



SAP Report Submission for Building Regulations Compliance

Client: Cheryl Simmonds
Belford Property Holdings Ltd

Project: 4, Belford House, 53 Hampton Road
Forest Gate, E7 0PD

Contact: Gareth John
Myideashed

Report Issue Date: 26/08/2024

EXCELLENCE
IN ENERGY
ASSESSMENT

PREDICTED ENERGY ASSESSMENT

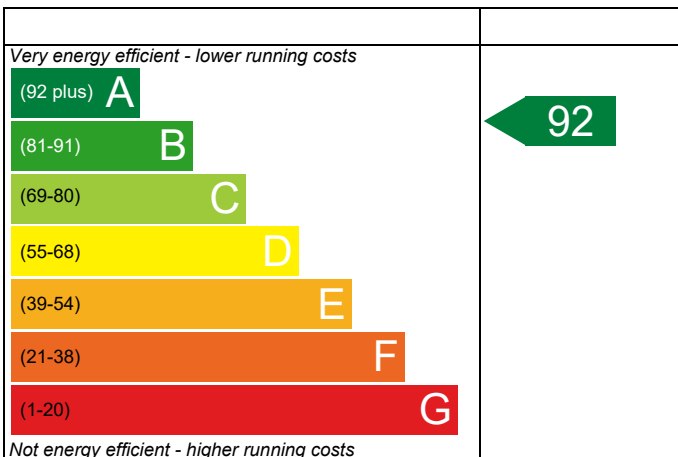
4, Belford House, 53 Hampton Road,
Forest Gate,
E7 0PD

Dwelling type: House, Mid-Terrace
Date of assessment: 26/08/2024
Produced by: Iftikhar Ahmed
Total floor area: 71.91 m²
DRRN: 7676-2308-2844

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

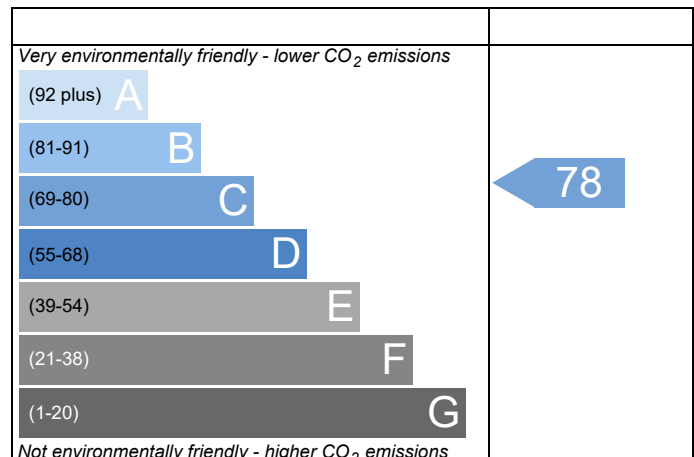


England

EU Directive
2002/91/EC

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



England

EU Directive
2002/91/EC

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	000009				Issued on Date	26/08/2024
Assessment Reference	001	Prop Type Ref	Forest Gate Part L1a			
Property	4, Belford House, 53 Hampton Road, Forest Gate, E7 OPD					
SAP Rating	92 A	DER	30.58	TER	32.70	
Environmental	78 C	% DER<TER	6.48			
CO ₂ Emissions (t/year)	1.48	DFEE	60.08	TFEE	71.37	
General Requirements Compliance	Pass	% DFEE<TFEE	15.82			
Assessor Details	Mr. Iftikhar Ahmed, Iftikhar Ahmed, Tel: 01706 662 700, ifty@energynational.co.uk				Assessor ID	D226-0001
Client	Cheryl Simmonds, Forest Gate					

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	Electricity		
Fuel factor	1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	32.70	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	30.58	kgCO ₂ /m ²	Pass
	-2.12 (-6.5%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	71.37	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	60.08	kWh/m ² /yr	
	-11.3 (-15.8%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.09 (max. 0.25)	0.09 (max. 0.70)	Pass
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	Pass
Openings	1.15 (max. 2.00)	1.40 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.70 (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

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)

Main heating system

Electric storage heaters with radiators or underfloor - Electric
High heat retention storage heaters

Secondary heating system

None

5 Cylinder insulation

Hot water storage

Nominal cylinder loss: 1.61 kWh/day
Permitted by DBSCG 1.89

Pass

Primary pipework insulated

No primary pipework

6 Controls

Space heating controls

Controls for high heat retention storage heaters

Pass

Hot water controls

Cylinderstat

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 (Thames Valley)

Medium

Pass

Based on:

Overshading

Average

Windows facing North

10.58 m², No overhang

Windows facing South

3.49 m², No overhang

Air change rate

4.00 ach

Blinds/curtains

Dark-coloured venetian blind, closed 1% of daylight hours

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

4.70 (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

0.11

W/m²K

Roof U-value

0.11

W/m²K

Floor U-value

0.09

W/m²K

Window U-value

1.10

W/m²K

Roof window U-value

1.10

W/m²K

Photovoltaic array

1.75

kW

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.

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	£108	A 94	B 82	Recommended
Photovoltaic			0	0	Already installed
Wind turbine			0	0	Not applicable
Totals	£4,000 - £6,000	£108	A 94	B 82	

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.

THERMAL BRIDGING

Calculation Type: New Build (As Designed)

Property Reference	000009	Issued on Date	26/08/2024
Assessment Reference	001	Prop Type Ref	Forest Gate Part L1a
Property	4, Belford House, 53 Hampton Road, Forest Gate, E7 0PD		
SAP Rating	92 A	DER	30.58
Environmental	78 C	TER	32.70
CO ₂ Emissions (t/year)	1.48	% DER<TER	6.48
General Requirements Compliance	Pass	DFEE	60.08
		TFEE	71.37
		% DFEE<TFEE	15.82
Assessor Details	Mr. Iftikhar Ahmed, Iftikhar Ahmed, Tel: 01706 662 700, ifty@energynational.co.uk		Assessor ID
			D226-0001
Client	Cheryl Simmonds, Forest Gate		

	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E1 Steel lintel with perforated steel base plate	Table K1 - Approved	0.500	8.05	4.03	
External wall	E3 Sill	Table K1 - Approved	0.040	3.32	0.13	
External wall	E4 Jamb	Table K1 - Approved	0.050	24.20	1.21	
External wall	E5 Ground floor (normal)	Table K1 - Approved	0.160	13.50	2.16	
External wall	E6 Intermediate floor within a dwelling	Table K1 - Approved	0.070	14.95	1.05	
External wall	E15 Flat roof with parapet	Table K1 - Default	0.560	27.26	15.27	
External wall	E16 Corner (normal)	Table K1 - Approved	0.090	13.78	1.24	
External wall	E17 Corner (inverted – internal area greater than external area)	Table K1 - Approved	-0.090	2.88	-0.26	
External wall	E18 Party wall between dwellings	Table K1 - Approved	0.060	16.04	0.96	
Party wall	P1 Party wall - Ground floor	Table K1 - Default	0.160	7.98	1.28	
Party wall	P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	0.000	7.95	0.00	
External roof	R1 Head of roof window	Table K1 - Default	0.080	2.80	0.22	
External roof	R2 Sill of roof window	Table K1 - Default	0.060	2.80	0.17	
External roof	R3 Jamb of roof window	Table K1 - Default	0.080	11.56	0.92	

Total: **28.38** W/mK:
Y-Value: **0.157** W/m²K:

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	000009				Issued on Date	26/08/2024
Assessment Reference	001	Prop Type Ref	Forest Gate Part L1a			
Property	4, Belford House, 53 Hampton Road, Forest Gate, E7 0PD					
SAP Rating	92 A	DER	30.58	TER	32.70	
Environmental	78 C	% DER<TER	6.48			
CO ₂ Emissions (t/year)	1.48	DFEE	60.08	TFEE	71.37	
General Requirements Compliance	Pass	% DFEE<TFEE	15.82			
Assessor Details	Mr. Iftikhar Ahmed, Iftikhar Ahmed, Tel: 01706 662 700, ifty@energynational.co.uk				Assessor ID	D226-0001
Client	Cheryl Simmonds, Forest Gate					

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

Mid-Terrace House, total floor area 72 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:Electricity

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 32.70 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 30.58 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)71.4 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)60.1 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.09 (max. 0.25)	0.09 (max. 0.70)	OK
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.15 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 4.70 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Electric storage heaters with radiators or underfloor - Electric
High heat retention storage heaters

Secondary heating system: None

5 Cylinder insulation

Hot water storage Nominal cylinder loss: 1.61 kWh/day
Permitted by DBSCG 1.89 OK
Primary pipework insulated: No primary pipework

6 Controls

Space heating controls: Controls for high heat retention storage heaters OK

Hot water controls: Cylinderstat 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 (Thames Valley): Medium OK

Based on:

Overshading:

Windows facing North: 10.58 m², No overhang

Windows facing South: 3.49 m², No overhang

Air change rate: 4.00 ach

Blinds/curtains: Dark-coloured venetian blind, closed 1% of daylight hours

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.11 W/m²K
Roof U-value 0.11 W/m²K
Floor U-value 0.09 W/m²K
Window U-value 1.10 W/m²K
Roof window U-value 1.10 W/m²K
Photovoltaic array 1.75 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	44.8000 (1b)	x 2.5700 (2b)	= 115.1360 (1b) - (3b)
First floor	27.1100 (1c)	x 2.8800 (2c)	= 78.0768 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.9100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 193.2128 (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																2 * 10 =	20.0000 (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) =										20.0000 / (5) =							0.1035 (8)
Pressure test										Yes							
Measured/design AP50																	4.7000
Infiltration rate																	0.3385 (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) =							0.2877 (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	0.3669	0.3597	0.3525	0.3165	0.3093	0.2733	0.2733	0.2662	0.2877	0.3093	0.3237	0.3381	(22b)				
Effective ac	0.5673	0.5647	0.5621	0.5501	0.5478	0.5374	0.5374	0.5354	0.5414	0.5478	0.5524	0.5572	(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
Triple glazed window (Uw = 1.10)			14.0700	1.0536	14.8247		(27)
Half glazed door			1.9000	1.4000	2.6600		(26a)
Walk-able roof light (Uw = 1.20)			4.4300	1.1450	5.0725		(27a)
Zinc Roof Window (Uw = 1.10)			1.9500	1.0536	2.0546		(27a)
Heat Loss Floor 1			44.8000	0.0900	4.0320		(28a)
External Wall 1	57.1600	15.9700	41.1900	0.1800	7.4142		(29a)
Zinc roof warm	42.1700	1.9500	40.2200	0.1100	4.4242		(30)
Flat roof warm	36.3400	4.4300	31.9100	0.1100	3.5101		(30)
Total net area of external elements Aum(A, m2)			180.4700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	43.9923		(33)
Party Wall 1			45.0700	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							28.3769 (36)
Total fabric heat loss						(33) + (36) =	72.3692 (37)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2916 (42)
Average daily hot water use (litres/day)												88.6252 (43)
Daily hot water use	Jan 97.4877	Feb 93.9427	Mar 90.3977	Apr 86.8527	May 83.3077	Jun 79.7627	Jul 79.7627	Aug 83.3077	Sep 86.8527	Oct 90.3977	Nov 93.9427	Dec 97.4877 (44)
Energy conte	144.5715	126.4431	130.4780	113.7539	109.1496	94.1878	87.2788	100.1537	101.3499	118.1135	128.9301	140.0098 (45)
Energy content (annual)												Total = Sum(45)m = 1394.4196 (45)
Distribution loss (46)m = 0.15 x (45)m	21.6857	18.9665	19.5717	17.0631	16.3724	14.1282	13.0918	15.0231	15.2025	17.7170	19.3395	21.0015 (46)

Water storage loss:												
Store volume												
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												
Volume factor from Table 2a												
Temperature factor from Table 2b												
Enter (49) or (54) in (55)												
Total storage loss											150.0000 (47)	
	29.9084	27.0140	29.9084	28.9436	29.9084	28.9436	29.9084	29.9084	28.9436	29.9084	28.9436	29.9084 (56)
If cylinder contains dedicated solar storage	29.9084	27.0140	29.9084	28.9436	29.9084	28.9436	29.9084	29.9084	28.9436	29.9084	28.9436	29.9084 (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)
Total heat required for water heating calculated for each month												
	174.4799	153.4572	160.3864	142.6975	139.0580	123.1314	117.1872	130.0621	130.2935	148.0219	157.8737	169.9182 (62)
WWHRS	-43.0054	-37.8364	-38.6186	-31.7934	-29.5308	-24.3685	-20.6366	-24.9819	-25.7049	-31.7626	-36.7738	-41.5624 eq.(G10)
Total of WWHRS savings												-386.5753
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)
								Solar input (sum of months) = Sum(63)m =				0.0000 (63)
Output from w/h												
	131.4745	115.6207	121.7679	110.9041	109.5271	98.7629	96.5506	105.0803	104.5886	116.2593	121.1000	128.3558 (64)
								Total per year (kWh/year) = Sum(64)m =				1359.9916 (64)
Heat gains from water heating, kWh/month												
	71.9967	63.6536	67.3107	60.9781	60.2190	54.4723	52.9469	57.2278	56.8537	63.1995	66.0242	70.4800 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	114.5794	114.5794	114.5794	114.5794	114.5794	114.5794	114.5794	114.5794	114.5794	114.5794	114.5794	114.5794 (66)
Lighting gains	(calculated in Appendix L, equation L9 or L9a), also see Table 5											
	17.9829	15.9722	12.9895	9.8339	7.3509	6.2060	6.7058	8.7164	11.6992	14.8548	17.3377	18.4827 (67)
Appliances gains	(calculated in Appendix L, equation L13 or L13a), also see Table 5											
	201.7132	203.8063	198.5317	187.3025	173.1277	159.8054	150.9053	148.8121	154.0868	165.3160	179.4908	192.8131 (68)
Cooking gains	(calculated in Appendix L, equation L15 or L15a), also see Table 5											
	34.4579	34.4579	34.4579	34.4579	34.4579	34.4579	34.4579	34.4579	34.4579	34.4579	34.4579	34.4579 (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)											
	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635 (71)
Water heating gains	(Table 5)											
	96.7698	94.7226	90.4713	84.6918	80.9395	75.6560	71.1652	76.9191	78.9635	84.9455	91.7002	94.7311 (72)
Total internal gains												
	373.8397	371.8750	359.3663	339.2019	318.7919	299.0412	286.1501	291.8215	302.1233	322.4901	345.9025	363.4007 (73)

[Jan	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	10.5800	10.6334	0.5700	0.8000	0.7700	35.5513 (74)
South	3.4900	46.7521	0.5700	0.5614	0.7700	51.5614 (78)
South	4.4300	26.0000	0.5700	0.7000	1.0000	41.3611 (82)
East	1.9500	26.6635	0.5700	0.7000	1.0000	18.6710 (82)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9924	0.9820	0.9520	0.8653	0.7023	0.5037	0.3516	0.4140	0.6994	0.9291	0.9848	0.9941 (94)
Useful gains	517.0047	636.5678	763.0377	854.3594	794.5676	575.4960	381.1932	398.4574	570.2191	599.8349	518.9281	483.3238 (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	1564.9423	1522.8049	1388.2478	1168.9992	898.4215	595.6649	384.6759	405.1434	642.9663	975.2153	1292.6116	1561.9347 (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	779.6655	595.5513	465.1563	226.5407	77.2673	0.0000	0.0000	0.0000	0.0000	279.2830	557.0522	802.4865 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Space heating
Space heating per m2 (98) / (4) = 3783.0029 (98)
52.6075 (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	1002.3353	789.0725	809.4585	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9008	0.9417	0.9149	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	902.9134	743.0740	740.5857	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1335.8267	1270.3559	1141.2976	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	311.6975	392.2978	298.1297	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												1002.1250	(104)
Cooled fraction												1.0000	(105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	77.9244	98.0744	74.5324	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling												250.5312	(107)
Space cooling per m2												3.4840	(108)

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 %)													100.0000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3783.0029 (211)
Cooling System Energy Efficiency Ratio (see Table 10c)													5.3375 (209)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	779.6655	595.5513	465.1563	226.5407	77.2673	0.0000	0.0000	0.0000	0.0000	279.2830	557.0522	802.4865	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	779.6655	595.5513	465.1563	226.5407	77.2673	0.0000	0.0000	0.0000	0.0000	279.2830	557.0522	802.4865	(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	131.4745	115.6207	121.7679	110.9041	109.5271	98.7629	96.5506	105.0803	104.5886	116.2593	121.1000	128.3558	(64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(216)
Fuel for water heating, kWh/month	131.4745	115.6207	121.7679	110.9041	109.5271	98.7629	96.5506	105.0803	104.5886	116.2593	121.1000	128.3558	(219)
Water heating fuel used												1359.9916	(219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	14.5994	18.3746	13.9639	0.0000	0.0000	0.0000	0.0000	(221)
Cooling												46.9379	(221)
Annual totals kWh/year													
Space heating fuel - main system												3783.0029	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												317.5832	(232)
Energy saving/generation technologies (Appendices M, N and Q)													
PV Unit 0 (0.80 * 1.75 * 908 * 1.00) =									-1270.9959			-1270.9959	(233)
Total delivered energy for all uses												4236.5198	(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	3783.0029	0.5190	1963.3785	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating	1359.9916	0.5190	705.8357	(264)
Space and water heating			2669.2142	(265)
Space cooling	46.9379	0.5190	24.3608	(266)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	317.5832	0.5190	164.8257	(268)
Energy saving/generation technologies				
PV Unit (0.90*35.09 + 0.10*14.87)	-1270.9959	0.5190	-659.6469	(269)
Total CO2, kg/year			2198.7538	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			30.5800	(273)

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

DER		30.5800	ZC1
Total Floor Area		71.9100	
Assumed number of occupants		2.2916	
CO2 emission factor in Table 12 for electricity displaced from grid		0.5190	
CO2 emissions from appliances, equation (L14)		16.6223	ZC2
CO2 emissions from cooking, equation (L16)		2.4197	ZC3
Total CO2 emissions		49.6220	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Additional allowable electricity generation, kWh/m ² /year	0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation	0.0000	ZC7
Net CO2 emissions	49.6220	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	44.8000 (1b)	x 2.5700 (2b)	= 115.1360 (1b) - (3b)
First floor	27.1100 (1c)	x 2.8800 (2c)	= 78.0768 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.9100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 193.2128 (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) = 0.1553 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4053 (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) =	0.3445 (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	0.4392	0.4306	0.4220	0.3789	0.3703	0.3273	0.3273	0.3186	0.3445	0.3703	0.3875	0.4048 (22b)
Effective ac	0.5965	0.5927	0.5890	0.5718	0.5686	0.5535	0.5535	0.5508	0.5593	0.5686	0.5751	0.5819 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Semi-glazed door			1.9000	1.2000	2.2800		(26a)
TER Opening Type (Uw = 1.40)			11.0700	1.3258	14.6761		(27)
TER Room Window (Uw = 1.70)			5.0100	1.5918	7.9747		(27a)
Heat Loss Floor 1			44.8000	0.1300	5.8240		(28a)
External Wall 1	57.1600	12.9700	44.1900	0.1800	7.9542		(29a)
Zinc roof warm	42.1700	1.5300	40.6400	0.1300	5.2832		(30)
Flat roof warm	36.3400	3.4800	32.8600	0.1300	4.2718		(30)
Total net area of external elements Aum(A, m ²)			180.4700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		48.2641		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							23.1027 (36)
Total fabric heat loss						(33) + (36) =	71.3668 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	38.0300	37.7912	37.5571	36.4576	36.2519	35.2943	35.2943	35.1170	35.6632	36.2519	36.6681	37.1031 (38)
Heat transfer coeff	109.3967	109.1579	108.9238	107.8244	107.6187	106.6611	106.6611	106.4838	107.0299	107.6187	108.0348	108.4699 (39)
Average = Sum(39)m / 12 =												107.8234 (39)
HLP	1.5213	1.5180	1.5147	1.4994	1.4966	1.4833	1.4833	1.4808	1.4884	1.4966	1.5024	1.5084 (40)
HLP (average)												1.4994 (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												2.2916 (42)
Average daily hot water use (litres/day)												88.6252 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	97.4877	93.9427	90.3977	86.8527	83.3077	79.7627	79.7627	83.3077	86.8527	90.3977	93.9427	97.4877 (44)
Energy conte	144.5715	126.4431	130.4780	113.7539	109.1496	94.1878	87.2788	100.1537	101.3499	118.1135	128.9301	140.0098 (45)
Energy content (annual)											Total = Sum(45)m =	1394.4196 (45)
Distribution loss	(46)m = 0.15 x (45)m											
	21.6857	18.9665	19.5717	17.0631	16.3724	14.1282	13.0918	15.0231	15.2025	17.7170	19.3395	21.0015 (46)
Water storage loss:												
Store volume												150.0000 (47)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage												
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month												
191.1664	168.5289	177.0729	158.8457	155.7445	139.2796	133.8737	146.7486	146.4417	164.7084	174.0220	186.6047	(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	(63)
Output from w/h												
191.1664	168.5289	177.0729	158.8457	155.7445	139.2796	133.8737	146.7486	146.4417	164.7084	174.0220	186.6047	(64)
Heat gains from water heating, kWh/month												
85.3459	75.7109	80.6599	73.8966	73.5681	67.3909	66.2961	70.5770	69.7723	76.5487	78.9427	83.8292	(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	114.5794	114.5794	114.5794	114.5794	114.5794	114.5794	114.5794	114.5794	114.5794	114.5794	114.5794	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
17.9829	15.9722	12.9895	9.8339	7.3509	6.2060	6.7058	8.7164	11.6992	14.8548	17.3377	18.4827	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
201.7132	203.8063	198.5317	187.3025	173.1277	159.8054	150.9053	148.8121	154.0868	165.3160	179.4908	192.8131	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
34.4579	34.4579	34.4579	34.4579	34.4579	34.4579	34.4579	34.4579	34.4579	34.4579	34.4579	34.4579	(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	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-91.6635	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635	(71)
Water heating gains (Table 5)												
114.7123	112.6651	108.4138	102.6342	98.8819	93.5985	89.1077	94.8616	96.9060	102.8880	109.6427	112.6736	(72)
Total internal gains												
394.7822	392.8174	380.3087	360.1444	339.7344	319.9837	307.0926	312.7640	323.0657	343.4325	366.8450	384.3432	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d			Gains W
North					8.3200	10.6334	0.6300	0.7000	0.7700			27.0375 (74)
South					2.7500	46.7521	0.6300	0.7000	0.7700			39.2921 (78)
East					1.5300	26.6635	0.6300	0.7000	1.0000			16.1916 (82)
South					3.4800	26.0000	0.6300	0.7000	1.0000			35.9115 (82)

Solar gains	118.4328	223.6049	359.9415	529.7995	665.0793	690.4975	653.2292	548.5385	418.6198	262.0852	145.9372	98.6587 (83)
Total gains	513.2149	616.4223	740.2503	889.9440	1004.8137	1010.4811	960.3217	861.3024	741.6856	605.5178	512.7821	483.0018 (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	45.6481	45.7479	45.8463	46.3137	46.4023	46.8189	46.8189	46.8968	46.6575	46.4023	46.2235	46.0381
alpha	4.0432	4.0499	4.0564	4.0876	4.0935	4.1213	4.1213	4.1265	4.1105	4.0935	4.0816	4.0692
util living area												
	0.9958	0.9906	0.9749	0.9224	0.8021	0.6253	0.4753	0.5434	0.8026	0.9612	0.9918	0.9967 (86)
MIT	19.3903	19.5963	19.9496	20.4059	20.7606	20.9374	20.9841	20.9732	20.8238	20.3400	19.7812	19.3561 (87)
Th 2	19.6716	19.6740	19.6765	19.6879	19.6901	19.7001	19.7001	19.7019	19.6962	19.6901	19.6857	19.6812 (88)
util rest of house												
	0.9943	0.9873	0.9658	0.8943	0.7366	0.5181	0.3415	0.4022	0.7104	0.9414	0.9883	0.9955 (89)
MIT 2	17.5729	17.8740	18.3845	19.0273	19.4747	19.6632	19.6952	19.6925	19.5664	18.9556	18.1526	17.5293 (90)
Living area fraction									fLA = Living area / (4)			0.4450 (91)
MIT	18.3816	18.6404	19.0809	19.6408	20.0469	20.2303	20.2688	20.2624	20.1259	19.5717	18.8773	18.3422 (92)
Temperature adjustment												0.0000
adjusted MIT	18.3816	18.6404	19.0809	19.6408	20.0469	20.2303	20.2688	20.2624	20.1259	19.5717	18.8773	18.3422 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9921	0.9837	0.9604	0.8931	0.7562	0.5640	0.4015	0.4654	0.7445	0.9391	0.9852	0.9938 (94)
Useful gains	509.1787	606.4007	710.9563	794.8197	759.8867	569.8620	385.5263	400.8734	552.1671	568.6605	505.2086	479.9907 (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												
	1540.4851	1499.8782	1370.3632	1158.1217	898.2835	600.5306	391.3180	411.2846	644.9564	965.5193	1272.3605	1534.0044 (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												
	767.2919	600.4169	490.5988	261.5775	102.9672	0.0000	0.0000	0.0000	0.0000	295.2629	552.3494	784.1861 (98)
Space heating												3854.6507 (98)
Space heating per m2												53.6038 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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 %)													93.5000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													4122.6211	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	767.2919	600.4169	490.5988	261.5775	102.9672	0.0000	0.0000	0.0000	0.0000	295.2629	552.3494	784.1861	(98)	
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)	
Space heating fuel (main heating system)	820.6331	642.1571	524.7046	279.7620	110.1253	0.0000	0.0000	0.0000	0.0000	315.7892	590.7481	838.7018	(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	191.1664	168.5289	177.0729	158.8457	155.7445	139.2796	133.8737	146.7486	146.4417	164.7084	174.0220	186.6047	(64)	
Efficiency of water heater (217)m	88.1427	87.9164	87.3923	86.1363	83.7405	79.8000	79.8000	79.8000	79.8000	86.3538	87.6833	88.2261	(217)	
Fuel for water heating, kWh/month	216.8827	191.6922	202.6185	184.4121	185.9846	174.5358	167.7615	183.8955	183.5109	190.7367	198.4665	211.5074	(219)	
Water heating fuel used												2292.0044	(219)	
Annual totals kWh/year														
Space heating fuel - main system												4122.6211	(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)													317.5832	(232)
Total delivered energy for all uses													6807.2087	(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	4122.6211	0.2160	890.4862 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2292.0044	0.2160	495.0730 (264)
Space and water heating			1385.5591 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	317.5832	0.5190	164.8257 (268)
Total CO2, kg/m2/year			1589.3098 (272)
Emissions per m2 for space and water heating			19.2680 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.2921 (272b)
Emissions per m2 for pumps and fans			0.5413 (272c)
Target Carbon Dioxide Emission Rate (TER) = (19.2680 * 1.55) + 2.2921 + 0.5413, rounded to 2 d.p.			32.7000 (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	44.8000 (1b)	x 2.5700 (2b)	= 115.1360 (1b) - (3b)
First floor	27.1100 (1c)	x 2.8800 (2c)	= 78.0768 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.9100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 193.2128 (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) =	0.1553 (8)
Pressure test										Yes							
Measured/design AP50										4.7000							
Infiltration rate										0.3903 (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) =					0.3317 (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	0.4230	0.4147	0.4064	0.3649	0.3566	0.3151	0.3151	0.3068	0.3317	0.3566	0.3732	0.3898	(22b)				
Effective ac	0.5894	0.5860	0.5826	0.5666	0.5636	0.5497	0.5497	0.5471	0.5550	0.5636	0.5696	0.5760	(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					
Triple glazed window (Uw = 1.10)			14.0700	1.0536	14.8247		(27)					
Half glazed door			1.9000	1.4000	2.6600		(26a)					
Walk-able roof light (Uw = 1.20)			4.4300	1.1450	5.0725		(27a)					
Zinc Roof Window (Uw = 1.10)			1.9500	1.0536	2.0546		(27a)					
Heat Loss Floor 1			44.8000	0.0900	4.0320		(28a)					
External Wall 1	57.1600	15.9700	41.1900	0.1800	7.4142		(29a)					
Zinc roof warm	42.1700	1.9500	40.2200	0.1100	4.4242		(30)					
Flat roof warm	36.3400	4.4300	31.9100	0.1100	3.5101		(30)					
Total net area of external elements Aum(A, m2)			180.4700				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	43.9923		(33)					
Party Wall 1			45.0700	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							28.3769 (36)					
Total fabric heat loss						(33) + (36) =	72.3692 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 37.5832	Feb 37.3617	Mar 37.1446	Apr 36.1251	May 35.9343	Jun 35.0463	Jul 35.0463	Aug 34.8818	Sep 35.3883	Oct 35.9343	Nov 36.3202	Dec 36.7236 (38)
Heat transfer coeff	109.9524	109.7309	109.5139	108.4943	108.3035	107.4155	107.4155	107.2511	107.7576	108.3035	108.6894	109.0929 (39)
Average = Sum(39)m / 12 =												108.4934 (39)
HLP	Jan 1.5290	Feb 1.5259	Mar 1.5229	Apr 1.5088	May 1.5061	Jun 1.4937	Jul 1.4937	Aug 1.4915	Sep 1.4985	Oct 1.5061	Nov 1.5115	Dec 1.5171 (40)
HLP (average)												1.5087 (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												2.2916 (42)
Average daily hot water use (litres/day)												88.6252 (43)
Daily hot water use	Jan 97.4877	Feb 93.9427	Mar 90.3977	Apr 86.8527	May 83.3077	Jun 79.7627	Jul 79.7627	Aug 83.3077	Sep 86.8527	Oct 90.3977	Nov 93.9427	Dec 97.4877 (44)
Energy conte	144.5715	126.4431	130.4780	113.7539	109.1496	94.1878	87.2788	100.1537	101.3499	118.1135	128.9301	140.0098 (45)
Energy content (annual)												Total = Sum(45)m = 1394.4196 (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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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	30.7214	26.8692	27.7266	24.1727	23.1943	20.0149	18.5467	21.2827	21.5368	25.0991	27.3977	29.7521	(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	114.5794	114.5794	114.5794	114.5794	114.5794	114.5794	114.5794	114.5794	114.5794	114.5794	114.5794	114.5794	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.9829	15.9722	12.9895	9.8339	7.3509	6.2060	6.7058	8.7164	11.6992	14.8548	17.3377	18.4827	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.7132	203.8063	198.5317	187.3025	173.1277	159.8054	150.9053	148.8121	154.0868	165.3160	179.4908	192.8131	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4579	34.4579	34.4579	34.4579	34.4579	34.4579	34.4579	34.4579	34.4579	34.4579	34.4579	34.4579	(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)	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635	(71)
Water heating gains (Table 5)	41.2923	39.9839	37.2669	33.5732	31.1751	27.7985	24.9284	28.6057	29.9123	33.7354	38.0523	39.9893	(72)
Total internal gains	318.3621	317.1363	306.1619	288.0834	269.0276	251.1837	239.9133	243.5081	253.0721	271.2799	292.2546	308.6589	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W
North	10.5800	10.6334	0.5700		0.8000	0.7700	35.5513 (74)
South	3.4900	46.7521	0.5700		0.8000	0.7700	51.5614 (78)
South	4.4300	26.0000	0.5700		0.7000	1.0000	41.3611 (82)
East	1.9500	26.6635	0.5700		0.7000	1.0000	18.6710 (82)

Solar gains	147.1448	276.3406	442.1226	648.1969	812.6502	843.5346	798.0577	670.6333	513.2056	323.0864	181.0283	122.7749	(83)
Total gains	465.5069	593.4768	748.2845	936.2803	1081.6778	1094.7183	1037.9710	914.1414	766.2776	594.3664	473.2828	431.4338	(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	45.4174	45.5090	45.5993	46.0278	46.1088	46.4900	46.4900	46.5613	46.3425	46.1088	45.9451	45.7752	
alpha	4.0278	4.0339	4.0400	4.0685	4.0739	4.0993	4.0993	4.1041	4.0895	4.0739	4.0630	4.0517	
util living area	0.9970	0.9918	0.9741	0.9115	0.7733	0.5897	0.4453	0.5190	0.7912	0.9636	0.9938	0.9978	(86)
MIT	19.3238	19.5600	19.9494	20.4369	20.7906	20.9485	20.9872	20.9768	20.8315	20.3210	19.7251	19.2834	(87)
Th 2	19.6658	19.6681	19.6703	19.6809	19.6829	19.6922	19.6922	19.6939	19.6886	19.6829	19.6789	19.6747	(88)
util rest of house	0.9960	0.9889	0.9648	0.8807	0.7045	0.4847	0.3180	0.3816	0.6970	0.9449	0.9912	0.9970	(89)
MIT 2	18.1682	18.4047	18.7893	19.2579	19.5571	19.6720	19.6896	19.6885	19.6050	19.1652	18.5784	18.1347	(90)
Living area fraction										fLA = Living area / (4) =		0.4450	(91)
MIT	18.6824	18.9188	19.3056	19.7826	20.1060	20.2401	20.2670	20.2618	20.1508	19.6796	19.0887	18.6458	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6824	18.9188	19.3056	19.7826	20.1060	20.2401	20.2670	20.2618	20.1508	19.6796	19.0887	18.6458	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	463.1179	585.5930	719.4801	827.1727	787.8898	580.6705	389.2579	405.2318	562.3743	561.5841	468.3326	429.7855	(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	1581.3797	1538.2977	1402.3866	1180.6961	910.3993	605.8314	393.8948	414.1799	652.0150	983.3494	1303.0468	1575.9393	(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	831.9867	640.2176	508.0824	254.5369	91.1471	0.0000	0.0000	0.0000	0.0000	313.7934	600.9943	852.7384	(98)
Space heating												4093.4967	(98)
Space heating per m2												(98) / (4) =	56.9253 (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	1009.7058	794.8747	815.1080	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8980	0.9328	0.9017	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	896.5824	741.4978	735.0158	0.0000	0.0000	0.0000	0.0000	(102)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1287.9691	1224.1191	1092.9842	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												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	281.7984	359.0703	266.3285	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												907.1972 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)												
Intermittency factor	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												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	70.4496	89.7676	66.5821	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												226.7993 (107)
Space cooling per m2												3.1539 (108)
Energy for space heating												56.9253 (99)
Energy for space cooling												3.1539 (108)
Total												60.0792 (109)
Dwelling Fabric Energy Efficiency (DFEE)												60.1 (109)

FULL SAP CALCULATION PRINTOUT

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	44.8000 (1b)	x 2.5700 (2b)	= 115.1360 (1b) - (3b)
First floor	27.1100 (1c)	x 2.8800 (2c)	= 78.0768 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.9100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 193.2128 (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) = 0.1553 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4053 (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) =	0.3445 (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	0.4392	0.4306	0.4220	0.3789	0.3703	0.3273	0.3273	0.3186	0.3445	0.3703	0.3875	0.4048 (22b)
Effective ac	0.5965	0.5927	0.5890	0.5718	0.5686	0.5535	0.5535	0.5508	0.5593	0.5686	0.5751	0.5819 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Semi-glazed door			1.9000	1.2000	2.2800		(26a)
TER Opening Type (Uw = 1.40)			11.0700	1.3258	14.6761		(27)
TER Room Window (Uw = 1.70)			5.0100	1.5918	7.9747		(27a)
Heat Loss Floor 1			44.8000	0.1300	5.8240		(28a)
External Wall 1	57.1600	12.9700	44.1900	0.1800	7.9542		(29a)
Zinc roof warm	42.1700	1.5300	40.6400	0.1300	5.2832		(30)
Flat roof warm	36.3400	3.4800	32.8600	0.1300	4.2718		(30)
Total net area of external elements Aum(A, m ²)			180.4700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		48.2641		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							23.1027 (36)
Total fabric heat loss						(33) + (36) =	71.3668 (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	38.0300	37.7912	37.5571	36.4576	36.2519	35.2943	35.2943	35.1170	35.6632	36.2519	36.6681	37.1031 (38)
Heat transfer coeff	109.3967	109.1579	108.9238	107.8244	107.6187	106.6611	106.6611	106.4838	107.0299	107.6187	108.0348	108.4699 (39)
Average = Sum(39)m / 12 =												107.8234 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.5213	1.5180	1.5147	1.4994	1.4966	1.4833	1.4833	1.4808	1.4884	1.4966	1.5024	1.5084 (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												2.2916 (42)
Average daily hot water use (litres/day)												88.6252 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	97.4877	93.9427	90.3977	86.8527	83.3077	79.7627	79.7627	83.3077	86.8527	90.3977	93.9427	97.4877 (44)
Energy conte	144.5715	126.4431	130.4780	113.7539	109.1496	94.1878	87.2788	100.1537	101.3499	118.1135	128.9301	140.0098 (45)
Energy content (annual)												Total = Sum(45)m = 1394.4196 (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												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

	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	30.7214	26.8692	27.7266	24.1727	23.1943	20.0149	18.5467	21.2827	21.5368	25.0991	27.3977	29.7521 (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	114.5794	114.5794	114.5794	114.5794	114.5794	114.5794	114.5794	114.5794	114.5794	114.5794	114.5794	114.5794	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.9829	15.9722	12.9895	9.8339	7.3509	6.2060	6.7058	8.7164	11.6992	14.8548	17.3377	18.4827	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.7132	203.8063	198.5317	187.3025	173.1277	159.8054	150.9053	148.8121	154.0868	165.3160	179.4908	192.8131	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4579	34.4579	34.4579	34.4579	34.4579	34.4579	34.4579	34.4579	34.4579	34.4579	34.4579	34.4579	(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)	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635	(71)
Water heating gains (Table 5)	41.2923	39.9839	37.2669	33.5732	31.1751	27.7985	24.9284	28.6057	29.9123	33.7354	38.0523	39.9893	(72)
Total internal gains	318.3621	317.1363	306.1619	288.0834	269.0276	251.1837	239.9133	243.5081	253.0721	271.2799	292.2546	308.6589	(73)

6. Solar gains

[Jan]		Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North		8.3200	10.6334	0.6300	0.7000	0.7700	27.0375	(74)
South		2.7500	46.7521	0.6300	0.7000	0.7700	39.2921	(78)
East		1.5300	26.6635	0.6300	0.7000	1.0000	16.1916	(82)
South		3.4800	26.0000	0.6300	0.7000	1.0000	35.9115	(82)

Solar gains	118.4328	223.6049	359.9415	529.7995	665.0793	690.4975	653.2292	548.5385	418.6198	262.0852	145.9372	98.6587	(83)
Total gains	436.7949	540.7412	666.1034	817.8829	934.1069	941.6811	893.1425	792.0465	671.6919	533.3652	438.1917	407.3176	(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	45.6481	45.7479	45.8463	46.3137	46.4023	46.8189	46.8189	46.8968	46.6575	46.4023	46.2235	46.0381	
alpha	4.0432	4.0499	4.0564	4.0876	4.0935	4.1213	4.1213	4.1265	4.1105	4.0935	4.0816	4.0692	
util living area	0.9977	0.9941	0.9824	0.9390	0.8304	0.6593	0.5072	0.5829	0.8405	0.9742	0.9953	0.9983	(86)
MIT	19.2982	19.5069	19.8671	20.3410	20.7234	20.9240	20.9799	20.9654	20.7860	20.2634	19.6923	19.2644	(87)
Th 2	19.6716	19.6740	19.6765	19.6879	19.6901	19.7001	19.7001	19.7019	19.6962	19.6901	19.6857	19.6812	(88)
util rest of house	0.9968	0.9920	0.9757	0.9156	0.7691	0.5506	0.3663	0.4351	0.7557	0.9602	0.9933	0.9976	(89)
MIT 2	18.1471	18.3567	18.7147	19.1791	19.5162	19.6687	19.6958	19.6934	19.5838	19.1175	18.5512	18.1206	(90)
Living area fraction									fLA = Living area / (4) =			0.4450	(91)
MIT	18.6593	18.8685	19.2275	19.6962	20.0534	20.2273	20.2672	20.2594	20.1188	19.6274	19.0590	18.6296	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6593	18.8685	19.2275	19.6962	20.0534	20.2273	20.2672	20.2594	20.1188	19.6274	19.0590	18.6296	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	435.0084	535.4713	647.9613	748.9760	736.0514	562.4384	383.7250	397.3007	528.7283	511.6817	434.6691	406.0571	(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	1570.8658	1524.7757	1386.3325	1164.0917	898.9832	600.2140	391.1502	410.9638	644.1919	971.5166	1291.9889	1565.1778	(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	845.0779	664.8126	549.3482	298.8833	121.2212	0.0000	0.0000	0.0000	0.0000	342.1171	617.2702	862.3858	(98)
Space heating												4301.1163	(98)
Space heating per m2										(98) / (4) =		59.8125	(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	1002.6143	789.2921	809.2766	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8463	0.9038	0.8664	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	848.5205	713.3958	701.1536	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1119.2218	1064.4103	958.2331	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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	194.9049	261.1548	191.2671	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												647.3269 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	48.7262	65.2887	47.8168	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												161.8317 (107)
Space cooling per m2												2.2505 (108)
Energy for space heating												59.8125 (99)
Energy for space cooling												2.2505 (108)
Total												62.0630 (109)
Target Fabric Energy Efficiency (TFEE)												71.4 (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	44.8000 (1b)	x 2.5700 (2b)	= 115.1360 (1b) - (3b)
First floor	27.1100 (1c)	x 2.8800 (2c)	= 78.0768 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.9100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 193.2128 (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																2 * 10 =	20.0000 (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) =					20.0000 / (5) =	0.1035 (8)	
Pressure test										Yes							
Measured/design AP50										4.7000							
Infiltration rate										0.3385 (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) =					0.2877 (21)		
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
	4.2000	4.0000	4.0000	3.7000	3.7000	3.2000	3.3000	3.5000	3.3000	3.5000	3.5000	3.9000	(22)				
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8000	0.8250	0.8750	0.8250	0.8750	0.8750	0.9750	(22a)				
Adj infilt rate	0.3021	0.2877	0.2877	0.2662	0.2662	0.2302	0.2374	0.2518	0.2374	0.2518	0.2518	0.2805	(22b)				
Effective ac	0.5456	0.5414	0.5414	0.5354	0.5354	0.5265	0.5282	0.5317	0.5282	0.5317	0.5317	0.5394	(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					
Triple glazed window (Uw = 1.10)			14.0700	1.0536	14.8247		(27)					
Half glazed door			1.9000	1.4000	2.6600		(26a)					
Walk-able roof light (Uw = 1.20)			4.4300	1.1450	5.0725		(27a)					
Zinc Roof Window (Uw = 1.10)			1.9500	1.0536	2.0546		(27a)					
Heat Loss Floor 1			44.8000	0.0900	4.0320		(28a)					
External Wall 1	57.1600	15.9700	41.1900	0.1800	7.4142		(29a)					
Zinc roof warm	42.1700	1.9500	40.2200	0.1100	4.4242		(30)					
Flat roof warm	36.3400	4.4300	31.9100	0.1100	3.5101		(30)					
Total net area of external elements Aum(A, m2)			180.4700				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	43.9923		(33)					
Party Wall 1			45.0700	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							28.3769 (36)					
Total fabric heat loss						(33) + (36) =	72.3692 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 34.7901	Feb 34.5195	Mar 34.5195	Apr 34.1385	May 34.1385	Jun 33.5693	Jul 33.6766	Aug 33.9009	Sep 33.6766	Oct 33.9009	Nov 33.9009	Dec 34.3892 (38)
Heat transfer coeff	107.1593	106.8888	106.8888	106.5077	106.5077	105.9386	106.0458	106.2701	106.0458	106.2701	106.2701	106.7584 (39)
Average = Sum(39)m / 12 =												106.4626 (39)
HLP	Jan 1.4902	Feb 1.4864	Mar 1.4864	Apr 1.4811	May 1.4811	Jun 1.4732	Jul 1.4747	Aug 1.4778	Sep 1.4747	Oct 1.4778	Nov 1.4778	Dec 1.4846 (40)
HLP (average)												1.4805 (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												2.2916 (42)
Average daily hot water use (litres/day)												88.6252 (43)
Daily hot water use	Jan 97.4877	Feb 93.9427	Mar 90.3977	Apr 86.8527	May 83.3077	Jun 79.7627	Jul 79.7627	Aug 83.3077	Sep 86.8527	Oct 90.3977	Nov 93.9427	Dec 97.4877 (44)
Energy conte	144.5715	126.4431	130.4780	113.7539	109.1496	94.1878	87.2788	100.1537	101.3499	118.1135	128.9301	140.0098 (45)
Energy content (annual)												Total = Sum(45)m = 1394.4196 (45)
Distribution loss (46)m = 0.15 x (45)m	21.6857	18.9665	19.5717	17.0631	16.3724	14.1282	13.0918	15.0231	15.2025	17.7170	19.3395	21.0015 (46)

[illegible]

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

RHI space heating demand

2462 (98)

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	44.8000 (1b)	x 2.5700 (2b)	= 115.1360 (1b) - (3b)
First floor	27.1100 (1c)	x 2.8800 (2c)	= 78.0768 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.9100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 193.2128 (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																2 * 10 =	20.0000 (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) =					20.0000	/ (5) =	0.1035 (8)
Pressure test										Yes							
Measured/design AP50										4.7000							
Infiltration rate										0.3385 (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) =					0.2877 (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	0.3669	0.3597	0.3525	0.3165	0.3093	0.2733	0.2733	0.2662	0.2877	0.3093	0.3237	0.3381	(22b)				
Effective ac	0.5673	0.5647	0.5621	0.5501	0.5478	0.5374	0.5374	0.5354	0.5414	0.5478	0.5524	0.5572	(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						
Triple glazed window (Uw = 1.10)			14.0700	1.0536	14.8247			(27)					
Half glazed door			1.9000	1.4000	2.6600			(26a)					
Walk-able roof light (Uw = 1.20)			4.4300	1.1450	5.0725			(27a)					
Zinc Roof Window (Uw = 1.10)			1.9500	1.0536	2.0546			(27a)					
Heat Loss Floor 1			44.8000	0.0900	4.0320			(28a)					
External Wall 1	57.1600	15.9700	41.1900	0.1800	7.4142			(29a)					
Zinc roof warm	42.1700	1.9500	40.2200	0.1100	4.4242			(30)					
Flat roof warm	36.3400	4.4300	31.9100	0.1100	3.5101			(30)					
Total net area of external elements Aum(A, m ²)			180.4700					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	43.9923			(33)					
Party Wall 1			45.0700	0.0000	0.0000			(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								28.3769 (36)					
Total fabric heat loss						(33) + (36) =		72.3692 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 36.1708	Feb 36.0042	Mar 35.8409	Apr 35.0738	May 34.9303	Jun 34.2622	Jul 34.2622	Aug 34.1385	Sep 34.5195	Oct 34.9303	Nov 35.2206	Dec 35.5242	(38)
Heat transfer coeff	108.5400	108.3734	108.2101	107.4430	107.2995	106.6314	106.6314	106.5077	106.8888	107.2995	107.5899	107.8934	(39)
Average = Sum(39)m / 12 =												107.4423	(39)
HLP	Jan 1.5094	Feb 1.5071	Mar 1.5048	Apr 1.4941	May 1.4921	Jun 1.4828	Jul 1.4828	Aug 1.4811	Sep 1.4864	Oct 1.4921	Nov 1.4962	Dec 1.5004	(40)
HLP (average)												1.4941	(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												2.2916 (42)
Average daily hot water use (litres/day)												88.6252 (43)
Daily hot water use	Jan 97.4877	Feb 93.9427	Mar 90.3977	Apr 86.8527	May 83.3077	Jun 79.7627	Jul 79.7627	Aug 83.3077	Sep 86.8527	Oct 90.3977	Nov 93.9427	Dec 97.4877 (44)
Energy conte	144.5715	126.4431	130.4780	113.7539	109.1496	94.1878	87.2788	100.1537	101.3499	118.1135	128.9301	140.0098 (45)
Energy content (annual)												Total = Sum(45)m = 1394.4196 (45)
Distribution loss (46)m = 0.15 x (45)m	21.6857	18.9665	19.5717	17.0631	16.3724	14.1282	13.0918	15.0231	15.2025	17.7170	19.3395	21.0015 (46)

Regs Region: England
Elmhurst Energy Systems
SAP2012 Calculator (Design
System) version 4.14r19

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Space heating 3206.2416 (98)
 Space heating per m2 (98) / (4) = 44.5869 (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	1002.3353	789.0725	809.4585	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9008	0.9417	0.9149	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	902.9134	743.0740	740.5857	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1335.8267	1270.3559	1141.2976	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	311.6975	392.2978	298.1297	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	311.6975	392.2978	298.1297	0.0000	0.0000	0.0000	1002.1250 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	77.9244	98.0744	74.5324	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												250.5312 (107)
Space cooling per m2												3.4840 (108)

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 %)												100.0000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												3206.2416 (211)
Cooling System Energy Efficiency Ratio (see Table 10c)												5.3375 (209)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	678.8991	510.7184	387.8094	180.0300	58.2381	0.0000	0.0000	0.0000	0.0000	217.1299	470.6842	702.7325 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	678.8991	510.7184	387.8094	180.0300	58.2381	0.0000	0.0000	0.0000	0.0000	217.1299	470.6842	702.7325 (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	131.4745	115.6207	121.7679	110.9041	109.5271	98.7629	96.5506	105.0803	104.5886	116.2593	121.1000	128.3558 (64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000 (216)
Fuel for water heating, kWh/month	131.4745	115.6207	121.7679	110.9041	109.5271	98.7629	96.5506	105.0803	104.5886	116.2593	121.1000	128.3558 (219)
Water heating fuel used												1359.9916 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	14.5994	18.3746	13.9639	0.0000	0.0000	0.0000	0.0000 (221)
Cooling												46.9379 (221)
Annual totals kWh/year												
Space heating fuel - main system												3206.2416 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)
Electricity for lighting (calculated in Appendix L)												317.5832 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 1.75 * 908 * 1.00) =									-1270.9959			-1270.9959 (233)
Total delivered energy for all uses												3659.7585 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1 (0.00*15.29 + 1.00*5.50)	3206.2416	5.5000	176.3433 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (electric off-peak tariff)			
High-rate fraction			0.1083 (243)
Low-rate fraction			0.8917 (244)
High-rate cost	147.3290	15.2900	22.5266 (245)
Low-rate cost	1212.6627	5.5000	66.6964 (246)
Space cooling (0.90*15.29 + 0.10*5.50)	46.9379	14.3110	6.7173 (248)
Pumps and fans for heating (0.90*15.29 + 0.10*5.50)	0.0000	0.0000	0.0000 (249)
Energy for lighting (0.90*15.29 + 0.10*5.50)	317.5832	14.3110	45.4493 (250)
Additional standing charges			24.0000 (251)
Energy saving/generation technologies			
PV Unit (0.90*35.09 + 0.10*14.87)	-1270.9959	13.7505	-174.7683 (252)
Total energy cost			166.9647 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12): 0.4200 (256)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] = 0.5998 (257)
 SAP value 91.6325
 SAP rating (Section 12) 92 (258)
 SAP band A

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	3206.2416	0.5190	1664.0394 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating	1359.9916	0.5190	705.8357 (264)
Space and water heating			2369.8751 (265)
Space cooling	46.9379	0.5190	24.3608 (266)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	317.5832	0.5190	164.8257 (268)
Energy saving/generation technologies			
PV Unit (0.90*35.09 + 0.10*14.87)	-1270.9959	0.5190	-659.6469 (269)
Total kg/year			1899.4147 (272)
CO2 emissions per m2			26.4100 (273)
EI value			78.2293
EI rating			78 (274)
EI band			C

Calculation of stars for heating and DHW

Main heating energy efficiency $5.50 \times (1 + 0.29 \times 0.20) / 1.0000 = 5.819$, stars = 3
 Main heating environmental impact $0.519 \times (1 + 0.29 \times 0.20) / 1.0000 = 0.5491$, stars = 2
 Water heating energy efficiency $6.56 / 1.0000 = 6.561$, stars = 4
 Water heating environmental impact $0.519 / 1.0000 = 0.5190$, stars = 3

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	44.8000 (1b)	x 2.5700 (2b)	= 115.1360 (1b) - (3b)
First floor	27.1100 (1c)	x 2.8800 (2c)	= 78.0768 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.9100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 193.2128 (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																2 * 10 =	20.0000 (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) =					20.0000	/ (5) =	0.1035 (8)
Pressure test										Yes							
Measured/design AP50										4.7000							
Infiltration rate										0.3385 (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) =					0.2877 (21)		
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
	4.2000	4.0000	4.0000	3.7000	3.7000	3.2000	3.3000	3.5000	3.3000	3.5000	3.5000	3.9000 (22)					
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8000	0.8250	0.8750	0.8250	0.8750	0.8750	0.9750 (22a)					
Adj infilt rate	0.3021	0.2877	0.2877	0.2662	0.2662	0.2302	0.2374	0.2518	0.2374	0.2518	0.2518	0.2805 (22b)					
Effective ac	0.5456	0.5414	0.5414	0.5354	0.5354	0.5265	0.5282	0.5317	0.5282	0.5317	0.5317	0.5394 (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						
Triple glazed window (Uw = 1.10)			14.0700	1.0536	14.8247			(27)					
Half glazed door			1.9000	1.4000	2.6600			(26a)					
Walk-able roof light (Uw = 1.20)			4.4300	1.1450	5.0725			(27a)					
Zinc Roof Window (Uw = 1.10)			1.9500	1.0536	2.0546			(27a)					
Heat Loss Floor 1			44.8000	0.0900	4.0320			(28a)					
External Wall 1	57.1600	15.9700	41.1900	0.1800	7.4142			(29a)					
Zinc roof warm	42.1700	1.9500	40.2200	0.1100	4.4242			(30)					
Flat roof warm	36.3400	4.4300	31.9100	0.1100	3.5101			(30)					
Total net area of external elements Aum(A, m2)			180.4700					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	43.9923			(33)					
Party Wall 1			45.0700	0.0000	0.0000			(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								28.3769 (36)					
Total fabric heat loss						(33) + (36) =		72.3692 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 34.7901	Feb 34.5195	Mar 34.5195	Apr 34.1385	May 34.1385	Jun 33.5693	Jul 33.6766	Aug 33.9009	Sep 33.6766	Oct 33.9009	Nov 33.9009	Dec 34.3892	(38)
Heat transfer coeff	107.1593	106.8888	106.8888	106.5077	106.5077	105.9386	106.0458	106.2701	106.0458	106.2701	106.2701	106.7584	(39)
Average = Sum(39)m / 12 =												106.4626	(39)
HLP	Jan 1.4902	Feb 1.4864	Mar 1.4864	Apr 1.4811	May 1.4811	Jun 1.4732	Jul 1.4747	Aug 1.4778	Sep 1.4747	Oct 1.4778	Nov 1.4778	Dec 1.4846	(40)
HLP (average)												1.4805	(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												2.2916 (42)
Average daily hot water use (litres/day)												88.6252 (43)
Daily hot water use	Jan 97.4877	Feb 93.9427	Mar 90.3977	Apr 86.8527	May 83.3077	Jun 79.7627	Jul 79.7627	Aug 83.3077	Sep 86.8527	Oct 90.3977	Nov 93.9427	Dec 97.4877 (44)
Energy conte	144.5715	126.4431	130.4780	113.7539	109.1496	94.1878	87.2788	100.1537	101.3499	118.1135	128.9301	140.0098 (45)
Energy content (annual)												Total = Sum(45)m = 1394.4196 (45)
Distribution loss (46)m = 0.15 x (45)m	21.6857	18.9665	19.5717	17.0631	16.3724	14.1282	13.0918	15.0231	15.2025	17.7170	19.3395	21.0015 (46)

Water storage loss:												
Store volume												
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												
Volume factor from Table 2a												
Temperature factor from Table 2b												
Enter (49) or (54) in (55)												
Total storage loss											150.0000 (47)	
	29.9084	27.0140	29.9084	28.9436	29.9084	28.9436	29.9084	29.9084	28.9436	29.9084	28.9436	29.9084 (56)
If cylinder contains dedicated solar storage	29.9084	27.0140	29.9084	28.9436	29.9084	28.9436	29.9084	29.9084	28.9436	29.9084	28.9436	29.9084 (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)
Total heat required for water heating calculated for each month												
	174.4799	153.4572	160.3864	142.6975	139.0580	123.1314	117.1872	130.0621	130.2935	148.0219	157.8737	169.9182 (62)
WWHRS	-43.0054	-37.8364	-38.6186	-31.7934	-29.5308	-24.3685	-20.6366	-24.9819	-25.7049	-31.7626	-36.7738	-41.5624 eq.(G10)
Total of WWHRS savings												-386.5753
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)
								Solar input (sum of months) =	Sum(63)m =			0.0000 (63)
Output from w/h												
	131.4745	115.6207	121.7679	110.9041	109.5271	98.7629	96.5506	105.0803	104.5886	116.2593	121.1000	128.3558 (64)
								Total per year (kWh/year) =	Sum(64)m =			1359.9916 (64)
Heat gains from water heating, kWh/month												
	71.9967	63.6536	67.3107	60.9781	60.2190	54.4723	52.9469	57.2278	56.8537	63.1995	66.0242	70.4800 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	137.4953	137.4953	137.4953	137.4953	137.4953	137.4953	137.4953	137.4953	137.4953	137.4953	137.4953	137.4953 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	44.9572	39.9306	32.4737	24.5847	18.3774	15.5149	16.7644	21.7910	29.2479	37.1369	43.3443	46.2067 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	301.0644	304.1886	296.3159	279.5560	258.3996	238.5155	225.2318	222.1076	229.9803	246.7402	267.8966	287.7807 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.0411	51.0411	51.0411	51.0411	51.0411	51.0411	51.0411	51.0411	51.0411	51.0411	51.0411	51.0411 (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)	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635 (71)
Water heating gains (Table 5)	96.7698	94.7226	90.4713	84.6918	80.9395	75.6560	71.1652	76.9191	78.9635	84.9455	91.7002	94.7311 (72)
Total internal gains	539.6643	535.7146	516.1338	485.7053	454.5892	426.5593	410.0343	417.6907	435.0646	465.6955	499.8140	525.5914 (73)

[Jan	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	10.5800	11.9672	0.5700	0.8000	0.7700	40.0108 (74)
South	3.4900	50.8329	0.5700	0.8619	0.7700	56.0619 (78)
South	4.4300	30.0000	0.5700	0.7000	1.0000	47.7244 (82)
East	1.9500	30.6054	0.5700	0.7000	1.0000	21.4313 (82)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	46.6012	46.7191	46.7191	46.8863	46.8863	47.1382	47.0905	46.9911	47.0905	46.9911	46.9911	46.7762
alpha	4.1067	4.1146	4.1146	4.1258	4.1258	4.1425	4.1394	4.1327	4.1394	4.1327	4.1327	4.1184
util living area	0.9820	0.9684	0.9224	0.7875	0.5798	0.3468	0.1918	0.2200	0.5293	0.8519	0.9629	0.9854 (86)
MIT	20.0152	20.1583	20.4438	20.7527	20.9044	20.9439	20.9475	20.9472	20.9259	20.7215	20.3208	19.9813 (87)
Th 2	19.6949	19.6977	19.6977	19.7017	19.7017	19.7077	19.7065	19.7042	19.7065	19.7042	19.7042	19.6991 (88)
util rest of house	0.9756	0.9576	0.8967	0.7286	0.4897	0.2464	0.0840	0.1013	0.4079	0.7902	0.9477	0.9802 (89)
MIT 2	18.4476	18.6532	19.0485	19.4408	19.5967	19.6300	19.6299	19.6274	19.6207	19.4225	18.8927	18.4024 (90)
Living area fraction										fLA = Living area / (4) =	0.4450	0.4450 (91)
MIT	19.1452	19.3230	19.6694	20.0246	20.1786	20.2147	20.2162	20.2147	20.2015	20.0006	19.5282	19.1050 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1452	19.3230	19.6694	20.0246	20.1786	20.2147	20.2162	20.2147	20.2015	20.0006	19.5282	19.1050 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9722	0.9538	0.8960	0.7446	0.5240	0.2861	0.1265	0.1482	0.4559	0.8062	0.9451	0.9771 (94)
Useful gains	685.2714	768.6826	852.9452	860.3129	663.1284	381.3740	160.7631	171.5444	455.9235	658.0207	669.4118	646.8240 (95)
Ext temp.	5.7000	6.2000	8.0000	10.6000	13.7000	16.6000	18.7000	18.6000	15.8000	12.3000	8.6000	5.7000 (96)
Heat loss rate W	1440.7776	1402.6980	1247.3282	1003.7956	690.0235	382.9334	160.7901	171.5992	466.7617	818.3396	1161.3431	1431.0948 (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	562.0966	426.0583	293.4210	103.3076	20.0100	0.0000	0.0000	0.0000	0.0000	119.2773	354.1906	583.4974 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Space heating
Space heating per m2 (98) / (4) = 2461.8586 (98)
34.2353 (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.	5.7000	6.2000	8.0000	10.6000	13.7000	16.6000	18.7000	18.6000	15.8000	12.3000	8.6000	5.7000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	783.9454	562.0427	573.8588	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9584	0.9838	0.9758	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	751.3010	552.9310	559.9559	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1403.3762	1337.4426	1215.9107	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	469.4941	583.6766	488.0304	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												1541.2011	(104)
Cooled fraction												1.0000	(105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	117.3735	145.9191	122.0076	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling												385.3003	(107)
Space cooling per m2												5.3581	(108)

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 %)													100.0000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2461.8586 (211)
Cooling System Energy Efficiency Ratio (see Table 10c)													5.3375 (209)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	562.0966	426.0583	293.4210	103.3076	20.0100	0.0000	0.0000	0.0000	0.0000	119.2773	354.1906	583.4974	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	562.0966	426.0583	293.4210	103.3076	20.0100	0.0000	0.0000	0.0000	0.0000	119.2773	354.1906	583.4974	(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	131.4745	115.6207	121.7679	110.9041	109.5271	98.7629	96.5506	105.0803	104.5886	116.2593	121.1000	128.3558	(64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(216)
Fuel for water heating, kWh/month	131.4745	115.6207	121.7679	110.9041	109.5271	98.7629	96.5506	105.0803	104.5886	116.2593	121.1000	128.3558	(219)
Water heating fuel used												1359.9916	(219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	21.9904	27.3385	22.8586	0.0000	0.0000	0.0000	0.0000	(221)
Cooling												72.1874	(221)
Annual totals kWh/year													
Space heating fuel - main system												2461.8586	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												317.5832	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.75 * 966 * 1.00) =									-1352.1363			-1352.1363	(233)
Total delivered energy for all uses												2859.4846	(238)

10a. Fuel costs - using BEDF prices (551)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1 (0.00*35.09 + 1.00*14.87)	2461.8586	14.8700	366.0784	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (electric off-peak tariff)				
High-rate fraction			0.1083	(243)
Low-rate fraction			0.8917	(244)
High-rate cost	147.3290	35.0900	51.6977	(245)
Low-rate cost	1212.6627	14.8700	180.3229	(246)
Space cooling (0.90*35.09 + 0.10*14.87)	72.1874	33.0680	23.8709	(248)
Pumps and fans for heating (0.90*35.09 + 0.10*14.87)	0.0000	0.0000	0.0000	(249)
Energy for lighting (0.90*35.09 + 0.10*14.87)	317.5832	33.0680	105.0184	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit (0.90*35.09 + 0.10*14.87)	-1352.1363	30.8640	-417.3234	(252)
Total energy cost			309.6651	(255)

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

Energy	Emission factor	Emissions
--------	-----------------	-----------

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

	kWh/year	kg CO2/kWh	kg CO2/year
Space heating - main system 1	2461.8586	0.5190	1277.7046 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating	1359.9916	0.5190	705.8357 (264)
Space and water heating			1983.5403 (265)
Space cooling	72.1874	0.5190	37.4653 (266)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	317.5832	0.5190	164.8257 (268)
Energy saving/generation technologies			
PV Unit (0.90*35.09 + 0.10*14.87)	-1352.1363	0.5190	-701.7587 (269)
Total kg/year			1484.0725 (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	2461.8586	3.0700	7557.9060 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating	1359.9916	3.0700	4175.1744 (264)
Space and water heating			11733.0803 (265)
Space cooling	72.1874	3.0700	221.6153 (266)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	317.5832	3.0700	974.9805 (268)
Energy saving/generation technologies			
PV Unit (0.90*35.09 + 0.10*14.87)	-1352.1363	3.0700	-4151.0585 (269)
Primary energy kWh/year			8778.6177 (272)
Primary energy kWh/m2/year			122.0778 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: A 92
Current environmental impact rating: C 78

(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	+ 2.0	-£ 108	-366 kg (24.6%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£108	5.09 kg/m²	A 94 B 82
Total Savings	£108	5.09 kg/m²	

Potential energy efficiency rating: A 94
Potential environmental impact rating: B 82

Fuel prices for cost data on this page from database revision number 551 TEST (31 Jul 2024)
Recommendation texts revision number 4.9c (22 Feb 2014)

Typical heating and lighting costs of this home (per year, Thames Valley):
Current Potential Saving

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Electricity	£727	£619	£108
Space heating	£366	£370	-£4
Space cooling	£24	£24	£0
Water heating	£232	£120	£112
Lighting	£105	£105	£0
Generated (PV)	-£417	-£417	£0
Total cost of fuels	£310	£202	£108
Total cost of uses	£310	£202	£108
Delivered energy	40 kWh/m²	30 kWh/m²	10 kWh/m²
Carbon dioxide emissions	1.5 tonnes	1.1 tonnes	0.4 tonnes
CO2 emissions per m²	21 kg/m²	16 kg/m²	5 kg/m²
Primary energy	122 kWh/m²	92 kWh/m²	30 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	44.8000 (1b)	x 2.5700 (2b)	= 115.1360 (1b) - (3b)
First floor	27.1100 (1c)	x 2.8800 (2c)	= 78.0768 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.9100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 193.2128 (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																2 * 10 =	20.0000 (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) =										20.0000 / (5) =							0.1035 (8)
Pressure test										Yes							
Measured/design AP50																	4.7000
Infiltration rate																	0.3385 (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) =							0.2877 (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	0.3669	0.3597	0.3525	0.3165	0.3093	0.2733	0.2733	0.2662	0.2877	0.3093	0.3237	0.3381	(22b)				
Effective ac	0.5673	0.5647	0.5621	0.5501	0.5478	0.5374	0.5374	0.5354	0.5414	0.5478	0.5524	0.5572	(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						
Triple glazed window (Uw = 1.10)			14.0700	1.0536	14.8247			(27)					
Half glazed door			1.9000	1.4000	2.6600			(26a)					
Walk-able roof light (Uw = 1.20)			4.4300	1.1450	5.0725			(27a)					
Zinc Roof Window (Uw = 1.10)			1.9500	1.0536	2.0546			(27a)					
Heat Loss Floor 1			44.8000	0.0900	4.0320			(28a)					
External Wall 1	57.1600	15.9700	41.1900	0.1800	7.4142			(29a)					
Zinc roof warm	42.1700	1.9500	40.2200	0.1100	4.4242			(30)					
Flat roof warm	36.3400	4.4300	31.9100	0.1100	3.5101			(30)					
Total net area of external elements Aum(A, m ²)			180.4700					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	43.9923			(33)					
Party Wall 1			45.0700	0.0000	0.0000			(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								28.3769 (36)					
Total fabric heat loss						(33) + (36) =		72.3692 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 36.1708	Feb 36.0042	Mar 35.8409	Apr 35.0738	May 34.9303	Jun 34.2622	Jul 34.2622	Aug 34.1385	Sep 34.5195	Oct 34.9303	Nov 35.2206	Dec 35.5242	(38)
Heat transfer coeff	108.5400	108.3734	108.2101	107.4430	107.2995	106.6314	106.6314	106.5077	106.8888	107.2995	107.5899	107.8934	(39)
Average = Sum(39)m / 12 =												107.4423	(39)
HLP	Jan 1.5094	Feb 1.5071	Mar 1.5048	Apr 1.4941	May 1.4921	Jun 1.4828	Jul 1.4828	Aug 1.4811	Sep 1.4864	Oct 1.4921	Nov 1.4962	Dec 1.5004	(40)
HLP (average)												1.4941	(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												2.2916 (42)
Average daily hot water use (litres/day)												88.6252 (43)
Daily hot water use	Jan 97.4877	Feb 93.9427	Mar 90.3977	Apr 86.8527	May 83.3077	Jun 79.7627	Jul 79.7627	Aug 83.3077	Sep 86.8527	Oct 90.3977	Nov 93.9427	Dec 97.4877 (44)
Energy conte	144.5715	126.4431	130.4780	113.7539	109.1496	94.1878	87.2788	100.1537	101.3499	118.1135	128.9301	140.0098 (45)
Energy content (annual)												Total = Sum(45)m = 1394.4196 (45)
Distribution loss (46)m = 0.15 x (45)m	21.6857	18.9665	19.5717	17.0631	16.3724	14.1282	13.0918	15.0231	15.2025	17.7170	19.3395	21.0015 (46)

												190.0000	(47)
Water storage loss:													
Store volume													
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													
Volume factor from Table 2a													
Temperature factor from Table 2b													
Enter (49) or (54) in (55)												1.1295	(55)
Total storage loss													
35.0134 31.6250 35.0134 33.8840 35.0134 33.8840 35.0134 35.0134 33.8840 35.0134 33.8840 35.0134													(56)
If cylinder contains dedicated solar storage													
21.1923 19.1415 21.1923 20.5087 21.1923 20.5087 21.1923 21.1923 20.5087 21.1923 20.5087 21.1923													(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													(59)
Total heat required for water heating calculated for each month													
165.7638 145.5846 151.6703 134.2626 130.3419 114.6965 108.4712 121.3461 121.8586 139.3058 149.4388 161.2021													(62)
WWHRS -43.0054 -37.8364 -38.6186 -31.7934 -29.5308 -24.3685 -20.6366 -24.9819 -25.7049 -31.7626 -36.7738 -41.5624 eq.(G10)													(610)
Total of WWHRS savings													
Aperture area of solar collector													
Zero-loss collector efficiency													
Collector heat loss coefficient													
Collector 2nd order heat loss coefficient													
Collector effective heat loss coefficient													
Collector performance ratio													
Annual solar radiation per m2													
Overshading factor													
Solar energy available													
Adjustment factor for showers													
Solar-to-load ratio													
Utilisation factor													
Collector performance factor													
Dedicated solar storage volume													
Effective solar volume													
Daily hot water demand													
Volume ratio Veff/V													
Solar storage volume factor													
Solar input													
Solar input -19.7150 -32.8987 -56.0303 -75.0916 -92.7694 -91.2071 -90.0017 -78.6350 -61.5870 -42.0566 -23.3849													
Solar input (sum of months) = Sum(63)m =													
Output from w/h													
103.0434 74.8494 57.0215 27.3775 8.0417 0.0000 0.0000 17.7292 34.5667 65.4866 89.2802													
Heat gains from water heating, kWh/month													
65.0239 57.3555 60.3378 54.2301 53.2461 47.7244 45.9741 50.2550 50.1058 56.2266 59.2762													
Total per year (kW/year) = Sum(64)m =													
103.1416 64													
580.5379 (65)													
63.5071 (65)													

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	137.4953	137.4953	137.4953	137.4953	137.4953	137.4953	137.4953	137.4953	137.4953	137.4953	137.4953	137.4953 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	44.9572	39.9306	32.4737	24.5847	18.3774	15.5149	16.7644	21.7910	29.2479	37.1369	43.3443	46.2067 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	301.0644	304.1886	296.3159	279.5560	258.3996	238.5155	225.2318	222.1076	229.9803	246.7402	267.8966	287.7807 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.0411	51.0411	51.0411	51.0411	51.0411	51.0411	51.0411	51.0411	51.0411	51.0411	51.0411	51.0411 (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)	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635 (71)
Water heating gains (Table 5)	87.3977	85.3505	81.0992	75.3196	71.5673	66.2839	61.7931	67.5470	69.5914	75.5734	82.3281	85.3590 (72)
Total internal gains	530.2922	526.3425	506.7617	476.3332	445.2171	417.1872	400.6622	408.3186	425.6925	456.3234	490.4419	516.2193 (73)

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W		
North					10.5800	10.6334	0.5700	0.8000	0.7700	35.5513 (74)		
South					3.4900	46.7521	0.5700	0.8000	0.7700	51.5614 (78)		
South					4.4300	26.0000	0.5700	0.7000	1.0000	41.3611 (82)		
East					1.9500	26.6635	0.5700	0.7000	1.0000	18.6710 (82)		
Solar gains	147.1448	276.3406	442.1226	648.1969	812.6502	843.5346	798.0577	670.6333	513.2056	323.0864	181.0283	122.7749 (83)
Total gains	677.4370	802.6830	948.8843	1124.5301	1257.8673	1260.7218	1198.7199	1078.9519	938.8980	779.4099	671.4702	638.9942 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n _{l,m} (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	46.0084	46.0791	46.1486	46.4781	46.5403	46.8319	46.8319	46.8863	46.7191	46.5403	46.4147	46.2841
alpha	4.0672	4.0719	4.0766	4.0985	4.1027	4.1221	4.1221	4.1258	4.1146	4.1027	4.0943	4.0856
util living area	0.9885	0.9767	0.9448	0.8574	0.7018	0.5206	0.3864	0.4444	0.6975	0.9176	0.9789	0.9908 (86)
MIT	19.8259	20.0042	20.2869	20.6170	20.8340	20.9218	20.9415	20.9372	20.8660	20.5531	20.1233	19.7886 (87)
Th 2	19.6805	19.6822	19.6839	19.6919	19.6934	19.7004	19.7004	19.7017	19.6977	19.6934	19.6904	19.6872 (88)
util rest of house	0.9847	0.9692	0.9273	0.8160	0.6293	0.4236	0.2748	0.3238	0.5970	0.8827	0.9707	0.9877 (89)
MIT 2	18.1629	18.4203	18.8203	19.2662	19.5209	19.6093	19.6218	19.6215	19.5662	19.2016	18.6012	18.1139 (90)
Living area fraction									f _{LA} = Living area / (4) =			0.4450 (91)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

MIT	18.9029	19.1251	19.4729	19.8673	20.1053	20.1934	20.2091	20.2070	20.1446	19.8030	19.2785	18.8591 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9029	19.1251	19.4729	19.8673	20.1053	20.1934	20.2091	20.2070	20.1446	19.8030	19.2785	18.8591 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9817	0.9651	0.9239	0.8222	0.6536	0.4614	0.3190	0.3716	0.6340	0.8861	0.9673	0.9852 (94)	
Useful gains	665.0449	774.6804	876.7069	924.5790	822.0802	581.7460	382.4161	400.9780	595.3028	690.6714	649.5446	629.5108 (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	1585.0046	1541.6270	1403.8016	1178.3583	901.8819	596.4305	384.8394	405.4712	646.1021	987.4802	1310.2876	1581.6222 (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	684.4500	515.3881	392.1584	182.7211	59.3724	0.0000	0.0000	0.0000	0.0000	220.8258	475.7349	708.3709 (98)	
Space heating												3239.0216 (98)	
Space heating per m2												(98) / (4) = 45.0427 (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	1002.3353	789.0725	809.4585	0.0000	0.0000	0.0000	0.0000 (100)	
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8990	0.9404	0.9130	0.0000	0.0000	0.0000	0.0000 (101)	
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	901.0504	742.0524	739.0102	0.0000	0.0000	0.0000	0.0000 (102)	
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1326.4545	1260.9838	1131.9255	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	306.2910	386.0849	292.3290	0.0000	0.0000	0.0000	0.0000 (104)	
Space cooling												984.7049 (104)	
Cooled fraction												FC = cooled area / (4) = 1.0000 (105)	
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)	
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	76.5728	96.5212	73.0822	0.0000	0.0000	0.0000	0.0000 (107)	
Space cooling												246.1762 (107)	
Space cooling per m2												3.4234 (108)	

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 %)													100.0000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3239.0216 (211)
Cooling System Energy Efficiency Ratio (see Table 10c)													5.3375 (209)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	684.4500	515.3881	392.1584	182.7211	59.3724	0.0000	0.0000	0.0000	0.0000	220.8258	475.7349	708.3709 (98)	
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)	
Space heating fuel (main heating system)	684.4500	515.3881	392.1584	182.7211	59.3724	0.0000	0.0000	0.0000	0.0000	220.8258	475.7349	708.3709 (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	103.0434	74.8494	57.0215	27.3775	8.0417	0.0000	0.0000	17.7292	34.5667	65.4866	89.2802	103.1416 (64)	
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000 (216)	
Fuel for water heating, kWh/month	103.0434	74.8494	57.0215	27.3775	8.0417	0.0000	0.0000	17.7292	34.5667	65.4866	89.2802	103.1416 (219)	
Water heating fuel used												580.5379 (219)	
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	14.3462	18.0836	13.6922	0.0000	0.0000	0.0000	0.0000 (221)	
Cooling												46.1220 (221)	
Annual totals kWh/year													
Space heating fuel - main system												3239.0216 (211)	
Space heating fuel - secondary												0.0000 (215)	
Electricity for pumps and fans:													
pump for solar water heating													50.0000 (230g)
Total electricity for the above, kWh/year													50.0000 (231)
Electricity for lighting (calculated in Appendix L)													317.5832 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.75 * 908 * 1.00) =										-1270.9959		-1270.9959 (233)	
Total delivered energy for all uses												2962.2688 (238)	

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1 (0.00*15.29 + 1.00*5.50)	3239.0216	5.5000	178.1462 (240)	
Space heating - secondary	0.0000	0.0000	0.0000 (242)	
Water heating (electric off-peak tariff)				

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

High-rate fraction			0.1521 (243)
Low-rate fraction			0.8479 (244)
High-rate cost	88.2883	15.2900	13.4993 (245)
Low-rate cost	492.2496	5.5000	27.0737 (246)
Space cooling (0.90*15.29 + 0.10*5.50)	46.1220	14.3110	6.6005 (248)
Pumps and fans for heating (0.90*15.29 + 0.10*5.50)	0.0000	0.0000	0.0000 (249)
Pump for solar water heating	50.0000	14.3110	7.1555 (249)
Energy for lighting (0.90*15.29 + 0.10*5.50)	317.5832	14.3110	45.4493 (250)
Additional standing charges			24.0000 (251)
Energy saving/generation technologies			
PV Unit (0.90*35.09 + 0.10*14.87)	-1270.9959	13.7505	-174.7683 (252)
Total energy cost			127.1563 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.4568 (257)
SAP value		93.6275
SAP rating (Section 12)		94 (258)
SAP band		A

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

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Space heating - main system 1	3239.0216	0.5190	1681.0522 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating	580.5379	0.5190	301.2992 (264)
Space and water heating			1982.3514 (265)
Space cooling	46.1220	0.5190	23.9373 (266)
Pumps and fans	50.0000	0.5190	25.9500 (267)
Energy for lighting	317.5832	0.5190	164.8257 (268)
Energy saving/generation technologies			
PV Unit (0.90*35.09 + 0.10*14.87)	-1270.9959	0.5190	-659.6469 (269)
Total kg/year			1537.4175 (272)
CO ₂ emissions per m ²			21.3800 (273)
EI value			82.3784
EI rating			82 (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	44.8000 (1b)	x 2.5700 (2b)	= 115.1360 (1b) - (3b)
First floor	27.1100 (1c)	x 2.8800 (2c)	= 78.0768 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.9100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 193.2128 (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					2 * 10 = 20.0000 (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) =					20.0000 / (5) = 0.1035 (8)
Pressure test					Yes
Measured/design AP50					4.7000
Infiltration rate					0.3385 (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) =		0.2877 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.2000	3.3000	3.5000	3.3000	3.5000	3.5000	3.9000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8000	0.8250	0.8750	0.8250	0.8750	0.8750	0.9750 (22a)
Adj infilt rate	0.3021	0.2877	0.2877	0.2662	0.2662	0.2302	0.2374	0.2518	0.2374	0.2518	0.2518	0.2805 (22b)
Effective ac	0.5456	0.5414	0.5414	0.5354	0.5354	0.5265	0.5282	0.5317	0.5282	0.5317	0.5317	0.5394 (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
Triple glazed window (Uw = 1.10)			14.0700	1.0536	14.8247		(27)
Half glazed door			1.9000	1.4000	2.6600		(26a)
Walk-able roof light (Uw = 1.20)			4.4300	1.1450	5.0725		(27a)
Zinc Roof Window (Uw = 1.10)			1.9500	1.0536	2.0546		(27a)
Heat Loss Floor 1			44.8000	0.0900	4.0320		(28a)
External Wall 1	57.1600	15.9700	41.1900	0.1800	7.4142		(29a)
Zinc roof warm	42.1700	1.9500	40.2200	0.1100	4.4242		(30)
Flat roof warm	36.3400	4.4300	31.9100	0.1100	3.5101		(30)
Total net area of external elements Aum(A, m ²)			180.4700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	43.9923		(33)
Party Wall 1			45.0700	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							28.3769 (36)
Total fabric heat loss						(33) + (36) =	72.3692 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	34.7901	34.5195	34.5195	34.1385	34.1385	33.5693	33.6766	33.9009	33.6766	33.9009	33.9009	34.3892 (38)
Heat transfer coeff	107.1593	106.8888	106.8888	106.5077	106.5077	105.9386	106.0458	106.2701	106.0458	106.2701	106.2701	106.7584 (39)
Average = Sum(39)m / 12 =												106.4626 (39)
HLP	1.4902	1.4864	1.4864	1.4811	1.4811	1.4732	1.4747	1.4778	1.4747	1.4778	1.4778	1.4846 (40)
HLP (average)												1.4805 (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												2.2916 (42)
Average daily hot water use (litres/day)												88.6252 (43)
Daily hot water use	97.4877	93.9427	90.3977	86.8527	83.3077	79.7627	79.7627	83.3077	86.8527	90.3977	93.9427	97.4877 (44)
Energy conte	144.5715	126.4431	130.4780	113.7539	109.1496	94.1878	87.2788	100.1537	101.3499	118.1135	128.9301	140.0098 (45)
Energy content (annual)										Total = Sum(45)m =		1394.4196 (45)
Distribution loss (46)m = 0.15 x (45)m	21.6857	18.9665	19.5717	17.0631	16.3724	14.1282	13.0918	15.0231	15.2025	17.7170	19.3395	21.0015 (46)

												190.0000	(47)											
Water storage loss:																								
Store volume																								
b) If manufacturer declared loss factor is not known :																								
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0115	(51)											
Volume factor from Table 2a												0.8580	(52)											
Temperature factor from Table 2b												0.6000	(53)											
Enter (49) or (54) in (55)												1.1295	(55)											
Total storage loss																								
35.0134	31.6250	35.0134	33.8840	35.0134	33.8840	35.0134	35.0134	33.8840	35.0134	33.8840	35.0134	33.8840	35.0134	(56)										
If cylinder contains dedicated solar storage																								
21.1923	19.1415	21.1923	20.5087	21.1923	20.5087	21.1923	21.1923	20.5087	21.1923	20.5087	21.1923	20.5087	21.1923	(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	0.0000	(59)										
Total heat required for water heating calculated for each month																								
165.7638	145.5846	151.6703	134.2626	130.3419	114.6965	108.4712	121.3461	121.8586	139.3058	149.4388	161.2021	161.2021	eq. (G10)	(62)										
-43.0054	-37.8364	-38.6186	-31.7934	-29.5308	-24.3685	-20.6366	-24.9819	-25.7049	-31.7626	-36.7738	-41.5624	-41.5624	eq. (G10)	(62)										
WWHRS																								
Total of WWHRS savings																								
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												1133.3053	(H5)											
Overshading factor												0.8000	(H6)											
Solar energy available												1903.9528	(H7)											
Adjustment factor for showers												1.0000	(H7a)											
Solar-to-load ratio												1.8891	(H8)											
Utilisation factor												0.4110	(H9)											
Collector performance factor												0.8793	(H10)											
Dedicated solar storage volume												75.0000	(H11)											
Effective solar volume												109.5000	(H13)											
Daily hot water demand												88.6252	(H14)											
Volume ratio Veff/V												1.2355	(H15)											
Solar storage volume factor												1.0000	(H16)											
Solar input												-688.0825	(H17)											
Solar input												-21.2737	-30.8361	-52.7691	-74.0118	-88.3477	-93.5744	-92.6269	-82.7707	-64.7180	-43.6699	-25.8595	-17.6249	(63)
												Solar input (sum of months) = Sum(63)m =						-688.0825	(63)					
Output from w/h																								
101.4847	76.9121	60.2827	28.4574	12.4634	0.0000	0.0000	13.5935	31.4357	63.8734	86.8056	102.0147	102.0147	eq. (64)	(64)										
												Total per year (kWh/year) = Sum(64)m =						577.3233	(64)					
Heat gains from water heating, kWh/month																								
65.0239	57.3555	60.3378	54.2301	53.2461	47.7244	45.9741	50.2550	50.1058	56.2266	59.2762	63.5071	63.5071	eq. (65)	(65)										

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	137.4953	137.4953	137.4953	137.4953	137.4953	137.4953	137.4953	137.4953	137.4953	137.4953	137.4953	137.4953 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	44.9572	39.9306	32.4737	24.5847	18.3774	15.5149	16.7644	21.7910	29.2479	37.1369	43.3443	46.2067 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	301.0644	304.1886	296.3159	279.5560	258.3996	238.5155	225.2318	222.1076	229.9803	246.7402	267.8966	287.7807 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.0411	51.0411	51.0411	51.0411	51.0411	51.0411	51.0411	51.0411	51.0411	51.0411	51.0411	51.0411 (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)	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635	-91.6635 (71)
Water heating gains (Table 5)	87.3977	85.3505	81.0992	75.3196	71.5673	66.2839	61.7931	67.5470	69.5914	75.5734	82.3281	85.3590 (72)
Total internal gains	530.2922	526.3425	506.7617	476.3332	445.2171	417.1872	400.6622	408.3186	425.6925	456.3234	490.4419	516.2193 (73)

[Jan	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	10.5800	11.9672	0.5700	0.8000	0.7700	40.0108 (74)
South	3.4900	50.8329	0.5700	0.8000	0.7700	56.0619 (78)
South	4.4300	30.0000	0.5700	0.7000	1.0000	47.7244 (82)
East	1.9500	30.6054	0.5700	0.7000	1.0000	21.4313 (82)

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	46.6012	46.7191	46.7191	46.8863	46.8863	47.1382	47.0905	46.9911	47.0905	46.9911	46.9911	46.7762
alpha	4.1067	4.1146	4.1146	4.1258	4.1258	4.1425	4.1394	4.1327	4.1394	4.1327	4.1327	4.1184
util living area												
	0.9828	0.9696	0.9245	0.7909	0.5833	0.3492	0.1932	0.2218	0.5337	0.8558	0.9645	0.9861 (86)
MIT	20.0067	20.1503	20.4373	20.7493	20.9034	20.9438	20.9475	20.9472	20.9253	20.7168	20.3130	19.9726 (87)
Th 2	19.6949	19.6977	19.6977	19.7017	19.7017	19.7077	19.7065	19.7042	19.7065	19.7042	19.7042	19.6991 (88)
util rest of house												
	0.9767	0.9592	0.8993	0.7324	0.4930	0.2482	0.0846	0.1022	0.4115	0.7950	0.9498	0.9812 (89)
MIT 2	18.4355	18.6420	19.0400	19.4372	19.5960	19.6300	19.6299	19.6274	19.6204	19.4174	18.8820	18.3900 (90)
Living area fraction									fLA = Living area / (4) =			0.4450 (91)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

MIT	19.1347	19.3132	19.6618	20.0211	20.1778	20.2146	20.2162	20.2147	20.2010	19.9956	19.5188	19.0943 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1347	19.3132	19.6618	20.0211	20.1778	20.2146	20.2162	20.2147	20.2010	19.9956	19.5188	19.0943 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9733	0.9553	0.8985	0.7481	0.5273	0.2881	0.1275	0.1494	0.4598	0.8106	0.9471	0.9781 (94)	
Useful gains	676.9471	760.9696	846.8873	857.3478	662.4167	381.3259	160.7620	171.5420	455.5308	653.9770	661.9699	638.3285 (95)	
Ext temp.	5.7000	6.2000	8.0000	10.6000	13.7000	16.6000	18.7000	18.6000	15.8000	12.3000	8.6000	5.7000 (96)	
Heat loss rate W	1439.6521	1401.6530	1246.5118	1003.4166	689.9369	382.9269	160.7898	171.5986	466.7126	817.8146	1160.3400	1429.9515 (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	567.4525	430.5393	297.3206	105.1695	20.4750	0.0000	0.0000	0.0000	0.0000	121.8952	358.8265	588.9675 (98)	
Space heating												2490.6461 (98)	
Space heating per m2										(98) / (4) =		34.6356 (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.	5.7000	6.2000	8.0000	10.6000	13.7000	16.6000	18.7000	18.6000	15.8000	12.3000	8.6000	5.7000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	783.9454	562.0427	573.8588	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9575	0.9834	0.9751	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	750.6062	552.7059	559.5913	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1394.0041	1328.0705	1206.5386	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	463.2465	576.8713	481.3288	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												1521.4466 (104)
Cooled fraction												1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	115.8116	144.2178	120.3322	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												380.3616 (107)
Space cooling per m2												5.2894 (108)

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 %)												100.0000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												2490.6461 (211)
Cooling System Energy Efficiency Ratio (see Table 10c)												5.3375 (209)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	567.4525	430.5393	297.3206	105.1695	20.4750	0.0000	0.0000	0.0000	0.0000	121.8952	358.8265	588.9675 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	567.4525	430.5393	297.3206	105.1695	20.4750	0.0000	0.0000	0.0000	0.0000	121.8952	358.8265	588.9675 (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	101.4847	76.9121	60.2827	28.4574	12.4634	0.0000	0.0000	13.5935	31.4357	63.8734	86.8056	102.0147 (64)
Efficiency of water heater	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000 (216)
Fuel for water heating, kWh/month	101.4847	76.9121	60.2827	28.4574	12.4634	0.0000	0.0000	13.5935	31.4357	63.8734	86.8056	102.0147 (219)
Water heating fuel used												577.3233 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	21.6977	27.0197	22.5447	0.0000	0.0000	0.0000	0.0000 (221)
Space cooling												71.2621 (221)
Annual totals kWh/year												
Space heating fuel - main system												2490.6461 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
pump for solar water heating												50.0000 (230g)
Total electricity for the above, kWh/year												50.0000 (231)
Electricity for lighting (calculated in Appendix L)												317.5832 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 1.75 * 966 * 1.00) =									-1352.1363			-1352.1363 (233)
Total delivered energy for all uses												2154.6785 (238)

10a. Fuel costs - using BEDF prices (£51)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1 (0.00*35.09 + 1.00*14.87)	2490.6461	14.8700	370.3591 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (electric off-peak tariff)			

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

High-rate fraction			0.1521 (243)
Low-rate fraction			0.8479 (244)
High-rate cost	87.7994	35.0900	30.8088 (245)
Low-rate cost	489.5239	14.8700	72.7922 (246)
Space cooling (0.90*35.09 + 0.10*14.87)	71.2621	33.0680	23.5650 (248)
Pumps and fans for heating (0.90*35.09 + 0.10*14.87)	0.0000	0.0000	0.0000 (249)
Pump for solar water heating	50.0000	33.0680	16.5340 (249)
Energy for lighting (0.90*35.09 + 0.10*14.87)	317.5832	33.0680	105.0184 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit (0.90*35.09 + 0.10*14.87)	-1352.1363	30.8640	-417.3234 (252)
Total energy cost			201.7541 (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	2490.6461	0.5190	1292.6453 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating	577.3233	0.5190	299.6308 (264)
Space and water heating			1592.2761 (265)
Space cooling	71.2621	0.5190	36.9850 (266)
Pumps and fans	50.0000	0.5190	25.9500 (267)
Energy for lighting	317.5832	0.5190	164.8257 (268)
Energy saving/generation technologies			
PV Unit (0.90*35.09 + 0.10*14.87)	-1352.1363	0.5190	-701.7587 (269)
Total kg/year			1118.2781 (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	2490.6461	3.0700	7646.2836 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating	577.3233	3.0700	1772.3826 (264)
Space and water heating			9418.6661 (265)
Space cooling	71.2621	3.0700	218.7748 (266)
Pumps and fans	50.0000	3.0700	153.5000 (267)
Energy for lighting	317.5832	3.0700	974.9805 (268)
Energy saving/generation technologies			
PV Unit (0.90*35.09 + 0.10*14.87)	-1352.1363	3.0700	-4151.0585 (269)
Primary energy kWh/year			6614.8629 (272)
Primary energy kWh/m2/year			91.9881 (273)

SAP 2012 OVERHEATING ASSESSMENT FOR New Build (As Designed) 9.92

Overheating Calculation Input Data

Dwelling type	MidTerrace House
Number of storeys	2
Cross ventilation possible	Yes
SAP Region	Thames Valley
Front of dwelling faces	South
Overshading	Average or unknown
Thermal mass parameter	250.0
Night ventilation	No
Ventilation rate during hot weather (ach)	4.00 (Windows half open)

Overheating Calculation

Summer ventilation heat loss coefficient	255.04 (P1)
Transmission heat loss coefficient	72.37 (37)
Summer heat loss coefficient	327.41 (P2)

Overhangs				
Orientation	Ratio	Z_overhangs		Overhang type
-----	-----	-----		
North	0.000	1.000		None
South	0.000	1.000		None
Solar shading				
Orientation	Z blinds	Solar access	Z overhangs	Z summer
-----	-----	-----		
North	0.999	0.90	1.000	0.899 (P8)
East	0.999	1.00	1.000	0.999 (P8)
South	0.999	0.90	1.000	0.899 (P8)
South	1.000	0.90	1.000	0.900 (P8)
South	1.000	1.00	1.000	1.000 (P8)

[Jul]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Shading	Gains W
-------	------------	------------------------	--------------------	---------------------	---------	------------

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

		W/m2	or Table 6b	or Table 6c		
North	10.5800	81.1852	0.5700	0.8000	0.8989	316.8771
South	3.4900	112.2060	0.5700	0.8000	0.8989	144.5470
South	4.4300	203.0000	0.5700	0.7000	1.0000	322.9350
East	1.9500	197.1775	0.5700	0.7000	0.9988	137.9069
total:						922.2659
Solar gains		Jun	Jul	Aug		
Internal gains		985	922	793		(P3)
Total summer gains		427	410	418		
		1412	1332	1211		(P5)
Summer gain/loss ratio		4.31	4.07	3.70		(P6)
Summer external temperature		16.00	17.90	17.80		
Thermal mass temperature increment (TMP = 250.0)		0.25	0.25	0.25		
Threshold temperature		20.56	22.22	21.75		(P7)
Likelihood of high internal temperature		Slight	Medium	Slight		
Assessment of likelihood of high internal temperature:		Medium				

U-VALUE CALCULATOR REPORT

Property Reference	000009	Issued on Date	26/08/2024
Assessment Reference	001	Prop Type Ref	Forest Gate Part L1a
Project	4, Belford House, 53 Hampton Road, Forest Gate, E7 0PD		
Calculation Type	New Build (As Designed)		

SAP Rating	92 A	DER	30.58	TER	32.70
Environmental	78 C	% DER<TER	6.48		
CO ₂ Emissions (t/year)	1.48	DFEE	60.08	TFEE	71.37
General Requirements Compliance	Pass	% DFEE<TFEE	15.82		

Assessor Details	Mr. Iftikhar Ahmed, Iftikhar Ahmed, Tel: 01706 662 700, ifty@energynational.co.uk	Assessor ID	D226-0001
Client	Cheryl Simmonds, Forest Gate		

Building Elements

Roof 000002 - Flat roof warm

Roof Type: Flat Roof standard (no precipitation)

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)
Ext surface				0.0400	
Layer 1	Felt				
	Main construction	6	0.0300	0.2000	100.00
Layer 2	Thermarroof TR27 (120mm +)				
	Main construction	130	0.0240	5.4167	100.00
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
Layer 3	Thermarroof TR27 (*80mm-119mm)				
	Main construction	80	0.0250	3.2000	100.00
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
Layer 4	Plywood				
	Main construction	22	0.1300	0.1692	87.50
	Main construction	22	0.1300	0.1692	12.50
Layer 5	Plasterboard, standard				
	Main construction	12.5	0.2100	0.0595	100.00
Layer 6	Plaster, standard				
	Main construction	3	0.4000	0.0075	100.00
Int surface				0.1000	

Total resistance:	Upper limit = 9.193 m ² K/W	Lower limit = 9.193 m ² K/W	Average = 9.193 m ² K/W
	Total correction = 0.0047 m ² K/W	U-value (unrounded) = 0.11 W/m ² K	

Unheated space: None

Total thickness: 254 mm

U-value: 0.11 W/m² K

Kappa: n/a

U-VALUE CALCULATOR REPORT

Property Reference	000009	Issued on Date	26/08/2024
Assessment Reference	001	Prop Type Ref	Forest Gate Part L1a
Project	4, Belford House, 53 Hampton Road, Forest Gate, E7 OPD		
Calculation Type	New Build (As Designed)		

SAP Rating	92 A	DER	30.58	TER	32.70
Environmental	78 C	% DER<TER	6.48		
CO ₂ Emissions (t/year)	1.48	DFEE	60.08	TFEE	71.37
General Requirements Compliance	Pass	% DFEE<TFEE	15.82		

Assessor Details	Mr. Iftikhar Ahmed, Iftikhar Ahmed, Tel: 01706 662 700, ifty@energynational.co.uk	Assessor ID	D226-0001
------------------	---	-------------	-----------

Client	Cheryl Simmonds, Forest Gate
--------	------------------------------

Building Elements

Roof 000004 - Warm roof flat

Roof Type: Flat Roof standard (no precipitation)

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)
Ext surface				0.0400	
Layer 1	Felt				
	Main construction	7	0.0300	0.2333	100.00
Layer 2	Plywood				
	Main construction	22	0.1300	0.1692	100.00
Layer 3	airspace/timber battens				
	Main construction	22	0.1222	0.1800	89.63
	Main construction	22	0.1375	0.1600	10.37
	Corrections - Cavity Unventilated, Emissivity: Normal				
Layer 4	Sarking felt				
	Main construction	0.5	0.2300	0.0022	100.00
Layer 5	Thermarroof TR27 (*80mm-119mm)				
	Main construction	110	0.0250	4.4000	91.67
	Main construction	110	0.1300	0.8462	8.33
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
Layer 6	Thermarroof TR27 (120mm +)				
	Main construction	130	0.0240	5.4167	97.50
	Main construction	130	0.1300	1.0000	2.50
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
Layer 7	Plasterboard, standard				
	Main construction	12.5	0.2100	0.0595	97.50
	Main construction	12.5	0.1300	0.0962	2.50
Layer 8	Plaster, standard				
	Main construction	3	0.4000	0.0075	100.00
Int surface				0.1000	

Total resistance:	Upper limit = 9.973 m ² K/W	Lower limit = 8.927 m ² K/W	Average = 9.450 m ² K/W
	Total correction = 0.0039 m ² K/W	U-value (unrounded) = 0.11 W/m ² K	

Unheated space: None

Total thickness: 307 mm

U-value: 0.11 W/m² K

Kappa: n/a

U-VALUE CALCULATOR REPORT

Property Reference	000009	Issued on Date	26/08/2024
Assessment Reference	001	Prop Type Ref	Forest Gate Part L1a
Project	4, Belford House, 53 Hampton Road, Forest Gate, E7 OPD		
Calculation Type	New Build (As Designed)		

SAP Rating	92 A	DER	30.58	TER	32.70
Environmental	78 C	% DER<TER	6.48		
CO ₂ Emissions (t/year)	1.48	DFEE	60.08	TFEE	71.37
General Requirements Compliance	Pass	% DFEE<TFEE	15.82		

Assessor Details	Mr. Iftikhar Ahmed, Iftikhar Ahmed, Tel: 01706 662 700, ifty@energynational.co.uk	Assessor ID	D226-0001
------------------	---	-------------	-----------

Client	Cheryl Simmonds, Forest Gate
--------	------------------------------

Building Elements

Wall 000001 - Masonry wall cavity Insulation Boards

Wall Type: Standard Wall

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)
Ext surface				0.0400	
Layer 1	Brick, outer leaf (smeed Deen mile End Mixture)				
	Main construction	102	0.7700	0.1325	100.00
Layer 2	Standard cavity				
	Main construction	50	0.2778	0.1800	100.00
	Corrections - Cavity Unventilated, Emissivity: Normal				
Layer 3	Kooltherm K8 Cavity Board (100)				
	Main construction	100	0.0200	5.0000	100.00
	Corrections - Air Gap: Level 1, Fasteners: Wall ties, Cross sectional area: 0.00 mm ² , Lambda: 0.000 W/m.K, per m ² : 2.500				
Layer 4	Blockwork, medium				
	Main construction	100	0.5700	0.1754	93.43
	Main construction	100	0.8803	0.1136	6.57
Layer 5	airspace, dot and dab				
	Main construction	22	0.1220	0.1803	88.20
	Main construction	22	0.1302	0.1690	11.80
	Corrections - Cavity Unventilated, Emissivity: Normal				
Layer 6	Plasterboard (standard wallboard)				
	Main construction	12.5	0.2100	0.0595	100.00
Layer 7	Plaster skim finish				
	Main construction	3	0.1800	0.0167	100.00
Int surface				0.1300	

Total resistance:	Upper limit = 5.909 m ² K/W	Lower limit = 5.907 m ² K/W	Average = 5.908 m ² K/W
	Total correction = 0.0072 m ² K/W	U-value (unrounded) = 0.18 W/m ² K	

Unheated space: None

Total thickness: 390 mm

U-value: 0.18 W/m² K

Kappa: n/a

U-VALUE CALCULATOR REPORT

Property Reference	000009	Issued on Date	26/08/2024
Assessment Reference	001	Prop Type Ref	Forest Gate Part L1a
Project	4, Belford House, 53 Hampton Road, Forest Gate, E7 0PD		
Calculation Type	New Build (As Designed)		

SAP Rating	92 A	DER	30.58	TER	32.70
Environmental	78 C	% DER<TER	6.48		
CO ₂ Emissions (t/year)	1.48	DFEE	60.08	TFEE	71.37
General Requirements Compliance	Pass	% DFEE<TFEE	15.82		

Assessor Details	Mr. Iftikhar Ahmed, Iftikhar Ahmed, Tel: 01706 662 700, ifty@energynational.co.uk	Assessor ID	D226-0001
------------------	---	-------------	-----------

Client	Cheryl Simmonds, Forest Gate
--------	------------------------------

Building Elements

Floor 000003 - floor - slab-on-ground floor

Floor Type: Slab On Ground Floor

Area = 44.80 m², Perimeter = 13.50 m, Wall thickness = 300.00 mm, Soil: Clay

Horizontal edge insulation: none

Vertical edge insulation: none

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)
Ext surface				0.0400	
Layer 1	Concrete, reinforced (2% steel)				
	Main construction	200	2.5000	0.0800	100.00
Layer 2	1200g Visqueen DPM				
	Main construction	1	0.0000	0.0000	100.00
Layer 3	Thermafloor TF70 zero ODP				
	Main construction	100	0.0220	4.5455	100.00
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
Layer 4	Thermafloor TF70 zero ODP				
	Main construction	100	0.0220	4.5455	100.00
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
Layer 5	1000g VCL				
	Main construction	1	0.0000	0.0000	100.00
Layer 6	Screed				
	Main construction	75	1.1500	0.0652	100.00
Int surface				0.1700	

Total resistance:	Upper limit = 9.236 m ² K/W	Lower limit = 9.236 m ² K/W	Average = 9.236 m ² K/W
	Total correction = 0.0048 m ² K/W	U-value (unrounded) = 0.09 W/m ² K	

Unheated space: None

Total thickness: 477 mm

U-value: 0.09 W/m² K

Kappa: n/a

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Property Reference	000009	Issued on Date	26/08/2024
Assessment Reference	001	Prop Type Ref	Forest Gate Part L1a
Property	4, Belford House, 53 Hampton Road, Forest Gate, E7 OPD		
SAP Rating	92 A	DER	30.58
Environmental	78 C	TER	32.70
CO ₂ Emissions (t/year)	1.48	% DER<TER	6.48
General Requirements Compliance	Pass	DfEE	60.08
		TfEE	71.37
		% DfEE<TfEE	15.82
Assessor Details	Mr. Iftikhar Ahmed, Iftikhar Ahmed, Tel: 01706 662 700, ifty@energynational.co.uk		Assessor ID
			D226-0001
Client	Cheryl Simmonds, Forest Gate		

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

Orientation	South				
Property Tenure	Unknown				
Transaction Type	New dwelling				
Terrain Type	Suburban				
1.0 Property Type	House, Mid-Terrace				
2.0 Number of Storeys	2				
3.0 Date Built	2022				
4.0 Sheltered Sides	2				
5.0 Sunlight/Shade	Average or unknown				
6.0 Measurements					
	Ground Floor:	Heat Loss Perimeter	Internal Floor Area	Average Storey Height	
		15.56 m	44.80 m²	2.57 m	
	1st Storey:	14.99 m	27.11 m²	2.88 m	
7.0 Living Area	32.00		m²		
8.0 Thermal Mass Parameter	Simple calculation - Medium				
Thermal Mass	250.00		kJ/m²K		
9.0 External Walls					
Description	Type		U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Wall 1	Cavity Wall		0.18	57.16	41.19
9.1 Party Walls					
Description	Type	Construction		U-Value (W/m²K)	Area (m²)
Party Wall 1	Filled Cavity with Edge Sealing			0.00	45.07
10.0 External Roofs					
Description	Type		U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
Zinc roof warm	External Flat Roof		0.11	42.17	40.22
Flat roof warm	External Flat Roof		0.11	36.34	31.91
11.0 Heat Loss Floors					
Description	Type	Construction		U-Value (W/m²K)	Area (m²)
Heat Loss Floor 1	Ground Floor - Solid			0.09	44.80

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Triple glazed window	Manufacturer	Window	Triple Low-E Soft 0.05			0.57		0.80	1.10
Half glazed door	Manufacturer	Half Glazed Door	Triple Low-E Soft 0.05			0.57		0.70	1.40
Walk-able roof light	Manufacturer	Roof Window	Triple Low-E Soft 0.05			0.57		0.70	1.20
Zinc Roof Window	Manufacturer	Roof Window	Triple Low-E Soft 0.05			0.57		0.70	1.10

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
Opening 1	Window	[1] External Wall 1	North	Dark-coloured venetian blind	0.00					2.73	1
Opening 2	Window	[1] External Wall 1	North	Dark-coloured venetian blind	0.00					7.85	1
Opening 3	Window	[1] External Wall 1	South	Dark-coloured venetian blind	0.00					1.40	1
Opening 4	Window	[1] External Wall 1	South	None	0.00					1.60	
Opening 5	Half Glazed Door	[1] External Wall 1	South							1.90	
Opening 6	Roof Window	[1] Zinc roof warm	East	Dark-coloured venetian blind						1.95	1
Opening 7	Window	[1] External Wall 1	South	Dark-coloured venetian blind	0.00					0.49	1
Opening 8	Roof Window	[2] Flat roof warm	South	None						3.18	
Opening 9	Roof Window	[2] Flat roof warm	South	None						1.25	

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
Table K1 - Approved	E1 Steel lintel with perforated steel base plate	8.05	0.500	No
Table K1 - Approved	E3 Sill	3.32	0.040	No
Table K1 - Approved	E4 Jamb	24.20	0.050	No
Table K1 - Approved	E5 Ground floor (normal)	13.50	0.160	No
Table K1 - Approved	E6 Intermediate floor within a dwelling	14.95	0.070	No
Table K1 - Default	E15 Flat roof with parapet	27.26	0.560	No
Table K1 - Approved	E16 Corner (normal)	13.78	0.090	No
Table K1 - Approved	E17 Corner (inverted – internal area greater than external area)	2.88	-0.090	No
Table K1 - Approved	E18 Party wall between dwellings	16.04	0.060	No
Table K1 - Default	P1 Party wall - Ground floor	7.98	0.160	No
Table K1 - Default	P2 Party wall - Intermediate floor within a dwelling	7.95	0.000	No
Table K1 - Default	R1 Head of roof window	2.80	0.080	No
Table K1 - Default	R2 Sill of roof window	2.80	0.060	No
Table K1 - Default	R3 Jamb of roof window	11.56	0.080	No

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Y-value	0.157	W/m²K
---------	-------	-------

18.0 Pressure Testing	Yes	
Designed AP ₅₀	4.70	m³/(h.m²) @ 50 Pa
Property Tested ?		
As Built AP ₅₀		m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation	
Summer Overheating	
Windows open in hot weather	Windows half open
Cross ventilation possible	Yes
Night Ventilation	No
Air change rate	4.00
Mechanical Ventilation	
Mechanical Ventilation System Present	No

20.0 Fans, Open Fireplaces, Flues				
	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				2
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System	Yes	
Cooled Area	71.91	m²
Data Source	Manufacturer	
Cooling Type	Split or Multi-Split	
Energy Efficiency Ratio	4.27	
System Control	On/Off	

22.0 Lighting	
Internal	
Total number of light fittings	11
Total number of L.E.L. fittings	11
Percentage of L.E.L. fittings	100.00
External	
External lights fitted	No

23.0 Electricity Tariff	7 Hour Off Peak
--------------------------------	-----------------

24.0 Main Heating 1	SAP table	
Description	Storage heaters	
Percentage of Heat	100	%
Main Heating	SEK	
SAP Code	409	
Efficiency (SAP Table)	100.0	%
Controls	CSD Controls for high heat retention storage heaters	
Sap Code	2404	

25.0 Main Heating 2	None
----------------------------	------

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Community Heating	None
28.0 Water Heating	HEI Immersion
Water Heating	Independent
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	Yes
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	903
Immersion Heater	Dual

28.2 Waste Water Heat Recovery System

Total rooms with shower and/or bath 1

Instantaneous System 1

Database ID	80128
Brand Model	Showersave, QB1-21D
Details	Year: 2017 + current Efficiency: 69.7 Utilisation factor: 0.961
Number of mixer showers in rooms with a bath	1
Number of mixer showers in rooms without a bath	0

29.0 Hot Water Cylinder	Hot Water Cylinder
Cylinder In Heated Space	Yes
Insulation Type	Foam
Insulation Thickness	80 mm
Cylinder Volume	150.00 L

32.0 Photovoltaic Unit		One Dwelling		
PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
1.75	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	£108	A 94	