



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 34 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 89	Issued on Date	01/03/2022
Assessment Reference	As Built	Prop Type Ref	O (H/A - S/O+)
Property	34 Shaw Road, West End, Southampton, SO30 3JZ		
SAP Rating	87 B	DER	14.87
Environmental	89 B	TER	19.71
CO ₂ Emissions (t/year)	0.75	% DER<TER	24.54
General Requirements Compliance	Pass	DFEE	45.15
		TFEE	55.70
		% DFEE<TFEE	18.94
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)	19.71	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.87	kgCO ₂ /m ²	Pass
	-4.84 (-24.6%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	55.70	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	45.15	kWh/m ² /yr	
	-10.6 (-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	4.15 (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

7.49 m², No overhang

Windows facing South

3.43 m², No overhang

Windows facing West

1.32 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

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

Maximum

10.0 m³/(h.m²) @ 50 Pa

Pass

10 Key features

Party wall U-value

0.00 W/m²K

Roof U-value

0.10 W/m²K

Floor U-value

0.12 W/m²K

Door U-value

1.10 W/m²K

Photovoltaic array

0.65 kW

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THERMAL BRIDGING

Calculation Type: New Build (As Built)

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Environmental	89 B	TER	19.71
CO ₂ Emissions (t/year)	0.75	% DER<TER	24.54
General Requirements Compliance	Pass	DFEE	45.15
		TFEE	55.70
		% DFEE<TFEE	18.94
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com		Assessor ID
			E477-0001
Client	Foreman Homes, FORE		

	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.098	1.26	0.12	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.053	3.76	0.20	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.043	3.60	0.15	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.060	1.51	0.09	Birtley Supatherm
External wall	E3 Sill	Independently assessed	0.034	7.61	0.26	CD0027
External wall	E4 Jamb	Independently assessed	0.039	27.30	1.06	CD0028
External wall	E5 Ground floor (normal)	Independently assessed	0.037	16.78	0.62	Knauf P7
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	16.78	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	8.41	0.50	
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.054	8.46	0.46	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	8.46	1.35	
Party wall	P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	0.000	8.46	0.00	
Party wall	P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	0.049	8.46	0.41	CD0020

Total: **6.35** W/mK:
Y-Value: **0.041** W/m²K:

FULL SAP CALCULATION PRINTOUT

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Environmental	89 B	% DER<TER	24.54		
CO ₂ Emissions (t/year)	0.75	DFEE	45.15	TFEE	55.70
General Requirements Compliance	Pass	% DFEE<TFEE	18.94		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com			Assessor ID	E477-0001
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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

DWELLING AS BUILT

Semi-Detached House, total floor area 70 m²

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

1a TER and DER

Fuel for main heating: Mains gas
Fuel factor: 1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 19.71 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 14.87 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 55.7 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 45.1 kWh/m²/yr OK

2 Fabric U-values

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 4.15 (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: 7.49 m², No overhang
Windows facing South: 3.43 m², No overhang
Windows facing West: 1.32 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.10 W/m²K
Floor U-value 0.12 W/m²K
Door U-value 1.10 W/m²K
Photovoltaic array 0.65 kW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	35.1300 (1b)	x 2.3900 (2b)	= 83.9607 (1b) - (3b)
First floor	35.1300 (1c)	x 2.6700 (2c)	= 93.7971 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 177.7578 (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) = 0.2250 (8)
Pressure test					Yes
Measured/design AP50					4.1500
Infiltration rate					0.4325 (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) =	0.4001 (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	0.5101	0.5001	0.4901	0.4401	0.4301	0.3801	0.3801	0.3701	0.4001	0.4301	0.4501	0.4701 (22b)
Effective ac	0.6301	0.6251	0.6201	0.5968	0.5925	0.5722	0.5722	0.5685	0.5800	0.5925	0.6013	0.6105 (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)			12.2400	1.1450	14.0153		(27)
Ground Floor			35.1300	0.1200	4.2156	84.0000	2950.9200 (28a)
Brick and Block	84.9100	14.3600	70.5500	0.2400	16.9320	42.2200	2978.6210 (29a)
Pitched Roof	35.1300		35.1300	0.1000	3.5130	9.1000	319.6830 (30)
Total net area of external elements Aum(A, m ²)			155.1700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.0079		(33)
Party Wall 1			42.7400	0.0000	0.0000	70.0000	2991.8000 (32)
GF Stud			58.6700			9.0000	528.0300 (32c)
First Floor			82.3100			9.0000	740.7900 (32c)
Internal Floor 1			35.1300			18.0000	632.3400 (32d)
Internal Ceiling 1			35.1300			18.0000	632.3400 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 11774.5240 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 167.5850 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.3530 (36)
Total fabric heat loss (33) + (36) = 47.3609 (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	36.9621	36.6657	36.3752	35.0108	34.7555	33.5671	33.5671	33.3470	34.0249	34.7555	35.2719	35.8118 (38)
Heat transfer coeff	84.3230	84.0266	83.7361	82.3717	82.1164	80.9280	80.9280	80.7080	81.3858	82.1164	82.6328	83.1727 (39)
Average = Sum(39)m / 12 =												82.3705 (39)
HLP	1.2002	1.1959	1.1918	1.1724	1.1688	1.1518	1.1518	1.1487	1.1584	1.1688	1.1761	1.1838 (40)
HLP (average)												1.1724 (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												2.2524 (42)
Average daily hot water use (litres/day)												87.6950 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	96.4645	92.9567	89.4489	85.9411	82.4333	78.9255	78.9255	82.4333	85.9411	89.4489	92.9567	96.4645 (44)
Energy conte	143.0540	125.1160	129.1085	112.5599	108.0039	93.1992	86.3627	99.1025	100.2861	116.8738	127.5769	138.5402 (45)
Energy content (annual)										Total = Sum(45)m =		1379.7836 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	21.4581	18.7674	19.3663	16.8840	16.2006	13.9799	12.9544	14.8654	15.0429	17.5311	19.1365	20.7810 (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	27.5375	24.8584	27.4993	26.5866	27.4543	26.5472	27.4188	27.4418	26.5687	27.4807	26.6238	27.5301 (61)
Total heat required for water heating calculated for each month	170.5916	149.9744	156.6078	139.1466	135.4582	119.7464	113.7815	126.5443	126.8548	144.3544	154.2007	166.0703 (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	170.5916	149.9744	156.6078	139.1466	135.4582	119.7464	113.7815	126.5443	126.8548	144.3544	154.2007	166.0703 (64)
Heat gains from water heating, kWh/month	54.4499	47.8157	49.8034	44.0728	42.7749	37.6255	35.5703	39.8120	39.9873	45.7307	49.0753	52.9472 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1703.3310 (64)												

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	112.6210	112.6210	112.6210	112.6210	112.6210	112.6210	112.6210	112.6210	112.6210	112.6210	112.6210	112.6210	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.1182	16.0924	13.0872	9.9079	7.4062	6.2527	6.7562	8.7820	11.7872	14.9665	17.4681	18.6217	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.9031	199.9567	194.7817	183.7646	169.8576	156.7869	148.0549	146.0013	151.1763	162.1934	176.1004	189.1711	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2621	34.2621	34.2621	34.2621	34.2621	34.2621	34.2621	34.2621	34.2621	34.2621	34.2621	34.2621	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	(71)
Water heating gains (Table 5)	73.1853	71.1543	66.9400	61.2123	57.4931	52.2577	47.8096	53.5108	55.5379	61.4660	68.1601	71.1655	(72)
Total internal gains	348.9929	346.9897	334.5953	314.6711	294.5432	275.0836	262.4070	268.0804	278.2877	298.4122	321.5150	338.7447	(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				7.4900	10.6334	0.6300	0.7000	0.7700	24.3403 (74)			
South				3.4300	46.7521	0.6300	0.7000	0.7700	49.0080 (78)			
West				1.3200	19.6403	0.6300	0.7000	0.7700	7.9231 (80)			
Solar gains	81.2713	142.2771	206.8063	279.7406	337.0639	345.6748	328.6246	283.7664	231.5216	160.3323	97.9972	69.1542 (83)
Total gains	430.2642	489.2669	541.4015	594.4117	631.6072	620.7583	591.0316	551.8468	509.8093	458.7445	419.5121	407.8989 (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	38.7878	38.9246	39.0596	39.7066	39.8301	40.4149	40.4149	40.5251	40.1876	39.8301	39.5811	39.3242	
alpha	3.5859	3.5950	3.6040	3.6471	3.6553	3.6943	3.6943	3.7017	3.6792	3.6553	3.6387	3.6216	
util living area	0.9901	0.9834	0.9691	0.9326	0.8528	0.7107	0.5619	0.6127	0.8226	0.9495	0.9836	0.9918	(86)
MIT	19.2460	19.4417	19.7662	20.2047	20.5950	20.8613	20.9566	20.9400	20.7434	20.2470	19.6780	19.2201	(87)
Th 2	19.9199	19.9233	19.9266	19.9422	19.9451	19.9587	19.9587	19.9613	19.9535	19.9451	19.9392	19.9330	(88)
util rest of house	0.9877	0.9794	0.9614	0.9148	0.8116	0.6299	0.4454	0.4974	0.7589	0.9325	0.9791	0.9899	(89)
MIT 2	18.3267	18.5233	18.8462	19.2844	19.6492	19.8816	19.9433	19.9379	19.7920	19.3340	18.7712	18.3108	(90)
Living area fraction									fLA = Living area / (4) =			0.2095	(91)
MIT	18.5193	18.7157	19.0389	19.4773	19.8473	20.0869	20.1556	20.1479	19.9913	19.5253	18.9612	18.5013	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5193	18.7157	19.0389	19.4773	19.8473	20.0869	20.1556	20.1479	19.9913	19.5253	18.9612	18.5013	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	423.2069	476.3499	516.1042	538.0458	509.8289	397.7777	277.0442	286.7915	388.2365	423.8483	408.3518	402.3022	(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	1199.0171	1160.8886	1049.9611	871.2660	669.0287	444.0427	287.7461	302.4821	479.4687	732.9097	980.1231	1189.4768	(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	577.2028	460.0100	397.1895	239.9186	118.4446	0.0000	0.0000	0.0000	0.0000	229.9417	411.6754	585.6579	(98)
Space heating												3020.0406	(98)
Space heating per m2												42.9838	(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													3329.7029 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	577.2028	460.0100	397.1895	239.9186	118.4446	0.0000	0.0000	0.0000	0.0000	229.9417	411.6754	585.6579	(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)	636.3868	507.1775	437.9157	264.5188	130.5895	0.0000	0.0000	0.0000	0.0000	253.5190	453.8869	645.7088	(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	170.5916	149.9744	156.6078	139.1466	135.4582	119.7464	113.7815	126.5443	126.8548	144.3544	154.2007	166.0703	(64)
Efficiency of water heater (217)m	90.0457	89.9952	89.8903	89.6517	89.1844	87.9000	87.9000	87.9000	87.9000	89.5993	89.9195	87.9000	(216)
Fuel for water heating, kWh/month	189.4501	166.6472	174.2210	155.2079	151.8856	136.2303	129.4443	143.9639	144.3172	161.1112	171.4875	184.3870	(219)
Water heating fuel used												1908.3533	(219)
Annual totals kWh/year													
Space heating fuel - main system												3329.7029	(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)												319.9724	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.65 * 1080 * 1.00) =										-561.3528		-561.3528	(233)
Total delivered energy for all uses												5071.6758	(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	3329.7029	0.2160	719.2158 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1908.3533	0.2160	412.2043 (264)
Space and water heating			1131.4201 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	319.9724	0.5190	166.0657 (268)
Energy saving/generation technologies			
PV Unit	-561.3528	0.5190	-291.3421 (269)
Total CO2, kg/year			1045.0687 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			14.8700 (273)

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

DER		14.8700	ZC1
Total Floor Area	TFA	70.2600	
Assumed number of occupants	N	2.2524	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.6913	ZC2
CO2 emissions from cooking, equation (L16)		2.4631	ZC3
Total CO2 emissions		34.0244	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		34.0244	ZC8

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1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	35.1300 (1b)	x 2.3900 (2b)	= 83.9607 (1b) - (3b)
First floor	35.1300 (1c)	x 2.6700 (2c)	= 93.7971 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 177.7578 (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) = 0.1688 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4188 (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) =	0.3874 (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	0.4939	0.4842	0.4745	0.4261	0.4164	0.3680	0.3680	0.3583	0.3874	0.4164	0.4358	0.4551 (22b)
Effective ac	0.6220	0.6172	0.6126	0.5908	0.5867	0.5677	0.5677	0.5642	0.5750	0.5867	0.5950	0.6036 (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)			12.2400	1.3258	16.2273		(27)
Ground Floor			35.1300	0.1300	4.5669		(28a)
Brick and Block	84.9100	14.3600	70.5500	0.1800	12.6990		(29a)
Pitched Roof	35.1300		35.1300	0.1300	4.5669		(30)
Total net area of external elements Aum(A, m ²)			155.1700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.1801		(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)							9.1560 (36)
Total fabric heat loss						(33) + (36) =	49.3361 (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	36.4843	36.2065	35.9342	34.6552	34.4159	33.3019	33.3019	33.0956	33.7310	34.4159	34.9000	35.4061 (38)
Heat transfer coeff	85.8204	85.5426	85.2703	83.9912	83.7519	82.6380	82.6380	82.4317	83.0670	83.7519	84.2360	84.7422 (39)
Average = Sum(39)m / 12 =												83.9901 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2215	1.2175	1.2136	1.1954	1.1920	1.1762	1.1762	1.1732	1.1823	1.1920	1.1989	1.2061 (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												2.2524 (42)
Average daily hot water use (litres/day)												87.6950 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.4645	92.9567	89.4489	85.9411	82.4333	78.9255	78.9255	82.4333	85.9411	89.4489	92.9567	96.4645 (44)
Energy conte	143.0540	125.1160	129.1085	112.5599	108.0039	93.1992	86.3627	99.1025	100.2861	116.8738	127.5769	138.5402 (45)
Energy content (annual)										Total = Sum(45)m =		1379.7836 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.4581	18.7674	19.3663	16.8840	16.2006	13.9799	12.9544	14.8654	15.0429	17.5311	19.1365	20.7810 (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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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	49.1572	42.7855	45.5822	42.3819	42.0071	38.9222	40.2196	42.0071	42.3819	45.5822	45.8417	49.1572 (61)
Solar input	192.2113	167.9015	174.6907	154.9418	150.0110	132.1213	126.5823	141.1096	142.6680	162.4559	173.4185	187.6975 (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	192.2113	167.9015	174.6907	154.9418	150.0110	132.1213	126.5823	141.1096	142.6680	162.4559	173.4185	187.6975 (64)
	59.8548	52.2975	54.3241	48.0216	46.4131	40.7193	38.7705	43.4534	43.9406	50.2561	53.8797	58.3539 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	112.6210	112.6210	112.6210	112.6210	112.6210	112.6210	112.6210	112.6210	112.6210	112.6210	112.6210	112.6210	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.1182	16.0924	13.0872	9.9079	7.4062	6.2527	6.7562	8.7820	11.7872	14.9665	17.4681	18.6217	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.9031	199.9567	194.7817	183.7646	169.8576	156.7869	148.0549	146.0013	151.1763	162.1934	176.1004	189.1711	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2621	34.2621	34.2621	34.2621	34.2621	34.2621	34.2621	34.2621	34.2621	34.2621	34.2621	34.2621	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	(71)
Water heating gains (Table 5)	80.4500	77.8236	73.0163	66.6967	62.3832	56.5545	52.1109	58.4050	61.0286	67.5485	74.8329	78.4327	(72)
Total internal gains	356.2576	353.6590	340.6715	320.1555	299.4333	279.3804	266.7083	272.9746	283.7784	304.4947	328.1878	346.0118	(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					7.4900	10.6334	0.6300	0.7000	0.7700		24.3403 (74)	
South					3.4300	46.7521	0.6300	0.7000	0.7700		49.0080 (78)	
West					1.3200	19.6403	0.6300	0.7000	0.7700		7.9231 (80)	

Solar gains	81.2713	142.2771	206.8063	279.7406	337.0639	345.6748	328.6246	283.7664	231.5216	160.3323	97.9972	69.1542 (83)
Total gains	437.5289	495.9362	547.4778	599.8962	636.4972	625.0552	595.3329	556.7410	515.3000	464.8270	426.1850	415.1660 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	56.8532	57.0379	57.2200	58.0914	58.2574	59.0427	59.0427	59.1904	58.7377	58.2574	57.9226	57.5766	
alpha	4.7902	4.8025	4.8147	4.8728	4.8838	4.9362	4.9362	4.9460	4.9158	4.8838	4.8615	4.8384	
util living area	0.9976	0.9952	0.9889	0.9671	0.9019	0.7554	0.5887	0.6449	0.8719	0.9777	0.9953	0.9982	(86)
MIT	19.6848	19.8332	20.0816	20.4218	20.7283	20.9246	20.9826	20.9732	20.8354	20.4474	20.0107	19.6646	(87)
Th 2	19.9029	19.9060	19.9091	19.9237	19.9264	19.9391	19.9391	19.9415	19.9342	19.9264	19.9209	19.9151	(88)
util rest of house	0.9968	0.9936	0.9848	0.9539	0.8612	0.6633	0.4579	0.5139	0.8045	0.9663	0.9934	0.9976	(89)
MIT 2	18.1579	18.3764	18.7396	19.2370	19.6527	19.8872	19.9326	19.9301	19.7978	19.2815	18.6467	18.1369	(90)
Living area fraction	18.4778	18.6816	19.0208	19.4852	19.8781	20.1046	20.1525	20.1486	20.0152	19.5257	18.9325	18.4569	(92)
Temperature adjustment	18.4778	18.6816	19.0208	19.4852	19.8781	20.1046	20.1525	20.1486	20.0152	19.5257	18.9325	18.4569	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	435.4355	491.4156	536.5493	568.0449	546.7339	424.4775	288.9659	301.2983	417.7026	446.4356	422.2356	413.6113	(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	1216.7437	1178.9161	1067.6509	889.0655	684.9284	454.8861	293.5747	309.0071	491.3576	747.5485	996.7212	1208.1626	(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	581.2933	462.0003	395.1396	231.1348	102.8167	0.0000	0.0000	0.0000	0.0000	224.0280	413.6296	591.1461	(98)
Space heating												3001.1886	(98)
Space heating per m2												42.7155	(99)

8c. Space cooling requirement

Not applicable

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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												3213.2640 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	581.2933	462.0003	395.1396	231.1348	102.8167	0.0000	0.0000	0.0000	0.0000	224.0280	413.6296	591.1461 (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)	622.3697	494.6470	423.0617	247.4677	110.0821	0.0000	0.0000	0.0000	0.0000	239.8587	442.8583	632.9188 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	192.2113	167.9015	174.6907	154.9418	150.0110	132.1213	126.5823	141.1096	142.6680	162.4559	173.4185	187.6975 (64)
Efficiency of water heater (217)m	87.6602	87.4675	87.0437	86.0561	84.1221	80.3000	80.3000	80.3000	80.3000	85.8605	87.1614	80.3000 (216)
Fuel for water heating, kWh/month	219.2687	191.9587	200.6932	180.0475	178.3253	164.5346	157.6367	175.7280	177.6687	189.2091	198.9624	213.9236 (219)
Water heating fuel used												2247.9566 (219)
Annual totals kWh/year												
Space heating fuel - main system												3213.2640 (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)												319.9724 (232)
Total delivered energy for all uses												5856.1930 (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	3213.2640	0.2160	694.0650 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2247.9566	0.2160	485.5586 (264)
Space and water heating			1179.6236 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	319.9724	0.5190	166.0657 (268)
Total CO2, kg/m2/year			1384.6143 (272)
Emissions per m2 for space and water heating			16.7894 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3636 (272b)
Emissions per m2 for pumps and fans			0.5540 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.7894 * 1.00) + 2.3636 + 0.5540, rounded to 2 d.p.			19.7100 (273)

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Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	35.1300 (1b)	x 2.3900 (2b)	= 83.9607 (1b) - (3b)
First floor	35.1300 (1c)	x 2.6700 (2c)	= 93.7971 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 177.7578 (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) = 0.1688 (8)
Pressure test					Yes
Measured/design AP50					4.1500
Infiltration rate					0.3763 (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) =	0.3480 (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	0.4438	0.4351	0.4264	0.3829	0.3742	0.3306	0.3306	0.3219	0.3480	0.3742	0.3916	0.4090 (22b)
Effective ac	0.5985	0.5946	0.5909	0.5733	0.5700	0.5547	0.5547	0.5518	0.5606	0.5700	0.5767	0.5836 (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)			12.2400	1.1450	14.0153		(27)
Ground Floor			35.1300	0.1200	4.2156	84.0000	2950.9200 (28a)
Brick and Block	84.9100	14.3600	70.5500	0.2400	16.9320	42.2200	2978.6210 (29a)
Pitched Roof	35.1300		35.1300	0.1000	3.5130	9.1000	319.6830 (30)
Total net area of external elements Aum(A, m ²)			155.1700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.0079		(33)
Party Wall 1			42.7400	0.0000	0.0000	70.0000	2991.8000 (32)
GF Stud			58.6700			9.0000	528.0300 (32c)
First Floor			82.3100			9.0000	740.7900 (32c)
Internal Floor 1			35.1300			18.0000	632.3400 (32d)
Internal Ceiling 1			35.1300			9.0000	316.1700 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 11458.3540 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 163.0850 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.3530 (36)
Total fabric heat loss (33) + (36) = 47.3609 (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	35.1059	34.8816	34.6617	33.6291	33.4360	32.5366	32.5366	32.3701	32.8830	33.4360	33.8268	34.2354 (38)
Heat transfer coeff	82.4668	82.2425	82.0226	80.9901	80.7969	79.8975	79.8975	79.7310	80.2439	80.7969	81.1877	81.5963 (39)
Average = Sum(39)m / 12 =												80.9891 (39)
HLP	1.1737	1.1705	1.1674	1.1527	1.1500	1.1372	1.1372	1.1348	1.1421	1.1500	1.1555	1.1613 (40)
HLP (average)												1.1527 (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												2.2524 (42)
Average daily hot water use (litres/day)												87.6950 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	96.4645	92.9567	89.4489	85.9411	82.4333	78.9255	78.9255	82.4333	85.9411	89.4489	92.9567	96.4645 (44)
Energy conte	143.0540	125.1160	129.1085	112.5599	108.0039	93.1992	86.3627	99.1025	100.2861	116.8738	127.5769	138.5402 (45)
Energy content (annual)										Total = Sum(45)m =		1379.7836 (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	30.3990	26.5871	27.4356	23.9190	22.9508	19.8048	18.3521	21.0593	21.3108	24.8357	27.1101	29.4398 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	112.6210	112.6210	112.6210	112.6210	112.6210	112.6210	112.6210	112.6210	112.6210	112.6210	112.6210	112.6210	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.1182	16.0924	13.0872	9.9079	7.4062	6.2527	6.7562	8.7820	11.7872	14.9665	17.4681	18.6217	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.9031	199.9567	194.7817	183.7646	169.8576	156.7869	148.0549	146.0013	151.1763	162.1934	176.1004	189.1711	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2621	34.2621	34.2621	34.2621	34.2621	34.2621	34.2621	34.2621	34.2621	34.2621	34.2621	34.2621	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	(71)
Water heating gains (Table 5)	40.8589	39.5642	36.8757	33.2208	30.8479	27.5067	24.6668	28.3055	29.5983	33.3813	37.6529	39.5696	(72)
Total internal gains	313.6664	312.3996	301.5310	283.6796	264.8980	247.3326	236.2642	239.8751	249.3481	267.3275	288.0078	304.1488	(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	7.4900	10.6334	0.6300	0.7000	0.7700	24.3403 (74)
South	3.4300	46.7521	0.6300	0.7000	0.7700	49.0080 (78)
West	1.3200	19.6403	0.6300	0.7000	0.7700	7.9231 (80)

Solar gains	81.2713	142.2771	206.8063	279.7406	337.0639	345.6748	328.6246	283.7664	231.5216	160.3323	97.9972	69.1542	(83)
Total gains	394.9378	454.6768	508.3372	563.4202	601.9619	593.0073	564.8888	523.6415	480.8697	427.6598	386.0049	373.3030	(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	38.5959	38.7011	38.8049	39.2996	39.3936	39.8370	39.8370	39.9202	39.6650	39.3936	39.2039	39.0076	
alpha	3.5731	3.5801	3.5870	3.6200	3.6262	3.6558	3.6558	3.6613	3.6443	3.6262	3.6136	3.6005	
util living area	0.9918	0.9856	0.9723	0.9379	0.8613	0.7237	0.5757	0.6301	0.8363	0.9556	0.9863	0.9933	(86)
MIT	19.1942	19.3936	19.7243	20.1682	20.5706	20.8480	20.9513	20.9318	20.7201	20.2044	19.6235	19.1619	(87)
Th 2	19.9411	19.9436	19.9462	19.9580	19.9602	19.9706	19.9706	19.9725	19.9666	19.9602	19.9557	19.9510	(88)
util rest of house	0.9898	0.9823	0.9655	0.9215	0.8223	0.6448	0.4596	0.5156	0.7763	0.9408	0.9825	0.9917	(89)
MIT 2	18.2939	18.4938	18.8228	19.2647	19.6425	19.8842	19.9527	19.9450	19.7866	19.3078	18.7326	18.2692	(90)
Living area fraction	18.4825	18.6823	19.0117	19.4540	19.8369	20.0861	20.1619	20.1518	19.9821	19.4957	18.9193	18.4562	(91)
Temperature adjustment	18.4825	18.6823	19.0117	19.4540	19.8369	20.0861	20.1619	20.1518	19.9821	19.4957	18.9193	18.4562	(92)
adjusted MIT	18.4825	18.6823	19.0117	19.4540	19.8369	20.0861	20.1619	20.1518	19.9821	19.4957	18.9193	18.4562	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	389.4935	444.1708	486.8375	513.6970	491.7928	388.1792	272.5738	281.3134	373.7926	398.6770	377.2848	369.0463	(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	1169.5838	1133.4897	1026.2418	854.7655	657.4377	438.3292	284.5849	299.1334	472.0068	718.7408	959.5779	1163.2530	(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	580.3871	463.2223	401.3169	245.5693	123.2398	0.0000	0.0000	0.0000	0.0000	238.1275	419.2511	590.8897	(98)
Space heating												3062.0037	(98)
Space heating per m2												43.5810	(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	751.0366	591.2416	605.9553	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7984	0.8645	0.8361	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	599.5913	511.1178	506.6343	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	776.9995	742.4568	695.6632	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	127.7339	172.1162	140.6375	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												440.4876 (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	31.9335	43.0291	35.1594	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												110.1219 (107)
Space cooling per m2												1.5673 (108)
Energy for space heating												43.5810 (99)
Energy for space cooling												1.5673 (108)
Total												45.1484 (109)
Dwelling Fabric Energy Efficiency (DFEE)												45.1 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	35.1300 (1b)	x 2.3900 (2b)	= 83.9607 (1b) - (3b)
First floor	35.1300 (1c)	x 2.6700 (2c)	= 93.7971 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 177.7578 (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) = 0.1688 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4188 (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) =	0.3874 (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	0.4939	0.4842	0.4745	0.4261	0.4164	0.3680	0.3680	0.3583	0.3874	0.4164	0.4358	0.4551 (22b)
Effective ac	0.6220	0.6172	0.6126	0.5908	0.5867	0.5677	0.5677	0.5642	0.5750	0.5867	0.5950	0.6036 (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)			12.2400	1.3258	16.2273		(27)
Ground Floor			35.1300	0.1300	4.5669		(28a)
Brick and Block	84.9100	14.3600	70.5500	0.1800	12.6990		(29a)
Pitched Roof	35.1300		35.1300	0.1300	4.5669		(30)
Total net area of external elements Aum(A, m ²)			155.1700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.1801		(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)							9.1560 (36)
Total fabric heat loss						(33) + (36) =	49.3361 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	36.4843	36.2065	35.9342	34.6552	34.4159	33.3019	33.3019	33.0956	33.7310	34.4159	34.9000	35.4061 (38)
Average = Sum(39)m / 12 =	85.8204	85.5426	85.2703	83.9912	83.7519	82.6380	82.6380	82.4317	83.0670	83.7519	84.2360	84.7422 (39)
												83.9901 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2215	1.2175	1.2136	1.1954	1.1920	1.1762	1.1762	1.1732	1.1823	1.1920	1.1989	1.2061 (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												2.2524 (42)
Average daily hot water use (litres/day)												87.6950 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	96.4645	92.9567	89.4489	85.9411	82.4333	78.9255	78.9255	82.4333	85.9411	89.4489	92.9567	96.4645 (44)
Energy content (annual)	143.0540	125.1160	129.1085	112.5599	108.0039	93.1992	86.3627	99.1025	100.2861	116.8738	127.5769	138.5402 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1379.7836 (45)
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
If cylinder contains dedicated solar storage												

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Calculation Type: New Build (As Built)

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Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
	30.3990	26.5871	27.4356	23.9190	22.9508	19.8048	18.3521	21.0593	21.3108	24.8357	27.1101	29.4398 (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
	112.6210	112.6210	112.6210	112.6210	112.6210	112.6210	112.6210	112.6210	112.6210	112.6210	112.6210	112.6210 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.1182	16.0924	13.0872	9.9079	7.4062	6.2527	6.7562	8.7820	11.7872	14.9665	17.4681	18.6217 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.9031	199.9567	194.7817	183.7646	169.8576	156.7869	148.0549	146.0013	151.1763	162.1934	176.1004	189.1711 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2621	34.2621	34.2621	34.2621	34.2621	34.2621	34.2621	34.2621	34.2621	34.2621	34.2621	34.2621 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968 (71)
Water heating gains (Table 5)	40.8589	39.5642	36.8757	33.2208	30.8479	27.5067	24.6668	28.3055	29.5983	33.3813	37.6529	39.5696 (72)
Total internal gains	313.6664	312.3996	301.5310	283.6796	264.8980	247.3326	236.2642	239.8751	249.3481	267.3275	288.0078	304.1488 (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				7.4900	10.6334		0.6300		0.7000		0.7700	24.3403 (74)
South				3.4300	46.7521		0.6300		0.7000		0.7700	49.0080 (78)
West				1.3200	19.6403		0.6300		0.7000		0.7700	7.9231 (80)

Solar gains	81.2713	142.2771	206.8063	279.7406	337.0639	345.6748	328.6246	283.7664	231.5216	160.3323	97.9972	69.1542 (83)
Total gains	394.9378	454.6768	508.3372	563.4202	601.9619	593.0073	564.8888	523.6415	480.8697	427.6598	386.0049	373.3030 (84)

7. Mean internal temperature (heating season)												

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	56.8532	57.0379	57.2200	58.0914	58.2574	59.0427	59.0427	59.1904	58.7377	58.2574	57.9226	57.5766
alpha	4.7902	4.8025	4.8147	4.8728	4.8838	4.9362	4.9362	4.9460	4.9158	4.8838	4.8615	4.8384
util living area	0.9985	0.9967	0.9918	0.9740	0.9173	0.7807	0.6156	0.6767	0.8949	0.9840	0.9970	0.9989 (86)
MIT	19.6292	19.7798	20.0324	20.3802	20.6993	20.9123	20.9789	20.9669	20.8102	20.4028	19.9586	19.6096 (87)
Th 2	19.9029	19.9060	19.9091	19.9237	19.9264	19.9391	19.9391	19.9415	19.9342	19.9264	19.9209	19.9151 (88)
util rest of house	0.9980	0.9956	0.9887	0.9632	0.8808	0.6905	0.4811	0.5433	0.8342	0.9754	0.9957	0.9985 (89)
MIT 2	18.6560	18.8087	19.0624	19.4156	19.7158	19.8969	19.9336	19.9316	19.8232	19.4436	18.9992	18.6462 (90)
Living area fraction										fLA = Living area / (4) =		0.2095 (91)
MIT	18.8599	19.0122	19.2656	19.6177	19.9218	20.1096	20.1526	20.1485	20.0300	19.6445	19.2002	18.8480 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8599	19.0122	19.2656	19.6177	19.9218	20.1096	20.1526	20.1485	20.0300	19.6445	19.2002	18.8480 (93)

8. Space heating requirement												

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9972	0.9943	0.9862	0.9593	0.8807	0.7067	0.5096	0.5715	0.8408	0.9724	0.9944	0.9979 (94)
Useful gains	393.8515	452.0627	501.3234	540.4670	530.1208	419.0654	287.8856	299.2491	404.3186	415.8364	383.8607	372.5226 (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	1249.5385	1207.1924	1088.5251	900.1954	688.5956	455.3048	293.5764	308.9965	492.5886	757.4977	1019.2733	1241.3061 (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	636.6311	507.4472	436.8781	259.0044	117.9052	0.0000	0.0000	0.0000	0.0000	254.1960	457.4971	646.3750 (98)
Space heating												3315.9340 (98)
Space heating per m2										(98) / (4) =		47.1952 (99)

8c. Space cooling requirement												

Calculated for June, July and August. See Table 10b												
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	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	776.7968	611.5209	626.4806	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8316	0.9010	0.8722	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	646.0230	551.0033	546.4270	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	776.9995	742.4568	695.6632	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	94.3031	142.4414	111.0318	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												347.7762 (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	23.5758	35.6104	27.7579	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												86.9441 (107)
Space cooling per m2												1.2375 (108)
Energy for space heating												47.1952 (99)
Energy for space cooling												1.2375 (108)
Total												48.4327 (109)
Target Fabric Energy Efficiency (TFEE)												55.7 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	35.1300 (1b)	x 2.3900 (2b)	= 83.9607 (1b) - (3b)
First floor	35.1300 (1c)	x 2.6700 (2c)	= 93.7971 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 177.7578 (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) = 0.2250 (8)
Pressure test					Yes
Measured/design AP50					4.1500
Infiltration rate					0.4325 (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) =	0.4001 (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	0.4701	0.4401	0.4401	0.4001	0.4101	0.3901	0.3901	0.3801	0.3801	0.4101	0.4001	0.4101 (22b)
Effective ac	0.6105	0.5968	0.5968	0.5800	0.5841	0.5761	0.5761	0.5722	0.5722	0.5841	0.5800	0.5841 (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)			12.2400	1.1450	14.0153		(27)
Ground Floor			35.1300	0.1200	4.2156	84.0000	2950.9200 (28a)
Brick and Block	84.9100	14.3600	70.5500	0.2400	16.9320	42.2200	2978.6210 (29a)
Pitched Roof	35.1300		35.1300	0.1000	3.5130	9.1000	319.6830 (30)
Total net area of external elements Aum(A, m ²)			155.1700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.0079		(33)
Party Wall 1			42.7400	0.0000	0.0000	70.0000	2991.8000 (32)
GF Stud			58.6700			9.0000	528.0300 (32c)
First Floor			82.3100			9.0000	740.7900 (32c)
Internal Floor 1			35.1300			18.0000	632.3400 (32d)
Internal Ceiling 1			35.1300			18.0000	632.3400 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	11774.5240 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							167.5850 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.3530 (36)
Total fabric heat loss						(33) + (36) =	47.3609 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	35.8118	35.0108	35.0108	34.0249	34.2625	33.7931	33.7931	33.5671	33.5671	34.2625	34.0249	34.2625 (38)
Average = Sum(39)m / 12 =	83.1727	82.3717	82.3717	81.3858	81.6234	81.1540	81.1540	80.9280	80.9280	81.6234	81.3858	81.6234 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1838	1.1724	1.1724	1.1584	1.1617	1.1551	1.1551	1.1518	1.1518	1.1617	1.1584	1.1617 (40)
HLP (average)												1.1620 (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												2.2524 (42)
Average daily hot water use (litres/day)												87.6950 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.4645	92.9567	89.4489	85.9411	82.4333	78.9255	78.9255	82.4333	85.9411	89.4489	92.9567	96.4645 (44)
Energy conte	143.0540	125.1160	129.1085	112.5599	108.0039	93.1992	86.3627	99.1025	100.2861	116.8738	127.5769	138.5402 (45)
Energy content (annual)										Total = Sum(45)m =		1379.7836 (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	21.4581	18.7674	19.3663	16.8840	16.2006	13.9799	12.9544	14.8654	15.0429	17.5311	19.1365	20.7810 (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	27.5375	24.8584	27.4993	26.5866	27.4543	26.5472	27.4188	27.4418	26.5687	27.4807	26.6238	27.5301 (61)
Total heat required for water heating calculated for each month	170.5916	149.9744	156.6078	139.1466	135.4582	119.7464	113.7815	126.5443	126.8548	144.3544	154.2007	166.0703 (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	170.5916	149.9744	156.6078	139.1466	135.4582	119.7464	113.7815	126.5443	126.8548	144.3544	154.2007	166.0703 (64)
RHI water heating demand												
Heat gains from water heating, kWh/month	54.4499	47.8157	49.8034	44.0728	42.7749	37.6255	35.5703	39.8120	39.9873	45.7307	49.0753	52.9472 (65)
												1703 (64)
												1703 (64)
												1703 (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	135.1452	135.1452	135.1452	135.1452	135.1452	135.1452	135.1452	135.1452	135.1452	135.1452	135.1452	135.1452 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	45.2954	40.2310	32.7180	24.7697	18.5156	15.6317	16.8906	21.9550	29.4679	37.4163	43.6704	46.5543 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	295.3778	298.4429	290.7190	274.2756	253.5188	234.0103	220.9775	217.9124	225.6363	242.0797	262.8365	282.3449 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7669	50.7669	50.7669	50.7669	50.7669	50.7669	50.7669	50.7669	50.7669	50.7669	50.7669	50.7669 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968 (71)
Water heating gains (Table 5)	73.1853	71.1543	66.9400	61.2123	57.4931	52.2577	47.8096	53.5108	55.5379	61.4660	68.1601	71.1655 (72)
Total internal gains	512.6738	508.6435	489.1924	459.0729	428.3429	400.7150	384.4929	392.1935	409.4575	439.7773	473.4823	498.8801 (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				7.4900	13.4684	0.6300	0.7000	0.7700		30.8298 (74)		
South				3.4300	56.5862	0.6300	0.7000	0.7700		59.3166 (78)		
West				1.3200	25.1733	0.6300	0.7000	0.7700		10.1551 (80)		
Solar gains	100.3015	150.0403	223.7650	306.5532	349.2470	396.8048	362.2780	325.3717	263.2108	182.9298	120.6667	80.7253 (83)
Total gains	612.9754	658.6838	712.9574	765.6261	777.5898	797.5198	746.7709	717.5652	672.6683	622.7072	594.1489	579.6055 (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	39.3242	39.7066	39.7066	40.1876	40.0706	40.3024	40.3024	40.4149	40.4149	40.0706	40.1876	40.0706
alpha	3.6216	3.6471	3.6471	3.6792	3.6714	3.6868	3.6868	3.6943	3.6943	3.6714	3.6792	3.6714
util living area	0.9626	0.9502	0.9172	0.8400	0.7071	0.4957	0.3533	0.3555	0.6131	0.8419	0.9361	0.9671 (86)
MIT	19.7615	19.9039	20.1912	20.5599	20.8288	20.9664	20.9929	20.9930	20.9263	20.6356	20.1827	19.7592 (87)
Th 2	19.9330	19.9422	19.9422	19.9535	19.9507	19.9561	19.9561	19.9587	19.9587	19.9507	19.9535	19.9507 (88)
util rest of house	0.9542	0.9393	0.8986	0.8041	0.6425	0.4033	0.2441	0.2425	0.5198	0.7970	0.9195	0.9596 (89)
MIT 2	18.8443	18.9897	19.2662	19.6174	19.8433	19.9425	19.9547	19.9574	19.9239	19.6903	19.2721	18.8565 (90)
Living area fraction									fLA = Living area / (4) =			0.2095 (91)
MIT	19.0365	19.1812	19.4600	19.8149	20.0498	20.1571	20.1722	20.1744	20.1339	19.8883	19.4628	19.0456 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0365	19.1812	19.4600	19.8149	20.0498	20.1571	20.1722	20.1744	20.1339	19.8883	19.4628	19.0456 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9453	0.9295	0.8886	0.7987	0.6491	0.4217	0.2671	0.2663	0.5365	0.7940	0.9100	0.9513 (94)
Ext temp.	579.4447	612.2726	633.5045	611.5408	504.7302	336.3350	199.4745	191.0703	360.9192	494.4145	540.6669	551.3777 (95)
Heat loss rate W	5.6000	6.0000	7.6000	10.1000	13.1000	15.9000	17.7000	17.8000	15.4000	12.1000	8.6000	5.7000 (96)
Month fracti	1117.5477	1085.7591	976.9286	790.6505	567.2663	345.4771	200.6307	192.1549	383.1083	635.7108	884.0806	1089.3155 (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	400.3487	318.1829	255.5075	128.9590	46.5269	0.0000	0.0000	0.0000	0.0000	105.1244	247.2579	400.2257 (98)
RHI space heating demand												1902.1331 (98)
												1902 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	35.1300 (1b)	x 2.3900 (2b)	= 83.9607 (1b) - (3b)
First floor	35.1300 (1c)	x 2.6700 (2c)	= 93.7971 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 177.7578 (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) = 0.2250 (8)
Pressure test					Yes
Measured/design AP50					4.1500
Infiltration rate					0.4325 (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) =	0.4001 (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	0.5101	0.5001	0.4901	0.4401	0.4301	0.3801	0.3801	0.3701	0.4001	0.4301	0.4501	0.4701 (22b)
Effective ac	0.6301	0.6251	0.6201	0.5968	0.5925	0.5722	0.5722	0.5685	0.5800	0.5925	0.6013	0.6105 (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)			12.2400	1.1450	14.0153		(27)
Ground Floor			35.1300	0.1200	4.2156	84.0000	2950.9200 (28a)
Brick and Block	84.9100	14.3600	70.5500	0.2400	16.9320	42.2200	2978.6210 (29a)
Pitched Roof	35.1300		35.1300	0.1000	3.5130	9.1000	319.6830 (30)
Total net area of external elements Aum(A, m ²)			155.1700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.0079		(33)
Party Wall 1			42.7400	0.0000	0.0000	70.0000	2991.8000 (32)
GF Stud			58.6700			9.0000	528.0300 (32c)
First Floor			82.3100			9.0000	740.7900 (32c)
Internal Floor 1			35.1300			18.0000	632.3400 (32d)
Internal Ceiling 1			35.1300			18.0000	632.3400 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 11774.5240 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 167.5850 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.3530 (36)
Total fabric heat loss (33) + (36) = 47.3609 (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	36.9621	36.6657	36.3752	35.0108	34.7555	33.5671	33.5671	33.3470	34.0249	34.7555	35.2719	35.8118 (38)
Heat transfer coeff	84.3230	84.0266	83.7361	82.3717	82.1164	80.9280	80.9280	80.7080	81.3858	82.1164	82.6328	83.1727 (39)
Average = Sum(39)m / 12 =												82.3705 (39)
HLP	1.2002	1.1959	1.1918	1.1724	1.1688	1.1518	1.1518	1.1487	1.1584	1.1688	1.1761	1.1838 (40)
HLP (average)												1.1724 (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												2.2524 (42)
Average daily hot water use (litres/day)												87.6950 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	96.4645	92.9567	89.4489	85.9411	82.4333	78.9255	78.9255	82.4333	85.9411	89.4489	92.9567	96.4645 (44)
Energy conte	143.0540	125.1160	129.1085	112.5599	108.0039	93.1992	86.3627	99.1025	100.2861	116.8738	127.5769	138.5402 (45)
Energy content (annual)										Total = Sum(45)m =		1379.7836 (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	21.4581	18.7674	19.3663	16.8840	16.2006	13.9799	12.9544	14.8654	15.0429	17.5311	19.1365	20.7810 (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	27.5375	24.8584	27.4993	26.5866	27.4543	26.5472	27.4188	27.4418	26.5687	27.4807	26.6238	27.5301 (61)
Total heat required for water heating calculated for each month	170.5916	149.9744	156.6078	139.1466	135.4582	119.7464	113.7815	126.5443	126.8548	144.3544	154.2007	166.0703 (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	170.5916	149.9744	156.6078	139.1466	135.4582	119.7464	113.7815	126.5443	126.8548	144.3544	154.2007	166.0703 (64)
Heat gains from water heating, kWh/month	54.4499	47.8157	49.8034	44.0728	42.7749	37.6255	35.5703	39.8120	39.9873	45.7307	49.0753	52.9472 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	135.1452	135.1452	135.1452	135.1452	135.1452	135.1452	135.1452	135.1452	135.1452	135.1452	135.1452	135.1452	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	45.2954	40.2310	32.7180	24.7697	18.5156	15.6317	16.8906	21.9550	29.4679	37.4163	43.6704	46.5543	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	295.3778	298.4429	290.7190	274.2756	253.5188	234.0103	220.9775	217.9124	225.6363	242.0797	262.8365	282.3449	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7669	50.7669	50.7669	50.7669	50.7669	50.7669	50.7669	50.7669	50.7669	50.7669	50.7669	50.7669	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	(71)
Water heating gains (Table 5)	73.1853	71.1543	66.9400	61.2123	57.4931	52.2577	47.8096	53.5108	55.5379	61.4660	68.1601	71.1655	(72)
Total internal gains	512.6738	508.6435	489.1924	459.0729	428.3429	400.7150	384.4929	392.1935	409.4575	439.7773	473.4823	498.8801	(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				7.4900	10.6334	0.6300	0.7000	0.7700	24.3403 (74)			
South				3.4300	46.7521	0.6300	0.7000	0.7700	49.0080 (78)			
West				1.3200	19.6403	0.6300	0.7000	0.7700	7.9231 (80)			
Solar gains	81.2713	142.2771	206.8063	279.7406	337.0639	345.6748	328.6246	283.7664	231.5216	160.3323	97.9972	69.1542 (83)
Total gains	593.9452	650.9206	695.9987	738.8135	765.4068	746.3898	713.1175	675.9599	640.9791	600.1096	571.4794	568.0343 (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	38.7878	38.9246	39.0596	39.7066	39.8301	40.4149	40.4149	40.5251	40.1876	39.8301	39.5811	39.3242
alpha	3.5859	3.5950	3.6040	3.6471	3.6553	3.6943	3.6943	3.7017	3.6792	3.6553	3.6387	3.6216
util living area	0.9733	0.9613	0.9378	0.8844	0.7843	0.6268	0.4793	0.5206	0.7315	0.8985	0.9588	0.9769 (86)
MIT	19.5177	19.7002	19.9953	20.3828	20.7060	20.9094	20.9742	20.9650	20.8328	20.4335	19.9210	19.4896 (87)
Th 2	19.9199	19.9233	19.9266	19.9422	19.9451	19.9587	19.9587	19.9613	19.9535	19.9451	19.9392	19.9330 (88)
util rest of house	0.9676	0.9530	0.9240	0.8580	0.7347	0.5455	0.3744	0.4147	0.6579	0.8698	0.9485	0.9718 (89)
MIT 2	18.5941	18.7755	19.0655	19.4466	19.7386	19.9108	19.9500	19.9484	19.8548	19.5035	19.0071	18.5766 (90)
Living area fraction									fLA = Living area / (4) =			0.2095 (91)
MIT	18.7876	18.9693	19.2603	19.6427	19.9413	20.1200	20.1646	20.1614	20.0597	19.6983	19.1986	18.7679 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7876	18.9693	19.2603	19.6427	19.9413	20.1200	20.1646	20.1614	20.0597	19.6983	19.1986	18.7679 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9598	0.9438	0.9136	0.8494	0.7345	0.5589	0.3959	0.4360	0.6661	0.8619	0.9395	0.9648 (94)
Useful gains	570.0846	614.3265	635.8809	627.5372	562.1673	417.1421	282.3219	294.7312	426.9682	517.2092	536.9064	548.0172 (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	1221.6355	1182.1925	1068.4987	884.8978	676.7448	446.7247	288.4759	303.5747	485.0339	747.1223	999.7398	1211.6533 (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	484.7539	381.6060	321.8676	185.2996	85.2457	0.0000	0.0000	0.0000	0.0000	171.0553	333.2401	493.7453 (98)
Space heating												2456.8135 (98)
Space heating per m2												34.9675 (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												2708.7249 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	484.7539	381.6060	321.8676	185.2996	85.2457	0.0000	0.0000	0.0000	0.0000	171.0553	333.2401	493.7453 (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)	534.4585	420.7342	354.8706	204.2995	93.9864	0.0000	0.0000	0.0000	0.0000	188.5946	367.4091	544.3719 (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	170.5916	149.9744	156.6078	139.1466	135.4582	119.7464	113.7815	126.5443	126.8548	144.3544	154.2007	166.0703 (64)
Efficiency of water heater (217)m	89.9541	89.8921	89.7641	89.4776	88.9607	87.9000	87.9000	87.9000	87.9000	89.3967	89.7951	87.9000 (216)
Fuel for water heating, kWh/month	189.6429	166.8382	174.4659	155.5099	152.2674	136.2303	129.4443	143.9639	144.3172	161.4762	171.7250	184.5665 (219)
Water heating fuel used												1910.4477 (219)
Annual totals kWh/year												
Space heating fuel - main system												2708.7249 (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)												319.9724 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 0.65 * 1080 * 1.00) =												-561.3528 (233)
Total delivered energy for all uses												4452.7922 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2708.7249	3.4800	94.2636 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1910.4477	3.4800	66.4836 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	319.9724	13.1900	42.2044 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-561.3528	13.1900	-74.0424 (252)
Total energy cost			258.8016 (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] =	0.9431 (257)
SAP value		86.8444
SAP rating (Section 12)		87 (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	2708.7249	0.2160	585.0846 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1910.4477	0.2160	412.6567 (264)
Space and water heating			997.7413 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	319.9724	0.5190	166.0657 (268)
Energy saving/generation technologies			
PV Unit	-561.3528	0.5190	-291.3421 (269)
Total kg/year			911.3899 (272)
CO2 emissions per m2			12.9700 (273)
EI value			89.4043
EI rating			89 (274)
EI band			B

Calculation of stars for heating and DHW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9070 = 3.837$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9070 = 0.2381$, stars = 4
Water heating energy efficiency	$3.48 / 0.8907 = 3.907$, stars = 4
Water heating environmental impact	$0.216 / 0.8907 = 0.2425$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	35.1300 (1b)	x 2.3900 (2b)	= 83.9607 (1b) - (3b)
First floor	35.1300 (1c)	x 2.6700 (2c)	= 93.7971 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 177.7578 (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) = 0.2250 (8)
Pressure test					Yes
Measured/design AP50					4.1500
Infiltration rate					0.4325 (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) =	0.4001 (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	0.4701	0.4401	0.4401	0.4001	0.4101	0.3901	0.3901	0.3801	0.3801	0.4101	0.4001	0.4101 (22b)
Effective ac	0.6105	0.5968	0.5968	0.5800	0.5841	0.5761	0.5761	0.5722	0.5722	0.5841	0.5800	0.5841 (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)			12.2400	1.1450	14.0153		(27)
Ground Floor			35.1300	0.1200	4.2156	84.0000	2950.9200 (28a)
Brick and Block	84.9100	14.3600	70.5500	0.2400	16.9320	42.2200	2978.6210 (29a)
Pitched Roof	35.1300		35.1300	0.1000	3.5130	9.1000	319.6830 (30)
Total net area of external elements Aum(A, m ²)			155.1700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.0079		(33)
Party Wall 1			42.7400	0.0000	0.0000	70.0000	2991.8000 (32)
GF Stud			58.6700			9.0000	528.0300 (32c)
First Floor			82.3100			9.0000	740.7900 (32c)
Internal Floor 1			35.1300			18.0000	632.3400 (32d)
Internal Ceiling 1			35.1300			18.0000	632.3400 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	11774.5240 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							167.5850 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.3530 (36)
Total fabric heat loss						(33) + (36) =	47.3609 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	35.8118	35.0108	35.0108	34.0249	34.2625	33.7931	33.7931	33.5671	33.5671	34.2625	34.0249	34.2625 (38)
Average = Sum(39)m / 12 =	83.1727	82.3717	82.3717	81.3858	81.6234	81.1540	81.1540	80.9280	80.9280	81.6234	81.3858	81.6234 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1838	1.1724	1.1724	1.1584	1.1617	1.1551	1.1551	1.1518	1.1518	1.1617	1.1584	1.1617 (40)
HLP (average)												1.1620 (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												2.2524 (42)
Average daily hot water use (litres/day)												87.6950 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.4645	92.9567	89.4489	85.9411	82.4333	78.9255	78.9255	82.4333	85.9411	89.4489	92.9567	96.4645 (44)
Energy conte	143.0540	125.1160	129.1085	112.5599	108.0039	93.1992	86.3627	99.1025	100.2861	116.8738	127.5769	138.5402 (45)
Energy content (annual)										Total = Sum(45)m =		1379.7836 (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	21.4581	18.7674	19.3663	16.8840	16.2006	13.9799	12.9544	14.8654	15.0429	17.5311	19.1365	20.7810 (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	27.5375	24.8584	27.4993	26.5866	27.4543	26.5472	27.4188	27.4418	26.5687	27.4807	26.6238	27.5301 (61)
Total heat required for water heating calculated for each month	170.5916	149.9744	156.6078	139.1466	135.4582	119.7464	113.7815	126.5443	126.8548	144.3544	154.2007	166.0703 (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	170.5916	149.9744	156.6078	139.1466	135.4582	119.7464	113.7815	126.5443	126.8548	144.3544	154.2007	166.0703 (64)
Heat gains from water heating, kWh/month	54.4499	47.8157	49.8034	44.0728	42.7749	37.6255	35.5703	39.8120	39.9873	45.7307	49.0753	52.9472 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1703.3310 (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	135.1452	135.1452	135.1452	135.1452	135.1452	135.1452	135.1452	135.1452	135.1452	135.1452	135.1452	135.1452	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	45.2954	40.2310	32.7180	24.7697	18.5156	15.6317	16.8906	21.9550	29.4679	37.4163	43.6704	46.5543	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	295.3778	298.4429	290.7190	274.2756	253.5188	234.0103	220.9775	217.9124	225.6363	242.0797	262.8365	282.3449	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7669	50.7669	50.7669	50.7669	50.7669	50.7669	50.7669	50.7669	50.7669	50.7669	50.7669	50.7669	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	(71)
Water heating gains (Table 5)	73.1853	71.1543	66.9400	61.2123	57.4931	52.2577	47.8096	53.5108	55.5379	61.4660	68.1601	71.1655	(72)
Total internal gains	512.6738	508.6435	489.1924	459.0729	428.3429	400.7150	384.4929	392.1935	409.4575	439.7773	473.4823	498.8801	(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				7.4900	13.4684	0.6300	0.7000		0.7700		30.8298 (74)	
South				3.4300	56.5862	0.6300	0.7000		0.7700		59.3166 (78)	
West				1.3200	25.1733	0.6300	0.7000		0.7700		10.1551 (80)	
Solar gains	100.3015	150.0403	223.7650	306.5532	349.2470	396.8048	362.2780	325.3717	263.2108	182.9298	120.6667	80.7253 (83)
Total gains	612.9754	658.6838	712.9574	765.6261	777.5898	797.5198	746.7709	717.5652	672.6683	622.7072	594.1489	579.6055 (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	39.3242	39.7066	39.7066	40.1876	40.0706	40.3024	40.3024	40.4149	40.4149	40.0706	40.1876	40.0706	
alpha	3.6216	3.6471	3.6471	3.6792	3.6714	3.6868	3.6868	3.6943	3.6943	3.6714	3.6792	3.6714	
util living area	0.9626	0.9502	0.9172	0.8400	0.7071	0.4957	0.3533	0.3555	0.6131	0.8419	0.9361	0.9671	(86)
MIT	19.7615	19.9039	20.1912	20.5599	20.8288	20.9664	20.9929	20.9930	20.9263	20.6356	20.1827	19.7592	(87)
Th 2	19.9330	19.9422	19.9422	19.9535	19.9507	19.9561	19.9561	19.9587	19.9587	19.9507	19.9535	19.9507	(88)
util rest of house	0.9542	0.9393	0.8986	0.8041	0.6425	0.4033	0.2441	0.2425	0.5198	0.7970	0.9195	0.9596	(89)
MIT 2	18.8443	18.9897	19.2662	19.6174	19.8433	19.9425	19.9547	19.9574	19.9239	19.6903	19.2721	18.8565	(90)
Living area fraction									fLA = Living area / (4)			0.2095	(91)
MIT	19.0365	19.1812	19.4600	19.8149	20.0498	20.1571	20.1722	20.1744	20.1339	19.8883	19.4628	19.0456	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0365	19.1812	19.4600	19.8149	20.0498	20.1571	20.1722	20.1744	20.1339	19.8883	19.4628	19.0456	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9453	0.9295	0.8886	0.7987	0.6491	0.4217	0.2671	0.2663	0.5365	0.7940	0.9100	0.9513	(94)
Useful gains	579.4447	612.2726	633.5045	611.5408	504.7302	336.3350	199.4745	191.0703	360.9192	494.4145	540.6669	551.3777	(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	1117.5477	1085.7591	976.9286	790.6505	567.2663	345.4771	200.6307	192.1549	383.1083	635.7108	884.0806	1089.3155	(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	400.3487	318.1829	255.5075	128.9590	46.5269	0.0000	0.0000	0.0000	0.0000	105.1244	247.2579	400.2257	(98)
Space heating												1902.1331	(98)
Space heating per m2												27.0728	(99)
										(98) / (4) =			

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												2097.1699	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	400.3487	318.1829	255.5075	128.9590	46.5269	0.0000	0.0000	0.0000	0.0000	105.1244	247.2579	400.2257	(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)	441.3987	350.8081	281.7062	142.1820	51.2976	0.0000	0.0000	0.0000	0.0000	115.9034	272.6107	441.2632	(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	170.5916	149.9744	156.6078	139.1466	135.4582	119.7464	113.7815	126.5443	126.8548	144.3544	154.2007	166.0703	(64)
Efficiency of water heater	89.8449	89.7838	89.6152	89.2249	88.5993	87.9000	87.9000	87.9000	87.9000	89.0585	89.6037	87.9000	(216)
(217)m												89.8606	(217)
Fuel for water heating, kWh/month	189.8735	167.0395	174.7558	155.9504	152.8886	136.2303	129.4443	143.9639	144.3172	162.0894	172.0919	184.8089	(219)
Water heating fuel used												1913.4537	(219)
Annual totals kWh/year													
Space heating fuel - main system												2097.1699	(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)												319.9724	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.65 * 1206 * 1.00) =										-627.1253		-627.1253	(233)
Total delivered energy for all uses												3778.4707	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2097.1699	3.6300	76.1273 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1913.4537	3.6300	69.4584 (247)
Pumps and fans for heating	75.0000	19.4400	14.5800 (249)
Energy for lighting	319.9724	19.4400	62.2026 (250)
Additional standing charges			95.0000 (251)
Energy saving/generation technologies			
PV Unit	-627.1253	19.4400	-121.9132 (252)
Total energy cost			195.4551 (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	2097.1699	0.2160	452.9887 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1913.4537	0.2160	413.3060 (264)
Space and water heating			866.2947 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	319.9724	0.5190	166.0657 (268)
Energy saving/generation technologies			
PV Unit	-627.1253	0.5190	-325.4780 (269)
Total kg/year			745.8073 (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	2097.1699	1.2200	2558.5473 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1913.4537	1.2200	2334.4135 (264)
Space and water heating			4892.9608 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	319.9724	3.0700	982.3153 (268)
Energy saving/generation technologies			
PV Unit	-627.1253	3.0700	-1925.2747 (269)
Primary energy kWh/year			4180.2514 (272)
Primary energy kWh/m2/year			59.4969 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

SAP 2012 EPC IMPROVEMENTS

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

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

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.3	-£ 25	-182 kg (24.4%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£25 2.60 kg/m²	B 88	B 91
Total Savings	£25 2.60 kg/m²		

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

Fuel prices for cost data on this page from database revision number 490 TEST (31 Jan 2022)
Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£77	£87	-£10
Mains gas	£241	£206	£35
Space heating	£186	£186	£0
Water heating	£69	£44	£25
Lighting	£62	£62	£0
Generated (PV)	-£122	-£122	£0
Total cost of fuels	£196	£171	£25
Total cost of uses	£195	£170	£25
Delivered energy	54 kWh/m²	41 kWh/m²	13 kWh/m²
Carbon dioxide emissions	0.7 tonnes	0.6 tonnes	0.2 tonnes
CO2 emissions per m²	11 kg/m²	8 kg/m²	3 kg/m²
Primary energy	59 kWh/m²	45 kWh/m²	15 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	35.1300 (1b)	x 2.3900 (2b)	= 83.9607 (1b) - (3b)
First floor	35.1300 (1c)	x 2.6700 (2c)	= 93.7971 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 177.7578 (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) = 0.2250 (8)
Pressure test					Yes
Measured/design AP50					4.1500
Infiltration rate					0.4325 (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) =	0.4001 (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	0.5101	0.5001	0.4901	0.4401	0.4301	0.3801	0.3801	0.3701	0.4001	0.4301	0.4501	0.4701 (22b)
Effective ac	0.6301	0.6251	0.6201	0.5968	0.5925	0.5722	0.5722	0.5685	0.5800	0.5925	0.6013	0.6105 (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)			12.2400	1.1450	14.0153		(27)
Ground Floor			35.1300	0.1200	4.2156	84.0000	2950.9200 (28a)
Brick and Block	84.9100	14.3600	70.5500	0.2400	16.9320	42.2200	2978.6210 (29a)
Pitched Roof	35.1300		35.1300	0.1000	3.5130	9.1000	319.6830 (30)
Total net area of external elements Aum(A, m ²)			155.1700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.0079		(33)
Party Wall 1			42.7400	0.0000	0.0000	70.0000	2991.8000 (32)
GF Stud			58.6700			9.0000	528.0300 (32c)
First Floor			82.3100			9.0000	740.7900 (32c)
Internal Floor 1			35.1300			18.0000	632.3400 (32d)
Internal Ceiling 1			35.1300			18.0000	632.3400 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 11774.5240 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 167.5850 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.3530 (36)
Total fabric heat loss (33) + (36) = 47.3609 (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	36.9621	36.6657	36.3752	35.0108	34.7555	33.5671	33.5671	33.3470	34.0249	34.7555	35.2719	35.8118 (38)
Heat transfer coeff	84.3230	84.0266	83.7361	82.3717	82.1164	80.9280	80.9280	80.7080	81.3858	82.1164	82.6328	83.1727 (39)
Average = Sum(39)m / 12 =												82.3705 (39)
HLP	1.2002	1.1959	1.1918	1.1724	1.1688	1.1518	1.1518	1.1487	1.1584	1.1688	1.1761	1.1838 (40)
HLP (average)												1.1724 (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												2.2524 (42)
Average daily hot water use (litres/day)												87.6950 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	96.4645	92.9567	89.4489	85.9411	82.4333	78.9255	78.9255	82.4333	85.9411	89.4489	92.9567	96.4645 (44)
Energy conte	143.0540	125.1160	129.1085	112.5599	108.0039	93.1992	86.3627	99.1025	100.2861	116.8738	127.5769	138.5402 (45)
Energy content (annual)										Total = Sum(45)m =		1379.7836 (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	21.4581	18.7674	19.3663	16.8840	16.2006	13.9799	12.9544	14.8654	15.0429	17.5311	19.1365	20.7810 (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	27.5375	24.8584	27.4993	26.5866	27.4543	26.5472	27.4188	27.4418	26.5687	27.4807	26.6238	27.5301 (61)
Total heat required for water heating calculated for each month	170.5916	149.9744	156.6078	139.1466	135.4582	119.7464	113.7815	126.5443	126.8548	144.3544	154.2007	166.0703 (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												1.3144 (H8)
Utilisation factor												0.5327 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												87.6950 (H14)
Volume ratio Veff/V												0.8552 (H15)
Solar storage volume factor												0.9687 (H16)
Solar input	-23.8634	-39.8211	-67.8200	-90.8921	-112.2895	-110.3985	-108.9395	-95.1810	-74.5458	-50.9060	-28.3054	-822.9321 (H17)
Solar input (sum of months) = Sum (63)m =												-822.9321 (63)
Output from w/h	146.7282	110.1533	88.7878	48.2545	23.1687	9.3479	4.8420	31.3633	52.3090	93.4484	125.8952	146.1008 (64)
Total per year (kWh/year) = Sum (64)m =												880.3989 (64)
Heat gains from water heating, kWh/month	54.4499	47.8157	49.8034	44.0728	42.7749	37.6255	35.5703	39.8120	39.9873	45.7307	49.0753	52.9472 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	135.1452	135.1452	135.1452	135.1452	135.1452	135.1452	135.1452	135.1452	135.1452	135.1452	135.1452	135.1452	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	45.2954	40.2310	32.7180	24.7697	18.5156	15.6317	16.8906	21.9550	29.4679	37.4163	43.6704	46.5543	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	295.3778	298.4429	290.7190	274.2756	253.5188	234.0103	220.9775	217.9124	225.6363	242.0797	262.8365	282.3449	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7669	50.7669	50.7669	50.7669	50.7669	50.7669	50.7669	50.7669	50.7669	50.7669	50.7669	50.7669	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	(71)
Water heating gains (Table 5)	73.1853	71.1543	66.9400	61.2123	57.4931	52.2577	47.8096	53.5108	55.5379	61.4660	68.1601	71.1655	(72)
Total internal gains	512.6738	508.6435	489.1924	459.0729	428.3429	400.7150	384.4929	392.1935	409.4575	439.7773	473.4823	498.8801	(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				7.4900	10.6334	0.6300	0.7000	0.7700	24.3403 (74)			
South				3.4300	46.7521	0.6300	0.7000	0.7700	49.0080 (78)			
West				1.3200	19.6403	0.6300	0.7000	0.7700	7.9231 (80)			
Solar gains	81.2713	142.2771	206.8063	279.7406	337.0639	345.6748	328.6246	283.7664	231.5216	160.3323	97.9972	69.1542 (83)
Total gains	593.9452	650.9206	695.9987	738.8135	765.4068	746.3898	713.1175	675.9599	640.9791	600.1096	571.4794	568.0343 (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	38.7878	38.9246	39.0596	39.7066	39.8301	40.4149	40.4149	40.5251	40.1876	39.8301	39.5811	39.3242	
alpha	3.5859	3.5950	3.6040	3.6471	3.6553	3.6943	3.6943	3.7017	3.6792	3.6553	3.6387	3.6216	
util living area	0.9733	0.9613	0.9378	0.8844	0.7843	0.6268	0.4793	0.5206	0.7315	0.8985	0.9588	0.9769	(86)
MIT	19.5177	19.7002	19.9953	20.3828	20.7060	20.9094	20.9742	20.9650	20.8328	20.4335	19.9210	19.4896	(87)
Th 2	19.9199	19.9233	19.9266	19.9422	19.9451	19.9587	19.9587	19.9613	19.9535	19.9451	19.9392	19.9330	(88)
util rest of house	0.9676	0.9530	0.9240	0.8580	0.7347	0.5455	0.3744	0.4147	0.6579	0.8698	0.9485	0.9718	(89)
MIT 2	18.5941	18.7755	19.0655	19.4466	19.7386	19.9108	19.9500	19.9484	19.8548	19.5035	19.0071	18.5766	(90)
Living area fraction													0.2095 (91)
MIT	18.7876	18.9693	19.2603	19.6427	19.9413	20.1200	20.1646	20.1614	20.0597	19.6983	19.1986	18.7679	(92)
Temperature adjustment													0.0000
adjusted MIT	18.7876	18.9693	19.2603	19.6427	19.9413	20.1200	20.1646	20.1614	20.0597	19.6983	19.1986	18.7679	(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	0.9598	0.9438	0.9136	0.8494	0.7345	0.5589	0.3959	0.4360	0.6661	0.8619	0.9395	0.9648	(94)
Useful gains	570.0846	614.3265	635.8809	627.5372	562.1673	417.1421	282.3219	294.7312	426.9682	517.2092	536.9064	548.0172	(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	1221.6355	1182.1925	1068.4987	884.8978	676.7448	446.7247	288.4759	303.5747	485.0339	747.1223	999.7398	1211.6533	(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	484.7539	381.6060	321.8676	185.2996	85.2457	0.0000	0.0000	0.0000	0.0000	171.0553	333.2401	493.7453	(98)
Space heating												2456.8135	(98)
Space heating per m2												34.9675	(99)
												(98) / (4) =	

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2708.7249 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	484.7539	381.6060	321.8676	185.2996	85.2457	0.0000	0.0000	0.0000	0.0000	171.0553	333.2401	493.7453	(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)	534.4585	420.7342	354.8706	204.2995	93.9864	0.0000	0.0000	0.0000	0.0000	188.5946	367.4091	544.3719	(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	146.7282	110.1533	88.7878	48.2545	23.1687	9.3479	4.8420	31.3633	52.3090	93.4484	125.8952	146.1008	(64)
Efficiency of water heater	90.0336	90.0574	90.0796	90.1070	90.0867	87.9000	87.9000	87.9000	87.9000	89.6906	89.9146	90.0451	(216)
(217)m	90.0336	90.0574	90.0796	90.1070	90.0867	87.9000	87.9000	87.9000	87.9000	89.6906	89.9146	90.0451	(217)
Fuel for water heating, kWh/month	162.9705	122.3145	98.5659	53.5524	25.7182	10.6347	5.5085	35.6806	59.5096	104.1897	140.0164	162.2529	(219)
Water heating fuel used													
Annual totals kWh/year												980.9141	(219)
Space heating fuel - main system												2708.7249	(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)												319.9724	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.65 * 1080 * 1.00) =										-561.3528		-561.3528	(233)
Total delivered energy for all uses												3573.2586	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2708.7249	3.4800	94.2636 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	980.9141	3.4800	34.1358 (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	319.9724	13.1900	42.2044 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-561.3528	13.1900	-74.0424 (252)
Total energy cost			233.0489 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):			0.4200 (256)
Energy cost factor (ECF)			0.8492 (257)
SAP value			88.1535
SAP rating (Section 12)			88 (258)
SAP band			B

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

Energy	Emission factor	Emissions
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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

	kWh/year	kg CO2/kWh	kg CO2/year
Space heating - main system 1	2708.7249	0.2160	585.0846 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	980.9141	0.2160	211.8774 (264)
Space and water heating			796.9620 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	319.9724	0.5190	166.0657 (268)
Energy saving/generation technologies			
PV Unit	-561.3528	0.5190	-291.3421 (269)
Total kg/year			736.5606 (272)
CO2 emissions per m2			10.4800 (273)
EI value			91.4368
EI rating			91 (274)
EI band			B

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	35.1300 (1b)	x 2.3900 (2b)	= 83.9607 (1b) - (3b)
First floor	35.1300 (1c)	x 2.6700 (2c)	= 93.7971 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 177.7578 (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) = 0.2250 (8)
Pressure test					Yes
Measured/design AP50					4.1500
Infiltration rate					0.4325 (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) =	0.4001 (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	0.4701	0.4401	0.4401	0.4001	0.4101	0.3901	0.3901	0.3801	0.3801	0.4101	0.4001	0.4101 (22b)
Effective ac	0.6105	0.5968	0.5968	0.5800	0.5841	0.5761	0.5761	0.5722	0.5722	0.5841	0.5800	0.5841 (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)			12.2400	1.1450	14.0153		(27)
Ground Floor			35.1300	0.1200	4.2156	84.0000	2950.9200 (28a)
Brick and Block	84.9100	14.3600	70.5500	0.2400	16.9320	42.2200	2978.6210 (29a)
Pitched Roof	35.1300		35.1300	0.1000	3.5130	9.1000	319.6830 (30)
Total net area of external elements Aum(A, m ²)			155.1700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.0079		(33)
Party Wall 1			42.7400	0.0000	0.0000	70.0000	2991.8000 (32)
GF Stud			58.6700			9.0000	528.0300 (32c)
First Floor			82.3100			9.0000	740.7900 (32c)
Internal Floor 1			35.1300			18.0000	632.3400 (32d)
Internal Ceiling 1			35.1300			18.0000	632.3400 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	11774.5240 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							167.5850 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.3530 (36)
Total fabric heat loss						(33) + (36) =	47.3609 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	35.8118	35.0108	35.0108	34.0249	34.2625	33.7931	33.7931	33.5671	33.5671	34.2625	34.0249	34.2625 (38)
Average = Sum(39)m / 12 =	83.1727	82.3717	82.3717	81.3858	81.6234	81.1540	81.1540	80.9280	80.9280	81.6234	81.3858	81.6234 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1838	1.1724	1.1724	1.1584	1.1617	1.1551	1.1551	1.1518	1.1518	1.1617	1.1584	1.1617 (40)
HLP (average)												1.1620 (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												2.2524 (42)
Average daily hot water use (litres/day)												87.6950 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.4645	92.9567	89.4489	85.9411	82.4333	78.9255	78.9255	82.4333	85.9411	89.4489	92.9567	96.4645 (44)
Energy conte	143.0540	125.1160	129.1085	112.5599	108.0039	93.1992	86.3627	99.1025	100.2861	116.8738	127.5769	138.5402 (45)
Energy content (annual)										Total = Sum(45)m =		1379.7836 (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	21.4581	18.7674	19.3663	16.8840	16.2006	13.9799	12.9544	14.8654	15.0429	17.5311	19.1365	20.7810 (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	27.5375	24.8584	27.4993	26.5866	27.4543	26.5472	27.4188	27.4418	26.5687	27.4807	26.6238	27.5301 (61)
Total heat required for water heating calculated for each month	170.5916	149.9744	156.6078	139.1466	135.4582	119.7464	113.7815	126.5443	126.8548	144.3544	154.2007	166.0703 (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												1.4684 (H8)
Utilisation factor												0.4939 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												87.6950 (H14)
Volume ratio Veff/V												0.8552 (H15)
Solar storage volume factor												0.9687 (H16)
Solar input	-27.8138	-39.5544	-68.6370	-92.3284	-107.2918	-116.7024	-110.6517	-100.9036	-78.9770	-54.5861	-32.8974	-852.3671 (H17)
Solar input (sum of months) = Sum (63)m =												-852.3671 (63)
Output from w/h	142.7778	110.4200	87.9707	46.8182	28.1664	3.0440	3.1299	25.6407	47.8778	89.7683	121.3032	144.0469 (64)
Total per year (kWh/year) = Sum (64)m =												850.9639 (64)
Heat gains from water heating, kWh/month	54.4499	47.8157	49.8034	44.0728	42.7749	37.6255	35.5703	39.8120	39.9873	45.7307	49.0753	52.9472 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	135.1452	135.1452	135.1452	135.1452	135.1452	135.1452	135.1452	135.1452	135.1452	135.1452	135.1452	135.1452	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	45.2954	40.2310	32.7180	24.7697	18.5156	15.6317	16.8906	21.9550	29.4679	37.4163	43.6704	46.5543	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	295.3778	298.4429	290.7190	274.2756	253.5188	234.0103	220.9775	217.9124	225.6363	242.0797	262.8365	282.3449	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7669	50.7669	50.7669	50.7669	50.7669	50.7669	50.7669	50.7669	50.7669	50.7669	50.7669	50.7669	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	-90.0968	(71)
Water heating gains (Table 5)	73.1853	71.1543	66.9400	61.2123	57.4931	52.2577	47.8096	53.5108	55.5379	61.4660	68.1601	71.1655	(72)
Total internal gains	512.6738	508.6435	489.1924	459.0729	428.3429	400.7150	384.4929	392.1935	409.4575	439.7773	473.4823	498.8801	(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			7.4900	13.4684	0.6300	0.7000	0.7700	30.8298 (74)				
South			3.4300	56.5862	0.6300	0.7000	0.7700	59.3166 (78)				
West			1.3200	25.1733	0.6300	0.7000	0.7700	10.1551 (80)				
Solar gains	100.3015	150.0403	223.7650	306.5532	349.2470	396.8048	362.2780	325.3717	263.2108	182.9298	120.6667	80.7253 (83)
Total gains	612.9754	658.6838	712.9574	765.6261	777.5898	797.5198	746.7709	717.5652	672.6683	622.7072	594.1489	579.6055 (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	39.3242	39.7066	39.7066	40.1876	40.0706	40.3024	40.3024	40.4149	40.4149	40.0706	40.1876	40.0706
alpha	3.6216	3.6471	3.6471	3.6792	3.6714	3.6868	3.6868	3.6943	3.6943	3.6714	3.6792	3.6714
util living area	0.9626	0.9502	0.9172	0.8400	0.7071	0.4957	0.3533	0.3555	0.6131	0.8419	0.9361	0.9671 (86)
MIT	19.7615	19.9039	20.1912	20.5599	20.8288	20.9664	20.9929	20.9930	20.9263	20.6356	20.1827	19.7592 (87)
Th 2	19.9330	19.9422	19.9422	19.9535	19.9507	19.9561	19.9561	19.9587	19.9587	19.9507	19.9535	19.9507 (88)
util rest of house	0.9542	0.9393	0.8986	0.8041	0.6425	0.4033	0.2441	0.2425	0.5198	0.7970	0.9195	0.9596 (89)
MIT 2	18.8443	18.9897	19.2662	19.6174	19.8433	19.9425	19.9547	19.9574	19.9239	19.6903	19.2721	18.8565 (90)
Living area fraction									fLA = Living area / (4) =			0.2095 (91)
MIT	19.0365	19.1812	19.4600	19.8149	20.0498	20.1571	20.1722	20.1744	20.1339	19.8883	19.4628	19.0456 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0365	19.1812	19.4600	19.8149	20.0498	20.1571	20.1722	20.1744	20.1339	19.8883	19.4628	19.0456 (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	0.9453	0.9295	0.8886	0.7987	0.6491	0.4217	0.2671	0.2663	0.5365	0.7940	0.9100	0.9513	(94)
Useful gains	579.4447	612.2726	633.5045	611.5408	504.7302	336.3350	199.4745	191.0703	360.9192	494.4145	540.6669	551.3777	(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	1117.5477	1085.7591	976.9286	790.6505	567.2663	345.4771	200.6307	192.1549	383.1083	635.7108	884.0806	1089.3155	(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	400.3487	318.1829	255.5075	128.9590	46.5269	0.0000	0.0000	0.0000	0.0000	105.1244	247.2579	400.2257	(98)
Space heating												1902.1331	(98)
Space heating per m2												27.0728	(99)
												(98) / (4) =	

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													90.7000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													2097.1699	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	400.3487	318.1829	255.5075	128.9590	46.5269	0.0000	0.0000	0.0000	0.0000	105.1244	247.2579	400.2257	(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)	441.3987	350.8081	281.7062	142.1820	51.2976	0.0000	0.0000	0.0000	0.0000	115.9034	272.6107	441.2632	(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	142.7778	110.4200	87.9707	46.8182	28.1664	3.0440	3.1299	25.6407	47.8778	89.7683	121.3032	144.0469	(64)	
Efficiency of water heater	89.9468	89.9617	89.9660	89.9369	89.6234	87.9000	87.9000	87.9000	87.9000	89.3885	89.7590	89.9417	(217)	
Fuel for water heating, kWh/month	158.7358	122.7411	97.7822	52.0566	31.4275	3.4631	3.5607	29.1703	54.4685	100.4250	135.1433	160.1558	(219)	
Water heating fuel used												949.1299	(219)	
Annual totals kWh/year														
Space heating fuel - main system													2097.1699	(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)													319.9724	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.65 * 1206 * 1.00) =										-627.1253			-627.1253	(233)
Total delivered energy for all uses													2864.1469	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2097.1699	3.6300	76.1273	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	949.1299	3.6300	34.4534	(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	319.9724	19.4400	62.2026	(250)
Additional standing charges			95.0000	(251)
Energy saving/generation technologies				
PV Unit	-627.1253	19.4400	-121.9132	(252)
Total energy cost			170.1702	(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	2097.1699	0.2160	452.9887	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	949.1299	0.2160	205.0121	(264)
Space and water heating			658.0008	(265)
Pumps and fans	125.0000	0.5190	64.8750	(267)
Energy for lighting	319.9724	0.5190	166.0657	(268)
Energy saving/generation technologies				
PV Unit	-627.1253	0.5190	-325.4780	(269)
Total kg/year			563.4634	(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	2097.1699	1.2200	2558.5473	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	949.1299	1.2200	1157.9385	(264)
Space and water heating			3716.4857	(265)
Pumps and fans	125.0000	3.0700	383.7500	(267)
Energy for lighting	319.9724	3.0700	982.3153	(268)
Energy saving/generation technologies				
PV Unit	-627.1253	3.0700	-1925.2747	(269)
Primary energy kWh/year			3157.2763	(272)
Primary energy kWh/m2/year			44.9370	(273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Plot 89	Issued on Date	01/03/2022
Assessment Reference	As Built	Prop Type Ref	O (H/A - S/O+)
Project	34 Shaw Road, West End, Southampton, SO30 3JZ		
Calculation Type	New Build (As Built)		

SAP Rating	87 B	DER	14.87	TER	19.71
Environmental	89 B	% DER<TER	24.54		
CO ₂ Emissions (t/year)	0.75	DFEE	45.15	TREE	55.70
General Requirements Compliance	Pass	% DFEE<TFEE	18.94		

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 89	Issued on Date	01/03/2022
Assessment Reference	As Built	Prop Type Ref	O (H/A - S/O+)
Project	34 Shaw Road, West End, Southampton, SO30 3JZ		
Calculation Type	New Build (As Built)		

SAP Rating	87 B	DER	14.87	TER	19.71
Environmental	89 B	% DER<TER	24.54		
CO ₂ Emissions (t/year)	0.75	DFEE	45.15	TFEE	55.70
General Requirements Compliance	Pass	% DFEE<TFEE	18.94		

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

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 89	Issued on Date	01/03/2022
Assessment Reference	As Built	Prop Type Ref	O (H/A - S/O+)
Project	34 Shaw Road, West End, Southampton, SO30 3JZ		
Calculation Type	New Build (As Built)		

SAP Rating	87 B	DER	14.87	TER	19.71
Environmental	89 B	% DER<TER	24.54		
CO ₂ Emissions (t/year)	0.75	DFEE	45.15	TFEE	55.70
General Requirements Compliance	Pass	% DFEE<TFEE	18.94		

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

Floor 000003 - Worst Case Slab

Floor Type: Slab On Ground Floor

Area = 35.11 m², Perimeter = 16.79 m, Wall thickness = 275.00 mm, Soil: Unknown

Horizontal edge insulation: none

Vertical edge insulation: none

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

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

Total correction = 0.0096 m² K/W

U-value (unrounded) = 0.12 W/m² K

Unheated space: None

Total thickness: 321 mm

U-value: 0.12 W/m² K

Kappa: 84.00 kJ/m² K

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Plot 89	Issued on Date	01/03/2022
Assessment Reference	As Built	Prop Type Ref	O (H/A - S/O+)
Property	34 Shaw Road, West End, Southampton, SO30 3JZ		
SAP Rating	87 B	DER	14.87
Environmental	89 B	TER	19.71
CO ₂ Emissions (t/year)	0.75	% DER<TER	24.54
General Requirements Compliance	Pass	DfEE	45.15
		TFEE	55.70
		% DfEE<TFEE	18.94
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	South
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:	16.78 m	35.13 m ²	2.39 m
	1st Storey:	16.78 m	35.13 m ²	2.67 m

7.0 Living Area	14.72	m ²
8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	167.59	kJ/m ² K

9.0 External Walls			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type	Construction				
Brick and Block	Cavity Wall	Other	0.24	42.22	84.91	70.55

9.1 Party Walls			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)
Description	Type	Construction			
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs on both sides, dense blocks, cavity or cavity fill	0.00	70.00	42.74

9.2 Internal Walls			Kappa (kJ/m ² K)	Area (m ²)
Description	Construction			
GF Stud	Plasterboard on timber frame		9.00	58.67
First Floor	Plasterboard on timber frame		9.00	82.31

10.0 External Roofs			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type	Construction				
Pitched Roof	External Plane Roof	Other	0.10	9.10	35.13	35.13

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

10.2 Internal Ceilings

Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
Internal Ceiling 1	Plasterboard ceiling, carpeted chipboard floor	9.00	35.13

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)
Ground Floor	Ground Floor - Solid	Other	0.12	84.00	35.13

11.2 Internal Floors

Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	35.13

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m ² K)
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 (m ²)	Curtain Closed
Front Door	Solid Door	[1] Brick and Block	South							2.12	
Front Elevation	Window	[1] Brick and Block	South	None	0.00					3.43	
Side Elevation	Window	[1] Brick and Block	West	None	0.00					1.32	
Rear Elevation	Window	[1] Brick and Block	North	None	0.00					7.49	

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)	1.26	0.098	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	3.76	0.053	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	3.60	0.043	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.51	0.060	No	Birtley Supatherm
Independently assessed	E3 Sill	7.61	0.034	No	CD0027
Independently assessed	E4 Jamb	27.30	0.039	No	CD0028
Independently assessed	E5 Ground floor (normal)	16.78	0.037	No	Knauf P7
Independently assessed	E6 Intermediate floor within a dwelling	16.78	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	8.41	0.060	No	
Independently assessed	E12 Gable (insulation at ceiling level)	8.46	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	8.46	0.160	No	
Table K1 - Default	P2 Party wall - Intermediate floor within a dwelling	8.46	0.000	No	
Independently assessed	P4 Party wall - Roof (insulation at ceiling level)	8.46	0.049	No	CD0020

Y-value 0.041 W/m²K

18.0 Pressure Testing

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

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

19.0 Mechanical Ventilation

Summer Overheating

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

Mechanical Ventilation

Mechanical Ventilation System Present	No
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20.0 Fans, Open Fireplaces, Flues

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

21.0 Fixed Cooling System

No

22.0 Lighting

Internal

Total number of light fittings	17	
Total number of L.E.L. fittings	17	
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

0 Main Heating 1	Database	
Description	Gas Combi	
Percentage of Heat	100	%
Database Ref. No.	17515	
Fuel Type	Mains gas	
Main Heating	BGW	
SAP Code	104	
In Winter	90.7	
In Summer	87.9	
Controls	CBE Programmer, room thermostat and TRVs	
PCDF Controls	0	
Delayed Start Stat	No	
Sap Code	2106	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heat Emitter	Radiators	
Flow Temperature	Normal (> 45°C)	
Combi boiler type	Standard Combi	
Combi keep hot type	Gas/Oil, time clock	

25.0 Main Heating 2

None

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Community Heating	None			
28.0 Water Heating	HWP From main heating 1			
Water Heating	Main Heating 1			
Flue Gas Heat Recovery System	No			
Waste Water Heat Recovery Instantaneous System 1	No			
Waste Water Heat Recovery Instantaneous System 2	No			
Waste Water Heat Recovery Storage System	No			
Solar Panel	No			
Water use <= 125 litres/person/day	Yes			
SAP Code	901			
29.0 Hot Water Cylinder	None			
32.0 Photovoltaic Unit	One Dwelling			
PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
0.65	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	£25	B 88	