALCULATION PRINTOUT

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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) 17.87 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 13.19 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 50.4 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 40.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.19 (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: 4.03 (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: 4.47 m², No overhang
Windows facing East: 1.92 m², No overhang
Windows facing South: 8.00 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.10 W/m²K
Floor U-value 0.12 W/m²K
Door U-value 1.10 W/m²K
Thermal bridging y-value 0.038 W/m²K
Photovoltaic array 0.73 kW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.0300 (1b)	x 2.3900 (2b)	= 100.4517 (1b) - (3b)
First floor	42.0300 (1c)	x 2.6700 (2c)	= 112.2201 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.0600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.6718 (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) = 0.1881 (8)
Pressure test					Yes
Measured/design AP50					4.0300
Infiltration rate					0.3896 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3604 (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	0.4595	0.4505	0.4414	0.3964	0.3874	0.3423	0.3423	0.3333	0.3604	0.3874	0.4054	0.4234 (22b)
Effective ac	0.6056	0.6015	0.5974	0.5786	0.5750	0.5586	0.5586	0.5556	0.5649	0.5750	0.5822	0.5896 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			14.3900	1.1450	16.4771		(27)
Ground Floor			42.0300	0.1200	5.0436	84.0000	3530.5200 (28a)
Brick and Block	93.0000	16.5100	76.4900	0.2400	18.3576	42.2200	3229.4078 (29a)
Pitched Roof	42.0300		42.0300	0.1000	4.2030	9.1000	382.4730 (30)
Total net area of external elements Aum(A, m ²)			177.0600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.4133		(33)
Party Wall 1			44.3300	0.0000	0.0000	70.0000	3103.1000 (32)
GF Stud			70.3600			9.0000	633.2400 (32c)
First Floor			96.9900			9.0000	872.9100 (32c)
Internal Floor 1			42.0300			18.0000	756.5400 (32d)
Internal Ceiling 1			42.0300			18.0000	756.5400 (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) = 13264.7308 (34)
157.8007 (35)
6.8065 (36)
(33) + (36) = 53.2197 (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	42.4988	42.2111	41.9292	40.6048	40.3570	39.2035	39.2035	38.9899	39.6478	40.3570	40.8583	41.3823 (38)
Heat transfer coeff	95.7185	95.4309	95.1489	93.8246	93.5768	92.4233	92.4233	92.2097	92.8676	93.5768	94.0780	94.6021 (39)
Average = Sum(39)m / 12 =												93.8234 (39)
HLP	1.1387	1.1353	1.1319	1.1162	1.1132	1.0995	1.0995	1.0970	1.1048	1.1132	1.1192	1.1254 (40)
HLP (average)												1.1161 (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												2.5354 (42)
Average daily hot water use (litres/day)												94.4157 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	103.8573	100.0806	96.3040	92.5274	88.7507	84.9741	84.9741	88.7507	92.5274	96.3040	100.0806	103.8573 (44)
Energy conte	154.0173	134.7045	139.0030	121.1862	116.2810	100.3417	92.9813	106.6974	107.9717	125.8306	137.3540	149.1575 (45)
Energy content (annual)										Total = Sum(45)m =		1485.5264 (45)

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	23.1026	20.2057	20.8505	18.1779	17.4422	15.0513	13.9472	16.0046	16.1958	18.8746	20.6031	22.3736 (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	27.5591	24.8897	27.5305	26.6128	27.4784	26.5671	27.4373	27.4639	26.5920	27.5089	26.6557	27.5511 (61)
Total heat required for water heating calculated for each month	181.5764	159.5942	166.5335	147.7990	143.7594	126.9088	120.4186	134.1614	134.5638	153.3396	164.0097	176.7086 (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	181.5764	159.5942	166.5335	147.7990	143.7594	126.9088	120.4186	134.1614	134.5638	153.3396	164.0097	176.7086 (64)
Heat gains from water heating, kWh/month	58.1005	51.0117	53.1011	46.9476	45.5330	40.0054	37.7756	42.3429	42.5486	48.7159	52.3341	56.4826 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1809.3731 (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	126.7699	126.7699	126.7699	126.7699	126.7699	126.7699	126.7699	126.7699	126.7699	126.7699	126.7699	126.7699 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.9117	18.5736	15.1051	11.4355	8.5482	7.2167	7.7979	10.1360	13.6046	17.2741	20.1615	21.4929 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	227.7164	230.0793	224.1247	211.4480	195.4459	180.4062	170.3587	167.9957	173.9504	186.6271	202.6292	217.6689 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6770	35.6770	35.6770	35.6770	35.6770	35.6770	35.6770	35.6770	35.6770	35.6770	35.6770	35.6770 (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)	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159 (71)
Water heating gains (Table 5)	78.0921	75.9102	71.3725	65.2050	61.2003	55.5631	50.7737	56.9125	59.0953	65.4784	72.6863	75.9175 (72)
Total internal gains	390.7511	388.5941	374.6332	352.1194	329.2253	307.2169	292.9613	299.0752	310.6812	333.4106	359.5079	379.1103 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				4.4700	10.6334	0.6300	0.7000	0.7700	14.5262 (74)			
East				1.9200	19.6403	0.6300	0.7000	0.7700	11.5245 (76)			
South				8.0000	46.7521	0.6300	0.7000	0.7700	114.3043 (78)			
Solar gains	140.3549	237.5055	322.7596	399.4298	449.2774	447.4774	430.7672	392.9465	348.9964	261.7095	167.7791	120.3563 (83)
Total gains	531.1061	626.0997	697.3927	751.5493	778.5027	754.6943	723.7285	692.0217	659.6776	595.1201	527.2870	499.4666 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	38.4946	38.6106	38.7251	39.2717	39.3757	39.8671	39.8671	39.9594	39.6764	39.3757	39.1659	38.9489
alpha	3.5663	3.5740	3.5817	3.6181	3.6250	3.6578	3.6578	3.6640	3.6451	3.6250	3.6111	3.5966
util living area	0.9868	0.9757	0.9551	0.9107	0.8252	0.6813	0.5298	0.5690	0.7732	0.9272	0.9772	0.9893 (86)
MIT	19.3007	19.5348	19.8694	20.2828	20.6372	20.8765	20.9629	20.9514	20.7914	20.3291	19.7403	19.2618 (87)
Th 2	19.9694	19.9721	19.9749	19.9877	19.9901	20.0012	20.0012	20.0033	19.9969	19.9901	19.9852	19.9801 (88)
util rest of house	0.9839	0.9704	0.9451	0.8899	0.7824	0.6036	0.4225	0.4626	0.7066	0.9059	0.9714	0.9869 (89)
MIT 2	18.4237	18.6570	18.9878	19.3966	19.7247	19.9315	19.9875	19.9839	19.8668	19.4494	18.8725	18.3933 (90)
Living area fraction	18.6132	18.8468	19.1783	19.5882	19.9220	20.1358	20.1983	20.1930	20.0667	19.6396	19.0601	0.2162 (91)
MIT	18.6132	18.8468	19.1783	19.5882	19.9220	20.1358	20.1983	20.1930	20.0667	19.6396	19.0601	18.5810 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6132	18.8468	19.1783	19.5882	19.9220	20.1358	20.1983	20.1930	20.0667	19.6396	19.0601	18.5810 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9789	0.9631	0.9355	0.8801	0.7791	0.6150	0.4447	0.4840	0.7117	0.8968	0.9645	0.9826 (94)
Ext temp.	519.8801	602.9774	652.4084	661.4445	606.5667	464.1023	321.8259	334.9438	469.5226	533.7320	508.5731	490.7769 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Month fracti	1370.0426	1330.9520	1206.3308	1002.8123	769.3849	511.6355	332.5713	349.7542	554.1118	845.8930	1125.1795	1360.4727 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating	632.5209	489.1990	412.1183	245.7848	121.1367	0.0000	0.0000	0.0000	0.0000	232.2478	443.9566	647.0537 (98)
Space heating per m2												3224.0179 (98)
												(98) / (4) = 38.3538 (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													3554.5952 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	632.5209	489.1990	412.1183	245.7848	121.1367	0.0000	0.0000	0.0000	0.0000	232.2478	443.9566	647.0537	(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)	697.3770	539.3594	454.3752	270.9865	133.5576	0.0000	0.0000	0.0000	0.0000	256.0616	489.4780	713.3999	(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	181.5764	159.5942	166.5335	147.7990	143.7594	126.9088	120.4186	134.1614	134.5638	153.3396	164.0097	176.7086	(64)
Efficiency of water heater (217)m	90.0601	89.9948	89.8761	89.6279	89.1587	87.9000	87.9000	87.9000	87.9000	89.5654	89.9272	87.9000	(216)
Fuel for water heating, kWh/month	201.6169	177.3371	185.2924	164.9030	161.2400	144.3787	136.9950	152.6295	153.0873	171.2040	182.3805	196.1589	(219)
Water heating fuel used												2027.2232	(219)
Annual totals kWh/year													
Space heating fuel - main system												3554.5952	(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)												369.3072	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.73 * 1080 * 1.00) =										-630.4424		-630.4424	(233)
Total delivered energy for all uses												5395.6832	(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	3554.5952	0.2160	767.7926 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2027.2232	0.2160	437.8802 (264)
Space and water heating			1205.6728 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	369.3072	0.5190	191.6704 (268)
Energy saving/generation technologies			
PV Unit	-630.4424	0.5190	-327.1996 (269)
Total CO2, kg/year			1109.0686 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			13.1900 (273)

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

DER			13.1900 ZC1
Total Floor Area		TFA	84.0600
Assumed number of occupants		N	2.5354
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			16.0528 ZC2
CO2 emissions from cooking, equation (L16)			2.1395 ZC3
Total CO2 emissions			31.3823 ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000 ZC7
Net CO2 emissions			31.3823 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	42.0300 (1b)	x 2.3900 (2b)	= 100.4517 (1b) - (3b)
First floor	42.0300 (1c)	x 2.6700 (2c)	= 112.2201 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.0600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.6718 (5)

2. Ventilation rate

										main	secondary	other	total	m3 per hour			
										heating	heating						
Number of chimneys										0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues										0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans																3 * 10 =	30.0000 (7a)
Number of passive vents																0 * 10 =	0.0000 (7b)
Number of flueless gas fires																0 * 40 =	0.0000 (7c)
														Air changes per hour			
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000	/ (5) =	0.1411 (8)	
Pressure test															Yes		
Measured/design AP50															5.0000		
Infiltration rate															0.3911	(18)	
Number of sides sheltered															1	(19)	
Shelter factor														(20) = 1 - [0.075 x (19)] =	0.9250	(20)	
Infiltration rate adjusted to include shelter factor														(21) = (18) x (20) =	0.3617	(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)				
	0.4612	0.4522	0.4431	0.3979	0.3889	0.3436	0.3436	0.3346	0.3617	0.3889	0.4069	0.4250	(22b)				
Effective ac	0.6064	0.6022	0.5982	0.5792	0.5756	0.5590	0.5590	0.5560	0.5654	0.5756	0.5828	0.5903	(25)				

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			2.1200	1.0000	2.1200		(26)					
TER Opening Type (Uw = 1.40)			14.3900	1.3258	19.0777		(27)					
Ground Floor			42.0300	0.1300	5.4639		(28a)					
Brick and Block	93.0000	16.5100	76.4900	0.1800	13.7682		(29a)					
Pitched Roof	42.0300		42.0300	0.1300	5.4639		(30)					
Total net area of external elements Aum(A, m2)			177.0600				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.8937		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.8806 (36)					
Total fabric heat loss						(33) + (36) =	55.7743 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 42.5552	Feb 42.2653	Mar 41.9812	Apr 40.6468	May 40.3971	Jun 39.2348	Jul 39.2348	Aug 39.0196	Sep 39.6825	Oct 40.3971	Nov 40.9022	Dec 41.4302 (38)
Heat transfer coeff	98.3294	98.0396	97.7555	96.4210	96.1713	95.0091	95.0091	94.7938	95.4568	96.1713	96.6764	97.2045 (39)
Average = Sum(39)m / 12 =												96.4198 (39)
HLP	Jan 1.1698	Feb 1.1663	Mar 1.1629	Apr 1.1470	May 1.1441	Jun 1.1303	Jul 1.1303	Aug 1.1277	Sep 1.1356	Oct 1.1441	Nov 1.1501	Dec 1.1564 (40)
HLP (average)												1.1470 (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												2.5354 (42)
Average daily hot water use (litres/day)												94.4157 (43)
Daily hot water use	Jan 103.8573	Feb 100.0806	Mar 96.3040	Apr 92.5274	May 88.7507	Jun 84.9741	Jul 84.9741	Aug 88.7507	Sep 92.5274	Oct 96.3040	Nov 100.0806	Dec 103.8573 (44)
Energy conte	154.0173	134.7045	139.0030	121.1862	116.2810	100.3417	92.9813	106.6974	107.9717	125.8306	137.3540	149.1575 (45)
Energy content (annual)										Total = Sum(45)m =		1485.5264 (45)
Distribution loss (46)m = 0.15 x (45)m	23.1026	20.2057	20.8505	18.1779	17.4422	15.0513	13.9472	16.0046	16.1958	18.8746	20.6031	22.3736 (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	49.0755	45.6299	45.2264	41.9050	43.3019	45.2264	45.6299	49.0755	49.3151	50.9589 (61)
Solar input	204.9762	180.7319	188.0785	166.8161	161.5074	142.2467	136.2832	151.9238	153.6017	174.9061	186.6691	200.1164 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	204.9762	180.7319	188.0785	166.8161	161.5074	142.2467	136.2832	151.9238	153.6017	174.9061	186.6691	200.1164 (64)
	63.9505	56.2961	58.4874	51.7019	49.9700	43.8399	41.7418	46.7835	47.3081	54.1076	57.9990	62.3346 (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	126.7699	126.7699	126.7699	126.7699	126.7699	126.7699	126.7699	126.7699	126.7699	126.7699	126.7699	126.7699	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.9117	18.5736	15.1051	11.4355	8.5482	7.2167	7.7979	10.1360	13.6046	17.2741	20.1615	21.4929	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	227.7164	230.0793	224.1247	211.4480	195.4459	180.4062	170.3587	167.9957	173.9504	186.6271	202.6292	217.6689	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6770	35.6770	35.6770	35.6770	35.6770	35.6770	35.6770	35.6770	35.6770	35.6770	35.6770	35.6770	(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)	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	(71)
Water heating gains (Table 5)	85.9549	83.7740	78.6120	71.8082	67.1640	60.8887	56.1045	62.8810	65.7057	72.7252	80.5541	83.7831	(72)
Total internal gains	398.6140	396.4578	381.8728	358.7226	335.1890	312.5426	298.2921	305.0438	317.2916	340.6574	367.3757	386.9758	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				4.4700	10.6334	0.6300	0.7000	0.7700	14.5262 (74)			
East				1.9200	19.6403	0.6300	0.7000	0.7700	11.5245 (76)			
South				8.0000	46.7521	0.6300	0.7000	0.7700	114.3043 (78)			
Solar gains	140.3549	237.5055	322.7596	399.4298	449.2774	447.4774	430.7672	392.9465	348.9964	261.7095	167.7791	120.3563 (83)
Total gains	538.9689	633.9634	704.6323	758.1525	784.4664	760.0200	729.0593	697.9903	666.2880	602.3669	535.1549	507.3322 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.3668	59.5423	59.7153	60.5418	60.6990	61.4415	61.4415	61.5810	61.1533	60.6990	60.3818	60.0538	
alpha	4.9578	4.9695	4.9810	5.0361	5.0466	5.0961	5.0961	5.1054	5.0769	5.0466	5.0255	5.0036	
util living area	0.9973	0.9935	0.9843	0.9569	0.8842	0.7310	0.5585	0.6022	0.8306	0.9677	0.9941	0.9980	(86)
MIT	19.7703	19.9434	20.1931	20.5067	20.7754	20.9412	20.9878	20.9824	20.8821	20.5333	20.0930	19.7426	(87)
Th 2	19.9443	19.9471	19.9498	19.9626	19.9650	19.9762	19.9762	19.9783	19.9719	19.9650	19.9601	19.9551	(88)
util rest of house	0.9964	0.9914	0.9787	0.9406	0.8401	0.6402	0.4362	0.4796	0.7559	0.9523	0.9917	0.9973	(89)
MIT 2	18.3117	18.5656	18.9292	19.3838	19.7424	19.9364	19.9717	19.9710	19.8785	19.4293	18.7942	18.2789	(90)
Living area fraction	18.6270	18.8634	19.2024	19.6265	19.9657	20.1536	20.1913	20.1896	20.0955	19.6680	19.0749	18.5953	(91)
MIT	18.6270	18.8634	19.2024	19.6265	19.9657	20.1536	20.1913	20.1896	20.0955	19.6680	19.0749	18.5953	(92)
Temperature adjustment	18.6270	18.8634	19.2024	19.6265	19.9657	20.1536	20.1913	20.1896	20.0955	19.6680	19.0749	18.5953	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9947	0.9882	0.9734	0.9340	0.8401	0.6572	0.4628	0.5061	0.7661	0.9465	0.9888	0.9960	(94)
Ext temp.	536.1192	626.4657	685.8717	708.1143	659.0267	499.4723	337.3823	353.2584	510.4480	570.1361	529.1413	505.3089	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	1408.7654	1368.9671	1241.7298	1034.2598	794.9262	527.6382	341.2086	359.2319	572.3076	872.0772	1157.6912	1399.2896	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating	649.2488	498.9609	413.5584	234.8248	101.1093	0.0000	0.0000	0.0000	0.0000	224.6442	452.5559	665.1216	(98)
Space heating per m2												3240.0239	(98)
												38.5442	(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												3468.9764 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	649.2488	498.9609	413.5584	234.8248	101.1093	0.0000	0.0000	0.0000	0.0000	224.6442	452.5559	665.1216 (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)	695.1272	534.2194	442.7820	251.4184	108.2540	0.0000	0.0000	0.0000	0.0000	240.5184	484.5352	712.1217 (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	204.9762	180.7319	188.0785	166.8161	161.5074	142.2467	136.2832	151.9238	153.6017	174.9061	186.6691	200.1164 (64)
Efficiency of water heater (217)m	87.7515	87.4744	86.9800	85.9119	83.9094	80.3000	80.3000	80.3000	80.3000	85.6823	87.1972	80.3000 (216)
Fuel for water heating, kWh/month	233.5870	206.6111	216.2319	194.1711	192.4784	177.1441	169.7176	189.1953	191.2848	204.1333	214.0768	227.8075 (219)
Water heating fuel used												2416.4390 (219)
Annual totals kWh/year												
Space heating fuel - main system												3468.9764 (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)												369.3072 (232)
Total delivered energy for all uses												6329.7225 (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	3468.9764	0.2160	749.2989 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2416.4390	0.2160	521.9508 (264)
Space and water heating			1271.2497 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	369.3072	0.5190	191.6704 (268)
Total CO2, kg/m2/year			1501.8451 (272)
Emissions per m2 for space and water heating			15.1231 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.2802 (272b)
Emissions per m2 for pumps and fans			0.4631 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.1231 * 1.00) + 2.2802 + 0.4631, rounded to 2 d.p.			17.8700 (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	42.0300 (1b)	x 2.3900 (2b)	= 100.4517 (1b) - (3b)
First floor	42.0300 (1c)	x 2.6700 (2c)	= 112.2201 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.0600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.6718 (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) = 0.1411 (8)
Pressure test					Yes
Measured/design AP50					4.0300
Infiltration rate					0.3426 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3169 (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	0.4040	0.3961	0.3882	0.3486	0.3406	0.3010	0.3010	0.2931	0.3169	0.3406	0.3565	0.3723 (22b)
Effective ac	0.5816	0.5784	0.5753	0.5607	0.5580	0.5453	0.5453	0.5430	0.5502	0.5580	0.5635	0.5693 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			14.3900	1.1450	16.4771		(27)
Ground Floor			42.0300	0.1200	5.0436	84.0000	3530.5200 (28a)
Brick and Block	93.0000	16.5100	76.4900	0.2400	18.3576	42.2200	3229.4078 (29a)
Pitched Roof	42.0300		42.0300	0.1000	4.2030	9.1000	382.4730 (30)
Total net area of external elements Aum(A, m ²)			177.0600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.4133		(33)
Party Wall 1			44.3300	0.0000	0.0000	70.0000	3103.1000 (32)
GF Stud			70.3600			9.0000	633.2400 (32c)
First Floor			96.9900			9.0000	872.9100 (32c)
Internal Floor 1			42.0300			18.0000	756.5400 (32d)
Internal Ceiling 1			42.0300			9.0000	378.2700 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 12886.4608 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 153.3007 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.8065 (36)
Total fabric heat loss (33) + (36) = 53.2197 (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	40.8185	40.5961	40.3781	39.3541	39.1625	38.2707	38.2707	38.1055	38.6142	39.1625	39.5501	39.9553 (38)
Heat transfer coeff	94.0383	93.8158	93.5978	92.5739	92.3823	91.4904	91.4904	91.3253	91.8340	92.3823	92.7698	93.1750 (39)
Average = Sum(39)m / 12 =												92.5729 (39)
HLP	1.1187	1.1161	1.1135	1.1013	1.0990	1.0884	1.0884	1.0864	1.0925	1.0990	1.1036	1.1084 (40)
HLP (average)												1.1013 (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 2.5354 (42)
Average daily hot water use (litres/day) 94.4157 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	103.8573	100.0806	96.3040	92.5274	88.7507	84.9741	84.9741	88.7507	92.5274	96.3040	100.0806	103.8573 (44)
Energy conte	154.0173	134.7045	139.0030	121.1862	116.2810	100.3417	92.9813	106.6974	107.9717	125.8306	137.3540	149.1575 (45)
Energy content (annual)										Total = Sum(45)m =		1485.5264 (45)

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Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	32.7287	28.6247	29.5381	25.7521	24.7097	21.3226	19.7585	22.6732	22.9440	26.7390	29.1877	31.6960 (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	126.7699	126.7699	126.7699	126.7699	126.7699	126.7699	126.7699	126.7699	126.7699	126.7699	126.7699	126.7699	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.9117	18.5736	15.1051	11.4355	8.5482	7.2167	7.7979	10.1360	13.6046	17.2741	20.1615	21.4929	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	227.7164	230.0793	224.1247	211.4480	195.4459	180.4062	170.3587	167.9957	173.9504	186.6271	202.6292	217.6689	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6770	35.6770	35.6770	35.6770	35.6770	35.6770	35.6770	35.6770	35.6770	35.6770	35.6770	35.6770	(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)	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	(71)
Water heating gains (Table 5)	43.9902	42.5963	39.7018	35.7668	33.2120	29.6147	26.5572	30.4747	31.8667	35.9395	40.5385	42.6021	(72)
Total internal gains	353.6492	352.2802	339.9625	319.6812	298.2370	278.2686	265.7448	269.6375	280.4526	300.8717	324.3601	342.7949	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				4.4700	10.6334	0.6300	0.7000	0.7700	14.5262 (74)			
East				1.9200	19.6403	0.6300	0.7000	0.7700	11.5245 (76)			
South				8.0000	46.7521	0.6300	0.7000	0.7700	114.3043 (78)			
Solar gains	140.3549	237.5055	322.7596	399.4298	449.2774	447.4774	430.7672	392.9465	348.9964	261.7095	167.7791	120.3563 (83)
Total gains	494.0041	589.7857	662.7221	719.1110	747.5144	725.7460	696.5120	662.5840	629.4490	562.5812	492.1392	463.1512 (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	38.0651	38.1553	38.2442	38.6672	38.7474	39.1251	39.1251	39.1959	38.9787	38.7474	38.5855	38.4177	
alpha	3.5377	3.5437	3.5496	3.5778	3.5832	3.6083	3.6083	3.6131	3.5986	3.5832	3.5724	3.5612	
util living area	0.9885	0.9779	0.9582	0.9156	0.8327	0.6924	0.5413	0.5831	0.7851	0.9334	0.9799	0.9908	(86)
MIT	19.2441	19.4839	19.8266	20.2473	20.6139	20.8642	20.9582	20.9447	20.7721	20.2893	19.6849	19.1997	(87)
Th 2	19.9856	19.9877	19.9899	19.9998	20.0016	20.0103	20.0103	20.0119	20.0070	20.0016	19.9979	19.9940	(88)
util rest of house	0.9860	0.9733	0.9491	0.8960	0.7917	0.6162	0.4340	0.4769	0.7210	0.9139	0.9749	0.9888	(89)
MIT 2	18.3825	18.6214	18.9602	19.3750	19.7160	19.9322	19.9944	19.9892	19.8622	19.4236	18.8302	18.3446	(90)
Living area fraction									fLA = Living area / (4) =			0.2162	(91)
MIT	18.5687	18.8078	19.1475	19.5636	19.9101	20.1337	20.2027	20.1958	20.0589	19.6107	19.0149	18.5295	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5687	18.8078	19.1475	19.5636	19.9101	20.1337	20.2027	20.1958	20.0589	19.6107	19.0149	18.5295	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	484.8034	569.8613	622.6503	637.0025	588.6378	454.7213	317.5581	329.8930	456.2271	508.8688	476.5902	456.1247	(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	1341.8045	1304.7748	1183.7777	987.1685	758.4675	506.2779	329.6150	346.6482	547.2272	832.4301	1105.3472	1335.1479	(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	637.6088	493.8619	417.4788	252.1195	126.3533	0.0000	0.0000	0.0000	0.0000	240.7296	452.7050	653.9932	(98)
Space heating												3274.8500	(98)
Space heating per m2										(98) / (4) =		38.9585	(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	860.0100	677.0292	694.0720	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8177	0.8808	0.8617	0.0000	0.0000	0.0000	0.0000	(101)

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Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	703.2220	596.3415	598.0488	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	943.4008	907.2686	869.2986	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	172.9288	231.3298	201.8099	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												606.0684 (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	43.2322	57.8324	50.4525	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												151.5171 (107)
Space cooling per m2												1.8025 (108)
Energy for space heating												38.9585 (99)
Energy for space cooling												1.8025 (108)
Total												40.7610 (109)
Dwelling Fabric Energy Efficiency (DFEE)												40.8 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.0300 (1b)	x 2.3900 (2b)	= 100.4517 (1b) - (3b)
First floor	42.0300 (1c)	x 2.6700 (2c)	= 112.2201 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.0600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.6718 (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) = 0.1411 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3911 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3617 (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	0.4612	0.4522	0.4431	0.3979	0.3889	0.3436	0.3436	0.3346	0.3617	0.3889	0.4069	0.4250 (22b)
Effective ac	0.6064	0.6022	0.5982	0.5792	0.5756	0.5590	0.5590	0.5560	0.5654	0.5756	0.5828	0.5903 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.40)			14.3900	1.3258	19.0777		(27)
Ground Floor			42.0300	0.1300	5.4639		(28a)
Brick and Block	93.0000	16.5100	76.4900	0.1800	13.7682		(29a)
Pitched Roof	42.0300		42.0300	0.1300	5.4639		(30)
Total net area of external elements Aum(A, m ²)			177.0600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.8937		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.8806 (36)
Total fabric heat loss						(33) + (36) =	55.7743 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	42.5552	42.2653	41.9812	40.6468	40.3971	39.2348	39.2348	39.0196	39.6825	40.3971	40.9022	41.4302 (38)
Heat transfer coeff	98.3294	98.0396	97.7555	96.4210	96.1713	95.0091	95.0091	94.7938	95.4568	96.1713	96.6764	97.2045 (39)
Average = Sum(39)m / 12 =												96.4198 (39)

HLP	Jan 1.1698	Feb 1.1663	Mar 1.1629	Apr 1.1470	May 1.1441	Jun 1.1303	Jul 1.1303	Aug 1.1277	Sep 1.1356	Oct 1.1441	Nov 1.1501	Dec 1.1564 (40)
HLP (average)												1.1470 (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												2.5354 (42)
Average daily hot water use (litres/day)												94.4157 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	103.8573	100.0806	96.3040	92.5274	88.7507	84.9741	84.9741	88.7507	92.5274	96.3040	100.0806	103.8573 (44)
Energy conte	154.0173	134.7045	139.0030	121.1862	116.2810	100.3417	92.9813	106.6974	107.9717	125.8306	137.3540	149.1575 (45)
Energy content (annual)										Total = Sum(45)m =		1485.5264 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

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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)
	32.7287	28.6247	29.5381	25.7521	24.7097	21.3226	19.7585	22.6732	22.9440	26.7390	29.1877	31.6960 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	126.7699	126.7699	126.7699	126.7699	126.7699	126.7699	126.7699	126.7699	126.7699	126.7699	126.7699	126.7699 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.9117	18.5736	15.1051	11.4355	8.5482	7.2167	7.7979	10.1360	13.6046	17.2741	20.1615	21.4929 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	227.7164	230.0793	224.1247	211.4480	195.4459	180.4062	170.3587	167.9957	173.9504	186.6271	202.6292	217.6689 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6770	35.6770	35.6770	35.6770	35.6770	35.6770	35.6770	35.6770	35.6770	35.6770	35.6770	35.6770 (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)	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159 (71)
Water heating gains (Table 5)	43.9902	42.5963	39.7018	35.7668	33.2120	29.6147	26.5572	30.4747	31.8667	35.9395	40.5385	42.6021 (72)
Total internal gains	353.6492	352.2802	339.9625	319.6812	298.2370	278.2686	265.7448	269.6375	280.4526	300.8717	324.3601	342.7949 (73)

6. Solar gains												

[Jan]			Area		Solar flux		g		FF		Access	Gains
			m2		Table 6a		Specific data		Specific data		factor	W
					W/m2		or Table 6b		or Table 6c		Table 6d	
North			4.4700		10.6334		0.6300		0.7000		0.7700	14.5262 (74)
East			1.9200		19.6403		0.6300		0.7000		0.7700	11.5245 (76)
South			8.0000		46.7521		0.6300		0.7000		0.7700	114.3043 (78)

Solar gains	140.3549	237.5055	322.7596	399.4298	449.2774	447.4774	430.7672	392.9465	348.9964	261.7095	167.7791	120.3563 (83)
Total gains	494.0041	589.7857	662.7221	719.1110	747.5144	725.7460	696.5120	662.5840	629.4490	562.5812	492.1392	463.1512 (84)

7. Mean internal temperature (heating season)												

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	59.3668	59.5423	59.7153	60.5418	60.6990	61.4415	61.4415	61.5810	61.1533	60.6990	60.3818	60.0538
alpha	4.9578	4.9695	4.9810	5.0361	5.0466	5.0961	5.0961	5.1054	5.0769	5.0466	5.0255	5.0036
util living area	0.9982	0.9953	0.9878	0.9646	0.8997	0.7543	0.5816	0.6293	0.8538	0.9753	0.9959	0.9987 (86)
MIT	19.7209	19.8956	20.1497	20.4712	20.7518	20.9320	20.9855	20.9786	20.8642	20.4950	20.0463	19.6938 (87)
Th 2	19.9443	19.9471	19.9498	19.9626	19.9650	19.9762	19.9762	19.9783	19.9719	19.9650	19.9601	19.9551 (88)
util rest of house	0.9976	0.9937	0.9834	0.9507	0.8591	0.6644	0.4557	0.5036	0.7835	0.9629	0.9942	0.9982 (89)
MIT 2	18.7804	18.9566	19.2107	19.5345	19.7943	19.9441	19.9724	19.9721	19.8964	19.5636	19.1178	18.7620 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.9837	19.1596	19.4137	19.7369	20.0013	20.1576	20.1914	20.1897	20.1056	19.7649	19.3185	18.9634 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.9837	19.1596	19.4137	19.7369	20.0013	20.1576	20.1914	20.1897	20.1056	19.7649	19.3185	18.9634 (93)

8. Space heating requirement												

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9968	0.9920	0.9804	0.9469	0.8608	0.6818	0.4832	0.5310	0.7941	0.9598	0.9928	0.9976 (94)
Useful gains	492.4071	585.0802	649.7394	680.9620	643.4659	494.8021	336.5705	351.8357	499.8315	539.9720	488.5966	462.0561 (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	1443.8377	1398.0009	1262.3814	1044.9075	798.3438	528.0267	341.2163	359.2355	573.2776	881.4001	1181.2385	1435.0667 (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	707.8644	546.2827	455.8056	262.0408	115.2292	0.0000	0.0000	0.0000	0.0000	254.0225	498.7022	723.9199 (98)
Space heating												3563.8672 (98)
Space heating per m2	(98) / (4) =											42.3967 (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	893.0853	703.0671	720.4332	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8580	0.9222	0.9038	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	766.2544	648.3558	651.1325	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	943.4008	907.2686	869.2986	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	127.5454	192.6311	162.3156	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												482.4921 (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	31.8863	48.1578	40.5789	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												120.6230 (107)
Space cooling per m2												1.4350 (108)
Energy for space heating												42.3967 (99)
Energy for space cooling												1.4350 (108)
Total												43.8317 (109)
Target Fabric Energy Efficiency (TFEE)												50.4 (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	42.0300 (1b)	x 2.3900 (2b)	= 100.4517 (1b) - (3b)
First floor	42.0300 (1c)	x 2.6700 (2c)	= 112.2201 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.0600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.6718 (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) = 0.1881 (8)
Pressure test					Yes
Measured/design AP50					4.0300
Infiltration rate					0.3896 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3604 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)
Adj infilt rate	0.4234	0.3964	0.3964	0.3604	0.3694	0.3514	0.3514	0.3423	0.3423	0.3694	0.3604	0.3694 (22b)
Effective ac	0.5896	0.5786	0.5786	0.5649	0.5682	0.5617	0.5617	0.5586	0.5586	0.5682	0.5649	0.5682 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			14.3900	1.1450	16.4771		(27)
Ground Floor			42.0300	0.1200	5.0436	84.0000	3530.5200 (28a)
Brick and Block	93.0000	16.5100	76.4900	0.2400	18.3576	42.2200	3229.4078 (29a)
Pitched Roof	42.0300		42.0300	0.1000	4.2030	9.1000	382.4730 (30)
Total net area of external elements Aum(A, m ²)			177.0600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.4133		(33)
Party Wall 1			44.3300	0.0000	0.0000	70.0000	3103.1000 (32)
GF Stud			70.3600			9.0000	633.2400 (32c)
First Floor			96.9900			9.0000	872.9100 (32c)
Internal Floor 1			42.0300			18.0000	756.5400 (32d)
Internal Ceiling 1			42.0300			18.0000	756.5400 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13264.7308 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 157.8007 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.8065 (36)
Total fabric heat loss (33) + (36) = 53.2197 (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	41.3823	40.6048	40.6048	39.6478	39.8785	39.4228	39.4228	39.2035	39.2035	39.8785	39.6478	39.8785 (38)
Heat transfer coeff	94.6021	93.8246	93.8246	92.8676	93.0983	92.6426	92.6426	92.4233	92.4233	93.0983	92.8676	93.0983 (39)
Average = Sum(39)m / 12 =												93.1177 (39)
HLP	1.1254	1.1162	1.1162	1.1048	1.1075	1.1021	1.1021	1.0995	1.0995	1.1075	1.1048	1.1075 (40)
HLP (average)												1.1078 (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												2.5354 (42)
Average daily hot water use (litres/day)												94.4157 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	103.8573	100.0806	96.3040	92.5274	88.7507	84.9741	84.9741	88.7507	92.5274	96.3040	100.0806	103.8573 (44)
Energy conte	154.0173	134.7045	139.0030	121.1862	116.2810	100.3417	92.9813	106.6974	107.9717	125.8306	137.3540	149.1575 (45)
Energy content (annual)										Total = Sum(45)m =		1485.5264 (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	23.1026	20.2057	20.8505	18.1779	17.4422	15.0513	13.9472	16.0046	16.1958	18.8746	20.6031	22.3736 (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	27.5591	24.8897	27.5305	26.6128	27.4784	26.5671	27.4373	27.4639	26.5920	27.5089	26.6557	27.5511 (61)
Total heat required for water heating calculated for each month	181.5764	159.5942	166.5335	147.7990	143.7594	126.9088	120.4186	134.1614	134.5638	153.3396	164.0097	176.7086 (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	181.5764	159.5942	166.5335	147.7990	143.7594	126.9088	120.4186	134.1614	134.5638	153.3396	164.0097	176.7086 (64)
RHI water heating demand												
Heat gains from water heating, kWh/month	58.1005	51.0117	53.1011	46.9476	45.5330	40.0054	37.7756	42.3429	42.5486	48.7159	52.3341	56.4826 (65)
												1809 (64)
												1809 (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	152.1238	152.1238	152.1238	152.1238	152.1238	152.1238	152.1238	152.1238	152.1238	152.1238	152.1238	152.1238	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	52.2793	46.4340	37.7626	28.5887	21.3704	18.0418	19.4948	25.3401	34.0114	43.1853	50.4036	53.7323	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	339.8751	343.4020	334.5145	315.5940	291.7103	269.2629	254.2667	250.7399	259.6274	278.5479	302.4316	324.8790	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7478	52.7478	52.7478	52.7478	52.7478	52.7478	52.7478	52.7478	52.7478	52.7478	52.7478	52.7478	(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)	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	(71)
Water heating gains (Table 5)	78.0921	75.9102	71.3725	65.2050	61.2003	55.5631	50.7737	56.9125	59.0953	65.4784	72.6863	75.9175	(72)
Total internal gains	576.7023	572.2019	550.1053	515.8435	480.7367	449.3235	430.9910	439.4482	459.1899	493.6674	531.9773	560.9845	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d		Gains W	
North				4.4700	13.4684	0.6300	0.7000		0.7700		18.3991 (74)	
East				1.9200	25.1733	0.6300	0.7000		0.7700		14.7711 (76)	
South				8.0000	56.5862	0.6300	0.7000		0.7700		138.3479 (78)	
Solar gains	171.5180	247.0225	342.6942	428.8232	457.1821	505.5098	466.8918	441.7132	388.8392	293.8823	204.3335	139.2620 (83)
Total gains	748.2203	819.2245	892.7995	944.6667	937.9188	954.8333	897.8827	881.1614	848.0291	787.5497	736.3108	700.2465 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	38.9489	39.2717	39.2717	39.6764	39.5780	39.7727	39.7727	39.8671	39.8671	39.5780	39.6764	39.5780	
alpha	3.5966	3.6181	3.6181	3.6451	3.6385	3.6515	3.6515	3.6578	3.6578	3.6385	3.6451	3.6385	
util living area	0.9536	0.9357	0.8942	0.8110	0.6808	0.4749	0.3361	0.3315	0.5669	0.8039	0.9192	0.9601	(86)
MIT	19.8202	19.9806	20.2700	20.6072	20.8455	20.9697	20.9937	20.9942	20.9412	20.6883	20.2426	19.8009	(87)
Th 2	19.9801	19.9877	19.9877	19.9969	19.9947	19.9991	19.9991	20.0012	20.0012	19.9947	19.9969	19.9947	(88)
util rest of house	0.9440	0.9230	0.8732	0.7738	0.6187	0.3893	0.2363	0.2301	0.4806	0.7565	0.9005	0.9517	(89)
MIT 2	18.9421	19.1027	19.3789	19.6968	19.8965	19.9863	19.9978	20.0001	19.9730	19.7728	19.3661	18.9354	(90)
Living area fraction									fLA = Living area / (4) =			0.2162	(91)
MIT	19.1319	19.2924	19.5715	19.8936	20.1016	20.1989	20.2130	20.2150	20.1823	19.9707	19.5555	19.1225	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1319	19.2924	19.5715	19.8936	20.1016	20.1989	20.2130	20.2150	20.1823	19.9707	19.5555	19.1225	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	698.9903	747.4779	770.7031	727.0112	586.9341	388.5650	231.5635	222.0985	421.4891	594.8178	655.7879	660.0858	(94)
Ext temp.	5.6000	6.0000	7.6000	10.1000	13.1000	15.9000	17.7000	17.8000	15.4000	12.1000	8.6000	5.7000	(96)
Heat loss rate W	1280.1449	1247.1578	1123.2219	909.5084	651.8408	398.2603	232.8135	223.1980	441.9922	732.7476	1017.4143	1249.6099	(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	432.3790	335.7849	262.2740	131.3980	48.2906	0.0000	0.0000	0.0000	0.0000	102.6198	260.3710	438.6059	(98)
Space heating												2011.7232	(98)
RHI space heating demand												2012	(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	42.0300 (1b)	x 2.3900 (2b)	= 100.4517 (1b) - (3b)
First floor	42.0300 (1c)	x 2.6700 (2c)	= 112.2201 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.0600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.6718 (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) = 0.1881 (8)
Pressure test					Yes
Measured/design AP50					4.0300
Infiltration rate					0.3896 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3604 (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	0.4595	0.4505	0.4414	0.3964	0.3874	0.3423	0.3423	0.3333	0.3604	0.3874	0.4054	0.4234 (22b)
Effective ac	0.6056	0.6015	0.5974	0.5786	0.5750	0.5586	0.5586	0.5556	0.5649	0.5750	0.5822	0.5896 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			14.3900	1.1450	16.4771		(27)
Ground Floor			42.0300	0.1200	5.0436	84.0000	3530.5200 (28a)
Brick and Block	93.0000	16.5100	76.4900	0.2400	18.3576	42.2200	3229.4078 (29a)
Pitched Roof	42.0300		42.0300	0.1000	4.2030	9.1000	382.4730 (30)
Total net area of external elements Aum(A, m ²)			177.0600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.4133		(33)
Party Wall 1			44.3300	0.0000	0.0000	70.0000	3103.1000 (32)
GF Stud			70.3600			9.0000	633.2400 (32c)
First Floor			96.9900			9.0000	872.9100 (32c)
Internal Floor 1			42.0300			18.0000	756.5400 (32d)
Internal Ceiling 1			42.0300			18.0000	756.5400 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13264.7308 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 157.8007 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.8065 (36)
Total fabric heat loss (33) + (36) = 53.2197 (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	42.4988	42.2111	41.9292	40.6048	40.3570	39.2035	39.2035	38.9899	39.6478	40.3570	40.8583	41.3823 (38)
Heat transfer coeff	95.7185	95.4309	95.1489	93.8246	93.5768	92.4233	92.4233	92.2097	92.8676	93.5768	94.0780	94.6021 (39)
Average = Sum(39)m / 12 =												93.8234 (39)
HLP	1.1387	1.1353	1.1319	1.1162	1.1132	1.0995	1.0995	1.0970	1.1048	1.1132	1.1192	1.1254 (40)
HLP (average)												1.1161 (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												2.5354 (42)
Average daily hot water use (litres/day)												94.4157 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	103.8573	100.0806	96.3040	92.5274	88.7507	84.9741	84.9741	88.7507	92.5274	96.3040	100.0806	103.8573 (44)
Energy conte	154.0173	134.7045	139.0030	121.1862	116.2810	100.3417	92.9813	106.6974	107.9717	125.8306	137.3540	149.1575 (45)
Energy content (annual)										Total = Sum(45)m =		1485.5264 (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	23.1026	20.2057	20.8505	18.1779	17.4422	15.0513	13.9472	16.0046	16.1958	18.8746	20.6031	22.3736 (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	27.5591	24.8897	27.5305	26.6128	27.4784	26.5671	27.4373	27.4639	26.5920	27.5089	26.6557	27.5511 (61)
Total heat required for water heating calculated for each month	181.5764	159.5942	166.5335	147.7990	143.7594	126.9088	120.4186	134.1614	134.5638	153.3396	164.0097	176.7086 (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	181.5764	159.5942	166.5335	147.7990	143.7594	126.9088	120.4186	134.1614	134.5638	153.3396	164.0097	176.7086 (64)
Heat gains from water heating, kWh/month	58.1005	51.0117	53.1011	46.9476	45.5330	40.0054	37.7756	42.3429	42.5486	48.7159	52.3341	56.4826 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1809.3731 (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	152.1238	152.1238	152.1238	152.1238	152.1238	152.1238	152.1238	152.1238	152.1238	152.1238	152.1238	152.1238 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	52.2793	46.4340	37.7626	28.5887	21.3704	18.0418	19.4948	25.3401	34.0114	43.1853	50.4036	53.7323 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	339.8751	343.4020	334.5145	315.5940	291.7103	269.2629	254.2667	250.7399	259.6274	278.5479	302.4316	324.8790 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7478	52.7478	52.7478	52.7478	52.7478	52.7478	52.7478	52.7478	52.7478	52.7478	52.7478	52.7478 (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)	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159 (71)
Water heating gains (Table 5)	78.0921	75.9102	71.3725	65.2050	61.2003	55.5631	50.7737	56.9125	59.0953	65.4784	72.6863	75.9175 (72)
Total internal gains	576.7023	572.2019	550.1053	515.8435	480.7367	449.3235	430.9910	439.4482	459.1899	493.6674	531.9773	560.9845 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				4.4700	10.6334	0.6300	0.7000	0.7700	14.5262 (74)			
East				1.9200	19.6403	0.6300	0.7000	0.7700	11.5245 (76)			
South				8.0000	46.7521	0.6300	0.7000	0.7700	114.3043 (78)			
Solar gains	140.3549	237.5055	322.7596	399.4298	449.2774	447.4774	430.7672	392.9465	348.9964	261.7095	167.7791	120.3563 (83)
Total gains	717.0572	809.7075	872.8649	915.2733	930.0141	896.8010	861.7582	832.3947	808.1863	755.3769	699.7564	681.3408 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	38.4946	38.6106	38.7251	39.2717	39.3757	39.8671	39.8671	39.9594	39.6764	39.3757	39.1659	38.9489
alpha	3.5663	3.5740	3.5817	3.6181	3.6250	3.6578	3.6578	3.6640	3.6451	3.6250	3.6111	3.5966
util living area	0.9676	0.9494	0.9188	0.8589	0.7570	0.6023	0.4554	0.4875	0.6861	0.8706	0.9485	0.9723 (86)
MIT	19.5691	19.7847	20.0847	20.4446	20.7354	20.9180	20.9773	20.9706	20.8623	20.4976	19.9763	19.5290 (87)
Th 2	19.9694	19.9721	19.9749	19.9877	19.9901	20.0012	20.0012	20.0033	19.9969	19.9901	19.9852	19.9801 (88)
util rest of house	0.9611	0.9396	0.9028	0.8306	0.7079	0.5257	0.3589	0.3908	0.6144	0.8388	0.9369	0.9667 (89)
MIT 2	18.6872	18.8995	19.1920	19.5421	19.8031	19.9569	19.9932	19.9921	19.9154	19.5998	19.1004	18.6563 (90)
Living area fraction									fLA = Living area / (4) =			0.2162 (91)
MIT	18.8778	19.0909	19.3849	19.7372	20.0046	20.1646	20.2059	20.2036	20.1200	19.7939	19.2897	18.8449 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8778	19.0909	19.3849	19.7372	20.0046	20.1646	20.2059	20.2036	20.1200	19.7939	19.2897	18.8449 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	682.9820	752.4622	778.5011	752.9490	659.0437	483.2728	326.8659	342.0249	504.1835	628.1999	648.6973	653.2982 (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	1395.3660	1354.2457	1225.9864	1016.7936	777.1190	514.2998	333.2708	350.7323	559.0670	860.3332	1146.7834	1385.4395 (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	530.0137	404.3985	332.9291	189.9681	87.8481	0.0000	0.0000	0.0000	0.0000	172.7072	358.6220	544.7131 (98)
Space heating												2621.1998 (98)
Space heating per m2												31.1825 (99)
(98) / (4) =												

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													2889.9667 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	530.0137	404.3985	332.9291	189.9681	87.8481	0.0000	0.0000	0.0000	0.0000	172.7072	358.6220	544.7131	(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)	584.3591	445.8638	367.0662	209.4467	96.8556	0.0000	0.0000	0.0000	0.0000	190.4159	395.3936	600.5658	(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	181.5764	159.5942	166.5335	147.7990	143.7594	126.9088	120.4186	134.1614	134.5638	153.3396	164.0097	176.7086	(64)
Efficiency of water heater (217)m	89.9687	89.8897	89.7468	89.4531	88.9414	87.9000	87.9000	87.9000	87.9000	89.3613	89.8023	87.9000	(216)
Fuel for water heating, kWh/month	201.8218	177.5444	185.5593	165.2251	161.6338	144.3787	136.9950	152.6295	153.0873	171.5951	182.6342	196.3477	(219)
Water heating fuel used												2029.4519	(219)
Annual totals kWh/year													
Space heating fuel - main system												2889.9667	(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)												369.3072	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.73 * 1080 * 1.00) =										-630.4424		-630.4424	(233)
Total delivered energy for all uses												4733.2834	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2889.9667	3.4800	100.5708 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2029.4519	3.4800	70.6249 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	369.3072	13.1900	48.7116 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-630.4424	13.1900	-83.1553 (252)
Total energy cost			266.6445 (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] =	0.8677 (257)
SAP value		87.8950
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	2889.9667	0.2160	624.2328 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2029.4519	0.2160	438.3616 (264)
Space and water heating			1062.5944 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	369.3072	0.5190	191.6704 (268)
Energy saving/generation technologies			
PV Unit	-630.4424	0.5190	-327.1996 (269)
Total kg/year			965.9902 (272)
CO2 emissions per m2			11.4900 (273)
EI value			89.9703
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	$3.48 / 0.8906 = 3.907$, stars = 4
Water heating environmental impact	$0.216 / 0.8906 = 0.2425$, 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	42.0300 (1b)	x 2.3900 (2b)	= 100.4517 (1b) - (3b)
First floor	42.0300 (1c)	x 2.6700 (2c)	= 112.2201 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.0600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.6718 (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) = 0.1881 (8)
Pressure test					Yes
Measured/design AP50					4.0300
Infiltration rate					0.3896 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3604 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)
Adj infilt rate	0.4234	0.3964	0.3964	0.3604	0.3694	0.3514	0.3514	0.3423	0.3423	0.3694	0.3604	0.3694 (22b)
Effective ac	0.5896	0.5786	0.5786	0.5649	0.5682	0.5617	0.5617	0.5586	0.5586	0.5682	0.5649	0.5682 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			14.3900	1.1450	16.4771		(27)
Ground Floor			42.0300	0.1200	5.0436	84.0000	3530.5200 (28a)
Brick and Block	93.0000	16.5100	76.4900	0.2400	18.3576	42.2200	3229.4078 (29a)
Pitched Roof	42.0300		42.0300	0.1000	4.2030	9.1000	382.4730 (30)
Total net area of external elements Aum(A, m ²)			177.0600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.4133		(33)
Party Wall 1			44.3300	0.0000	0.0000	70.0000	3103.1000 (32)
GF Stud			70.3600			9.0000	633.2400 (32c)
First Floor			96.9900			9.0000	872.9100 (32c)
Internal Floor 1			42.0300			18.0000	756.5400 (32d)
Internal Ceiling 1			42.0300			18.0000	756.5400 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13264.7308 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 157.8007 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.8065 (36)
Total fabric heat loss (33) + (36) = 53.2197 (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	41.3823	40.6048	40.6048	39.6478	39.8785	39.4228	39.4228	39.2035	39.2035	39.8785	39.6478	39.8785 (38)
Heat transfer coeff	94.6021	93.8246	93.8246	92.8676	93.0983	92.6426	92.6426	92.4233	92.4233	93.0983	92.8676	93.0983 (39)
Average = Sum(39)m / 12 =												93.1177 (39)
HLP	1.1254	1.1162	1.1162	1.1048	1.1075	1.1021	1.1021	1.0995	1.0995	1.1075	1.1048	1.1075 (40)
HLP (average)												1.1078 (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												2.5354 (42)
Average daily hot water use (litres/day)												94.4157 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	103.8573	100.0806	96.3040	92.5274	88.7507	84.9741	84.9741	88.7507	92.5274	96.3040	100.0806	103.8573 (44)
Energy conte	154.0173	134.7045	139.0030	121.1862	116.2810	100.3417	92.9813	106.6974	107.9717	125.8306	137.3540	149.1575 (45)
Energy content (annual)										Total = Sum(45)m =		1485.5264 (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	23.1026	20.2057	20.8505	18.1779	17.4422	15.0513	13.9472	16.0046	16.1958	18.8746	20.6031	22.3736 (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	27.5591	24.8897	27.5305	26.6128	27.4784	26.5671	27.4373	27.4639	26.5920	27.5089	26.6557	27.5511 (61)
Total heat required for water heating calculated for each month	181.5764	159.5942	166.5335	147.7990	143.7594	126.9088	120.4186	134.1614	134.5638	153.3396	164.0097	176.7086 (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	181.5764	159.5942	166.5335	147.7990	143.7594	126.9088	120.4186	134.1614	134.5638	153.3396	164.0097	176.7086 (64)
Heat gains from water heating, kWh/month	58.1005	51.0117	53.1011	46.9476	45.5330	40.0054	37.7756	42.3429	42.5486	48.7159	52.3341	56.4826 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1809.3731 (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	152.1238	152.1238	152.1238	152.1238	152.1238	152.1238	152.1238	152.1238	152.1238	152.1238	152.1238	152.1238 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	52.2793	46.4340	37.7626	28.5887	21.3704	18.0418	19.4948	25.3401	34.0114	43.1853	50.4036	53.7323 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	339.8751	343.4020	334.5145	315.5940	291.7103	269.2629	254.2667	250.7399	259.6274	278.5479	302.4316	324.8790 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7478	52.7478	52.7478	52.7478	52.7478	52.7478	52.7478	52.7478	52.7478	52.7478	52.7478	52.7478 (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)	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159 (71)
Water heating gains (Table 5)	78.0921	75.9102	71.3725	65.2050	61.2003	55.5631	50.7737	56.9125	59.0953	65.4784	72.6863	75.9175 (72)
Total internal gains	576.7023	572.2019	550.1053	515.8435	480.7367	449.3235	430.9910	439.4482	459.1899	493.6674	531.9773	560.9845 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
North					4.4700	13.4684	0.6300	0.7000	0.7700		18.3991 (74)	
East					1.9200	25.1733	0.6300	0.7000	0.7700		14.7711 (76)	
South					8.0000	56.5862	0.6300	0.7000	0.7700		138.3479 (78)	
Solar gains	171.5180	247.0225	342.6942	428.8232	457.1821	505.5098	466.8918	441.7132	388.8392	293.8823	204.3335	139.2620 (83)
Total gains	748.2203	819.2245	892.7995	944.6667	937.9188	954.8333	897.8827	881.1614	848.0291	787.5497	736.3108	700.2465 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	38.9489	39.2717	39.2717	39.6764	39.5780	39.7727	39.7727	39.8671	39.8671	39.5780	39.6764	39.5780
alpha	3.5966	3.6181	3.6181	3.6451	3.6385	3.6515	3.6515	3.6578	3.6578	3.6385	3.6451	3.6385
util living area	0.9536	0.9357	0.8942	0.8110	0.6808	0.4749	0.3361	0.3315	0.5669	0.8039	0.9192	0.9601 (86)
MIT	19.8202	19.9806	20.2700	20.6072	20.8455	20.9697	20.9937	20.9942	20.9412	20.6883	20.2426	19.8009 (87)
Th 2	19.9801	19.9877	19.9877	19.9969	19.9947	19.9991	19.9991	20.0012	20.0012	19.9947	19.9969	19.9947 (88)
util rest of house	0.9440	0.9230	0.8732	0.7738	0.6187	0.3893	0.2363	0.2301	0.4806	0.7565	0.9005	0.9517 (89)
MIT 2	18.9421	19.1027	19.3789	19.6968	19.8965	19.9863	19.9978	20.0001	19.9730	19.7728	19.3661	18.9354 (90)
Living area fraction	19.1319	19.2924	19.5715	19.8936	20.1016	20.1989	20.2130	20.2150	fLA = Living area / (4) =	19.9707	19.5555	0.2162 (91)
MIT	19.1319	19.2924	19.5715	19.8936	20.1016	20.1989	20.2130	20.2150	20.1823	19.9707	19.5555	19.1225 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1319	19.2924	19.5715	19.8936	20.1016	20.1989	20.2130	20.2150	20.1823	19.9707	19.5555	19.1225 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9342	0.9124	0.8632	0.7696	0.6258	0.4069	0.2579	0.2521	0.4970	0.7553	0.8906	0.9426 (94)
Useful gains	698.9903	747.4779	770.7031	727.0112	586.9341	388.5650	231.5635	222.0985	421.4891	594.8178	655.7879	660.0858 (95)
Ext temp.	5.6000	6.0000	7.6000	10.1000	13.1000	15.9000	17.7000	17.8000	15.4000	12.1000	8.6000	5.7000 (96)
Heat loss rate W	1280.1449	1247.1578	1123.2219	909.5084	651.8408	398.2603	232.8135	223.1980	441.9922	732.7476	1017.4143	1249.6099 (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	432.3790	335.7849	262.2740	131.3980	48.2906	0.0000	0.0000	0.0000	0.0000	102.6198	260.3710	438.6059 (98)
Space heating												2011.7232 (98)
Space heating per m2										(98) / (4) =		23.9320 (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													2217.9969 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	432.3790	335.7849	262.2740	131.3980	48.2906	0.0000	0.0000	0.0000	0.0000	102.6198	260.3710	438.6059	(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)	476.7134	370.2149	289.1665	144.8710	53.2421	0.0000	0.0000	0.0000	0.0000	113.1420	287.0683	483.5787	(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	181.5764	159.5942	166.5335	147.7990	143.7594	126.9088	120.4186	134.1614	134.5638	153.3396	164.0097	176.7086	(64)
Efficiency of water heater (217)m	89.8535	89.7787	89.5917	89.1959	88.5877	87.9000	87.9000	87.9000	87.9000	89.0016	89.5970	87.9000	(216)
Fuel for water heating, kWh/month	202.0806	177.7641	185.8806	165.7016	162.2793	144.3787	136.9950	152.6295	153.0873	172.2887	183.0527	196.6099	(219)
Water heating fuel used												2032.7478	(219)
Annual totals kWh/year													
Space heating fuel - main system												2217.9969	(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)												369.3072	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.73 * 1206 * 1.00) =										-704.3100		-704.3100	(233)
Total delivered energy for all uses												3990.7419	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2217.9969	3.6300	80.5133 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2032.7478	3.6300	73.7887 (247)
Pumps and fans for heating	75.0000	19.4400	14.5800 (249)
Energy for lighting	369.3072	19.4400	71.7933 (250)
Additional standing charges			95.0000 (251)
Energy saving/generation technologies			
PV Unit	-704.3100	19.4400	-136.9179 (252)
Total energy cost			198.7575 (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	2217.9969	0.2160	479.0873 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2032.7478	0.2160	439.0735 (264)
Space and water heating			918.1609 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	369.3072	0.5190	191.6704 (268)
Energy saving/generation technologies			
PV Unit	-704.3100	0.5190	-365.5369 (269)
Total kg/year			783.2194 (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	2217.9969	1.2200	2705.9562 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2032.7478	1.2200	2479.9523 (264)
Space and water heating			5185.9085 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	369.3072	3.0700	1133.7730 (268)
Energy saving/generation technologies			
PV Unit	-704.3100	3.0700	-2162.2316 (269)
Primary energy kWh/year			4387.6999 (272)
Primary energy kWh/m2/year			52.1972 (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	-£ 27	-190 kg (24.2%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£27 2.26 kg/m²	B 89	A 92
Total Savings	£27 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 490 TEST (31 Jan 2022)
Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£86	£96	-£10
Mains gas	£249	£213	£36
Space heating	£190	£190	£0
Water heating	£74	£47	£27
Lighting	£72	£72	£0
Generated (PV)	-£137	-£137	£0
Total cost of fuels	£198	£172	£26
Total cost of uses	£199	£172	£27
Delivered energy	47 kWh/m²	36 kWh/m²	11 kWh/m²
Carbon dioxide emissions	0.8 tonnes	0.6 tonnes	0.2 tonnes
CO2 emissions per m²	9 kg/m²	7 kg/m²	2 kg/m²
Primary energy	52 kWh/m²	40 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	42.0300 (1b)	x 2.3900 (2b)	= 100.4517 (1b) - (3b)
First floor	42.0300 (1c)	x 2.6700 (2c)	= 112.2201 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.0600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.6718 (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) = 0.1881 (8)
Pressure test					Yes
Measured/design AP50					4.0300
Infiltration rate					0.3896 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3604 (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	0.4595	0.4505	0.4414	0.3964	0.3874	0.3423	0.3423	0.3333	0.3604	0.3874	0.4054	0.4234 (22b)
Effective ac	0.6056	0.6015	0.5974	0.5786	0.5750	0.5586	0.5586	0.5556	0.5649	0.5750	0.5822	0.5896 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			14.3900	1.1450	16.4771		(27)
Ground Floor			42.0300	0.1200	5.0436	84.0000	3530.5200 (28a)
Brick and Block	93.0000	16.5100	76.4900	0.2400	18.3576	42.2200	3229.4078 (29a)
Pitched Roof	42.0300		42.0300	0.1000	4.2030	9.1000	382.4730 (30)
Total net area of external elements Aum(A, m ²)			177.0600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.4133		(33)
Party Wall 1			44.3300	0.0000	0.0000	70.0000	3103.1000 (32)
GF Stud			70.3600			9.0000	633.2400 (32c)
First Floor			96.9900			9.0000	872.9100 (32c)
Internal Floor 1			42.0300			18.0000	756.5400 (32d)
Internal Ceiling 1			42.0300			18.0000	756.5400 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13264.7308 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 157.8007 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.8065 (36)
Total fabric heat loss (33) + (36) = 53.2197 (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	42.4988	42.2111	41.9292	40.6048	40.3570	39.2035	39.2035	38.9899	39.6478	40.3570	40.8583	41.3823 (38)
Heat transfer coeff	95.7185	95.4309	95.1489	93.8246	93.5768	92.4233	92.4233	92.2097	92.8676	93.5768	94.0780	94.6021 (39)
Average = Sum(39)m / 12 =												93.8234 (39)
HLP	1.1387	1.1353	1.1319	1.1162	1.1132	1.0995	1.0995	1.0970	1.1048	1.1132	1.1192	1.1254 (40)
HLP (average)												1.1161 (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												2.5354 (42)
Average daily hot water use (litres/day)												94.4157 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	103.8573	100.0806	96.3040	92.5274	88.7507	84.9741	84.9741	88.7507	92.5274	96.3040	100.0806	103.8573 (44)
Energy conte	154.0173	134.7045	139.0030	121.1862	116.2810	100.3417	92.9813	106.6974	107.9717	125.8306	137.3540	149.1575 (45)
Energy content (annual)										Total = Sum(45)m =		1485.5264 (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	23.1026	20.2057	20.8505	18.1779	17.4422	15.0513	13.9472	16.0046	16.1958	18.8746	20.6031	22.3736 (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	27.5591	24.8897	27.5305	26.6128	27.4784	26.5671	27.4373	27.4639	26.5920	27.5089	26.6557	27.5511 (61)
Total heat required for water heating calculated for each month	181.5764	159.5942	166.5335	147.7990	143.7594	126.9088	120.4186	134.1614	134.5638	153.3396	164.0097	176.7086 (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												1.2208 (H8)
Utilisation factor												0.5592 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												94.4157 (H14)
Volume ratio Veff/V												0.7944 (H15)
Solar storage volume factor												0.9540 (H16)
Solar input	-24.6671	-41.1623	-70.1042	-93.9534	-116.0715	-114.1168	-112.6087	-98.3868	-77.0566	-52.6206	-29.2588	-850.6490 (H17)
Solar input (sum of months) = Sum (63)m =												-850.6490 (63)
Output from w/h	156.9093	118.4319	96.4293	53.8456	27.6879	12.7920	7.8099	35.7746	57.5072	100.7190	134.7509	156.0664 (64)
Total per year (kWh/year) = Sum (64)m =												958.7241 (64)
Heat gains from water heating, kWh/month	58.1005	51.0117	53.1011	46.9476	45.5330	40.0054	37.7756	42.3429	42.5486	48.7159	52.3341	56.4826 (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	152.1238	152.1238	152.1238	152.1238	152.1238	152.1238	152.1238	152.1238	152.1238	152.1238	152.1238	152.1238	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	52.2793	46.4340	37.7626	28.5887	21.3704	18.0418	19.4948	25.3401	34.0114	43.1853	50.4036	53.7323	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	339.8751	343.4020	334.5145	315.5940	291.7103	269.2629	254.2667	250.7399	259.6274	278.5479	302.4316	324.8790	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7478	52.7478	52.7478	52.7478	52.7478	52.7478	52.7478	52.7478	52.7478	52.7478	52.7478	52.7478	(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)	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	(71)
Water heating gains (Table 5)	78.0921	75.9102	71.3725	65.2050	61.2003	55.5631	50.7737	56.9125	59.0953	65.4784	72.6863	75.9175	(72)
Total internal gains	576.7023	572.2019	550.1053	515.8435	480.7367	449.3235	430.9910	439.4482	459.1899	493.6674	531.9773	560.9845	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				4.4700	10.6334	0.6300	0.7000	0.7700	14.5262 (74)			
East				1.9200	19.6403	0.6300	0.7000	0.7700	11.5245 (76)			
South				8.0000	46.7521	0.6300	0.7000	0.7700	114.3043 (78)			
Solar gains	140.3549	237.5055	322.7596	399.4298	449.2774	447.4774	430.7672	392.9465	348.9964	261.7095	167.7791	120.3563 (83)
Total gains	717.0572	809.7075	872.8649	915.2733	930.0141	896.8010	861.7582	832.3947	808.1863	755.3769	699.7564	681.3408 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	38.4946	38.6106	38.7251	39.2717	39.3757	39.8671	39.8671	39.9594	39.6764	39.3757	39.1659	38.9489
alpha	3.5663	3.5740	3.5817	3.6181	3.6250	3.6578	3.6578	3.6640	3.6451	3.6250	3.6111	3.5966
util living area	0.9676	0.9494	0.9188	0.8589	0.7570	0.6023	0.4554	0.4875	0.6861	0.8706	0.9485	0.9723 (86)
MIT	19.5691	19.7847	20.0847	20.4446	20.7354	20.9180	20.9773	20.9706	20.8623	20.4976	19.9763	19.5290 (87)
Th 2	19.9694	19.9721	19.9749	19.9877	19.9901	20.0012	20.0012	20.0033	19.9969	19.9901	19.9852	19.9801 (88)
util rest of house	0.9611	0.9396	0.9028	0.8306	0.7079	0.5257	0.3589	0.3908	0.6144	0.8388	0.9369	0.9667 (89)
MIT 2	18.6872	18.8995	19.1920	19.5421	19.8031	19.9569	19.9932	19.9921	19.9154	19.5998	19.1004	18.6563 (90)
Living area fraction									fLA = Living area / (4) =			0.2162 (91)
MIT	18.8778	19.0909	19.3849	19.7372	20.0046	20.1646	20.2059	20.2036	20.1200	19.7939	19.2897	18.8449 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8778	19.0909	19.3849	19.7372	20.0046	20.1646	20.2059	20.2036	20.1200	19.7939	19.2897	18.8449 (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	0.9525	0.9293	0.8919	0.8226	0.7086	0.5389	0.3793	0.4109	0.6238	0.8316	0.9270	0.9588	(94)
Useful gains	682.9820	752.4622	778.5011	752.9490	659.0437	483.2728	326.8659	342.0249	504.1835	628.1999	648.6973	653.2982	(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	1395.3660	1354.2457	1225.9864	1016.7936	777.1190	514.2998	333.2708	350.7323	559.0670	860.3332	1146.7834	1385.4395	(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	530.0137	404.3985	332.9291	189.9681	87.8481	0.0000	0.0000	0.0000	0.0000	172.7072	358.6220	544.7131	(98)
Space heating												2621.1998	(98)
Space heating per m2											(98) / (4) =	31.1825	(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													2889.9667	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	530.0137	404.3985	332.9291	189.9681	87.8481	0.0000	0.0000	0.0000	0.0000	172.7072	358.6220	544.7131	(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)	584.3591	445.8638	367.0662	209.4467	96.8556	0.0000	0.0000	0.0000	0.0000	190.4159	395.3936	600.5658	(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	156.9093	118.4319	96.4293	53.8456	27.6879	12.7920	7.8099	35.7746	57.5072	100.7190	134.7509	156.0664	(64)	
Efficiency of water heater	90.0448	90.0502	90.0557	90.0664	90.0129	87.9000	87.9000	87.9000	87.9000	89.6481	89.9177	90.0611	(217)	
Fuel for water heating, kWh/month	174.2569	131.5176	107.0774	59.7843	30.7599	14.5529	8.8850	40.6992	65.4234	112.3493	149.8603	173.2895	(219)	
Water heating fuel used												1068.4558	(219)	
Annual totals kWh/year														
Space heating fuel - main system													2889.9667	(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)													369.3072	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.73 * 1080 * 1.00) =										-630.4424			-630.4424	(233)
Total delivered energy for all uses													3822.2873	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2889.9667	3.4800	100.5708	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1068.4558	3.4800	37.1823	(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	369.3072	13.1900	48.7116	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	-630.4424	13.1900	-83.1553	(252)
Total energy cost			239.7969	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):			0.4200	(256)
Energy cost factor (ECF)			0.7804	(257)
SAP value			89.1138	
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	2889.9667	0.2160	624.2328 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1068.4558	0.2160	230.7865 (264)
Space and water heating			855.0193 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	369.3072	0.5190	191.6704 (268)
Energy saving/generation technologies			
PV Unit	-630.4424	0.5190	-327.1996 (269)
Total kg/year			784.3651 (272)
CO2 emissions per m2			9.3300 (273)
EI value			91.8561
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	42.0300 (1b)	x 2.3900 (2b)	= 100.4517 (1b) - (3b)
First floor	42.0300 (1c)	x 2.6700 (2c)	= 112.2201 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.0600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.6718 (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) = 0.1881 (8)
Pressure test					Yes
Measured/design AP50					4.0300
Infiltration rate					0.3896 (18)
Number of sides sheltered					1 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3604 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)
Adj infilt rate	0.4234	0.3964	0.3964	0.3604	0.3694	0.3514	0.3514	0.3423	0.3423	0.3694	0.3604	0.3694 (22b)
Effective ac	0.5896	0.5786	0.5786	0.5649	0.5682	0.5617	0.5617	0.5586	0.5586	0.5682	0.5649	0.5682 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			14.3900	1.1450	16.4771		(27)
Ground Floor			42.0300	0.1200	5.0436	84.0000	3530.5200 (28a)
Brick and Block	93.0000	16.5100	76.4900	0.2400	18.3576	42.2200	3229.4078 (29a)
Pitched Roof	42.0300		42.0300	0.1000	4.2030	9.1000	382.4730 (30)
Total net area of external elements Aum(A, m ²)			177.0600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.4133		(33)
Party Wall 1			44.3300	0.0000	0.0000	70.0000	3103.1000 (32)
GF Stud			70.3600			9.0000	633.2400 (32c)
First Floor			96.9900			9.0000	872.9100 (32c)
Internal Floor 1			42.0300			18.0000	756.5400 (32d)
Internal Ceiling 1			42.0300			18.0000	756.5400 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13264.7308 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 157.8007 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.8065 (36)
Total fabric heat loss (33) + (36) = 53.2197 (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	41.3823	40.6048	40.6048	39.6478	39.8785	39.4228	39.4228	39.2035	39.2035	39.8785	39.6478	39.8785 (38)
Heat transfer coeff	94.6021	93.8246	93.8246	92.8676	93.0983	92.6426	92.6426	92.4233	92.4233	93.0983	92.8676	93.0983 (39)
Average = Sum(39)m / 12 =												93.1177 (39)
HLP	1.1254	1.1162	1.1162	1.1048	1.1075	1.1021	1.1021	1.0995	1.0995	1.1075	1.1048	1.1075 (40)
HLP (average)												1.1078 (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												2.5354 (42)
Average daily hot water use (litres/day)												94.4157 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	103.8573	100.0806	96.3040	92.5274	88.7507	84.9741	84.9741	88.7507	92.5274	96.3040	100.0806	103.8573 (44)
Energy conte	154.0173	134.7045	139.0030	121.1862	116.2810	100.3417	92.9813	106.6974	107.9717	125.8306	137.3540	149.1575 (45)
Energy content (annual)										Total = Sum(45)m =		1485.5264 (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	23.1026	20.2057	20.8505	18.1779	17.4422	15.0513	13.9472	16.0046	16.1958	18.8746	20.6031	22.3736 (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	27.5591	24.8897	27.5305	26.6128	27.4784	26.5671	27.4373	27.4639	26.5920	27.5089	26.6557	27.5511 (61)
Total heat required for water heating calculated for each month	181.5764	159.5942	166.5335	147.7990	143.7594	126.9088	120.4186	134.1614	134.5638	153.3396	164.0097	176.7086 (62)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.7000 (H2)
Collector heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0050 (H3a)
Collector effective heat loss coefficient												1.8063 (H3b)
Collector performance ratio												2.5804 (H4)
Annual solar radiation per m2												1206.0102 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												2026.0972 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.3639 (H8)
Utilisation factor												0.5196 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												94.4157 (H14)
Volume ratio Veff/V												0.7944 (H15)
Solar storage volume factor												0.9540 (H16)
Solar input	-28.8171	-40.9811	-71.1128	-95.6587	-111.1618	-120.9118	-114.6428	-104.5432	-81.8257	-56.5550	-34.0840	-883.1118 (H17)
Solar input (sum of months) = Sum (63)m =												-883.1118 (63)
Output from w/h	152.7594	118.6131	95.4208	52.1403	32.5976	5.9970	5.7757	29.6182	52.7381	96.7846	129.9257	153.8908 (64)
Total per year (kWh/year) = Sum (64)m =												926.2612 (64)
Heat gains from water heating, kWh/month	58.1005	51.0117	53.1011	46.9476	45.5330	40.0054	37.7756	42.3429	42.5486	48.7159	52.3341	56.4826 (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	152.1238	152.1238	152.1238	152.1238	152.1238	152.1238	152.1238	152.1238	152.1238	152.1238	152.1238	152.1238	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	52.2793	46.4340	37.7626	28.5887	21.3704	18.0418	19.4948	25.3401	34.0114	43.1853	50.4036	53.7323	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	339.8751	343.4020	334.5145	315.5940	291.7103	269.2629	254.2667	250.7399	259.6274	278.5479	302.4316	324.8790	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7478	52.7478	52.7478	52.7478	52.7478	52.7478	52.7478	52.7478	52.7478	52.7478	52.7478	52.7478	(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)	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	-101.4159	(71)
Water heating gains (Table 5)	78.0921	75.9102	71.3725	65.2050	61.2003	55.5631	50.7737	56.9125	59.0953	65.4784	72.6863	75.9175	(72)
Total internal gains	576.7023	572.2019	550.1053	515.8435	480.7367	449.3235	430.9910	439.4482	459.1899	493.6674	531.9773	560.9845	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d		Gains W	
North				4.4700	13.4684	0.6300	0.7000		0.7700		18.3991 (74)	
East				1.9200	25.1733	0.6300	0.7000		0.7700		14.7711 (76)	
South				8.0000	56.5862	0.6300	0.7000		0.7700		138.3479 (78)	
Solar gains	171.5180	247.0225	342.6942	428.8232	457.1821	505.5098	466.8918	441.7132	388.8392	293.8823	204.3335	139.2620 (83)
Total gains	748.2203	819.2245	892.7995	944.6667	937.9188	954.8333	897.8827	881.1614	848.0291	787.5497	736.3108	700.2465 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	38.9489	39.2717	39.2717	39.6764	39.5780	39.7727	39.7727	39.8671	39.8671	39.5780	39.6764	39.5780
alpha	3.5966	3.6181	3.6181	3.6451	3.6385	3.6515	3.6515	3.6578	3.6578	3.6385	3.6451	3.6385
util living area	0.9536	0.9357	0.8942	0.8110	0.6808	0.4749	0.3361	0.3315	0.5669	0.8039	0.9192	0.9601 (86)
MIT	19.8202	19.9806	20.2700	20.6072	20.8455	20.9697	20.9937	20.9942	20.9412	20.6883	20.2426	19.8009 (87)
Th 2	19.9801	19.9877	19.9877	19.9969	19.9947	19.9991	19.9991	20.0012	20.0012	19.9947	19.9969	19.9947 (88)
util rest of house	0.9440	0.9230	0.8732	0.7738	0.6187	0.3893	0.2363	0.2301	0.4806	0.7565	0.9005	0.9517 (89)
MIT 2	18.9421	19.1027	19.3789	19.6968	19.8965	19.9863	19.9978	20.0001	19.9730	19.7728	19.3661	18.9354 (90)
Living area fraction									fLA = Living area / (4) =			0.2162 (91)
MIT	19.1319	19.2924	19.5715	19.8936	20.1016	20.1989	20.2130	20.2150	20.1823	19.9707	19.5555	19.1225 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1319	19.2924	19.5715	19.8936	20.1016	20.1989	20.2130	20.2150	20.1823	19.9707	19.5555	19.1225 (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	0.9342	0.9124	0.8632	0.7696	0.6258	0.4069	0.2579	0.2521	0.4970	0.7553	0.8906	0.9426	(94)
Useful gains	698.9903	747.4779	770.7031	727.0112	586.9341	388.5650	231.5635	222.0985	421.4891	594.8178	655.7879	660.0858	(95)
Ext temp.	5.6000	6.0000	7.6000	10.1000	13.1000	15.9000	17.7000	17.8000	15.4000	12.1000	8.6000	5.7000	(96)
Heat loss rate W	1280.1449	1247.1578	1123.2219	909.5084	651.8408	398.2603	232.8135	223.1980	441.9922	732.7476	1017.4143	1249.6099	(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	432.3790	335.7849	262.2740	131.3980	48.2906	0.0000	0.0000	0.0000	0.0000	102.6198	260.3710	438.6059	(98)
Space heating												2011.7232	(98)
Space heating per m2											(98) / (4) =	23.9320	(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													2217.9969	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	432.3790	335.7849	262.2740	131.3980	48.2906	0.0000	0.0000	0.0000	0.0000	102.6198	260.3710	438.6059	(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)	476.7134	370.2149	289.1665	144.8710	53.2421	0.0000	0.0000	0.0000	0.0000	113.1420	287.0683	483.5787	(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	152.7594	118.6131	95.4208	52.1403	32.5976	5.9970	5.7757	29.6182	52.7381	96.7846	129.9257	153.8908	(64)	
Efficiency of water heater	89.9520	89.9520	89.9358	89.8866	89.5504	87.9000	87.9000	87.9000	87.9000	89.3190	89.7483	89.9557	(217)	
Fuel for water heating, kWh/month	169.8233	131.8626	106.0988	58.0068	36.4014	6.8225	6.5708	33.6953	59.9978	108.3583	144.7667	171.0739	(219)	
Water heating fuel used												1033.4783	(219)	
Annual totals kWh/year														
Space heating fuel - main system												2217.9969	(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)													369.3072	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.73 * 1206 * 1.00) =										-704.3100		-704.3100	(233)	
Total delivered energy for all uses												3041.4724	(238)	

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2217.9969	3.6300	80.5133	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1033.4783	3.6300	37.5153	(247)
Pumps and fans for heating	75.0000	19.4400	14.5800	(249)
Pump for solar water heating	50.0000	19.4400	9.7200	(249)
Energy for lighting	369.3072	19.4400	71.7933	(250)
Additional standing charges			95.0000	(251)
Energy saving/generation technologies				
PV Unit	-704.3100	19.4400	-136.9179	(252)
Total energy cost			172.2040	(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	2217.9969	0.2160	479.0873	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1033.4783	0.2160	223.2313	(264)
Space and water heating			702.3186	(265)
Pumps and fans	125.0000	0.5190	64.8750	(267)
Energy for lighting	369.3072	0.5190	191.6704	(268)
Energy saving/generation technologies				
PV Unit	-704.3100	0.5190	-365.5369	(269)
Total kg/year			593.3272	(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	2217.9969	1.2200	2705.9562 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1033.4783	1.2200	1260.8435 (264)
Space and water heating			3966.7997 (265)
Pumps and fans	125.0000	3.0700	383.7500 (267)
Energy for lighting	369.3072	3.0700	1133.7730 (268)
Energy saving/generation technologies			
PV Unit	-704.3100	3.0700	-2162.2316 (269)
Primary energy kWh/year			3322.0911 (272)
Primary energy kWh/m2/year			39.5205 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Plot 70	Issued on Date	01/03/2022
Assessment Reference	As Built	Prop Type Ref	H (HA/SO)
Project	10 Shaw Road, West End, Southampton, SO30 3JZ		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	13.19	TER	17.87
Environmental	90 B	% DER<TER	26.17		
CO ₂ Emissions (t/year)	0.78	DFEE	40.76	TFEE	50.41
General Requirements Compliance	Pass	% DFEE<TFEE	19.14		

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

Building Elements

Roof 000002 - Mineral Wool between and above

Roof Type: Pitched Roof, insulated flat ceiling

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	Earthwool Loft Roll 40						
	Main construction	150	0.0400	3.7500	100.00		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 2	Earthwool Loft Roll 40						
	Main construction	200	0.0400	5.0000	100.00		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 3	Earthwool Loft Roll 40						
	Main construction	100	0.0400	2.5000	87.50		
	Main construction	100	0.1300	0.7692	12.50		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 4	Plasterboard, standard						
	Main construction	12.5	0.2100	0.0595	100.00	700	1000
Int surface				0.1000			

Total resistance:	Upper limit = 11.200 m ² K/W	Lower limit = 10.901 m ² K/W	Average = 11.050 m ² K/W
	Total correction = 0.0065 m ² K/W	U-value (unrounded) = 0.1 W/m ² K	

Unheated space: None

Total thickness: 463 mm

U-value: 0.10 W/m² K

Kappa: 9.10 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Plot 70	Issued on Date	01/03/2022
Assessment Reference	As Built	Prop Type Ref	H (HA/SO)
Project	10 Shaw Road, West End, Southampton, SO30 3JZ		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	13.19	TER	17.87
Environmental	90 B	% DER<TER	26.17		
CO ₂ Emissions (t/year)	0.78	DFEE	40.76	TFEE	50.41
General Requirements Compliance	Pass	% DFEE<TFEE	19.14		

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

Wall 000001

Wall Type: Standard Wall

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	Brick, outer leaf						
	Main construction	102	0.7700	0.1325	82.81		
	Main construction	102	0.9407	0.1084	17.19		
Layer 2	Supafil 34						
	Main construction	100	0.0340	2.9412	100.00		
	Corrections - Air Gap: Level 0, Fasteners: None or plastic						
Layer 3	Supabloc						
	Main construction	100	0.1100	0.9091	94.04	460	1000
	Main construction	100	0.8803	0.1136	5.96	460	1000
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 4	airspace/plaster dabs						
	Main construction	15	0.0882	0.1700	80.00		
	Main construction	15	0.0882	0.1700	20.00		
	Corrections - Cavity Unventilated, Emissivity: Normal						
Layer 5	Plasterboard, standard						
	Main construction	12.5	0.2100	0.0595	100.00	700	1000
Int surface				0.1300			

Total resistance:	Upper limit = 4.321 m ² K/W	Lower limit = 4.110 m ² K/W	Average = 4.215 m ² K/W
	Total correction = 0.0002 m ² K/W	U-value (unrounded) = 0.24 W/m ² K	

Unheated space: None		
Total thickness: 330 mm	U-value: 0.24 W/m² K	Kappa: 42.22 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Plot 70	Issued on Date	01/03/2022
Assessment Reference	As Built	Prop Type Ref	H (HA/SO)
Project	10 Shaw Road, West End, Southampton, SO30 3JZ		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	13.19	TER	17.87
Environmental	90 B	% DER<TER	26.17		
CO ₂ Emissions (t/year)	0.78	DFEE	40.76	TFEE	50.41
General Requirements Compliance	Pass	% DFEE<TFEE	19.14		

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

Floor 000003 - Worst Case Slab

Floor Type: Slab On Ground Floor

Area = 42.03 m², Perimeter = 18.38 m, Wall thickness = 275.00 mm, Soil: Unknown

Horizontal edge insulation: none

Vertical edge insulation: none

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

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

Total correction = 0.0096 m² K/W

U-value (unrounded) = 0.12 W/m² K

Unheated space: None

Total thickness: 321 mm

U-value: 0.12 W/m² K

Kappa: 84.00 kJ/m² K

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Plot 70	Issued on Date	01/03/2022
Assessment Reference	As Built	Prop Type Ref	H (HA/SO)
Property	10 Shaw Road, West End, Southampton, SO30 3JZ		
SAP Rating	88 B	DER	13.19
Environmental	90 B	TER	17.87
CO ₂ Emissions (t/year)	0.78	% DER<TER	26.17
General Requirements Compliance	Pass	DfEE	40.76
		TFEE	50.41
		% DfEE<TFEE	19.14
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com		Assessor ID
			E477-0001
Client	Foreman Homes, FORE		

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

Orientation	North						
Property Tenure	Unknown						
Transaction Type	New dwelling						
Terrain Type	Suburban						
1.0 Property Type	House, Semi-Detached						
2.0 Number of Storeys	2						
3.0 Date Built	2020						
4.0 Sheltered Sides	1						
5.0 Sunlight/Shade	Average or unknown						
6.0 Measurements							
		Heat Loss Perimeter		Internal Floor Area		Average Storey Height	
		Ground Floor:		18.38 m		42.03 m ²	
		1st Storey:		18.38 m		42.03 m ²	
7.0 Living Area		18.17		m ²			
8.0 Thermal Mass Parameter		Precise calculation					
Thermal Mass		157.8		kJ/m ² K			
9.0 External Walls							
Description		Type	Construction		U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)
Brick and Block		Cavity Wall	Other		0.24	42.22	93.00
9.1 Party Walls							
Description		Type	Construction		U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)
Party Wall 1		Filled Cavity with Edge Sealing	Single plasterboard on dabs on both sides, dense blocks, cavity or cavity fill		0.00	70.00	44.33
9.2 Internal Walls							
Description		Construction				Kappa (kJ/m ² K)	Area (m ²)
GF Stud		Plasterboard on timber frame				9.00	70.36
First Floor		Plasterboard on timber frame				9.00	96.99
10.0 External Roofs							
Description		Type	Construction		U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)
Pitched Roof		External Plane Roof	Other		0.10	9.10	42.03

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	42.03

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)
Ground Floor	Ground Floor - Solid	Other	0.12	84.00	42.03

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	42.03

12.0 Opening Types

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

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
Front Door	Solid Door	[1] Brick and Block	North							2.12	
Front Elevation	Window	[1] Brick and Block	North	None	0.00					3.96	
Front Elevation	Window	[1] Brick and Block	North	None	0.57	Yes				0.51	
Side Elevation	Window	[1] Brick and Block	East	None	0.00					1.92	
Rear Elevation	Window	[1] Brick and Block	South	None	0.00					8.00	

14.0 Conservatory

None

15.0 Draught Proofing

100

%

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	1.12	0.098	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.01	0.053	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	7.20	0.043	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	3.28	0.060	No	Birtley Supatherm
Independently assessed	E3 Sill	10.09	0.034	No	CD0027
Independently assessed	E4 Jamb	28.50	0.039	No	CD0028
Independently assessed	E5 Ground floor (normal)	18.38	0.037	No	Knauf P7
Independently assessed	E6 Intermediate floor within a dwelling	18.38	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	0.054	No	CD0031
Independently assessed	E16 Corner (normal)	10.10	0.050	No	CD0035
Table K1 - Approved	E18 Party wall between dwellings	10.10	0.060	No	
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	0.049	No	CD0020

Y-value 0.038 W/m²K

18.0 Pressure Testing

Yes

Designed AP₅₀ 5.00 m³/(h.m²) @ 50 Pa

Property Tested ? Yes

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

As Built AP₅₀

4.03

m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather

Windows half open

Cross ventilation possible

Yes

Night Ventilation

Yes

Air change rate

4.00

Mechanical Ventilation

Mechanical Ventilation System Present

No

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				4
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System

No

22.0 Lighting

Internal

Total number of light fittings

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	Gas Combi	%
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	
Combi boiler type	Normal (> 45°C)	
Combi keep hot type	Standard Combi	
	Gas/Oil, time clock	

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

25.0 Main Heating 2

Community Heating

28.0 Water Heating

Water Heating

Flue Gas Heat Recovery System

Waste Water Heat Recovery Instantaneous System 1

Waste Water Heat Recovery Instantaneous System 2

Waste Water Heat Recovery Storage System

Solar Panel

Water use <= 125 litres/person/day

SAP Code

29.0 Hot Water Cylinder

32.0 Photovoltaic Unit

PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
0.73	South	30°	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar water heating	£4,000 - £6,000	£27	B 89	