



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: Plot 131

Contact: Tobias Whiting
Abacus Energy (UK) Ltd
toby@abacusenergyuk.com

Report Issue Date: 28/03/2023

EXCELLENCE
IN ENERGY
ASSESSMENT

PREDICTED ENERGY ASSESSMENT

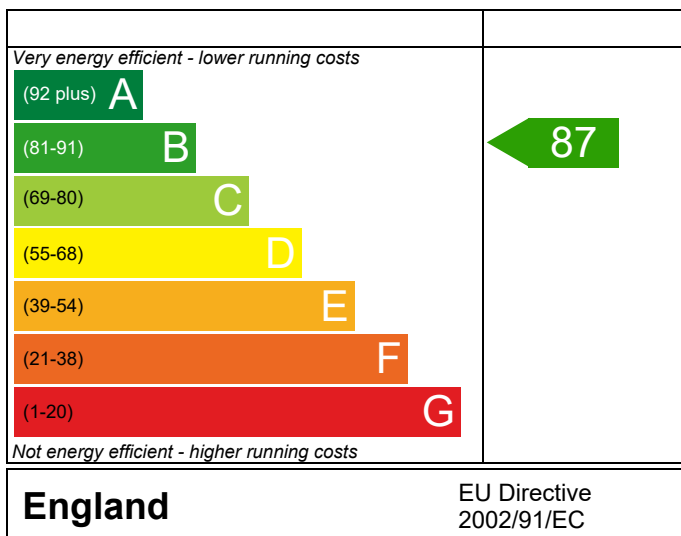
Plot 131

Dwelling type: House, Semi-Detached
Date of assessment: 28/03/2023
Produced by: Abacus Energy (UK) Ltd
Total floor area: 70.34 m²
DRRN: 9092-2768-7203

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

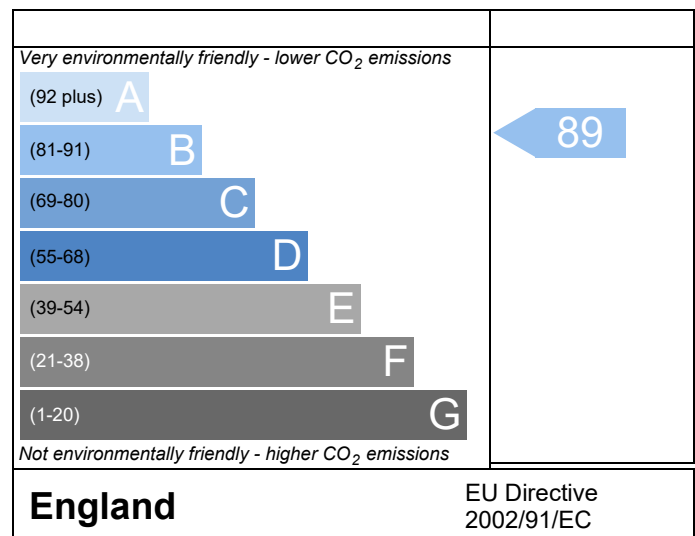
The energy performance has been assessed using the Government approved SAP2012 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.

Energy Efficiency Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

Environmental Impact (CO₂) Rating



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions. The higher the rating the less impact it has on the environment.

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 Designed)

Property Reference	SAP 0879 Plot 131			Issued on Date	28/03/2023
Assessment Reference	Rev A	Prop Type Ref	Beeley V3		
Property	Plot 131				
SAP Rating	87 B	DER	15.32	TER	19.40
Environmental	89 B	% DER<TER	21.05		
CO ₂ Emissions (t/year)	0.78	DFEE	50.86	TFEE	53.55
General Requirements Compliance	Pass	% DFEE<TFEE	5.01		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com			Assessor ID	E477-0001
Client	Foreman Homes, FORE				

SUMMARY FOR INPUT DATA FOR New Build (As Designed)

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)	19.40	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	15.32	kgCO ₂ /m ²	Pass
	-4.08 (-21.0%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	53.55	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	50.86	kWh/m ² /yr	
	-2.6 (-4.9%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	m ³ /(h.m ²) @ 50 Pa	
Maximum	10.0	m ³ /(h.m ²) @ 50 Pa	Pass

Limiting System Efficiencies

4 Heating efficiency

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BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Designed)

Main heating system

Boiler system with radiators or underfloor - Mains gas
Data from database
Worcester Greenstar 32CDi 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 East

6.60 m², No overhang

Windows facing West

3.35 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

5.00 (design value)

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

0.90

kW

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RECOMMENDATIONS

	Typical cost	Typical savings per year	Energy efficiency	Environmental impact	Result
Low energy lights			0	0	Already installed
Solar water heating	£4,000 - £6,000	£77	B 88	B 91	Recommended
Photovoltaic			0	0	Already installed
Wind turbine			0	0	Not applicable
Totals	£4,000 - £6,000	£77	B 88	B 91	

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THERMAL BRIDGING

Calculation Type: New Build (As Designed)

Property Reference	SAP 0879 Plot 131	Issued on Date	28/03/2023
Assessment Reference	Rev A	Prop Type Ref	Beeley V3
Property	Plot 131		

SAP Rating	87 B	DER	15.32	TER	19.40
Environmental	89 B	% DER<TER	21.05		
CO ₂ Emissions (t/year)	0.78	DFEE	50.86	TFEE	53.55
General Requirements Compliance	Pass	% DFEE<TFEE	5.01		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com	Assessor ID	E477-0001
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Client	Foreman Homes, FORE
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	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.110	0.46	0.05	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.910	5.46	4.97	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.071	1.02	0.07	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.067	1.59	0.11	Birtley Supatherm
External wall	E3 Sill	Independently assessed	0.021	5.92	0.12	Knauf P5
External wall	E4 Jamb	Independently assessed	0.016	24.32	0.39	Knauf P6
External wall	E5 Ground floor (normal)	Table K1 - Default	0.320	16.79	5.37	
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	16.79	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	9.10	0.55	
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.044	15.64	0.69	Knauf P21
External wall	E16 Corner (normal)	Independently assessed	0.039	10.46	0.41	Knauf P23
External wall	E18 Party wall between dwellings	Table K1 - Approved	0.060	9.55	0.57	
Party wall	P1 Party wall - Ground floor	Table K1 - Default	0.160	7.82	1.25	
Party wall	P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	0.000	7.82	0.00	
Party wall	P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	0.069	7.82	0.54	Knauf P29

Total: **15.09** W/mK:
Y-Value: **0.098** W/m²K:

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	SAP 0879 Plot 131				Issued on Date	28/03/2023
Assessment Reference	Rev A	Prop Type Ref	Beeley V3			
Property	Plot 131					
SAP Rating	87 B	DER	15.32	TER	19.40	
Environmental	89 B	% DER<TER	21.05			
CO ₂ Emissions (t/year)	0.78	DFEE	50.86	TFEE	53.55	
General Requirements Compliance	Pass	% DFEE<TFEE	5.01			
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com				Assessor ID	E477-0001
Client	Foreman Homes, FORE					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

DWELLING AS DESIGNED

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) 19.40 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.32 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)53.5 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)50.9 kWh/m²/yrOK

2 Fabric U-values

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 5.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from database
Worcester Greenstar 32CDi 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 East: 6.60 m², No overhang
Windows facing West: 3.35 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 0.90 kW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	35.1700 (1b)	x 2.3900 (2b)	= 84.0563 (1b) - (3b)
First floor	35.1700 (1c)	x 2.6200 (2c)	= 92.1454 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.3400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.2017 (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) = 0.1703 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4203 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3572 (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	0.4555	0.4465	0.4376	0.3929	0.3840	0.3394	0.3394	0.3304	0.3572	0.3840	0.4019	0.4197 (22b)
Effective ac	0.6037	0.5997	0.5957	0.5772	0.5737	0.5576	0.5576	0.5546	0.5638	0.5737	0.5808	0.5881 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1500	1.1000	2.3650		(26)
Windows & Fully Glazed Do (Uw = 1.20)			9.9500	1.1450	11.3931		(27)
Ground Floor			35.3100	0.1200	4.2372	90.0000	3177.9000 (28a)
Brick and Block	84.0200	12.1000	71.9200	0.2400	17.2608	42.2200	3036.4624 (29a)
External Roof 1	35.1700		35.1700	0.1000	3.5170	9.1000	320.0470 (30)
Total net area of external elements Aum(A, m ²)			154.5000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	38.7731		(33)
Party Wall 1			38.9200	0.0000	0.0000	45.0000	1751.4000 (32)
GF Timber Stud			62.4400			9.0000	561.9600 (32c)
FF Timber Stud			74.3000			9.0000	668.7000 (32c)
Internal Floor 1			35.3100			18.0000	635.5800 (32d)
Internal Ceiling 1			35.1700			18.0000	633.0600 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 10785.1094 (34)
153.3283 (35)
15.0903 (36)
(33) + (36) = 53.8634 (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	35.1043	34.8701	34.6405	33.5623	33.3606	32.4215	32.4215	32.2476	32.7832	33.3606	33.7687	34.1953 (38)
Heat transfer coeff	88.9677	88.7335	88.5039	87.4257	87.2240	86.2849	86.2849	86.1110	86.6466	87.2240	87.6321	88.0587 (39)
Average = Sum(39)m / 12 =												87.4247 (39)
HLP	1.2648	1.2615	1.2582	1.2429	1.2400	1.2267	1.2267	1.2242	1.2318	1.2400	1.2458	1.2519 (40)
HLP (average)												1.2429 (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												2.2544 (42)
Average daily hot water use (litres/day)												87.7408 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	96.5149	93.0053	89.4957	85.9860	82.4764	78.9668	78.9668	82.4764	85.9860	89.4957	93.0053	96.5149 (44)
Energy conte	143.1288	125.1814	129.1760	112.6188	108.0604	93.2479	86.4079	99.1543	100.3385	116.9349	127.6436	138.6126 (45)
Energy content (annual)										Total = Sum(45)m =		1380.5050 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	21.4693	18.7772	19.3764	16.8928	16.2091	13.9872	12.9612	14.8731	15.0508	17.5402	19.1465	20.7919 (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	25.2867	22.8171	25.2259	24.3716	25.1544	24.3089	25.0980	25.1346	24.3430	25.1963	24.4306	25.2750 (61)
Total heat required for water heating calculated for each month	168.4156	147.9985	154.4019	136.9903	133.2148	117.5568	111.5059	124.2889	124.6816	142.1312	152.0742	163.8876 (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	168.4156	147.9985	154.4019	136.9903	133.2148	117.5568	111.5059	124.2889	124.6816	142.1312	152.0742	163.8876 (64)
Heat gains from water heating, kWh/month	53.9120	47.3271	49.2575	43.5386	42.2187	37.0822	35.0051	39.2524	39.4483	45.1799	48.5491	52.4074 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1677.1472 (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	112.7175	112.7175	112.7175	112.7175	112.7175	112.7175	112.7175	112.7175	112.7175	112.7175	112.7175	112.7175 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.9032	16.7897	13.6543	10.3372	7.7272	6.5236	7.0490	9.1625	12.2979	15.6150	18.2250	19.4286 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.0893	200.1448	194.9649	183.9375	170.0174	156.9344	148.1942	146.1386	151.3186	162.3460	176.2661	189.3491 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2718	34.2718	34.2718	34.2718	34.2718	34.2718	34.2718	34.2718	34.2718	34.2718	34.2718	34.2718 (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)	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740 (71)
Water heating gains (Table 5)	72.4624	70.4272	66.2063	60.4703	56.7455	51.5030	47.0499	52.7587	54.7893	60.7257	67.4294	70.4401 (72)
Total internal gains	349.2702	347.1770	334.6408	314.5603	294.3053	274.7763	262.1083	267.8751	278.2211	298.5020	321.7358	339.0331 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
East					6.6000	19.6403	0.6300	0.7000	0.7700		39.6153 (76)	
West					3.3500	19.6403	0.6300	0.7000	0.7700		20.1078 (80)	

Solar gains	59.7231	116.8310	192.4041	280.6098	343.8979	352.0407	335.1571	287.8950	223.7739	138.6298	74.4677	49.1134 (83)
Total gains	408.9933	464.0080	527.0448	595.1701	638.2032	626.8169	597.2654	555.7701	501.9949	437.1318	396.2034	388.1464 (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	33.6736	33.7625	33.8501	34.2675	34.3468	34.7206	34.7206	34.7907	34.5757	34.3468	34.1868	34.0212
alpha	3.2449	3.2508	3.2567	3.2845	3.2898	3.3147	3.3147	3.3194	3.3050	3.2898	3.2791	3.2681
util living area	0.9889	0.9824	0.9668	0.9277	0.8492	0.7174	0.5756	0.6261	0.8298	0.9509	0.9829	0.9907 (86)
MIT	18.9814	19.1825	19.5531	20.0507	20.4943	20.8067	20.9324	20.9092	20.6587	20.0767	19.4455	18.9494 (87)
Th 2	19.8685	19.8711	19.8737	19.8858	19.8881	19.8987	19.8987	19.9007	19.8946	19.8881	19.8835	19.8787 (88)
util rest of house	0.9865	0.9785	0.9589	0.9094	0.8080	0.6361	0.4543	0.5073	0.7678	0.9349	0.9784	0.9886 (89)
MIT 2	18.0360	18.2374	18.6054	19.0988	19.5152	19.7885	19.8736	19.8639	19.6750	19.1339	18.5092	18.0115 (90)
Living area fraction									fLA = Living area / (4) =			0.2528 (91)
MIT	18.2750	18.4763	18.8450	19.3394	19.7627	20.0459	20.1412	20.1281	19.9236	19.3722	18.7459	18.2486 (92)
Temperature adjustment												0.0000
adjusted MIT	18.2750	18.4763	18.8450	19.3394	19.7627	20.0459	20.1412	20.1281	19.9236	19.3722	18.7459	18.2486 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	401.4857	450.9490	500.4542	534.6340	512.2471	406.2862	288.4225	296.8414	386.3837	404.4624	385.1192	382.0736 (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	1243.3204	1204.6691	1092.5781	912.6744	703.2581	469.8985	305.5550	321.0339	504.5989	765.1472	1020.5538	1237.0984 (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	626.3251	506.4999	440.5402	272.1891	142.1121	0.0000	0.0000	0.0000	0.0000	268.3495	457.5129	636.1385 (98)
Space heating												3349.6672 (98)
Space heating per m2										(98) / (4) =		47.6211 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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													3693.1281 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	626.3251	506.4999	440.5402	272.1891	142.1121	0.0000	0.0000	0.0000	0.0000	268.3495	457.5129	636.1385	(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)	690.5458	558.4343	485.7114	300.0982	156.6837	0.0000	0.0000	0.0000	0.0000	295.8649	504.4243	701.3654	(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	168.4156	147.9985	154.4019	136.9903	133.2148	117.5568	111.5059	124.2889	124.6816	142.1312	152.0742	163.8876	(64)
Efficiency of water heater (217)m	89.9350	89.8842	89.7649	89.4974	88.9721	87.2000	87.2000	87.2000	87.2000	89.4567	89.8008	89.9603	(216)
Fuel for water heating, kWh/month	187.2636	164.6546	172.0069	153.0663	149.7264	134.8128	127.8737	142.5331	142.9834	158.8826	169.3461	182.1777	(219)
Water heating fuel used													(219)
Annual totals kWh/year													
Space heating fuel - main system													3693.1281 (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)													333.8367 (232)
Energy saving/generation technologies (Appendices M, N and Q)													
PV Unit 0 (0.80 * 0.90 * 908 * 1.00) =										-653.6551			-653.6551 (233)
Total delivered energy for all uses													5333.6371 (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	3693.1281	0.2160	797.7157	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1885.3274	0.2160	407.2307	(264)
Space and water heating			1204.9464	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	333.8367	0.5190	173.2613	(268)
Energy saving/generation technologies				
PV Unit	-653.6551	0.5190	-339.2470	(269)
Total CO2, kg/year			1077.8857	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			15.3200	(273)

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

DER			15.3200	ZC1
Total Floor Area		TFA	70.3400	
Assumed number of occupants		N	2.2544	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			16.6880	ZC2
CO2 emissions from cooking, equation (L16)			2.4610	ZC3
Total CO2 emissions			34.4690	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			34.4690	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	35.1700 (1b)	x 2.3900 (2b)	= 84.0563 (1b) - (3b)
First floor	35.1700 (1c)	x 2.6200 (2c)	= 92.1454 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.3400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.2017 (5)

2. Ventilation rate

	main heating	+	secondary heating	+	other	=	total	m3 per hour				
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							3 * 10 =	30.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
								Air changes per hour				
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						30.0000 / (5) =	0.1703 (8)				
Pressure test							Yes					
Measured/design AP50							5.0000					
Infiltration rate							0.4203 (18)					
Number of sides sheltered							2 (19)					
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.8500 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.3572 (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	0.4555	0.4465	0.4376	0.3929	0.3840	0.3394	0.3394	0.3304	0.3572	0.3840	0.4019	0.4197 (22b)
Effective ac	0.6037	0.5997	0.5957	0.5772	0.5737	0.5576	0.5576	0.5546	0.5638	0.5737	0.5808	0.5881 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			2.1500	1.0000	2.1500		(26)					
TER Opening Type (Uw = 1.40)			9.9500	1.3258	13.1913		(27)					
Ground Floor			35.3100	0.1300	4.5903		(28a)					
Brick and Block	84.0200	12.1000	71.9200	0.1800	12.9456		(29a)					
External Roof 1	35.1700		35.1700	0.1300	4.5721		(30)					
Total net area of external elements Aum(A, m2)			154.5000				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	37.4493		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.1877 (36)					
Total fabric heat loss						(33) + (36) =	46.6370 (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	35.1043	34.8701	34.6405	33.5623	33.3606	32.4215	32.4215	32.2476	32.7832	33.3606	33.7687	34.1953 (38)
Heat transfer coeff	81.7412	81.5070	81.2775	80.1993	79.9976	79.0585	79.0585	78.8846	79.4202	79.9976	80.4057	80.8323 (39)
Average = Sum(39)m / 12 =												80.1983 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1621	1.1588	1.1555	1.1402	1.1373	1.1239	1.1239	1.1215	1.1291	1.1373	1.1431	1.1492 (40)
HLP (average)												1.1402 (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												2.2544 (42)
Average daily hot water use (litres/day)												87.7408 (43)
Daily hot water use	Jan 96.5149	Feb 93.0053	Mar 89.4957	Apr 85.9860	May 82.4764	Jun 78.9668	Jul 78.9668	Aug 82.4764	Sep 85.9860	Oct 89.4957	Nov 93.0053	Dec 96.5149 (44)
Energy conte	143.1288	125.1814	129.1760	112.6188	108.0604	93.2479	86.4079	99.1543	100.3385	116.9349	127.6436	138.6126 (45)
Energy content (annual)										Total = Sum(45)m =		1380.5050 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	21.4693	18.7772	19.3764	16.8928	16.2091	13.9872	12.9612	14.8731	15.0508	17.5402	19.1465	20.7919 (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 (56)
If cylinder contains dedicated solar storage												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Total heat required for water heating calculated for each month	49.1829	42.8079	45.6060	42.4041	42.0291	38.9425	40.2406	42.0291	42.4041	45.6060	45.8656	49.1829 (61)
Solar input	192.3118	167.9893	174.7820	155.0228	150.0894	132.1904	126.6485	141.1834	142.7426	162.5409	173.5092	187.7956 (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	192.3118	167.9893	174.7820	155.0228	150.0894	132.1904	126.6485	141.1834	142.7426	162.5409	173.5092	187.7956 (64)
	59.8861	52.3248	54.3525	48.0468	46.4373	40.7406	38.7908	43.4761	43.9636	50.2823	53.9079	58.3844 (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	112.7175	112.7175	112.7175	112.7175	112.7175	112.7175	112.7175	112.7175	112.7175	112.7175	112.7175	112.7175	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.9032	16.7897	13.6543	10.3372	7.7272	6.5236	7.0490	9.1625	12.2979	15.6150	18.2250	19.4286	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.0893	200.1448	194.9649	183.9375	170.0174	156.9344	148.1942	146.1386	151.3186	162.3460	176.2661	189.3491	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2718	34.2718	34.2718	34.2718	34.2718	34.2718	34.2718	34.2718	34.2718	34.2718	34.2718	34.2718	(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)	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	(71)
Water heating gains (Table 5)	80.4920	77.8643	73.0545	66.7316	62.4158	56.5841	52.1381	58.4356	61.0605	67.5838	74.8721	78.4737	(72)
Total internal gains	357.2998	354.6141	341.4889	320.8215	299.9756	279.8574	267.1965	273.5520	284.4922	305.3601	329.1785	347.0666	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
East				6.6000	19.6403	0.6300	0.7000	0.7700	39.6153 (76)			
West				3.3500	19.6403	0.6300	0.7000	0.7700	20.1078 (80)			
Solar gains	59.7231	116.8310	192.4041	280.6098	343.8979	352.0407	335.1571	287.8950	223.7739	138.6298	74.4677	49.1134 (83)
Total gains	417.0229	471.4451	533.8930	601.4314	643.8735	631.8980	602.3536	561.4470	508.2661	443.9899	403.6461	396.1800 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.7584	59.9301	60.0993	60.9073	61.0609	61.7862	61.7862	61.9224	61.5048	61.0609	60.7510	60.4303	
alpha	4.9839	4.9953	5.0066	5.0605	5.0707	5.1191	5.1191	5.1282	5.1003	5.0707	5.0501	5.0287	
util living area	0.9981	0.9961	0.9895	0.9643	0.8893	0.7319	0.5623	0.6201	0.8659	0.9803	0.9963	0.9986	(86)
MIT	19.7359	19.8767	20.1327	20.4777	20.7706	20.9417	20.9877	20.9803	20.8554	20.4690	20.0435	19.7149	(87)
Th 2	19.9504	19.9531	19.9558	19.9682	19.9705	19.9813	19.9813	19.9833	19.9771	19.9705	19.9658	19.9609	(88)
util rest of house	0.9975	0.9948	0.9857	0.9503	0.8464	0.6414	0.4399	0.4959	0.7985	0.9701	0.9947	0.9981	(89)
MIT 2	18.2659	18.4733	18.8473	19.3489	19.7419	19.9418	19.9767	19.9750	19.8576	19.3454	18.7264	18.2425	(90)
Living area fraction	18.6375	18.8280	19.1722	19.6342	20.0019	20.1945	20.2323	20.2291	20.1098	19.6294	19.0593	18.6147	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6375	18.8280	19.1722	19.6342	20.0019	20.1945	20.2323	20.2291	20.1098	19.6294	19.0593	18.6147	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	415.4615	468.0085	524.1225	568.1233	545.9640	418.2105	283.7375	296.1167	411.0423	428.6902	400.7082	395.0262	(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	1171.9627	1135.2339	1029.9656	860.8784	664.1333	442.2935	287.1622	302.0595	477.2993	722.3338	961.5989	1165.1723	(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	562.8369	448.3755	376.3473	210.7836	87.9180	0.0000	0.0000	0.0000	0.0000	218.4709	403.8413	572.9887	(98)
Space heating												2881.5621	(98)
Space heating per m2												40.9662	(99)

8c. Space cooling requirement

Not applicable

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3085.1843 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	562.8369	448.3755	376.3473	210.7836	87.9180	0.0000	0.0000	0.0000	0.0000	218.4709	403.8413	572.9887	(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)	602.6091	480.0594	402.9414	225.6784	94.1306	0.0000	0.0000	0.0000	0.0000	233.9088	432.3783	613.4783	(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	192.3118	167.9893	174.7820	155.0228	150.0894	132.1904	126.6485	141.1834	142.7426	162.5409	173.5092	187.7956	(64)
Efficiency of water heater	87.5942	87.4037	86.9324	85.8253	83.7567	80.3000	80.3000	80.3000	80.3000	85.7964	87.1074	87.6778	(217)
Fuel for water heating, kWh/month	219.5485	192.1992	201.0551	180.6261	179.1970	164.6207	157.7191	175.8199	177.7616	189.4496	199.1900	214.1883	(219)
Water heating fuel used												2251.3750	(219)
Annual totals kWh/year													
Space heating fuel - main system												3085.1843	(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)												333.8367	(232)
Total delivered energy for all uses												5745.3960	(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	3085.1843	0.2160	666.3998 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2251.3750	0.2160	486.2970 (264)
Space and water heating			1152.6968 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	333.8367	0.5190	173.2613 (268)
Total CO2, kg/m2/year			1364.8831 (272)
Emissions per m2 for space and water heating			16.3875 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4632 (272b)
Emissions per m2 for pumps and fans			0.5534 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.3875 * 1.00) + 2.4632 + 0.5534, rounded to 2 d.p.			19.4000 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	35.1700 (1b)	x 2.3900 (2b)	= 84.0563 (1b) - (3b)
First floor	35.1700 (1c)	x 2.6200 (2c)	= 92.1454 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.3400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.2017 (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) = 0.1703 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4203 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3572 (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	0.4555	0.4465	0.4376	0.3929	0.3840	0.3394	0.3394	0.3304	0.3572	0.3840	0.4019	0.4197 (22b)
Effective ac	0.6037	0.5997	0.5957	0.5772	0.5737	0.5576	0.5576	0.5546	0.5638	0.5737	0.5808	0.5881 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1500	1.1000	2.3650		(26)
Windows & Fully Glazed Do (Uw = 1.20)			9.9500	1.1450	11.3931		(27)
Ground Floor			35.3100	0.1200	4.2372	90.0000	3177.9000 (28a)
Brick and Block	84.0200	12.1000	71.9200	0.2400	17.2608	42.2200	3036.4624 (29a)
External Roof 1	35.1700		35.1700	0.1000	3.5170	9.1000	320.0470 (30)
Total net area of external elements Aum(A, m ²)			154.5000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	38.7731		(33)
Party Wall 1			38.9200	0.0000	0.0000	45.0000	1751.4000 (32)
GF Timber Stud			62.4400			9.0000	561.9600 (32c)
FF Timber Stud			74.3000			9.0000	668.7000 (32c)
Internal Floor 1			35.3100			18.0000	635.5800 (32d)
Internal Ceiling 1			35.1700			9.0000	316.5300 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 10468.5794 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 148.8283 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.0903 (36)
Total fabric heat loss (33) + (36) = 53.8634 (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	35.1043	34.8701	34.6405	33.5623	33.3606	32.4215	32.4215	32.2476	32.7832	33.3606	33.7687	34.1953 (38)
Heat transfer coeff	88.9677	88.7335	88.5039	87.4257	87.2240	86.2849	86.2849	86.1110	86.6466	87.2240	87.6321	88.0587 (39)
Average = Sum(39)m / 12 =												87.4247 (39)
HLP	1.2648	1.2615	1.2582	1.2429	1.2400	1.2267	1.2267	1.2242	1.2318	1.2400	1.2458	1.2519 (40)
HLP (average)												1.2429 (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												2.2544 (42)
Average daily hot water use (litres/day)												87.7408 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	96.5149	93.0053	89.4957	85.9860	82.4764	78.9668	78.9668	82.4764	85.9860	89.4957	93.0053	96.5149 (44)
Energy conte	143.1288	125.1814	129.1760	112.6188	108.0604	93.2479	86.4079	99.1543	100.3385	116.9349	127.6436	138.6126 (45)
Energy content (annual)										Total = Sum(45)m =		1380.5050 (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	30.4149	26.6010	27.4499	23.9315	22.9628	19.8152	18.3617	21.0703	21.3219	24.8487	27.1243	29.4552 (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	112.7175	112.7175	112.7175	112.7175	112.7175	112.7175	112.7175	112.7175	112.7175	112.7175	112.7175	112.7175	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.9032	16.7897	13.6543	10.3372	7.7272	6.5236	7.0490	9.1625	12.2979	15.6150	18.2250	19.4286	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.0893	200.1448	194.9649	183.9375	170.0174	156.9344	148.1942	146.1386	151.3186	162.3460	176.2661	189.3491	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2718	34.2718	34.2718	34.2718	34.2718	34.2718	34.2718	34.2718	34.2718	34.2718	34.2718	34.2718	(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)	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	(71)
Water heating gains (Table 5)	40.8802	39.5849	36.8950	33.2382	30.8640	27.5211	24.6797	28.3203	29.6138	33.3987	37.6726	39.5903	(72)
Total internal gains	314.6880	313.3347	302.3295	284.3281	265.4238	247.7943	236.7381	240.4367	250.0455	268.1750	288.9790	305.1832	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
East					6.6000	19.6403	0.6300	0.7000			0.7700			39.6153 (76)
West					3.3500	19.6403	0.6300	0.7000			0.7700			20.1078 (80)
Solar gains	59.7231	116.8310	192.4041	280.6098	343.8979	352.0407	335.1571	287.8950	223.7739	138.6298	74.4677	49.1134	(83)	
Total gains	374.4111	430.1657	494.7335	564.9380	609.3217	599.8350	571.8952	528.3317	473.8194	406.8048	363.4466	354.2966	(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	32.6853	32.7716	32.8566	33.2618	33.3388	33.7016	33.7016	33.7697	33.5609	33.3388	33.1835	33.0227	
alpha	3.1790	3.1848	3.1904	3.2175	3.2226	3.2468	3.2468	3.2513	3.2374	3.2226	3.2122	3.2015	
util living area	0.9906	0.9846	0.9701	0.9333	0.8589	0.7320	0.5923	0.6456	0.8441	0.9569	0.9855	0.9921	(86)
MIT	18.8765	19.0840	19.4672	19.9836	20.4482	20.7823	20.9213	20.8941	20.6197	20.0073	19.3540	18.8445	(87)
Th 2	19.8685	19.8711	19.8737	19.8858	19.8881	19.8987	19.8987	19.9007	19.8946	19.8881	19.8835	19.8787	(88)
util rest of house	0.9885	0.9812	0.9630	0.9164	0.8198	0.6525	0.4703	0.5270	0.7856	0.9428	0.9817	0.9904	(89)
MIT 2	17.9353	18.1433	18.5244	19.0377	19.4766	19.7722	19.8686	19.8564	19.6452	19.0703	18.4221	17.9108	(90)
Living area fraction									fLA = Living area / (4) =			0.2528	(91)
MIT	18.1732	18.3811	18.7627	19.2768	19.7222	20.0275	20.1347	20.1187	19.8915	19.3071	18.6577	18.1468	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1732	18.3811	18.7627	19.2768	19.7222	20.0275	20.1347	20.1187	19.8915	19.3071	18.6577	18.1468	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9842	0.9750	0.9539	0.9049	0.8130	0.6629	0.4986	0.5529	0.7854	0.9331	0.9758	0.9866	(94)
Ext temp.	368.4897	419.4125	471.9283	511.2184	495.3898	397.6372	285.1282	292.1122	372.1605	379.5904	354.6667	349.5600	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	1234.2673	1196.2225	1085.3011	907.2029	699.7289	468.3114	304.9907	320.2206	501.8168	759.4706	1012.8249	1228.1360	(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	644.1385	522.0163	456.3494	285.1088	152.0283	0.0000	0.0000	0.0000	0.0000	282.6308	473.8739	653.6605	(98)
Space heating per m2												3469.8065	(98)
												49.3291	(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	811.0781	638.5083	654.4436	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7521	0.8224	0.7907	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	610.0010	525.1340	517.4778	0.0000	0.0000	0.0000	0.0000	(102)

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Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	785.4041	751.0970	701.7120	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	126.2903	168.1165	137.0703	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												431.4770 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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	31.5726	42.0291	34.2676	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												107.8693 (107)
Space cooling per m2												1.5335 (108)
Energy for space heating												49.3291 (99)
Energy for space cooling												1.5335 (108)
Total												50.8626 (109)
Dwelling Fabric Energy Efficiency (DFEE)												50.9 (109)

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Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	35.1700 (1b)	x 2.3900 (2b)	= 84.0563 (1b) - (3b)
First floor	35.1700 (1c)	x 2.6200 (2c)	= 92.1454 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.3400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.2017 (5)

2. Ventilation rate

										main	secondary	other	total	m3 per hour			
										heating	heating						
Number of chimneys										0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues										0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans																3 * 10 =	30.0000 (7a)
Number of passive vents																0 * 10 =	0.0000 (7b)
Number of flueless gas fires																0 * 40 =	0.0000 (7c)
										Air changes per hour							
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000	/ (5) =	0.1703 (8)
Pressure test										Yes							
Measured/design AP50										5.0000							
Infiltration rate										0.4203 (18)							
Number of sides sheltered										2 (19)							
Shelter factor										(20) = 1 - [0.075 x (19)] =					0.8500 (20)		
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =					0.3572 (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	0.4555	0.4465	0.4376	0.3929	0.3840	0.3394	0.3394	0.3304	0.3572	0.3840	0.4019	0.4197	(22b)				
Effective ac	0.6037	0.5997	0.5957	0.5772	0.5737	0.5576	0.5576	0.5546	0.5638	0.5737	0.5808	0.5881	(25)				

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			2.1500	1.0000	2.1500		(26)					
TER Opening Type (Uw = 1.40)			9.9500	1.3258	13.1913		(27)					
Ground Floor			35.3100	0.1300	4.5903		(28a)					
Brick and Block	84.0200	12.1000	71.9200	0.1800	12.9456		(29a)					
External Roof 1	35.1700		35.1700	0.1300	4.5721		(30)					
Total net area of external elements Aum(A, m2)			154.5000				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	37.4493		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.1877 (36)					
Total fabric heat loss						(33) + (36) =	46.6370 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 35.1043	Feb 34.8701	Mar 34.6405	Apr 33.5623	May 33.3606	Jun 32.4215	Jul 32.4215	Aug 32.2476	Sep 32.7832	Oct 33.3606	Nov 33.7687	Dec 34.1953 (38)
Heat transfer coeff	81.7412	81.5070	81.2775	80.1993	79.9976	79.0585	79.0585	78.8846	79.4202	79.9976	80.4057	80.8323 (39)
Average = Sum(39)m / 12 =												80.1983 (39)
HLP	Jan 1.1621	Feb 1.1588	Mar 1.1555	Apr 1.1402	May 1.1373	Jun 1.1239	Jul 1.1239	Aug 1.1215	Sep 1.1291	Oct 1.1373	Nov 1.1431	Dec 1.1492 (40)
HLP (average)												1.1402 (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												2.2544 (42)
Average daily hot water use (litres/day)												87.7408 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.5149	93.0053	89.4957	85.9860	82.4764	78.9668	78.9668	82.4764	85.9860	89.4957	93.0053	96.5149 (44)
Energy conte	143.1288	125.1814	129.1760	112.6188	108.0604	93.2479	86.4079	99.1543	100.3385	116.9349	127.6436	138.6126 (45)
Energy content (annual)											Total = Sum(45)m =	1380.5050 (45)
Distribution loss	(46)m = 0.15 x (45)m											
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

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Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
	30.4149	26.6010	27.4499	23.9315	22.9628	19.8152	18.3617	21.0703	21.3219	24.8487	27.1243	29.4552 (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	112.7175	112.7175	112.7175	112.7175	112.7175	112.7175	112.7175	112.7175	112.7175	112.7175	112.7175	112.7175	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.9032	16.7897	13.6543	10.3372	7.7272	6.5236	7.0490	9.1625	12.2979	15.6150	18.2250	19.4286	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.0893	200.1448	194.9649	183.9375	170.0174	156.9344	148.1942	146.1386	151.3186	162.3460	176.2661	189.3491	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2718	34.2718	34.2718	34.2718	34.2718	34.2718	34.2718	34.2718	34.2718	34.2718	34.2718	34.2718	(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)	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	(71)
Water heating gains (Table 5)	40.8802	39.5849	36.8950	33.2382	30.8640	27.5211	24.6797	28.3203	29.6138	33.3987	37.6726	39.5903	(72)
Total internal gains	314.6880	313.3347	302.3295	284.3281	265.4238	247.7943	236.7381	240.4367	250.0455	268.1750	288.9790	305.1832	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W		
East				6.6000	19.6403	0.6300	0.7000		0.7700	39.6153 (76)		
West				3.3500	19.6403	0.6300	0.7000		0.7700	20.1078 (80)		

Solar gains	59.7231	116.8310	192.4041	280.6098	343.8979	352.0407	335.1571	287.8950	223.7739	138.6298	74.4677	49.1134 (83)
Total gains	374.4111	430.1657	494.7335	564.9380	609.3217	599.8350	571.8952	528.3317	473.8194	406.8048	363.4466	354.2966 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.7584	59.9301	60.0993	60.9073	61.0609	61.7862	61.7862	61.9224	61.5048	61.0609	60.7510	60.4303	
alpha	4.9839	4.9953	5.0066	5.0605	5.0707	5.1191	5.1191	5.1282	5.1003	5.0707	5.0501	5.0287	
util living area	0.9988	0.9974	0.9924	0.9719	0.9064	0.7581	0.5886	0.6520	0.8904	0.9862	0.9977	0.9991	(86)
MIT	19.6796	19.8227	20.0829	20.4364	20.7435	20.9313	20.9849	20.9753	20.8310	20.4235	19.9906	19.6593	(87)
Th 2	19.9504	19.9531	19.9558	19.9682	19.9705	19.9813	19.9813	19.9833	19.9771	19.9705	19.9658	19.9609	(88)
util rest of house	0.9984	0.9965	0.9896	0.9605	0.8677	0.6688	0.4623	0.5247	0.8297	0.9789	0.9967	0.9988	(89)
MIT 2	18.7442	18.8890	19.1500	19.5067	19.7926	19.9488	19.9774	19.9760	19.8785	19.5002	19.0671	18.7322	(90)
Living area fraction													(91)
MIT	18.9806	19.1250	19.3859	19.7417	20.0329	20.1971	20.2321	20.2286	20.1192	19.7336	19.3005	18.9665	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9806	19.1250	19.3859	19.7417	20.0329	20.1971	20.2321	20.2286	20.1192	19.7336	19.3005	18.9665	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9979	0.9955	0.9875	0.9574	0.8704	0.6894	0.4946	0.5573	0.8398	0.9766	0.9958	0.9984	(94)
Ext temp.	373.6343	428.2498	488.5561	540.8499	530.3577	413.5428	282.8802	294.4218	397.8979	397.2776	361.9233	353.7418	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	1200.0122	1159.4390	1047.3300	869.4950	666.6147	442.4994	287.1461	302.0197	478.0497	730.6656	980.9933	1193.6138	(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	614.8252	491.3591	415.7277	236.6245	101.3752	0.0000	0.0000	0.0000	0.0000	248.0407	445.7304	624.8648	(98)
Space heating per m2												3178.5475	(98)
												45.1883	(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	743.1498	585.0328	599.5228	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8588	0.9214	0.8950	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	638.2189	539.0743	536.5787	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	785.4041	751.0970	701.7120	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	105.9734	157.7448	122.8592	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												386.5774	(104)
Cooled fraction												1.0000	(105)

fC = cooled area / (4) =

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	26.4933	39.4362	30.7148	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											96.6444 (107)
Space cooling per m2											1.3740 (108)
Energy for space heating											45.1883 (99)
Energy for space cooling											1.3740 (108)
Total											46.5623 (109)
Target Fabric Energy Efficiency (TFEE)											53.5 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	35.1700 (1b)	x 2.3900 (2b)	= 84.0563 (1b) - (3b)
First floor	35.1700 (1c)	x 2.6200 (2c)	= 92.1454 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.3400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.2017 (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) = 0.1703 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4203 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3572 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	4.7000	4.6000	4.3000	4.3000	4.0000	4.0000	3.9000	4.0000	4.5000	4.4000	4.7000 (22)
Wind factor	1.2750	1.1750	1.1500	1.0750	1.0750	1.0000	1.0000	0.9750	1.0000	1.1250	1.1000	1.1750 (22a)
Adj infilt rate	0.4555	0.4197	0.4108	0.3840	0.3840	0.3572	0.3572	0.3483	0.3572	0.4019	0.3929	0.4197 (22b)
Effective ac	0.6037	0.5881	0.5844	0.5737	0.5737	0.5638	0.5638	0.5607	0.5638	0.5808	0.5772	0.5881 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1500	1.1000	2.3650		(26)
Windows & Fully Glazed Do (Uw = 1.20)			9.9500	1.1450	11.3931		(27)
Ground Floor			35.3100	0.1200	4.2372	90.0000	3177.9000 (28a)
Brick and Block	84.0200	12.1000	71.9200	0.2400	17.2608	42.2200	3036.4624 (29a)
External Roof 1	35.1700		35.1700	0.1000	3.5170	9.1000	320.0470 (30)
Total net area of external elements Aum(A, m ²)			154.5000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	38.7731		(33)
Party Wall 1			38.9200	0.0000	0.0000	45.0000	1751.4000 (32)
GF Timber Stud			62.4400			9.0000	561.9600 (32c)
FF Timber Stud			74.3000			9.0000	668.7000 (32c)
Internal Floor 1			35.3100			18.0000	635.5800 (32d)
Internal Ceiling 1			35.1700			18.0000	633.0600 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 10785.1094 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 153.3283 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.0903 (36)
Total fabric heat loss (33) + (36) = 53.8634 (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	35.1043	34.1953	33.9797	33.3606	33.3606	32.7832	32.7832	32.6000	32.7832	33.7687	33.5623	34.1953 (38)
Heat transfer coeff	88.9677	88.0587	87.8431	87.2240	87.2240	86.6466	86.6466	86.4634	86.6466	87.6321	87.4257	88.0587 (39)
Average = Sum(39)m / 12 =												87.4031 (39)
HLP	1.2648	1.2519	1.2488	1.2400	1.2400	1.2318	1.2318	1.2292	1.2318	1.2458	1.2429	1.2519 (40)
HLP (average)												1.2426 (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												2.2544 (42)
Average daily hot water use (litres/day)												87.7408 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	96.5149	93.0053	89.4957	85.9860	82.4764	78.9668	78.9668	82.4764	85.9860	89.4957	93.0053	96.5149 (44)
Energy conte	143.1288	125.1814	129.1760	112.6188	108.0604	93.2479	86.4079	99.1543	100.3385	116.9349	127.6436	138.6126 (45)
Energy content (annual)										Total = Sum(45)m =		1380.5050 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	21.4693	18.7772	19.3764	16.8928	16.2091	13.9872	12.9612	14.8731	15.0508	17.5402	19.1465	20.7919 (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	25.2867	22.8171	25.2259	24.3716	25.1544	24.3089	25.0980	25.1346	24.3430	25.1963	24.4306	25.2750 (61)
Total heat required for water heating calculated for each month	168.4156	147.9985	154.4019	136.9903	133.2148	117.5568	111.5059	124.2889	124.6816	142.1312	152.0742	163.8876 (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	168.4156	147.9985	154.4019	136.9903	133.2148	117.5568	111.5059	124.2889	124.6816	142.1312	152.0742	163.8876 (64)
RHI water heating demand												
Heat gains from water heating, kWh/month	53.9120	47.3271	49.2575	43.5386	42.2187	37.0822	35.0051	39.2524	39.4483	45.1799	48.5491	52.4074 (65)
												1677 (64)
												1677 (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	135.2611	135.2611	135.2611	135.2611	135.2611	135.2611	135.2611	135.2611	135.2611	135.2611	135.2611	135.2611 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	47.2580	41.9742	34.1357	25.8429	19.3179	16.3090	17.6224	22.9063	30.7448	39.0375	45.5626	48.5715 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	295.6557	298.7237	290.9924	274.5336	253.7573	234.2305	221.1854	218.1174	225.8486	242.3074	263.0837	282.6106 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7805	50.7805	50.7805	50.7805	50.7805	50.7805	50.7805	50.7805	50.7805	50.7805	50.7805	50.7805 (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)	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740 (71)
Water heating gains (Table 5)	72.4624	70.4272	66.2063	60.4703	56.7455	51.5030	47.0499	52.7587	54.7893	60.7257	67.4294	70.4401 (72)
Total internal gains	514.2436	509.9925	490.2019	459.7143	428.6882	400.9099	384.7251	392.6498	410.2502	440.9381	474.9432	500.4896 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g	Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W
East					6.6000	25.9136		0.6300	0.7000			0.7700	52.2690 (76)
West					3.3500	25.9136		0.6300	0.7000			0.7700	26.5305 (80)

Solar gains	78.7995	131.6277	214.8617	317.4482	370.3264	409.7588	380.9630	335.0722	264.4201	165.0171	97.3464		61.8758 (83)
Total gains	593.0431	641.6203	705.0636	777.1626	799.0145	810.6687	765.6882	727.7220	674.6703	605.9552	572.2896		562.3654 (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	33.6736	34.0212	34.1047	34.3468	34.3468	34.5757	34.5757	34.6489	34.5757	34.1868	34.2675	34.0212
alpha	3.2449	3.2681	3.2736	3.2898	3.2898	3.3050	3.3050	3.3099	3.3050	3.2791	3.2845	3.2681
util living area	0.9627	0.9516	0.9199	0.8512	0.7326	0.5491	0.4047	0.4229	0.6598	0.8619	0.9405	0.9668 (86)
MIT	19.4749	19.6201	19.9600	20.3747	20.7233	20.9245	20.9798	20.9771	20.8593	20.4674	19.9425	19.4619 (87)
Th 2	19.8685	19.8787	19.8811	19.8881	19.8881	19.8946	19.8946	19.8967	19.8946	19.8835	19.8858	19.8787 (88)
util rest of house	0.9547	0.9414	0.9026	0.8187	0.6730	0.4573	0.2900	0.3041	0.5704	0.8222	0.9255	0.9596 (89)
MIT 2	18.5224	18.6715	19.0025	19.3976	19.7040	19.8593	19.8894	19.8907	19.8207	19.4893	18.9950	18.5179 (90)
Living area fraction									fLA = Living area / (4) =			0.2528 (91)
MIT	18.7632	18.9113	19.2445	19.6446	19.9617	20.1286	20.1650	20.1653	20.0832	19.7366	19.2345	18.7565 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7632	18.9113	19.2445	19.6446	19.9617	20.1286	20.1650	20.1653	20.0832	19.7366	19.2345	18.7565 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9446	0.9304	0.8907	0.8106	0.6773	0.4777	0.3189	0.3340	0.5870	0.8161	0.9145	0.9502 (94)
Useful gains	560.2165	596.9412	628.0327	629.9536	541.1722	387.2825	244.1568	243.0824	396.0016	494.5209	523.3527	534.3335 (95)
Ext temp.	5.4000	5.7000	7.3000	9.6000	12.6000	15.4000	17.3000	17.3000	15.0000	11.8000	8.4000	5.5000 (96)
Heat loss rate W	1188.8915	1163.3693	1049.2406	876.1305	642.1141	409.7157	248.2434	247.7440	440.4426	695.4965	947.2138	1167.3530 (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	467.7342	380.6397	313.3787	177.2474	75.1007	0.0000	0.0000	0.0000	0.0000	149.5258	305.1800	470.9665 (98)
Space heating												2339.7730 (98)
RHI space heating demand												2340 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	35.1700 (1b)	x 2.3900 (2b)	= 84.0563 (1b) - (3b)
First floor	35.1700 (1c)	x 2.6200 (2c)	= 92.1454 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.3400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.2017 (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) = 0.1703 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4203 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3572 (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	0.4555	0.4465	0.4376	0.3929	0.3840	0.3394	0.3394	0.3304	0.3572	0.3840	0.4019	0.4197 (22b)
Effective ac	0.6037	0.5997	0.5957	0.5772	0.5737	0.5576	0.5576	0.5546	0.5638	0.5737	0.5808	0.5881 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1500	1.1000	2.3650		(26)
Windows & Fully Glazed Do (Uw = 1.20)			9.9500	1.1450	11.3931		(27)
Ground Floor			35.3100	0.1200	4.2372	90.0000	3177.9000 (28a)
Brick and Block	84.0200	12.1000	71.9200	0.2400	17.2608	42.2200	3036.4624 (29a)
External Roof 1	35.1700		35.1700	0.1000	3.5170	9.1000	320.0470 (30)
Total net area of external elements Aum(A, m ²)			154.5000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	38.7731		(33)
Party Wall 1			38.9200	0.0000	0.0000	45.0000	1751.4000 (32)
GF Timber Stud			62.4400			9.0000	561.9600 (32c)
FF Timber Stud			74.3000			9.0000	668.7000 (32c)
Internal Floor 1			35.3100			18.0000	635.5800 (32d)
Internal Ceiling 1			35.1700			18.0000	633.0600 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 10785.1094 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 153.3283 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.0903 (36)
Total fabric heat loss (33) + (36) = 53.8634 (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	35.1043	34.8701	34.6405	33.5623	33.3606	32.4215	32.4215	32.2476	32.7832	33.3606	33.7687	34.1953 (38)
Heat transfer coeff	88.9677	88.7335	88.5039	87.4257	87.2240	86.2849	86.2849	86.1110	86.6466	87.2240	87.6321	88.0587 (39)
Average = Sum(39)m / 12 =												87.4247 (39)
HLP	1.2648	1.2615	1.2582	1.2429	1.2400	1.2267	1.2267	1.2242	1.2318	1.2400	1.2458	1.2519 (40)
HLP (average)												1.2429 (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												2.2544 (42)
Average daily hot water use (litres/day)												87.7408 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	96.5149	93.0053	89.4957	85.9860	82.4764	78.9668	78.9668	82.4764	85.9860	89.4957	93.0053	96.5149 (44)
Energy conte	143.1288	125.1814	129.1760	112.6188	108.0604	93.2479	86.4079	99.1543	100.3385	116.9349	127.6436	138.6126 (45)
Energy content (annual)										Total = Sum(45)m =		1380.5050 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	21.4693	18.7772	19.3764	16.8928	16.2091	13.9872	12.9612	14.8731	15.0508	17.5402	19.1465	20.7919 (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	25.2867	22.8171	25.2259	24.3716	25.1544	24.3089	25.0980	25.1346	24.3430	25.1963	24.4306	25.2750 (61)
Total heat required for water heating calculated for each month	168.4156	147.9985	154.4019	136.9903	133.2148	117.5568	111.5059	124.2889	124.6816	142.1312	152.0742	163.8876 (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	168.4156	147.9985	154.4019	136.9903	133.2148	117.5568	111.5059	124.2889	124.6816	142.1312	152.0742	163.8876 (64)
Heat gains from water heating, kWh/month	53.9120	47.3271	49.2575	43.5386	42.2187	37.0822	35.0051	39.2524	39.4483	45.1799	48.5491	52.4074 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1677.1472 (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	135.2611	135.2611	135.2611	135.2611	135.2611	135.2611	135.2611	135.2611	135.2611	135.2611	135.2611	135.2611	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	47.2580	41.9742	34.1357	25.8429	19.3179	16.3090	17.6224	22.9063	30.7448	39.0375	45.5626	48.5715	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	295.6557	298.7237	290.9924	274.5336	253.7573	234.2305	221.1854	218.1174	225.8486	242.3074	263.0837	282.6106	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7805	50.7805	50.7805	50.7805	50.7805	50.7805	50.7805	50.7805	50.7805	50.7805	50.7805	50.7805	(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)	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	(71)
Water heating gains (Table 5)	72.4624	70.4272	66.2063	60.4703	56.7455	51.5030	47.0499	52.7587	54.7893	60.7257	67.4294	70.4401	(72)
Total internal gains	514.2436	509.9925	490.2019	459.7143	428.6882	400.9099	384.7251	392.6498	410.2502	440.9381	474.9432	500.4896	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
East					6.6000	19.6403	0.6300	0.7000	0.7700		39.6153 (76)	
West					3.3500	19.6403	0.6300	0.7000	0.7700		20.1078 (80)	
Solar gains	59.7231	116.8310	192.4041	280.6098	343.8979	352.0407	335.1571	287.8950	223.7739	138.6298	74.4677	49.1134 (83)
Total gains	573.9667	626.8235	682.6060	740.3241	772.5861	752.9506	719.8822	680.5448	634.0240	579.5680	549.4108	549.6030 (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	33.6736	33.7625	33.8501	34.2675	34.3468	34.7206	34.7206	34.7907	34.5757	34.3468	34.1868	34.0212	
alpha	3.2449	3.2508	3.2567	3.2845	3.2898	3.3147	3.3147	3.3194	3.3050	3.2898	3.2791	3.2681	
util living area	0.9715	0.9602	0.9357	0.8813	0.7852	0.6386	0.4955	0.5374	0.7447	0.9031	0.9583	0.9749	(86)
MIT	19.2673	19.4554	19.7947	20.2390	20.6158	20.8654	20.9567	20.9427	20.7633	20.2791	19.7027	19.2327	(87)
Th 2	19.8685	19.8711	19.8737	19.8858	19.8881	19.8987	19.8987	19.9007	19.8946	19.8881	19.8835	19.8787	(88)
util rest of house	0.9656	0.9521	0.9220	0.8550	0.7359	0.5556	0.3841	0.4259	0.6716	0.8760	0.9483	0.9697	(89)
MIT 2	18.3174	18.5041	18.8373	19.2711	19.6145	19.8254	19.8835	19.8788	19.7511	19.3199	18.7594	18.2919	(90)
Living area fraction	18.5575	18.7446	19.0793	19.5157	19.8676	20.0883	20.1547	20.1477	20.0069	19.5623	18.9978	18.5291	(91)
MIT	18.5575	18.7446	19.0793	19.5157	19.8676	20.0883	20.1547	20.1477	20.0069	19.5623	18.9978	18.5291	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5575	18.7446	19.0793	19.5157	19.8676	20.0883	20.1547	20.1477	20.0069	19.5623	18.9978	18.5291	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9567	0.9417	0.9102	0.8448	0.7349	0.5709	0.4112	0.4524	0.6799	0.8663	0.9381	0.9616	(94)
Useful gains	549.1341	590.2837	621.2753	625.4061	567.7662	429.8694	296.0419	307.8702	431.0882	502.1018	515.4177	528.4795	(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	1268.4589	1228.4768	1113.3162	928.0886	712.4087	473.5564	306.7208	322.7198	511.8170	781.7312	1042.6311	1261.8008	(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	535.1777	428.8658	366.0785	217.9314	107.6140	0.0000	0.0000	0.0000	0.0000	208.0442	379.5937	545.5911	(98)
Space heating												2788.8963	(98)
Space heating per m2											(98) / (4) =	39.6488	(99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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													3074.8581 (211)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	535.1777	428.8658	366.0785	217.9314	107.6140	0.0000	0.0000	0.0000	0.0000	208.0442	379.5937	545.5911	(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)	590.0526	472.8399	403.6147	240.2772	118.6482	0.0000	0.0000	0.0000	0.0000	229.3762	418.5156	601.5337	(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	168.4156	147.9985	154.4019	136.9903	133.2148	117.5568	111.5059	124.2889	124.6816	142.1312	152.0742	163.8876	(64)
Efficiency of water heater (217)m	89.8369	89.7755	89.6327	89.3163	88.7300	87.2000	87.2000	87.2000	87.2000	89.2461	89.6705	89.8668	(216)
Fuel for water heating, kWh/month	187.4682	164.8539	172.2606	153.3766	150.1350	134.8128	127.8737	142.5331	142.9834	159.2577	169.5922	182.3673	(219)
Water heating fuel used												1887.5145	(219)
Annual totals kWh/year													
Space heating fuel - main system												3074.8581	(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)												333.8367	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.90 * 908 * 1.00) =										-653.6551		-653.6551	(233)
Total delivered energy for all uses												4717.5543	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3074.8581	3.4800	107.0051 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1887.5145	3.4800	65.6855 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	333.8367	13.1900	44.0331 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-653.6551	13.1900	-86.2171 (252)
Total energy cost			260.3990 (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] =	0.9482 (257)
SAP value		86.7723
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	3074.8581	0.2160	664.1693 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1887.5145	0.2160	407.7031 (264)
Space and water heating			1071.8725 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	333.8367	0.5190	173.2613 (268)
Energy saving/generation technologies			
PV Unit	-653.6551	0.5190	-339.2470 (269)
Total kg/year			944.8118 (272)
CO2 emissions per m2			13.4300 (273)
EI value			89.0233
EI rating			89 (274)
EI band			B

Calculation of stars for heating and DHW

Main heating energy efficiency $3.48 \times (1 + 0.29 \times 0.00) / 0.9070 = 3.837$, stars = 4

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CALCULATION OF ENERGY RATINGS 09 Jan 2014

Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9070 = 0.2381$, stars = 4
Water heating energy efficiency	$3.48 / 0.8874 = 3.922$, stars = 4
Water heating environmental impact	$0.216 / 0.8874 = 0.2434$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	35.1700 (1b)	x 2.3900 (2b)	= 84.0563 (1b) - (3b)
First floor	35.1700 (1c)	x 2.6200 (2c)	= 92.1454 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.3400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.2017 (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) = 0.1703 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4203 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3572 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	4.7000	4.6000	4.3000	4.3000	4.0000	4.0000	3.9000	4.0000	4.5000	4.4000	4.7000 (22)
Wind factor	1.2750	1.1750	1.1500	1.0750	1.0750	1.0000	1.0000	0.9750	1.0000	1.1250	1.1000	1.1750 (22a)
Adj infilt rate	0.4555	0.4197	0.4108	0.3840	0.3840	0.3572	0.3572	0.3483	0.3572	0.4019	0.3929	0.4197 (22b)
Effective ac	0.6037	0.5881	0.5844	0.5737	0.5737	0.5638	0.5638	0.5607	0.5638	0.5808	0.5772	0.5881 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1500	1.1000	2.3650		(26)
Windows & Fully Glazed Do (Uw = 1.20)			9.9500	1.1450	11.3931		(27)
Ground Floor			35.3100	0.1200	4.2372	90.0000	3177.9000 (28a)
Brick and Block	84.0200	12.1000	71.9200	0.2400	17.2608	42.2200	3036.4624 (29a)
External Roof 1	35.1700		35.1700	0.1000	3.5170	9.1000	320.0470 (30)
Total net area of external elements Aum(A, m ²)			154.5000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	38.7731		(33)
Party Wall 1			38.9200	0.0000	0.0000	45.0000	1751.4000 (32)
GF Timber Stud			62.4400			9.0000	561.9600 (32c)
FF Timber Stud			74.3000			9.0000	668.7000 (32c)
Internal Floor 1			35.3100			18.0000	635.5800 (32d)
Internal Ceiling 1			35.1700			18.0000	633.0600 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 10785.1094 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 153.3283 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.0903 (36)
Total fabric heat loss (33) + (36) = 53.8634 (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	35.1043	34.1953	33.9797	33.3606	33.3606	32.7832	32.7832	32.6000	32.7832	33.7687	33.5623	34.1953 (38)
Heat transfer coeff	88.9677	88.0587	87.8431	87.2240	87.2240	86.6466	86.6466	86.4634	86.6466	87.6321	87.4257	88.0587 (39)
Average = Sum(39)m / 12 =												87.4031 (39)
HLP	1.2648	1.2519	1.2488	1.2400	1.2400	1.2318	1.2318	1.2292	1.2318	1.2458	1.2429	1.2519 (40)
HLP (average)												1.2426 (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												2.2544 (42)
Average daily hot water use (litres/day)												87.7408 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	96.5149	93.0053	89.4957	85.9860	82.4764	78.9668	78.9668	82.4764	85.9860	89.4957	93.0053	96.5149 (44)
Energy conte	143.1288	125.1814	129.1760	112.6188	108.0604	93.2479	86.4079	99.1543	100.3385	116.9349	127.6436	138.6126 (45)
Energy content (annual)										Total = Sum(45)m =		1380.5050 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Distribution loss (46)m = 0.15 x (45)m	21.4693	18.7772	19.3764	16.8928	16.2091	13.9872	12.9612	14.8731	15.0508	17.5402	19.1465	20.7919 (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	25.2867	22.8171	25.2259	24.3716	25.1544	24.3089	25.0980	25.1346	24.3430	25.1963	24.4306	25.2750 (61)
Total heat required for water heating calculated for each month	168.4156	147.9985	154.4019	136.9903	133.2148	117.5568	111.5059	124.2889	124.6816	142.1312	152.0742	163.8876 (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	168.4156	147.9985	154.4019	136.9903	133.2148	117.5568	111.5059	124.2889	124.6816	142.1312	152.0742	163.8876 (64)
Heat gains from water heating, kWh/month	53.9120	47.3271	49.2575	43.5386	42.2187	37.0822	35.0051	39.2524	39.4483	45.1799	48.5491	52.4074 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1677.1472 (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	135.2611	135.2611	135.2611	135.2611	135.2611	135.2611	135.2611	135.2611	135.2611	135.2611	135.2611	135.2611	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	47.2580	41.9742	34.1357	25.8429	19.3179	16.3090	17.6224	22.9063	30.7448	39.0375	45.5626	48.5715	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	295.6557	298.7237	290.9924	274.5336	253.7573	234.2305	221.1854	218.1174	225.8486	242.3074	263.0837	282.6106	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7805	50.7805	50.7805	50.7805	50.7805	50.7805	50.7805	50.7805	50.7805	50.7805	50.7805	50.7805	(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)	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	(71)
Water heating gains (Table 5)	72.4624	70.4272	66.2063	60.4703	56.7455	51.5030	47.0499	52.7587	54.7893	60.7257	67.4294	70.4401	(72)
Total internal gains	514.2436	509.9925	490.2019	459.7143	428.6882	400.9099	384.7251	392.6498	410.2502	440.9381	474.9432	500.4896	(73)

6. Solar gains

[Jan]			Area m2		Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
East			6.6000		25.9136		0.6300		0.7000		0.7700		52.2690 (76)
West			3.3500		25.9136		0.6300		0.7000		0.7700		26.5305 (80)
Solar gains	78.7995	131.6277	214.8617	317.4482	370.3264	409.7588	380.9630	335.0722	264.4201	165.0171	97.3464		61.8758 (83)
Total gains	593.0431	641.6203	705.0636	777.1626	799.0145	810.6687	765.6882	727.7220	674.6703	605.9552	572.2896		562.3654 (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	33.6736	34.0212	34.1047	34.3468	34.3468	34.5757	34.5757	34.6489	34.5757	34.1868	34.2675	34.0212	
alpha	3.2449	3.2681	3.2736	3.2898	3.2898	3.3050	3.3050	3.3099	3.3050	3.2791	3.2845	3.2681	
util living area	0.9627	0.9516	0.9199	0.8512	0.7326	0.5491	0.4047	0.4229	0.6598	0.8619	0.9405	0.9668 (86)	
MIT	19.4749	19.6201	19.9600	20.3747	20.7233	20.9245	20.9798	20.9771	20.8593	20.4674	19.9425	19.4619 (87)	
Th 2	19.8685	19.8787	19.8811	19.8881	19.8881	19.8946	19.8946	19.8967	19.8946	19.8835	19.8858	19.8787 (88)	
util rest of house	0.9547	0.9414	0.9026	0.8187	0.6730	0.4573	0.2900	0.3041	0.5704	0.8222	0.9255	0.9596 (89)	
MIT 2	18.5224	18.6715	19.0025	19.3976	19.7040	19.8593	19.8894	19.8907	19.8207	19.4893	18.9950	18.5179 (90)	
Living area fraction	18.7632	18.9113	19.2445	19.6446	19.9617	20.1286	20.1650	20.1653	20.0832	fLA = Living area / (4) =			0.2528 (91)
MIT	18.7632	18.9113	19.2445	19.6446	19.9617	20.1286	20.1650	20.1653	20.0832	19.7366	19.2345	18.7565 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.7632	18.9113	19.2445	19.6446	19.9617	20.1286	20.1650	20.1653	20.0832	19.7366	19.2345	18.7565 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9446	0.9304	0.8907	0.8106	0.6773	0.4777	0.3189	0.3340	0.5870	0.8161	0.9145	0.9502 (94)
Useful gains	560.2165	596.9412	628.0327	629.9536	541.1722	387.2825	244.1568	243.0824	396.0016	494.5209	523.3527	534.3335 (95)
Ext temp.	5.4000	5.7000	7.3000	9.6000	12.6000	15.4000	17.3000	17.3000	15.0000	11.8000	8.4000	5.5000 (96)
Heat loss rate W	1188.8915	1163.3693	1049.2406	876.1305	642.1141	409.7157	248.2434	247.7440	440.4426	695.4965	947.2138	1167.3530 (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	467.7342	380.6397	313.3787	177.2474	75.1007	0.0000	0.0000	0.0000	0.0000	149.5258	305.1800	470.9665 (98)
Space heating												2339.7730 (98)
Space heating per m2										(98) / (4) =		33.2638 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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													2579.6836 (211)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	467.7342	380.6397	313.3787	177.2474	75.1007	0.0000	0.0000	0.0000	0.0000	149.5258	305.1800	470.9665 (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)	515.6937	419.6689	345.5112	195.4216	82.8012	0.0000	0.0000	0.0000	0.0000	164.8576	336.4719	519.2574 (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	168.4156	147.9985	154.4019	136.9903	133.2148	117.5568	111.5059	124.2889	124.6816	142.1312	152.0742	163.8876 (64)	
Efficiency of water heater (217)m	89.7463	89.6921	89.5141	89.1402	88.4302	87.2000	87.2000	87.2000	87.2000	88.9599	89.5052	89.7698 (217)	
Fuel for water heating, kWh/month	187.6573	165.0072	172.4889	153.6795	150.6440	134.8128	127.8737	142.5331	142.9834	159.7699	169.9054	182.5642 (219)	
Water heating fuel used												1889.9196 (219)	
Annual totals kWh/year													
Space heating fuel - main system												2579.6836 (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)												333.8367 (232)	
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.90 * 1054 * 1.00) =										-759.1987		-759.1987 (233)	
Total delivered energy for all uses												4119.2412 (238)	

10a. Fuel costs - using BEDF prices (513)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2579.6836	9.7400	251.2612 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1889.9196	9.7400	184.0782 (247)
Pumps and fans for heating	75.0000	36.8500	27.6375 (249)
Energy for lighting	333.8367	36.8500	123.0188 (250)
Additional standing charges			104.0000 (251)
Energy saving/generation technologies			
PV Unit	-759.1987	36.8500	-279.7647 (252)
Total energy cost			410.2310 (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	2579.6836	0.2160	557.2117 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1889.9196	0.2160	408.2226 (264)
Space and water heating			965.4343 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	333.8367	0.5190	173.2613 (268)
Energy saving/generation technologies			
PV Unit	-759.1987	0.5190	-394.0241 (269)
Total kg/year			783.5964 (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	2579.6836	1.2200	3147.2140 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1889.9196	1.2200	2305.7019 (264)
Space and water heating			5452.9159 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	333.8367	3.0700	1024.8788 (268)
Energy saving/generation technologies			
PV Unit	-759.1987	3.0700	-2330.7401 (269)
Primary energy kWh/year			4377.3045 (272)
Primary energy kWh/m2/year			62.2307 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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	-£ 77	-185 kg (23.6%)

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
Solar water heating	£77	2.62 kg/m²	B 88 B 91
Total Savings	£77	2.62 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 513 TEST (28 Feb 2023)
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	£151	£169	-£18
Mains gas	£539	£444	£95
Space heating	£383	£383	£0
Water heating	£184	£108	£77
Lighting	£123	£123	£0
Generated (PV)	-£280	-£280	£0
Total cost of fuels	£410	£333	£77
Total cost of uses	£410	£334	£77
Delivered energy	59 kWh/m²	45 kWh/m²	13 kWh/m²
Carbon dioxide emissions	0.8 tonnes	0.6 tonnes	0.2 tonnes
CO2 emissions per m²	11 kg/m²	9 kg/m²	3 kg/m²
Primary energy	62 kWh/m²	48 kWh/m²	15 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	35.1700 (1b)	x 2.3900 (2b)	= 84.0563 (1b) - (3b)
First floor	35.1700 (1c)	x 2.6200 (2c)	= 92.1454 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.3400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.2017 (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) = 0.1703 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4203 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3572 (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	0.4555	0.4465	0.4376	0.3929	0.3840	0.3394	0.3394	0.3304	0.3572	0.3840	0.4019	0.4197 (22b)
Effective ac	0.6037	0.5997	0.5957	0.5772	0.5737	0.5576	0.5576	0.5546	0.5638	0.5737	0.5808	0.5881 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1500	1.1000	2.3650		(26)
Windows & Fully Glazed Do (Uw = 1.20)			9.9500	1.1450	11.3931		(27)
Ground Floor			35.3100	0.1200	4.2372	90.0000	3177.9000 (28a)
Brick and Block	84.0200	12.1000	71.9200	0.2400	17.2608	42.2200	3036.4624 (29a)
External Roof 1	35.1700		35.1700	0.1000	3.5170	9.1000	320.0470 (30)
Total net area of external elements Aum(A, m ²)			154.5000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	38.7731		(33)
Party Wall 1			38.9200	0.0000	0.0000	45.0000	1751.4000 (32)
GF Timber Stud			62.4400			9.0000	561.9600 (32c)
FF Timber Stud			74.3000			9.0000	668.7000 (32c)
Internal Floor 1			35.3100			18.0000	635.5800 (32d)
Internal Ceiling 1			35.1700			18.0000	633.0600 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 10785.1094 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 153.3283 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.0903 (36)
Total fabric heat loss (33) + (36) = 53.8634 (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	35.1043	34.8701	34.6405	33.5623	33.3606	32.4215	32.4215	32.2476	32.7832	33.3606	33.7687	34.1953 (38)
Heat transfer coeff	88.9677	88.7335	88.5039	87.4257	87.2240	86.2849	86.2849	86.1110	86.6466	87.2240	87.6321	88.0587 (39)
Average = Sum(39)m / 12 =												87.4247 (39)
HLP	1.2648	1.2615	1.2582	1.2429	1.2400	1.2267	1.2267	1.2242	1.2318	1.2400	1.2458	1.2519 (40)
HLP (average)												1.2429 (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												2.2544 (42)
Average daily hot water use (litres/day)												87.7408 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	96.5149	93.0053	89.4957	85.9860	82.4764	78.9668	78.9668	82.4764	85.9860	89.4957	93.0053	96.5149 (44)
Energy conte	143.1288	125.1814	129.1760	112.6188	108.0604	93.2479	86.4079	99.1543	100.3385	116.9349	127.6436	138.6126 (45)
Energy content (annual)										Total = Sum(45)m =		1380.5050 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	21.4693	18.7772	19.3764	16.8928	16.2091	13.9872	12.9612	14.8731	15.0508	17.5402	19.1465	20.7919 (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	25.2867	22.8171	25.2259	24.3716	25.1544	24.3089	25.0980	25.1346	24.3430	25.1963	24.4306	25.2750 (61)
Total heat required for water heating calculated for each month	168.4156	147.9985	154.4019	136.9903	133.2148	117.5568	111.5059	124.2889	124.6816	142.1312	152.0742	163.8876 (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												1.3137 (H8)
Utilisation factor												0.5329 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												87.7408 (H14)
Volume ratio Veff/V												0.8548 (H15)
Solar storage volume factor												0.9686 (H16)
Solar input	-23.8691	-39.8307	-67.8363	-90.9140	-112.3166	-110.4251	-108.9658	-95.2040	-74.5638	-50.9183	-28.3122	-823.1303 (H17)
Solar input (sum of months) = Sum (63)m =												-823.1303 (63)
Output from w/h	144.5464	108.1678	86.5656	46.0763	20.8982	7.1317	2.5401	29.0849	50.1178	91.2129	123.7619	143.9132 (64)
Total per year (kWh/year) = Sum (64)m =												854.0169 (64)
Heat gains from water heating, kWh/month	53.9120	47.3271	49.2575	43.5386	42.2187	37.0822	35.0051	39.2524	39.4483	45.1799	48.5491	52.4074 (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	135.2611	135.2611	135.2611	135.2611	135.2611	135.2611	135.2611	135.2611	135.2611	135.2611	135.2611	135.2611 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	47.2580	41.9742	34.1357	25.8429	19.3179	16.3090	17.6224	22.9063	30.7448	39.0375	45.5626	48.5715 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	295.6557	298.7237	290.9924	274.5336	253.7573	234.2305	221.1854	218.1174	225.8486	242.3074	263.0837	282.6106 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7805	50.7805	50.7805	50.7805	50.7805	50.7805	50.7805	50.7805	50.7805	50.7805	50.7805	50.7805 (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)	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740 (71)
Water heating gains (Table 5)	72.4624	70.4272	66.2063	60.4703	56.7455	51.5030	47.0499	52.7587	54.7893	60.7257	67.4294	70.4401 (72)
Total internal gains	514.2436	509.9925	490.2019	459.7143	428.6882	400.9099	384.7251	392.6498	410.2502	440.9381	474.9432	500.4896 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d	Gains W	
East				6.6000	19.6403	0.6300		0.7000		0.7700	39.6153 (76)	
West				3.3500	19.6403	0.6300		0.7000		0.7700	20.1078 (80)	

Solar gains	59.7231	116.8310	192.4041	280.6098	343.8979	352.0407	335.1571	287.8950	223.7739	138.6298	74.4677	49.1134 (83)
Total gains	573.9667	626.8235	682.6060	740.3241	772.5861	752.9506	719.8822	680.5448	634.0240	579.5680	549.4108	549.6030 (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	33.6736	33.7625	33.8501	34.2675	34.3468	34.7206	34.7206	34.7907	34.5757	34.3468	34.1868	34.0212
alpha	3.2449	3.2508	3.2567	3.2845	3.2898	3.3147	3.3147	3.3194	3.3050	3.2898	3.2791	3.2681
util living area	0.9715	0.9602	0.9357	0.8813	0.7852	0.6386	0.4955	0.5374	0.7447	0.9031	0.9583	0.9749 (86)
MIT	19.2673	19.4554	19.7947	20.2390	20.6158	20.8654	20.9567	20.9427	20.7633	20.2791	19.7027	19.2327 (87)
Th 2	19.8685	19.8711	19.8737	19.8858	19.8881	19.8987	19.8987	19.9007	19.8946	19.8881	19.8835	19.8787 (88)
util rest of house	0.9656	0.9521	0.9220	0.8550	0.7359	0.5556	0.3841	0.4259	0.6716	0.8760	0.9483	0.9697 (89)
MIT 2	18.3174	18.5041	18.8373	19.2711	19.6145	19.8254	19.8835	19.8788	19.7511	19.3199	18.7594	18.2911 (90)
Living area fraction									fLA = Living area / (4) =			0.2528 (91)
MIT	18.5575	18.7446	19.0793	19.5157	19.8676	20.0883	20.1547	20.1477	20.0069	19.5623	18.9978	18.5291 (92)
Temperature adjustment												0.0000
adjusted MIT	18.5575	18.7446	19.0793	19.5157	19.8676	20.0883	20.1547	20.1477	20.0069	19.5623	18.9978	18.5291 (93)

8. Space heating requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Space heating - main system 1	3074.8581	0.2160	664.1693 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	952.9867	0.2160	205.8451 (264)
Space and water heating			870.0145 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	333.8367	0.5190	173.2613 (268)
Energy saving/generation technologies			
PV Unit			
Total kg/year	-653.6551	0.5190	-339.2470 (269)
CO2 emissions per m2			768.9038 (272)
EI value			10.9300 (273)
EI rating			91 (274)
EI band			B

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	35.1700 (1b)	x 2.3900 (2b)	= 84.0563 (1b) - (3b)
First floor	35.1700 (1c)	x 2.6200 (2c)	= 92.1454 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.3400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.2017 (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) = 0.1703 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4203 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3572 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	4.7000	4.6000	4.3000	4.3000	4.0000	4.0000	3.9000	4.0000	4.5000	4.4000	4.7000 (22)
Wind factor	1.2750	1.1750	1.1500	1.0750	1.0750	1.0000	1.0000	0.9750	1.0000	1.1250	1.1000	1.1750 (22a)
Adj infilt rate	0.4555	0.4197	0.4108	0.3840	0.3840	0.3572	0.3572	0.3483	0.3572	0.4019	0.3929	0.4197 (22b)
Effective ac	0.6037	0.5881	0.5844	0.5737	0.5737	0.5638	0.5638	0.5607	0.5638	0.5808	0.5772	0.5881 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1500	1.1000	2.3650		(26)
Windows & Fully Glazed Do (Uw = 1.20)			9.9500	1.1450	11.3931		(27)
Ground Floor			35.3100	0.1200	4.2372	90.0000	3177.9000 (28a)
Brick and Block	84.0200	12.1000	71.9200	0.2400	17.2608	42.2200	3036.4624 (29a)
External Roof 1	35.1700		35.1700	0.1000	3.5170	9.1000	320.0470 (30)
Total net area of external elements Aum(A, m ²)			154.5000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	38.7731		(33)
Party Wall 1			38.9200	0.0000	0.0000	45.0000	1751.4000 (32)
GF Timber Stud			62.4400			9.0000	561.9600 (32c)
FF Timber Stud			74.3000			9.0000	668.7000 (32c)
Internal Floor 1			35.3100			18.0000	635.5800 (32d)
Internal Ceiling 1			35.1700			18.0000	633.0600 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 10785.1094 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 153.3283 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.0903 (36)
Total fabric heat loss (33) + (36) = 53.8634 (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	35.1043	34.1953	33.9797	33.3606	33.3606	32.7832	32.7832	32.6000	32.7832	33.7687	33.5623	34.1953 (38)
Heat transfer coeff	88.9677	88.0587	87.8431	87.2240	87.2240	86.6466	86.6466	86.4634	86.6466	87.6321	87.4257	88.0587 (39)
Average = Sum(39)m / 12 =												87.4031 (39)
HLP	1.2648	1.2519	1.2488	1.2400	1.2400	1.2318	1.2318	1.2292	1.2318	1.2458	1.2429	1.2519 (40)
HLP (average)												1.2426 (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												2.2544 (42)
Average daily hot water use (litres/day)												87.7408 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	96.5149	93.0053	89.4957	85.9860	82.4764	78.9668	78.9668	82.4764	85.9860	89.4957	93.0053	96.5149 (44)
Energy conte	143.1288	125.1814	129.1760	112.6188	108.0604	93.2479	86.4079	99.1543	100.3385	116.9349	127.6436	138.6126 (45)
Energy content (annual)										Total = Sum(45)m =		1380.5050 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Distribution loss (46)m = 0.15 x (45)m	21.4693	18.7772	19.3764	16.8928	16.2091	13.9872	12.9612	14.8731	15.0508	17.5402	19.1465	20.7919 (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	25.2867	22.8171	25.2259	24.3716	25.1544	24.3089	25.0980	25.1346	24.3430	25.1963	24.4306	25.2750 (61)
Total heat required for water heating calculated for each month	168.4156	147.9985	154.4019	136.9903	133.2148	117.5568	111.5059	124.2889	124.6816	142.1312	152.0742	163.8876 (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												1234.4649 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												2073.9010 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.5023 (H8)
Utilisation factor												0.4861 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												87.7408 (H14)
Volume ratio Veff/V												0.8548 (H15)
Solar storage volume factor												0.9686 (H16)
Solar input	-28.1750	-40.2207	-68.1672	-93.0184	-109.7820	-116.8288	-112.5156	-100.3787	-79.4438	-54.3950	-33.1253	-858.5560 (H17)
Solar input (sum of months) = Sum (63)m =												-858.5560 (63)
Output from w/h	140.2406	107.7778	86.2347	43.9719	23.4328	0.7280	0.0000	23.9102	45.2377	87.7362	118.9488	141.3821 (64)
Total per year (kWh/year) = Sum (64)m =												819.6009 (64)
Heat gains from water heating, kWh/month	53.9120	47.3271	49.2575	43.5386	42.2187	37.0822	35.0051	39.2524	39.4483	45.1799	48.5491	52.4074 (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	135.2611	135.2611	135.2611	135.2611	135.2611	135.2611	135.2611	135.2611	135.2611	135.2611	135.2611	135.2611	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	47.2580	41.9742	34.1357	25.8429	19.3179	16.3090	17.6224	22.9063	30.7448	39.0375	45.5626	48.5715	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	295.6557	298.7237	290.9924	274.5336	253.7573	234.2305	221.1854	218.1174	225.8486	242.3074	263.0837	282.6106	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7805	50.7805	50.7805	50.7805	50.7805	50.7805	50.7805	50.7805	50.7805	50.7805	50.7805	50.7805	(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)	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	-90.1740	(71)
Water heating gains (Table 5)	72.4624	70.4272	66.2063	60.4703	56.7455	51.5030	47.0499	52.7587	54.7893	60.7257	67.4294	70.4401	(72)
Total internal gains	514.2436	509.9925	490.2019	459.7143	428.6882	400.9099	384.7251	392.6498	410.2502	440.9381	474.9432	500.4896	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
East					6.6000	25.9136	0.6300	0.7000			0.7700			52.2690 (76)
West					3.3500	25.9136	0.6300	0.7000			0.7700			26.5305 (80)

Solar gains	78.7995	131.6277	214.8617	317.4482	370.3264	409.7588	380.9630	335.0722	264.4201	165.0171	97.3464	61.8758 (83)		
Total gains	593.0431	641.6203	705.0636	777.1626	799.0145	810.6687	765.6882	727.7220	674.6703	605.9552	572.2896	562.3654 (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	33.6736	34.0212	34.1047	34.3468	34.3468	34.5757	34.5757	34.6489	34.5757	34.1868	34.2675	34.0212	
alpha	3.2449	3.2681	3.2736	3.2898	3.2898	3.3050	3.3050	3.3099	3.3050	3.2791	3.2845	3.2681	
util living area	0.9627	0.9516	0.9199	0.8512	0.7326	0.5491	0.4047	0.4229	0.6598	0.8619	0.9405	0.9668	(86)
MIT	19.4749	19.6201	19.9600	20.3747	20.7233	20.9245	20.9798	20.9771	20.8593	20.4674	19.9425	19.4619	(87)
Th 2	19.8685	19.8787	19.8811	19.8881	19.8881	19.8946	19.8946	19.8967	19.8946	19.8835	19.8858	19.8787	(88)
util rest of house	0.9547	0.9414	0.9026	0.8187	0.6730	0.4573	0.2900	0.3041	0.5704	0.8222	0.9255	0.9596	(89)
MIT 2	18.5224	18.6715	19.0025	19.3976	19.7040	19.8593	19.8894	19.8907	19.8207	19.4893	18.9950	18.5179	(90)
Living area fraction									fLA = Living area / (4) =			0.2528	(91)
MIT	18.7632	18.9113	19.2445	19.6446	19.9617	20.1286	20.1650	20.1653	20.0832	19.7366	19.2345	18.7565	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7632	18.9113	19.2445	19.6446	19.9617	20.1286	20.1650	20.1653	20.0832	19.7366	19.2345	18.7565	(93)

8. Space heating requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9446	0.9304	0.8907	0.8106	0.6773	0.4777	0.3189	0.3340	0.5870	0.8161	0.9145	0.9502	(94)
Useful gains	560.2165	596.9412	628.0327	629.9536	541.1722	387.2825	244.1568	243.0824	396.0016	494.5209	523.3527	534.3335	(95)
Ext temp.	5.4000	5.7000	7.3000	9.6000	12.6000	15.4000	17.3000	17.3000	15.0000	11.8000	8.4000	5.5000	(96)
Heat loss rate W	1188.8915	1163.3693	1049.2406	876.1305	642.1141	409.7157	248.2434	247.7440	440.4426	695.4965	947.2138	1167.3530	(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	467.7342	380.6397	313.3787	177.2474	75.1007	0.0000	0.0000	0.0000	0.0000	149.5258	305.1800	470.9665	(98)
Space heating												2339.7730	(98)
Space heating per m2										(98) / (4) =		33.2638	(99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													90.7000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													2579.6836	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	467.7342	380.6397	313.3787	177.2474	75.1007	0.0000	0.0000	0.0000	0.0000	149.5258	305.1800	470.9665	(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)	515.6937	419.6689	345.5112	195.4216	82.8012	0.0000	0.0000	0.0000	0.0000	164.8576	336.4719	519.2574	(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	140.2406	107.7778	86.2347	43.9719	23.4328	0.7280	0.0000	23.9102	45.2377	87.7362	118.9488	141.3821	(64)	
Efficiency of water heater (217)m	89.8680	89.9037	89.9211	89.9821	89.8424	87.2000	87.2000	87.2000	87.2000	89.3735	89.6904	89.8672	(217)	
Fuel for water heating, kWh/month	156.0518	119.8814	95.9003	48.8674	26.0821	0.8349	0.0000	27.4199	51.8781	98.1680	132.6216	157.3234	(219)	
Water heating fuel used												915.0291	(219)	
Annual totals kWh/year														
Space heating fuel - main system													2579.6836	(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)													333.8367	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.90 * 1054 * 1.00) =										-759.1987			-759.1987	(233)
Total delivered energy for all uses													3194.3506	(238)

10a. Fuel costs - using BEDF prices (£13)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2579.6836	9.7400	251.2612	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	915.0291	9.7400	89.1238	(247)
Pumps and fans for heating	75.0000	36.8500	27.6375	(249)
Pump for solar water heating	50.0000	36.8500	18.4250	(249)
Energy for lighting	333.8367	36.8500	123.0188	(250)
Additional standing charges			104.0000	(251)
Energy saving/generation technologies				
PV Unit	-759.1987	36.8500	-279.7647	(252)
Total energy cost			333.7016	(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	2579.6836	0.2160	557.2117	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	915.0291	0.2160	197.6463	(264)
Space and water heating			754.8579	(265)
Pumps and fans	125.0000	0.5190	64.8750	(267)
Energy for lighting	333.8367	0.5190	173.2613	(268)
Energy saving/generation technologies				
PV Unit	-759.1987	0.5190	-394.0241	(269)
Total kg/year			598.9700	(272)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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	2579.6836	1.2200	3147.2140 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	915.0291	1.2200	1116.3354 (264)
Space and water heating			4263.5494 (265)
Pumps and fans	125.0000	3.0700	383.7500 (267)
Energy for lighting	333.8367	3.0700	1024.8788 (268)
Energy saving/generation technologies			
PV Unit	-759.1987	3.0700	-2330.7401 (269)
Primary energy kWh/year			3341.4380 (272)
Primary energy kWh/m2/year			47.5041 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0879 Plot 131	Issued on Date	28/03/2023
Assessment Reference	Rev A	Prop Type Ref	Beeley V3
Project	Plot 131		
Calculation Type	New Build (As Designed)		

SAP Rating	87 B	DER	15.32	TER	19.40
Environmental	89 B	% DER<TER	21.05		
CO ₂ Emissions (t/year)	0.78	DFEE	50.86	TREE	53.55
General Requirements Compliance	Pass	% DFEE<TFEE	5.01		

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

Building Elements

Roof 000002 - Mineral Wool between and above

Roof Type: Pitched Roof, insulated flat ceiling

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	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 0879 Plot 131	Issued on Date	28/03/2023
Assessment Reference	Rev A	Prop Type Ref	Beeley V3
Project	Plot 131		
Calculation Type	New Build (As Designed)		

SAP Rating	87 B	DER	15.32	TER	19.40
Environmental	89 B	% DER<TER	21.05		
CO ₂ Emissions (t/year)	0.78	DFEE	50.86	TFEE	53.55
General Requirements Compliance	Pass	% DFEE<TFEE	5.01		

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

Wall 000001

Wall Type: Standard Wall

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

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

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

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0879 Plot 131	Issued on Date	28/03/2023
Assessment Reference	Rev A	Prop Type Ref	Beeley V3
Project	Plot 131		
Calculation Type	New Build (As Designed)		

SAP Rating	87 B	DER	15.32	TER	19.40
Environmental	89 B	% DER<TER	21.05		
CO ₂ Emissions (t/year)	0.78	DFEE	50.86	TFEE	53.55
General Requirements Compliance	Pass	% DFEE<TFEE	5.01		

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

Floor 000008

Floor Type: Suspended Floor

Area = 42.22 m², Perimeter = 18.37 m, Wall thickness = 300.00 mm, Soil: Unknown

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

Floor height above ground: h = 0.200 m

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

Ventilation openings per perimeter length: e = 0.0015 %

Mean wind speed: v = 5.000 m/s

Resistance on solum: R_g = 0.000 m²K/W

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.1700			
Layer 1	EPS 200 Lower portion						
	Main construction	55	0.0340	1.6176	80.65		
	Main construction	55	2.0000	0.0275	19.35		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 2	EPS Upper portion						
	Main construction	100	0.0340	2.9412	87.10		
	Main construction	100	2.0000	0.0500	12.90		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 3	Grey EPS 100 Topsheet						
	Main construction	155	0.0300	5.1667	100.00	15	1450
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 4	Screed						
	Main construction	75	1.1500	0.0652	100.00	1200	1000
Int surface				0.1700			

Total resistance:	Upper limit = 9.271 m ² K/W	Lower limit = 6.052 m ² K/W	Average = 7.661 m ² K/W
	Total correction = 0.0046 m ² K/W	U-value (unrounded) = 0.12 W/m ² K	

Unheated space: None

Total thickness: 385 mm

U-value: 0.12 W/m² K

Kappa: 90.00 kJ/m² K

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Property Reference	SAP 0879 Plot 131	Issued on Date	28/03/2023
Assessment Reference	Rev A	Prop Type Ref	Beeley V3
Property	Plot 131		
SAP Rating	87 B	DER	15.32
Environmental	89 B	TER	19.40
CO ₂ Emissions (t/year)	0.78	% DER<TER	21.05
General Requirements Compliance	Pass	DfEE	50.86
		TFEE	53.55
		% DfEE<TFEE	5.01
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com	Assessor ID	E477-0001
Client	Foreman Homes, FORE		

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

Orientation	West							
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	2							
5.0 Sunlight/Shade	Average or unknown							
6.0 Measurements								
		Heat Loss Perimeter		Internal Floor Area		Average Storey Height		
Ground Floor:		16.77 m		35.17 m ²		2.39 m		
1st Storey:		16.77 m		35.17 m ²		2.62 m		
7.0 Living Area	17.78				m ²			
8.0 Thermal Mass Parameter	Precise calculation							
Thermal Mass	153.33				kJ/m ² K			
9.0 External Walls								
Description		Type	Construction		U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Brick and Block		Cavity Wall	Other		0.24	42.22	84.02	71.92
9.1 Party Walls								
Description		Type	Construction		U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)	
Party Wall 1		Filled Cavity with Edge Sealing	Plasterboard on dabs mounted on cement render on both sides, AAC blocks, cavity		0.00	45.00	38.92	
9.2 Internal Walls								
Description		Construction				Kappa (kJ/m ² K)	Area (m ²)	
GF Timber Stud		Plasterboard on timber frame				9.00	62.44	
FF Timber Stud		Plasterboard on timber frame				9.00	74.30	
10.0 External Roofs								
Description		Type	Construction		U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
External Roof 1		External Plane Roof	Other		0.10	9.10	35.17	35.17

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

10.2 Internal Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Ceiling 1	Plasterboard ceiling, carpeted chipboard floor	9.00	35.17

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)
Ground Floor	Ground Floor - Solid	Other	0.12	90.00	35.31

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	35.31

12.0 Opening Types

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

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
Front Door	Solid Door	[1] Brick and Block	West							2.15	
Front Elevation	Window	[1] Brick and Block	West	None	0.00					3.35	
Rear Elevation	Window	[1] Brick and Block	East	None	0.00					6.60	

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)	0.46	0.110	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	5.46	0.910	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.02	0.071	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.59	0.067	No	Birtley Supatherm
Independently assessed	E3 Sill	5.92	0.021	No	Knauf P5
Independently assessed	E4 Jamb	24.32	0.016	No	Knauf P6
Table K1 - Default	E5 Ground floor (normal)	16.79	0.320	No	
Independently assessed	E6 Intermediate floor within a dwelling	16.79	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	9.10	0.060	No	
Independently assessed	E12 Gable (insulation at ceiling level)	15.64	0.044	No	Knauf P21
Independently assessed	E16 Corner (normal)	10.46	0.039	No	Knauf P23
Table K1 - Approved	E18 Party wall between dwellings	9.55	0.060	No	
Table K1 - Default	P1 Party wall - Ground floor	7.82	0.160	No	
Table K1 - Default	P2 Party wall - Intermediate floor within a dwelling	7.82	0.000	No	
Independently assessed	P4 Party wall - Roof (insulation at ceiling level)	7.82	0.069	No	Knauf P29

Y-value 0.098 W/m²K

18.0 Pressure Testing

Yes

Designed AP₅₀ 5.00 m³/(h.m²) @ 50 Pa

Property Tested ?

As Built AP₅₀ m³/(h.m²) @ 50 Pa

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

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				3
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System

No

22.0 Lighting

Internal

Total number of light fittings	16	
Total number of L.E.L. fittings	16	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	Yes
Light and motion sensor	Yes

23.0 Electricity Tariff

Standard

24.0 Main Heating 1

	Database	
Description	Gas Combi	
Percentage of Heat	100	%
Database Ref. No.	17513	
Fuel Type	Mains gas	
Main Heating	BGW	
SAP Code	104	
In Winter	90.7	
In Summer	87.2	
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 Designed)

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
0.90	East	30°	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar water heating	£4,000 - £6,000	£77	B 88	