



Full planning application for single dwelling.

Site to the rear of 12 Sarre Road,
facing Gondar Gardens

Energy Statement
Rev 00

Sustainability strategy

This energy statement has been developed following the energy hierarchy 'Be Lean, Be Clean, Be Green' akin to adopted council strategy. SAP calculations using accredited software have been undertaken to demonstrate the savings associated with the measures incorporated, these focus on building fabric and use of renewable energy sources.

Building Fabric

This is the primary point of focus in reduction of the carbon emission from the development by 19% above the requirements outlined in the building regulations for new build dwellings.

An efficient appropriately designed thermal envelope will greatly mitigate the need for space heating and cooling as heat transmittance through the thermal elements is reduced.

Low air permeability rates will also reduce heating and cooling energy demand by reducing the volume of air that can penetrate the building and a/c calculations list this at 5.

As part of a 'fabric first' approach, the building fabric has been carefully considered and elements listed as follows:

External walls -	0.16
Floors	0.18
Roofs	0.17
Glazed openings	1.62

Overheating

Consideration of the internal spaces overheating due to the glazing has been calculated as slight when measured relative to the Part L1A criteria.

Solar Gain Control and Daylight

With a north south orientation to the building, glazing has been designed to benefit from the excessive solar gains whilst ensuring all habitable rooms are well lit and do not require the use of artificial lighting sources during daylight hours.

At ground floor, the dual aspect nature of the space allows for natural cross ventilation.

Glazing will benefit from low emissivity coatings to limit over heating without reducing the level of natural daylight into the space.

Renewable energy sources

As recommended in the SAP report, solar hot water panels will be installed to the roof. This in tandem with low energy lights will reduce carbon emissions.

Water efficiency

Water fittings will be specified with the following or similar flow rates to meet the target water consumption of 105 L/p/day:

- Wash basin and kitchen taps – 6.5 L/min
- Showers – 7.5 L/min
- Bath – 120l to overflow
- Dishwasher - 1.2 L/place setting
- Washing machine - 9 L/kg load
- WC – 6/4 litre dual flush

Water meters will be installed to encourage residents to limit their consumption.

Materials

Brick has been chosen for the external facade, akin to the local context this provides a durable low maintenance building material that has a long life. Insulation as denoted in the SAP calculations will be sustainably sourced, with Thermafleece, a naturally UK produced insulation being adopted.

Low embodied final finishes internally will also be given consideration and adopted in so far as viable and these will also be responsibly sourced, with consideration of cradle to cradle where viable when considering whole life cycle analysis.

Where possible, FSC or equivalent timber will be used. Sourcing of other materials will include products where the manufacturer employs an environmental management system such as ISO 14001 or BES 6001. Where possible, materials will be sourced locally.

Waste Management and Construction

Construction site waste will be managed in such a way to reduce the amount of waste produced as much as possible, and the waste hierarchy will be followed. In addition, at least 85% of waste that does arise will be recycled using an external waste contractor.

Household waste will be recycled through the local authority collection scheme. Internal recycling bins in a kitchen cupboard will be provided to facilitate this, with space for caddies in the bin store.

Conclusion

To conclude, the measures taken will reduce carbon emissions above the building regulations for this 2 bed unit by 21.28%.

SAP Calculations to demonstrate this are as appended,



elmhurst
energy



SAP Report Submission for Building Regulations Compliance

Client: Formed Architects

Project: Rear of 12 Sarre Road

Contact: Carlos Val Escudero
Carlos Val
carlos@rjacoustics.com

Report Issue Date: 22/09/2020

EXCELLENCE
IN ENERGY
ASSESSMENT

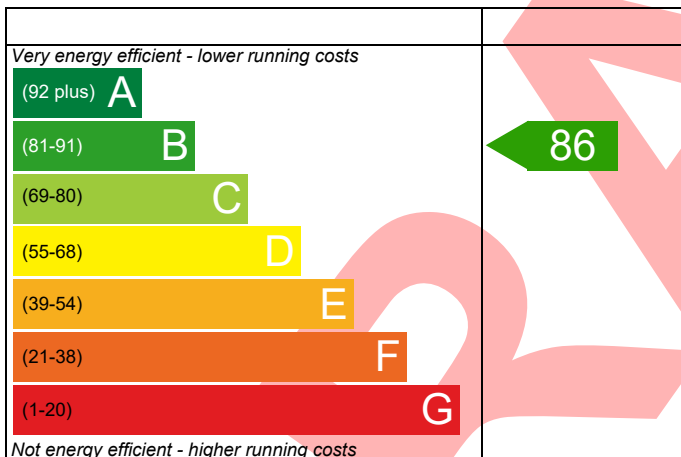
PREDICTED ENERGY ASSESSMENT

Dwelling type: House, Detached
 Date of assessment: 22/09/2020
 Produced by: Carlos Val
 Total floor area: 72.19 m²

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.

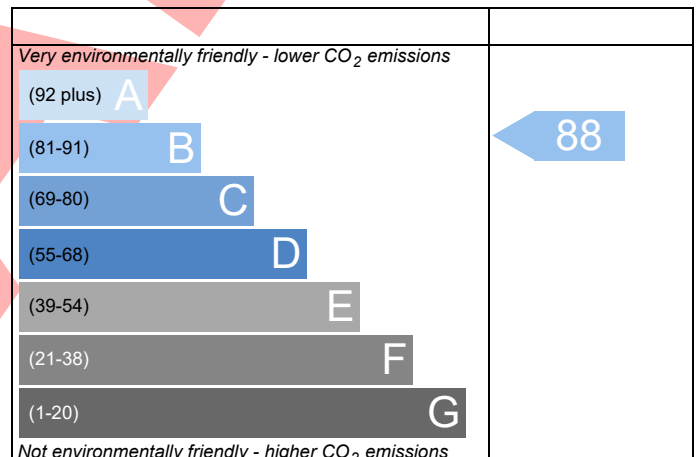
Energy Efficiency Rating



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 not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Designed)

Property Reference	1500	Issued on Date	22/09/2020
Assessment Reference	As design 2 bed	Prop Type Ref	
Property			

SAP Rating	86 B	DER	16.66	TER	21.16
Environmental	88 B	% DER<TER	21.28		
CO ₂ Emissions (t/year)	0.93	DFEE	63.25	TFEE	66.01
General Requirements Compliance	Pass	% DFEE<TFEE	4.18		

Assessor Details	Mr. Carlos Val Escudero, Carlos Val, Tel: 01923 518923, carlos@rjacoustics.com	Assessor ID	H664-0001
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Client	Formed Architects, 1500
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SUMMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	21.16	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.66	kgCO ₂ /m ²	Pass
	-4.50 (-21.3%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	66.01	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	63.25	kWh/m ² /yr	
	-2.8 (-4.2%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.16 (max. 0.70)	Pass
Floor	0.18 (max. 0.25)	0.20 (max. 0.70)	Pass
Roof	0.17 (max. 0.20)	0.17 (max. 0.35)	Pass
Openings	1.62 (max. 2.00)	1.80 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

Limiting System Efficiencies

4 Heating efficiency

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BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Designed)

Main heating system

Boiler system with radiators or underfloor - Mains gas
Data from database
Worcester Greenstar 8000 Life GR8300iW 50 R NG

Efficiency: 89.7% SEDBUK2009
Minimum: 88.0%

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

Measured cylinder loss: 1.75 kWh/day
Permitted by DBSCG 2.24

Pass

Primary pipework insulated

Yes

Pass

6 Controls

Space heating controls

Time and temperature zone control

Pass

Hot water controls

Cylinderstat

Pass

Independent timer for DHW

Pass

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100 %

Minimum

75 %

Pass

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)

Slight

Pass

Based on:

Overshading

Average

Windows facing North East

5.89 m², No overhang

Windows facing South West

13.36 m², No overhang

Air change rate

4.00 ach

Blinds/curtains

Light-coloured venetian blind, closed 50% of daylight hours

Criterion 4 – Building performance consistent with DER and DFEE rate

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

5.00 (design value) m³/(h.m²) @ 50 Pa

Maximum

10.0 m³/(h.m²) @ 50 Pa

Pass

10 Key features

Photovoltaic array

1.20 kW

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RECOMMENDATIONS

	Typical cost	Typical savings per year	Energy efficiency	Environmental impact	Result
Low energy lights			0	0	Already installed
Solar water heating	£4,000 - £6,000	£40	B 88	B 90	Recommended
Photovoltaic			0	0	Already installed
Wind turbine			0	0	Not applicable
Totals	£4,000 - £6,000	£40	B 88	B 90	

DRAFT

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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	1500			Issued on Date	22/09/2020
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Property					
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Environmental	88 B	% DER<TER	21.28		
CO ₂ Emissions (t/year)	0.93	DFEE	63.25	TFEE	66.01
General Requirements Compliance	Pass	% DFEE<TFEE	4.18		
Assessor Details	Mr. Carlos Val Escudero, Carlos Val, Tel: 01923 518923, carlos@rjacoustics.com			Assessor ID	H664-0001
Client	Formed Architects, 1500				

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

Detached 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:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 21.16 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 16.66 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 66.0 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 63.2 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.16 (max. 0.70)	OK
Floor	0.18 (max. 0.25)	0.20 (max. 0.70)	OK
Roof	0.17 (max. 0.20)	0.17 (max. 0.35)	OK
Openings	1.62 (max. 2.00)	1.80 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas

Data from database

Worcester Greenstar 8000 Life GR8300iW 50 R NG

Efficiency: 89.7% SEDBUK2009

Minimum: 88.0% OK

Secondary heating system:

None

5 Cylinder insulation

Hot water storage Measured cylinder loss: 1.75 kWh/day

Permitted by DBSCG 2.24

OK

Primary pipework insulated:

Yes

OK

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls:

Cylinderstat

OK

Independent timer for DHW

OK

Boiler interlock

Yes

OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%

Minimum

75%

OK

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames Valley): Slight OK

Based on:

Overshading:

Average

Windows facing North East:

5.89 m², No overhang

Windows facing South West:

13.36 m², No overhang

Air change rate:

4.00 ach

Blinds/curtains:

Light-coloured venetian blind, closed 50% of daylight hours

10 Key features

Photovoltaic array 1.20 kW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	35.3400 (1b)	2.6800 (2b)	94.7112 (1b) - (3b)
First floor	36.8500 (1c)	2.7500 (2c)	101.3375 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.1900		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 196.0487 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ 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				4 * 10 =	40.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)				40.0000 / (5) =	0.2040 (8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate				0.4540 (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) =		0.3859 (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	0.4921	0.4824	0.4728	0.4245	0.4149	0.3666	0.3666	0.3570	0.3859	0.4149	0.4342	0.4535 (22b)
Effective ac	0.6211	0.6164	0.6118	0.5901	0.5861	0.5672	0.5672	0.5637	0.5745	0.5861	0.5943	0.6028 (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
Entrance door			2.1100	1.8000	3.7980		(26)
Windows (Uw = 1.60)			19.2500	1.5038	28.9474		(27)
Rooflights (Uw = 1.60)			2.1800	1.5038	3.2782		(27a)
Heat Loss Floor			33.8300	0.1800	6.0894		(28a)
Exposed floor			1.5100	0.2000	0.3020		(28b)
External Wall	135.6900	21.3600	114.3300	0.1600	18.2928		(29a)
External Roof	38.0600	2.1800	35.8800	0.1700	6.0996		(30)
Total net area of external elements Aum(A, m ²)			209.0900				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	66.8074	(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 250.0000 (35)
 Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.8118 (36)
 Total fabric heat loss (33) + (36) = 80.6192 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	40.1801	39.8760	39.5779	38.1777	37.9157	36.6962	36.6962	36.4703	37.1659	37.9157	38.4457	38.9997 (38)
Heat transfer coeff	120.7993	120.4951	120.1970	118.7968	118.5349	117.3153	117.3153	117.0895	117.7851	118.5349	119.0648	119.6189 (39)
Average = Sum(39)m / 12 =												118.7956 (39)
HLP	1.6734	1.6691	1.6650	1.6456	1.6420	1.6251	1.6251	1.6220	1.6316	1.6420	1.6493	1.6570 (40)
HLP (average)												1.6456 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.2981 (42)
Average daily hot water use (litres/day)												88.7798 (43)
Daily hot water use	97.6578	94.1066	90.5554	87.0042	83.4530	79.9018	79.9018	83.4530	87.0042	90.5554	94.1066	97.6578 (44)
Energy conte	144.8237	126.6637	130.7056	113.9523	109.3400	94.3521	87.4311	100.3284	101.5267	118.3195	129.1550	140.2540 (45)
Energy content (annual)												Total = Sum(45)m = 1396.8521 (45)
Distribution loss (46)m = 0.15 x (45)m												
21.7236	18.9996	19.6058	17.0928	16.4010	14.1528	13.1147	15.0493	15.2290	17.7479	19.3733	21.0381 (46)	
Water storage loss:												
Store volume												200.0000 (47)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

a) If manufacturer declared loss factor is known (kWh/day):													1.7500 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.9450 (55)
Total storage loss													
	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage													
	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	197.3811	174.1349	183.2630	164.8143	161.8974	145.2141	139.9885	152.8858	152.3887	170.8769	180.0170	192.8114	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
								Solar input (sum of months) = Sum(63)m =				0.0000 (63)	
Output from w/h													
	197.3811	174.1349	183.2630	164.8143	161.8974	145.2141	139.9885	152.8858	152.3887	170.8769	180.0170	192.8114	(64)
	Total per year (kWh/year) = Sum(64)m =											2015.6731 (64)	
Heat gains from water heating, kWh/month													
	90.1998	80.0926	85.5055	78.5787	78.4015	72.0617	71.1167	75.4051	74.4472	81.3872	83.6336	88.6804	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	114.9049	114.9049	114.9049	114.9049	114.9049	114.9049	114.9049	114.9049	114.9049	114.9049	114.9049	114.9049	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	18.0400	16.0229	13.0307	9.8651	7.3743	6.2257	6.7271	8.7441	11.7363	14.9019	17.3927	18.5413	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	202.3534	204.4532	199.1618	187.8970	173.6772	160.3126	151.3843	149.2845	154.5759	165.8407	180.0605	193.4251	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.4905	34.4905	34.4905	34.4905	34.4905	34.4905	34.4905	34.4905	34.4905	34.4905	34.4905	34.4905	(69)
Pumps, fans													
	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	(71)
Water heating gains (Table 5)													
	121.2363	119.1855	114.9268	109.1371	105.3783	100.0856	95.5870	101.3510	103.3989	109.3914	116.1578	119.1941	(72)
Total internal gains	402.1011	400.1331	387.5908	367.3707	346.9013	327.0954	314.1698	319.8510	330.1826	350.6054	374.0825	391.6319	(73)

6. Solar gains

[Jan]		Area	Solar flux										
		m ²	Table 6a	Specific data	g	Specific data	FF	Access		Gains			
			W/m ²	or Table 6b		or Table 6c		factor		W			
Northeast		5.8900	11.2829	0.6300		0.7000		0.7700		20.3100			(75)
Southwest		13.3600	36.7938	0.6300		0.7000		0.7700		150.2288			(79)
Southeast		1.0900	32.2347	0.6300		0.7000		1.0000		13.9454			(82)
Northwest		1.0900	20.9739	0.6300		0.7000		1.0000		9.0738			(82)

Solar gains	193.5580	343.9296	506.1429	683.1008	813.5745	828.2959	790.0428	690.0194	567.2470	389.9198	234.4831	163.9043	(83)
Total gains	595.6591	744.0627	893.7337	1050.4715	1160.4758	1155.3914	1104.2126	1009.8704	897.4296	740.5252	608.5656	555.5362	(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	41.5002	41.6049	41.7081	42.1997	42.2930	42.7326	42.7326	42.8151	42.5622	42.2930	42.1047	41.9097	
alpha	3.7667	3.7737	3.7805	3.8133	3.8195	3.8488	3.8488	3.8543	3.8375	3.8195	3.8070	3.7940	
util living area	0.9929	0.9833	0.9593	0.8955	0.7717	0.6004	0.4538	0.5102	0.7522	0.9377	0.9859	0.9945	(86)
MIT	19.3064	19.5638	19.9468	20.4073	20.7530	20.9316	20.9819	20.9720	20.8354	20.3572	19.7419	19.2646	(87)
Th 2	19.5600	19.5630	19.5660	19.5801	19.5827	19.5950	19.5950	19.5973	19.5902	19.5827	19.5774	19.5718	(88)
util rest of house	0.9904	0.9775	0.9451	0.8597	0.6994	0.4881	0.3155	0.3656	0.6486	0.9079	0.9800	0.9925	(89)
MIT 2	17.3794	17.7534	18.3017	18.9410	19.3680	19.5564	19.5898	19.5882	19.4770	18.8965	18.0242	17.3262	(90)
Living area fraction									fLA = Living area / (4) =				0.3779 (91)
MIT	18.1076	18.4375	18.9234	19.4951	19.8914	20.0761	20.1159	20.1111	19.9903	19.4484	18.6733	18.0587	(92)
Temperature adjustment													-0.1500
adjusted MIT	17.9576	18.2875	18.7734	19.3451	19.7414	19.9261	19.9659	19.9611	19.8403	19.2984	18.5233	17.9087	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9861	0.9702	0.9348	0.8526	0.7084	0.5162	0.3532	0.4048	0.6694	0.9002	0.9736	0.9891	(94)
Useful gains	587.3925	721.8933	835.4505	895.6042	822.1132	596.4615	389.9921	408.7622	600.7099	666.5851	592.4879	549.4549	(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													
	1649.8266	1613.1332	1475.2217	1240.8438	953.1860	624.8332	394.8713	416.9674	676.1276	1031.0694	1360.1147	1639.8180	(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													
	790.4510	598.9132	475.9898	248.5726	97.5182	0.0000	0.0000	0.0000	0.0000	271.1763	552.6913	811.2301	(98)
Space heating													3846.5426 (98)
Space heating per m ²													(98) / (4) = 53.2836 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													4240.9510 (211)
Space heating requirement	790.4510	598.9132	475.9898	248.5726	97.5182	0.0000	0.0000	0.0000	0.0000	271.1763	552.6913	811.2301	(98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)
Space heating fuel (main heating system)	871.5006	660.3232	524.7958	274.0602	107.5173	0.0000	0.0000	0.0000	0.0000	298.9816	609.3620	894.4103	(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	197.3811	174.1349	183.2630	164.8143	161.8974	145.2141	139.9885	152.8858	152.3887	170.8769	180.0170	192.8114	(64)
Efficiency of water heater (217)m	88.3391	88.0473	87.4486	86.1083	83.7124	80.0000	80.0000	80.0000	80.0000	86.2412	87.8144	88.4287	(216)
Fuel for water heating, kWh/month	223.4356	197.7743	209.5665	191.4036	193.3971	181.5176	174.9856	191.1073	190.4858	198.1384	204.9972	218.0416	(219)
Water heating fuel used													2374.8506 (219)
Annual totals kWh/year													
Space heating fuel - main system													4240.9510 (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)													318.5913 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.20 * 1080 * 0.80) =										-829.0749			-829.0749 (233)
Total delivered energy for all uses													6180.3179 (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	4240.9510	0.2160	916.0454	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2374.8506	0.2160	512.9677	(264)
Space and water heating			1429.0131	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	318.5913	0.5190	165.3489	(268)
Energy saving/generation technologies				
PV Unit	-829.0749	0.5190	-430.2899	(269)
Total CO2, kg/year			1202.9971	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			16.6600	(273)

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

DER		16.6600	ZC1
Total Floor Area		72.1900	TFA
Assumed number of occupants		2.2981	N
CO2 emission factor in Table 12 for electricity displaced from grid		0.5190	EF
CO2 emissions from appliances, equation (L14)		16.6104	ZC2
CO2 emissions from cooking, equation (L16)		2.4124	ZC3
Total CO2 emissions		35.6828	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
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		35.6828	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	35.3400 (1b)	2.6800 (2b)	94.7112 (1b) - (3b)
First floor	36.8500 (1c)	2.7500 (2c)	101.3375 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.1900		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 196.0487 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				3 * 10 =	30.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) =	0.1530 (8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate				0.4030 (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) =		0.3426 (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												
Effective ac	0.4368	0.4282	0.4196	0.3768	0.3683	0.3254	0.3254	0.3169	0.3426	0.3683	0.3854	0.4025 (22b)
	0.5954	0.5917	0.5881	0.5710	0.5678	0.5530	0.5530	0.5502	0.5587	0.5678	0.5743	0.5810 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1100	1.0000	2.1100		(26)
TER Opening Type (Uw = 1.40)			14.3200	1.3258	18.9848		(27)
TER Room Window (Uw = 1.70)			1.6200	1.5918	2.5787		(27a)
Heat Loss Floor			33.8300	0.1300	4.3979		(28a)
Exposed floor			1.5100	0.1300	0.1963		(28b)
External Wall	135.6900	16.4300	119.2600	0.1800	21.4668		(29a)
External Roof	38.0600	1.6200	36.4400	0.1300	4.7372		(30)
Total net area of external elements Aum(A, m ²)			209.0900				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 54.4717		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 250.0000 (35)
 Thermal bridges (Sum(L x Psi) calculated using Appendix K) 12.7257 (36)
 Total fabric heat loss (33) + (36) = 67.1974 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	38.5192	38.2796	38.0447	36.9414	36.7350	35.7741	35.7741	35.5961	36.1442	36.7350	37.1526	37.5891 (38)
Heat transfer coeff	105.7166	105.4770	105.2421	104.1388	103.9324	102.9715	102.9715	102.7935	103.3416	103.9324	104.3500	104.7865 (39)
Average = Sum(39)m / 12 =												104.1378 (39)
HLP	1.4644	1.4611	1.4578	1.4426	1.4397	1.4264	1.4264	1.4239	1.4315	1.4397	1.4455	1.4515 (40)
HLP (average)												1.4426 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.2981 (42)
Average daily hot water use (litres/day)												88.7798 (43)
Daily hot water use	97.6578	94.1066	90.5554	87.0042	83.4530	79.9018	79.9018	83.4530	87.0042	90.5554	94.1066	97.6578 (44)
Energy conte	144.8237	126.6637	130.7056	113.9523	109.3400	94.3521	87.4311	100.3284	101.5267	118.3195	129.1550	140.2540 (45)
Energy content (annual)												Total = Sum(45)m = 1396.8521 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	21.7236	18.9996	19.6058	17.0928	16.4010	14.1528	13.1147	15.0493	15.2290	17.7479	19.3733	21.0381 (46)
Store volume												200.0000 (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):											1.6525 (48)	
Temperature factor from Table 2b											0.5400 (49)	
Enter (49) or (54) in (55)											0.8924 (55)	
Total storage loss	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637 (56)
If cylinder contains dedicated solar storage												
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (57)
Total heat required for water heating calculated for each month	195.7497	172.6615	181.6317	163.2356	160.2660	143.6354	138.3571	151.2545	150.8100	169.2456	178.4383	191.1801 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	195.7497	172.6615	181.6317	163.2356	160.2660	143.6354	138.3571	151.2545	150.8100	169.2456	178.4383	191.1801 (64)
Heat gains from water heating, kWh/month	88.8947	78.9139	84.2005	77.3158	77.0964	70.7987	69.8117	74.1001	73.1843	80.0821	82.3707	87.3753 (65)
											Solar input (sum of months) = Sum(63)m =	0.0000 (63)
											Total per year (kWh/year) = Sum(64)m =	1996.4655 (64)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	114.9049	114.9049	114.9049	114.9049	114.9049	114.9049	114.9049	114.9049	114.9049	114.9049	114.9049	114.9049 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.0371	16.0204	13.0286	9.8635	7.3731	6.2247	6.7260	8.7427	11.7344	14.8995	17.3900	18.5384 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	202.3534	204.4532	199.1618	187.8970	173.6772	160.3126	151.3843	149.2845	154.5759	165.8407	180.0605	193.4251 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4905	34.4905	34.4905	34.4905	34.4905	34.4905	34.4905	34.4905	34.4905	34.4905	34.4905	34.4905 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239 (71)
Water heating gains (Table 5)	119.4822	117.4314	113.1727	107.3830	103.6242	98.3315	93.8329	99.5969	101.6448	107.6372	114.4037	117.4399 (72)
Total internal gains	400.3441	398.3764	385.8346	365.6150	345.1460	325.3403	312.4146	318.0955	328.4266	348.8489	372.3256	389.8749 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	4.3800	11.2829	0.6300	0.7000	0.7700	15.1032 (75)
Southwest	9.9400	36.7938	0.6300	0.7000	0.7700	111.7721 (79)
Southeast	0.8100	32.2347	0.6300	0.7000	1.0000	10.3631 (82)
Northwest	0.8100	20.9739	0.6300	0.7000	1.0000	6.7429 (82)

Solar gains	143.9812	255.8304	376.4754	508.0755	605.1012	616.0434	587.5955	513.2144	421.9173	290.0354	174.4227	121.9238 (83)
Total gains	544.3253	654.2069	762.3100	873.6906	950.2472	941.3837	900.0101	831.3099	750.3439	638.8843	546.7483	511.7986 (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	47.4211	47.5288	47.6349	48.1395	48.2352	48.6853	48.6853	48.7695	48.5109	48.2352	48.0421	47.8420
alpha	4.1614	4.1686	4.1757	4.2093	4.2157	4.2457	4.2457	4.2513	4.2341	4.2157	4.2028	4.1895
util living area	0.9948	0.9884	0.9716	0.9229	0.8151	0.6454	0.4895	0.5453	0.7878	0.9524	0.9896	0.9960 (86)
MIT	19.4939	19.7053	20.0326	20.4396	20.7627	20.9363	20.9845	20.9758	20.8491	20.4162	19.8773	19.4576 (87)
Th 2	19.7143	19.7168	19.7193	19.7309	19.7330	19.7432	19.7432	19.7450	19.7392	19.7330	19.7286	19.7240 (88)
util rest of house	0.9930	0.9844	0.9616	0.8954	0.7527	0.5401	0.3566	0.4079	0.6956	0.9294	0.9853	0.9946 (89)
MIT 2	17.7516	18.0599	18.5318	19.1057	19.5165	19.7047	19.7382	19.7364	19.6290	19.0898	18.3200	17.7052 (90)
Living area fraction												fLA = Living area / (4) =
MIT	18.4100	18.6817	19.0989	19.6098	19.9874	20.1701	20.2092	20.2047	20.0900	19.5910	18.9085	18.3675 (92)
Temperature adjustment												0.0000
adjusted MIT	18.4100	18.6817	19.0989	19.6098	19.9874	20.1701	20.2092	20.2047	20.0900	19.5910	18.9085	18.3675 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9904	0.9800	0.9553	0.8923	0.7666	0.5779	0.4072	0.4602	0.7242	0.9262	0.9814	0.9924 (94)	
Ext temp.	539.0873	641.0948	728.2460	779.5876	728.4808	544.0263	366.4878	382.5449	543.4330	591.7142	536.6022	507.9116 (95)	
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)	
Month fracti	1491.6646	1453.6523	1325.9346	1115.3006	861.3290	573.5652	371.6421	391.1028	619.0204	934.4565	1232.2164	1484.5592 (97)	
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000 (97a)	
Space heating	708.7175	546.0386	444.6803	241.7134	98.8391	0.0000	0.0000	0.0000	0.0000	255.0003	500.8422	726.6258 (98)	
Space heating per m ²												(98) / (4) =	48.7943 (99)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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													3767.3340 (211)
Space heating requirement	708.7175	546.0386	444.6803	241.7134	98.8391	0.0000	0.0000	0.0000	0.0000	255.0003	500.8422	726.6258	(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)	757.9867	583.9985	475.5939	258.5170	105.7103	0.0000	0.0000	0.0000	0.0000	272.7276	535.6601	777.1399	(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	195.7497	172.6615	181.6317	163.2356	160.2660	143.6354	138.3571	151.2545	150.8100	169.2456	178.4383	191.1801	(64)
Efficiency of water heater (217)m	87.9478	87.6757	87.1126	85.8593	83.5691	79.8000	79.8000	79.8000	79.8000	85.9049	87.4208	88.0410	(216)
Fuel for water heating, kWh/month	222.5749	196.9319	208.5021	190.1199	191.7767	179.9942	173.3799	189.5420	188.9849	197.0152	204.1142	217.1489	(219)
Water heating fuel used													2360.0848 (219)
Annual totals kWh/year													
Space heating fuel - main system													3767.3340 (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)													318.5405 (232)
Total delivered energy for all uses													6520.9593 (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	3767.3340	0.2160	813.7442	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2360.0848	0.2160	509.7783	(264)
Space and water heating			1323.5225	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	318.5405	0.5190	165.3225	(268)
Total CO2, kg/m2/year			1527.7700	(272)
Emissions per m2 for space and water heating			18.3339	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.2901	(272b)
Emissions per m2 for pumps and fans			0.5392	(272c)
Target Carbon Dioxide Emission Rate (TER) = (18.3339 * 1.00) + 2.2901 + 0.5392, rounded to 2 d.p.			21.1600	(273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	35.3400 (1b)	x 2.6800 (2b)	= 94.7112 (1b) - (3b)
First floor	36.8500 (1c)	x 2.7500 (2c)	= 101.3375 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.1900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 196.0487 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					30.0000 / (5) = 0.1530 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4030 (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) =		0.3426 (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												
Effective ac	0.4368	0.4282	0.4196	0.3768	0.3683	0.3254	0.3254	0.3169	0.3426	0.3683	0.3854	0.4025 (22b)
	0.5954	0.5917	0.5881	0.5710	0.5678	0.5530	0.5530	0.5502	0.5587	0.5678	0.5743	0.5810 (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
Entrance door			2.1100	1.8000	3.7980		(26)
Windows (Uw = 1.60)			19.2500	1.5038	28.9474		(27)
Rooflights (Uw = 1.60)			2.1800	1.5038	3.2782		(27a)
Heat Loss Floor			33.8300	0.1800	6.0894		(28a)
Exposed floor			1.5100	0.2000	0.3020		(28b)
External Wall	135.6900	21.3600	114.3300	0.1600	18.2928		(29a)
External Roof	38.0600	2.1800	35.8800	0.1700	6.0996		(30)
Total net area of external elements Aum(A, m ²)			209.0900				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 66.8074		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 250.0000 (35)
 Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.8118 (36)
 Total fabric heat loss (33) + (36) = 80.6192 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	38.5192	38.2796	38.0447	36.9414	36.7350	35.7741	35.7741	35.5961	36.1442	36.7350	37.1526	37.5891 (38)
Heat transfer coeff	119.1384	118.8987	118.6638	117.5606	117.3542	116.3932	116.3932	116.2153	116.7634	117.3542	117.7717	118.2083 (39)
Average = Sum(39)m / 12 =												117.5596 (39)
HLP	1.6503	1.6470	1.6438	1.6285	1.6256	1.6123	1.6123	1.6099	1.6174	1.6256	1.6314	1.6375 (40)
HLP (average)												1.6285 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.2981 (42)
Average daily hot water use (litres/day)												88.7798 (43)
Daily hot water use	97.6578	94.1066	90.5554	87.0042	83.4530	79.9018	79.9018	83.4530	87.0042	90.5554	94.1066	97.6578 (44)
Energy conte	144.8237	126.6637	130.7056	113.9523	109.3400	94.3521	87.4311	100.3284	101.5267	118.3195	129.1550	140.2540 (45)
Energy content (annual)												Total = Sum(45)m = 1396.8521 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Total storage loss												

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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	0.0000	(56)
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	(57)
Heat gains from water heating, kWh/month	30.7750	26.9160	27.7749	24.2149	23.2347	20.0498	18.5791	21.3198	21.5744	25.1429	27.4454	29.8040		(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	114.9049	114.9049	114.9049	114.9049	114.9049	114.9049	114.9049	114.9049	114.9049	114.9049	114.9049	114.9049	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.0400	16.0229	13.0307	9.8651	7.3743	6.2257	6.7271	8.7441	11.7363	14.9019	17.3927	18.5413	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	202.3534	204.4532	199.1618	187.8970	173.6772	160.3126	151.3843	149.2845	154.5759	165.8407	180.0605	193.4251	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4905	34.4905	34.4905	34.4905	34.4905	34.4905	34.4905	34.4905	34.4905	34.4905	34.4905	34.4905	(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)	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	(71)
Water heating gains (Table 5)	41.3643	40.0536	37.3319	33.6318	31.2295	27.8470	24.9719	28.6556	29.9645	33.7942	38.1187	40.0591	(72)
Total internal gains	319.2291	318.0013	306.9959	288.8653	269.7525	251.8567	240.5547	244.1556	253.7481	272.0083	293.0433	309.4970	(73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	5.8900	11.2829	0.6300	0.7000	0.7700	20.3100 (75)
Southwest	13.3600	36.7938	0.6300	0.7000	0.7700	150.2288 (79)
Southeast	1.0900	32.2347	0.6300	0.7000	1.0000	13.9454 (82)
Northwest	1.0900	20.9739	0.6300	0.7000	1.0000	9.0738 (82)

Solar gains	193.5580	343.9296	506.1429	683.1008	813.5745	828.2959	790.0428	690.0194	567.2470	389.9198	234.4831	163.9043	(83)
Total gains	512.7871	661.9309	813.1388	971.9662	1083.3270	1080.1527	1030.5975	934.1751	820.9951	661.9281	527.5265	473.4013	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area, nil,m (see Table 9a)	0.9957	0.9885	0.9690	0.9129	0.7967	0.6289	0.4797	0.5421	0.7868	0.9542	0.9912	0.9968	(86)
MIT	19.2366	19.4969	19.8867	20.3596	20.7266	20.9213	20.9787	20.9662	20.8085	20.2950	19.6674	19.1910	(87)
Th 2	19.5766	19.5790	19.5814	19.5925	19.5946	19.6043	19.6043	19.6061	19.6006	19.5946	19.5904	19.5860	(88)
util rest of house	0.9942	0.9844	0.9578	0.8815	0.7276	0.5153	0.3359	0.3920	0.6876	0.9309	0.9874	0.9957	(89)
MIT 2	18.0144	18.2743	18.6581	19.1136	19.4291	19.5733	19.6001	19.5984	19.5074	19.0686	18.4539	17.9760	(90)
Living area fraction									fLA = Living area / (4) =			0.3779	(91)
MIT	18.4763	18.7363	19.1224	19.5844	19.9194	20.0827	20.1210	20.1153	19.9991	19.5320	18.9125	18.4352	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4763	18.7363	19.1224	19.5844	19.9194	20.0827	20.1210	20.1153	19.9991	19.5320	18.9125	18.4352	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	508.9473	649.4584	775.0115	856.5669	807.4346	601.2678	402.7956	419.8334	590.7458	615.3086	519.5289	470.7424	(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	1688.9387	1645.1206	1497.8225	1256.0680	964.5810	638.1492	409.8241	431.7737	688.7952	1048.2089	1391.1771	1682.7132	(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	877.9136	669.0850	537.7714	287.6407	116.9169	0.0000	0.0000	0.0000	0.0000	322.0778	627.5867	901.7063	(98)
Space heating per m ²										(98) / (4) =		60.1288	(99)

8c. Space cooling requirement

Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1094.0965	861.3100	883.2363	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8617	0.9141	0.8859	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	942.7692	787.3613	782.4156	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1319.0692	1261.0357	1154.4284	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)

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Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	270.9360	352.4137	276.7775	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												900.1273 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)												
Space cooling kWh	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	67.7340	88.1034	69.1944	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												225.0318 (107)
Space cooling per m2												3.1172 (108)
Energy for space heating												60.1288 (99)
Energy for space cooling												3.1172 (108)
Total												63.2460 (109)
Dwelling Fabric Energy Efficiency (DFEE)												63.2 (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 (m2)	Storey height (m)	Volume (m3)
Ground floor	35.3400 (1b)	2.6800 (2b)	94.7112 (1b) - (3b)
First floor	36.8500 (1c)	2.7500 (2c)	101.3375 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.1900		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 196.0487 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				3 * 10 =	30.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) =	0.1530 (8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate				0.4030 (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) =		0.3426 (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	0.4368	0.4282	0.4196	0.3768	0.3683	0.3254	0.3254	0.3169	0.3426	0.3683	0.3854	0.4025 (22b)
Effective ac	0.5954	0.5917	0.5881	0.5710	0.5678	0.5530	0.5530	0.5502	0.5587	0.5678	0.5743	0.5810 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			2.1100	1.0000	2.1100		(26)
TER Opening Type (Uw = 1.40)			14.3200	1.3258	18.9848		(27)
TER Room Window (Uw = 1.70)			1.6200	1.5918	2.5787		(27a)
Heat Loss Floor			33.8300	0.1300	4.3979		(28a)
Exposed floor			1.5100	0.1300	0.1963		(28b)
External Wall	135.6900	16.4300	119.2600	0.1800	21.4668		(29a)
External Roof	38.0600	1.6200	36.4400	0.1300	4.7372		(30)
Total net area of external elements Aum(A, m2)			209.0900				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 54.4717		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)
 Thermal bridges (Sum(L x Psi) calculated using Appendix K) 12.7257 (36)
 Total fabric heat loss (33) + (36) = 67.1974 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	38.5192	38.2796	38.0447	36.9414	36.7350	35.7741	35.7741	35.5961	36.1442	36.7350	37.1526	37.5891 (38)
Heat transfer coeff	105.7166	105.4770	105.2421	104.1388	103.9324	102.9715	102.9715	102.7935	103.3416	103.9324	104.3500	104.7865 (39)
Average = Sum(39)m / 12 =												104.1378 (39)
HLP	1.4644	1.4611	1.4578	1.4426	1.4397	1.4264	1.4264	1.4239	1.4315	1.4397	1.4455	1.4515 (40)
HLP (average)												1.4426 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.2981 (42)
Average daily hot water use (litres/day)												88.7798 (43)
Daily hot water use	97.6578	94.1066	90.5554	87.0042	83.4530	79.9018	79.9018	83.4530	87.0042	90.5554	94.1066	97.6578 (44)
Energy conte	144.8237	126.6637	130.7056	113.9523	109.3400	94.3521	87.4311	100.3284	101.5267	118.3195	129.1550	140.2540 (45)
Energy content (annual)												Total = Sum(45)m = 1396.8521 (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

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	0.0000	0.0000	(56)
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	0.0000	(57)
Heat gains from water heating, kWh/month	30.7750	26.9160	27.7749	24.2149	23.2347	20.0498	18.5791	21.3198	21.5744	25.1429	27.4454	29.8040			(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	114.9049	114.9049	114.9049	114.9049	114.9049	114.9049	114.9049	114.9049	114.9049	114.9049	114.9049	114.9049	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.0371	16.0204	13.0286	9.8635	7.3731	6.2247	6.7260	8.7427	11.7344	14.8995	17.3900	18.5384	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	202.3534	204.4532	199.1618	187.8970	173.6772	160.3126	151.3843	149.2845	154.5759	165.8407	180.0605	193.4251	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4905	34.4905	34.4905	34.4905	34.4905	34.4905	34.4905	34.4905	34.4905	34.4905	34.4905	34.4905	(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)	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	(71)
Water heating gains (Table 5)	41.3643	40.0536	37.3319	33.6318	31.2295	27.8470	24.9719	28.6556	29.9645	33.7942	38.1187	40.0591	(72)
Total internal gains	319.2263	317.9987	306.9938	288.8638	269.7513	251.8557	240.5536	244.1543	253.7462	272.0059	293.0406	309.4940	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	4.3800	11.2829	0.6300	0.7000	0.7700	15.1032 (75)
Southwest	9.9400	36.7938	0.6300	0.7000	0.7700	111.7721 (79)
Southeast	0.8100	32.2347	0.6300	0.7000	1.0000	10.3631 (82)
Northwest	0.8100	20.9739	0.6300	0.7000	1.0000	6.7429 (82)

Solar gains	143.9812	255.8304	376.4754	508.0755	605.1012	616.0434	587.5955	513.2144	421.9173	290.0354	174.4227	121.9238	(83)
Total gains	463.2075	573.8291	683.4692	796.9393	874.8525	867.8992	828.1491	757.3687	675.6635	562.0413	467.4633	431.4178	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area, nil _m (see Table 9a)													21.0000 (85)
tau	47.4211	47.5288	47.6349	48.1395	48.2352	48.6853	48.6853	48.7695	48.5109	48.2352	48.0421	47.8420	
alpha	4.1614	4.1686	4.1757	4.2093	4.2157	4.2457	4.2457	4.2513	4.2341	4.2157	4.2028	4.1895	
util living area	0.9972	0.9928	0.9804	0.9412	0.8463	0.6850	0.5271	0.5898	0.8301	0.9685	0.9942	0.9979	(86)
MIT	19.3960	19.6106	19.9456	20.3700	20.7205	20.9201	20.9795	20.9676	20.8116	20.3369	19.7831	19.3599	(87)
Th 2	19.7143	19.7168	19.7193	19.7309	19.7330	19.7432	19.7432	19.7450	19.7392	19.7330	19.7286	19.7240	(88)
util rest of house	0.9962	0.9902	0.9732	0.9187	0.7889	0.5786	0.3864	0.4452	0.7449	0.9521	0.9917	0.9972	(89)
MIT 2	18.2769	18.4922	18.8248	19.2420	19.5542	19.7092	19.7386	19.7368	19.6409	19.2213	18.6741	18.2485	(90)
Living area fraction													0.3779 (91)
MIT	18.6998	18.9149	19.2483	19.6683	19.9949	20.1668	20.2075	20.2019	20.0833	19.6429	19.0932	18.6685	(92)
Temperature adjustment													0.0000
adjusted MIT	18.6998	18.9149	19.2483	19.6683	19.9949	20.1668	20.2075	20.2019	20.0833	19.6429	19.0932	18.6685	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9951	0.9881	0.9697	0.9173	0.8023	0.6170	0.4402	0.5005	0.7715	0.9506	0.9900	0.9963	(94)
Useful gains	460.9227	566.9815	662.7812	731.0647	701.8901	535.4927	364.5590	379.0909	521.2528	534.2789	462.7666	429.8205	(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	1522.2998	1478.2456	1341.6613	1121.3959	862.1117	573.2220	371.4722	390.8100	618.3247	939.8497	1251.4872	1516.1024	(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	789.6646	612.3695	505.0868	281.0385	119.2049	0.0000	0.0000	0.0000	0.0000	301.7447	567.8788	808.1937	(98)
Space heating per m2										(98) / (4) =		55.2041	(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	967.9319	761.9890	781.2309	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8504	0.9092	0.8807	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	823.1084	692.8065	687.9935	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1078.3778	1031.3872	953.5406	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	183.7940	251.9041	197.5670	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling													633.2650 (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	45.9485	62.9760	49.3917	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling													158.3163 (107)
Space cooling per m2													2.1930 (108)
Energy for space heating													55.2041 (99)
Energy for space cooling													2.1930 (108)
Total													57.3971 (109)
Target Fabric Energy Efficiency (TFEE)													66.0 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	35.3400 (1b)	2.6800 (2b)	94.7112 (1b) - (3b)
First floor	36.8500 (1c)	2.7500 (2c)	101.3375 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.1900		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 196.0487 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ 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				4 * 10 =	40.0000 (7a)							
Number of passive vents				0 * 10 =	0.0000 (7b)							
Number of flueless gas fires				0 * 40 =	0.0000 (7c)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				40.0000 / (5) =	0.2040 (8)							
Pressure test				Yes								
Measured/design AP50				5.0000								
Infiltration rate				0.4540 (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) =		0.3859 (21)							
Wind speed	Jan 4.2000	Feb 4.0000	Mar 4.0000	Apr 3.7000	May 3.7000	Jun 3.3000	Jul 3.4000	Aug 3.2000	Sep 3.3000	Oct 3.5000	Nov 3.5000	Dec 3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.4052	0.3859	0.3859	0.3570	0.3570	0.3184	0.3280	0.3087	0.3184	0.3377	0.3377	0.3666 (22b)
Effective ac	0.5821	0.5745	0.5745	0.5637	0.5637	0.5507	0.5538	0.5477	0.5507	0.5570	0.5570	0.5672 (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					
Entrance door			2.1100	1.8000	3.7980		(26)					
Windows (Uw = 1.60)			19.2500	1.5038	28.9474		(27)					
Rooflights (Uw = 1.60)			2.1800	1.5038	3.2782		(27a)					
Heat Loss Floor			33.8300	0.1800	6.0894		(28a)					
Exposed floor			1.5100	0.2000	0.3020		(28b)					
External Wall	135.6900	21.3600	114.3300	0.1600	18.2928		(29a)					
External Roof	38.0600	2.1800	35.8800	0.1700	6.0996		(30)					
Total net area of external elements Aum(A, m ²)			209.0900				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =		66.8074 (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)							13.8118 (36)					
Total fabric heat loss							(33) + (36) = 80.6192 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 37.6598	Feb 37.1659	Mar 37.1659	Apr 36.4703	May 36.4703	Jun 35.6272	Jul 35.8290	Aug 35.4315	Sep 35.6272	Oct 36.0367	Nov 36.0367	Dec 36.6962 (38)
Heat transfer coeff	118.2789	117.7851	117.7851	117.0895	117.0895	116.2464	116.4481	116.0506	116.2464	116.6559	116.6559	117.3153 (39)
Average = Sum(39)m / 12 =												116.9706 (39)
HLP	Jan 1.6384	Feb 1.6316	Mar 1.6316	Apr 1.6220	May 1.6220	Jun 1.6103	Jul 1.6131	Aug 1.6076	Sep 1.6103	Oct 1.6160	Nov 1.6160	Dec 1.6251 (40)
HLP (average)												1.6203 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												
Average daily hot water use (litres/day)												2.2981 (42)
Daily hot water use	97.6578	94.1066	90.5554	87.0042	83.4530	79.9018	79.9018	83.4530	87.0042	90.5554	94.1066	97.6578 (44)
Energy conte	144.8237	126.6637	130.7056	113.9523	109.3400	94.3521	87.4311	100.3284	101.5267	118.3195	129.1550	140.2540 (45)
Energy content (annual)												Total = Sum(45)m = 1396.8521 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	21.7236	18.9996	19.6058	17.0928	16.4010	14.1528	13.1147	15.0493	15.2290	17.7479	19.3733	21.0381 (46)
Store volume												200.0000 (47)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

a) If manufacturer declared loss factor is known (kWh/day):																			1.7500 (48)	
Temperature factor from Table 2b																			0.5400 (49)	
Enter (49) or (54) in (55)																			0.9450 (55)	
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	28.3500	29.2950	28.3500	29.2950	28.3500	29.2950	28.3500	29.2950 (56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	28.3500	29.2950	28.3500	29.2950	28.3500	29.2950	28.3500	29.2950 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	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	197.3811	174.1349	183.2630	164.8143	161.8974	145.2141	139.9885	152.8858	152.3887	170.8769	180.0170	192.8114	192.8114	192.8114	192.8114	192.8114	192.8114	192.8114	192.8114	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Output from w/h	197.3811	174.1349	183.2630	164.8143	161.8974	145.2141	139.9885	152.8858	152.3887	170.8769	180.0170	192.8114	192.8114	192.8114	192.8114	192.8114	192.8114	192.8114	192.8114	(64)
RHI water heating demand	90.1998	80.0926	85.5055	78.5787	78.4015	72.0617	71.1167	75.4051	74.4472	81.3872	83.6336	88.6804	88.6804	88.6804	88.6804	88.6804	88.6804	88.6804	88.6804	(65)

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

Metabolic gains (Table 5), Watts	Month												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	137.8858	137.8858	137.8858	137.8858	137.8858	137.8858	137.8858	137.8858	137.8858	137.8858	137.8858	137.8858	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	45.0999	40.0573	32.5768	24.6627	18.4357	15.5642	16.8176	21.8602	29.3407	37.2548	43.4819	46.3534	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	302.0201	305.1541	297.2565	280.4433	259.2198	239.2726	225.9467	222.8126	230.7103	247.5234	268.7470	288.6941	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.0867	51.0867	51.0867	51.0867	51.0867	51.0867	51.0867	51.0867	51.0867	51.0867	51.0867	51.0867	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	(71)
Water heating gains (Table 5)	121.2363	119.1855	114.9268	109.1371	105.3783	100.0856	95.5870	101.3510	103.3989	109.3914	116.1578	119.1941	(72)
Total internal gains	568.4049	564.4455	544.8087	514.2918	483.0824	454.9710	438.4000	446.0725	463.4986	494.2182	528.4353	554.2902	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W							
Northeast	5.8900	12.9236	0.6300	0.7000	0.7700	23.2632 (75)							
Southwest	13.3600	40.4699	0.6300	0.7000	0.7700	165.2382 (79)							
Southeast	1.0900	36.7235	0.6300	0.7000	1.0000	15.8874 (82)							
Northwest	1.0900	24.2711	0.6300	0.7000	1.0000	10.5002 (82)							
Solar gains	214.8890	344.2495	502.3850	702.1093	817.2920	891.4723	840.7204	749.1095	611.4843	417.2484	266.8235	180.1363	(83)
Total gains	783.2938	908.6951	1047.1937	1216.4011	1300.3743	1346.4434	1279.1204	1195.1819	1074.9828	911.4666	795.2588	734.4265	(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	42.3845	42.5622	42.5622	42.8151	42.8151	43.1256	43.0509	43.1983	43.1256	42.9742	42.9742	42.7326	
alpha	3.8256	3.8375	3.8375	3.8543	3.8543	3.8750	3.8701	3.8799	3.8750	3.8649	3.8649	3.8488	
util living area	0.9792	0.9635	0.9223	0.8194	0.6489	0.4221	0.2807	0.3084	0.5844	0.8607	0.9590	0.9830	(86)
MIT	19.6696	19.8777	20.2392	20.6371	20.8887	20.9844	20.9977	20.9967	20.9448	20.6258	20.0960	19.6310	(87)
Th 2	19.5853	19.5902	19.5902	19.5973	19.5973	19.6058	19.6038	19.6078	19.6058	19.6017	19.6017	19.5950	(88)
util rest of house	0.9722	0.9516	0.8970	0.7658	0.5588	0.3090	0.1550	0.1754	0.4619	0.8038	0.9429	0.9772	(89)
MIT 2	17.9198	18.2184	18.7205	19.2395	19.5169	19.6003	19.6035	19.6074	19.5784	19.2490	18.5416	17.8714	(90)
Living area fraction	fLA = Living area / (4) =												
MIT	18.5811	18.8454	19.2944	19.7676	20.0353	20.1233	20.1304	20.1324	20.0948	19.7693	19.1289	18.5364	(92)
Temperature adjustment	-0.1500												
adjusted MIT	18.4311	18.6954	19.1444	19.6176	19.8853	19.9733	19.9804	19.9824	19.9448	19.6193	18.9789	18.3864	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9642	0.9415	0.8872	0.7667	0.5786	0.3395	0.1891	0.2115	0.4935	0.8047	0.9333	0.9700	(94)
Useful gains	755.2144	855.5745	929.0230	932.5999	752.3869	457.0568	241.9415	252.7860	530.5176	733.4147	742.2499	712.4045	(95)
Ext temp.	5.1000	5.6000	7.4000	9.0000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000	(96)
Heat loss rate W	1576.7835	1542.4454	1383.3194	1137.8308	806.1996	461.8861	242.2552	253.2712	551.5628	935.4949	1280.7592	1558.6935	(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	611.2474	461.5773	337.9965	147.7662	40.0367	0.0000	0.0000	0.0000	0.0000	150.3477	387.7266	629.6391	(98)
Space heating RHI space heating demand	2766.3374 (98)												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	35.3400 (1b)	2.6800 (2b)	94.7112 (1b) - (3b)
First floor	36.8500 (1c)	2.7500 (2c)	101.3375 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.1900		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 196.0487 (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				4 * 10 =	40.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				40.0000 / (5) =	0.2040 (8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate				0.4540 (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) =		0.3859 (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	0.4921	0.4824	0.4728	0.4245	0.4149	0.3666	0.3666	0.3570	0.3859	0.4149	0.4342	0.4535 (22b)
Effective ac	0.6211	0.6164	0.6118	0.5901	0.5861	0.5672	0.5672	0.5637	0.5745	0.5861	0.5943	0.6028 (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
Entrance door			2.1100	1.8000	3.7980		(26)
Windows (Uw = 1.60)			19.2500	1.5038	28.9474		(27)
Rooflights (Uw = 1.60)			2.1800	1.5038	3.2782		(27a)
Heat Loss Floor			33.8300	0.1800	6.0894		(28a)
Exposed floor			1.5100	0.2000	0.3020		(28b)
External Wall	135.6900	21.3600	114.3300	0.1600	18.2928		(29a)
External Roof	38.0600	2.1800	35.8800	0.1700	6.0996		(30)
Total net area of external elements Aum(A, m2)			209.0900				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	66.8074	(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)
 Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.8118 (36)
 Total fabric heat loss (33) + (36) = 80.6192 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	40.1801	39.8760	39.5779	38.1777	37.9157	36.6962	36.6962	36.4703	37.1659	37.9157	38.4457	38.9997 (38)
Heat transfer coeff	120.7993	120.4951	120.1970	118.7968	118.5349	117.3153	117.3153	117.0895	117.7851	118.5349	119.0648	119.6189 (39)
Average = Sum(39)m / 12 =												118.7956 (39)
HLP	1.6734	1.6691	1.6650	1.6456	1.6420	1.6251	1.6251	1.6220	1.6316	1.6420	1.6493	1.6570 (40)
HLP (average)												1.6456 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.2981 (42)
Average daily hot water use (litres/day)												88.7798 (43)
Daily hot water use	97.6578	94.1066	90.5554	87.0042	83.4530	79.9018	79.9018	83.4530	87.0042	90.5554	94.1066	97.6578 (44)
Energy conte	144.8237	126.6637	130.7056	113.9523	109.3400	94.3521	87.4311	100.3284	101.5267	118.3195	129.1550	140.2540 (45)
Energy content (annual)										Total = Sum(45)m =		1396.8521 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.7236	18.9996	19.6058	17.0928	16.4010	14.1528	13.1147	15.0493	15.2290	17.7479	19.3733	21.0381 (46)
Water storage loss:												
Store volume												200.0000 (47)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

a) If manufacturer declared loss factor is known (kWh/day):																			1.7500 (48)	
Temperature factor from Table 2b																			0.5400 (49)	
Enter (49) or (54) in (55)																			0.9450 (55)	
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	28.3500	29.2950	28.3500	29.2950	28.3500	29.2950	28.3500	29.2950 (56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	28.3500	29.2950	28.3500	29.2950	28.3500	29.2950	28.3500	29.2950 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	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	197.3811	174.1349	183.2630	164.8143	161.8974	145.2141	139.9885	152.8858	152.3887	170.8769	180.0170	192.8114	192.8114	192.8114	192.8114	192.8114	192.8114	192.8114	192.8114	192.8114 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	197.3811	174.1349	183.2630	164.8143	161.8974	145.2141	139.9885	152.8858	152.3887	170.8769	180.0170	192.8114	192.8114	192.8114	192.8114	192.8114	192.8114	192.8114	192.8114	192.8114 (64)
Heat gains from water heating, kWh/month	90.1998	80.0926	85.5055	78.5787	78.4015	72.0617	71.1167	75.4051	74.4472	81.3872	83.6336	88.6804	88.6804	88.6804	88.6804	88.6804	88.6804	88.6804	88.6804	88.6804 (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	137.8858	137.8858	137.8858	137.8858	137.8858	137.8858	137.8858	137.8858	137.8858	137.8858	137.8858	137.8858	137.8858 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	45.0999	40.0573	32.5768	24.6627	18.4357	15.5642	16.8176	21.8602	29.3407	37.2548	43.4819	46.3534	46.3534 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	302.0201	305.1541	297.2565	280.4433	259.2198	239.2726	225.9467	222.8126	230.7103	247.5234	268.7470	288.6941	288.6941 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.0867	51.0867	51.0867	51.0867	51.0867	51.0867	51.0867	51.0867	51.0867	51.0867	51.0867	51.0867	51.0867 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239 (71)
Water heating gains (Table 5)	121.2363	119.1855	114.9268	109.1371	105.3783	100.0856	95.5870	101.3510	103.3989	109.3914	116.1578	119.1941	119.1941 (72)
Total internal gains	568.4049	564.4455	544.8087	514.2918	483.0824	454.9710	438.4000	446.0725	463.4986	494.2182	528.4353	554.2902	554.2902 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	5.8900	11.2829	0.6300	0.7000	0.7700	20.3100 (75)
Southwest	13.3600	36.7938	0.6300	0.7000	0.7700	150.2288 (79)
Southeast	1.0900	32.2347	0.6300	0.7000	1.0000	13.9454 (82)
Northwest	1.0900	20.9739	0.6300	0.7000	1.0000	9.0738 (82)

Solar gains	193.5580	343.9296	506.1429	683.1008	813.5745	828.2959	790.0428	690.0194	567.2470	389.9198	234.4831	163.9043	163.9043 (83)
Total gains	761.9628	908.3751	1050.9516	1197.3926	1296.6569	1283.2670	1228.4428	1136.0919	1030.7456	884.1380	762.9184	718.1945	718.1945 (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	41.5002	41.6049	41.7081	42.1997	42.2930	42.7326	42.7326	42.8151	42.5622	42.2930	42.1047	41.9097	41.9097 (86)							
alpha	3.7667	3.7737	3.7805	3.8133	3.8195	3.8488	3.8488	3.8543	3.8375	3.8195	3.8070	3.7940	3.7940 (86)							
util living area	0.9839	0.9688	0.9356	0.8578	0.7239	0.5518	0.4114	0.4597	0.6904	0.9005	0.9710	0.9869	0.9869 (86)							
MIT	19.4944	19.7402	20.0966	20.5104	20.8045	20.9488	20.9871	20.9804	20.8791	20.4787	19.9098	19.4508	19.4508 (87)							
Th 2	19.5600	19.5630	19.5660	19.5801	19.5827	19.5950	19.5950	19.5973	19.5902	19.5827	19.5774	19.5718	19.5718 (88)							
util rest of house	0.9786	0.9588	0.9151	0.8145	0.6481	0.4442	0.2844	0.3264	0.5837	0.8591	0.9599	0.9826	0.9826 (89)							
MIT 2	17.6504	18.0035	18.5055	19.0672	19.4182	19.5670	19.5914	19.5911	19.5114	19.0489	18.2617	17.5953	17.5953 (90)							
Living area fraction									fLA = Living area / (4) =				0.3779 (91)							
MIT	18.3472	18.6598	19.1068	19.6126	19.9421	20.0892	20.1188	20.1161	20.0283	19.5892	18.8845	18.2965	18.2965 (92)							
Temperature adjustment													-0.1500							
adjusted MIT	18.1972	18.5098	18.9568	19.4626	19.7921	19.9392	19.9688	19.9661	19.8783	19.4392	18.7345	18.1465	18.1465 (93)							

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9715	0.9490	0.9041	0.8104	0.6603	0.4718	0.3189	0.3626	0.6076	0.8539	0.9508	0.9763	0.9763 (94)
Ext temp.	740.2255	862.0072	950.2170	970.3352	856.1597	605.4385	391.7920	411.9356	626.2874	754.9691	725.4052	701.1825	701.1825 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	4.2000 (96)
Month fracti	1678.7757	1639.9123	1497.2667	1254.7995	959.1915	626.3684	395.2148	417.5544	680.5941	1047.7576	1385.2594	1668.2651	1668.2651 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating per m2	698.2814	522.7522	407.0050	204.8143	76.6556	0.0000	0.0000	0.0000	0.0000	217.8347	475.0950	719.5095	719.5095 (98)
													3321.9477 (98)
										(98) / (4) =			46.0167 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3662.5664 (211)
Space heating requirement	698.2814	522.7522	407.0050	204.8143	76.6556	0.0000	0.0000	0.0000	0.0000	217.8347	475.0950	719.5095	(98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)
Space heating fuel (main heating system)	769.8802	576.3531	448.7376	225.8152	84.5156	0.0000	0.0000	0.0000	0.0000	240.1705	523.8093	793.2850	(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	197.3811	174.1349	183.2630	164.8143	161.8974	145.2141	139.9885	152.8858	152.3887	170.8769	180.0170	192.8114	(64)
Efficiency of water heater (217)m	88.1032	87.7668	87.0838	85.5953	83.1522	80.0000	80.0000	80.0000	80.0000	85.6633	87.4847	88.2067	(217)
Fuel for water heating, kWh/month	224.0341	198.4064	210.4445	192.5507	194.7001	181.5176	174.9856	191.1073	190.4858	199.4750	205.7698	218.5905	(219)
Water heating fuel used													2382.0674 (219)
Annual totals kWh/year													
Space heating fuel - main system													3662.5664 (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)													318.5913 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.20 * 1080 * 0.80) =										-829.0749			-829.0749 (233)
Total delivered energy for all uses													5609.1502 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3662.5664	3.4800	127.4573 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2382.0674	3.4800	82.8959 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	318.5913	13.1900	42.0222 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-829.0749	13.1900	-109.3550 (252)
Total energy cost			272.9130 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.9781 (257)
SAP value		86.3555
SAP rating (Section 12)		86 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3662.5664	0.2160	791.1143 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2382.0674	0.2160	514.5266 (264)
Space and water heating			1305.6409 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	318.5913	0.5190	165.3489 (268)
Energy saving/generation technologies			
PV Unit	-829.0749	0.5190	-430.2899 (269)
Total kg/year			1079.6249 (272)
CO2 emissions per m2			14.9600 (273)
EI value			87.6551
EI rating			88 (274)
EI band			B

Calculation of stars for heating and DHW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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Main heating energy efficiency $3.48 \times (1 + 0.29 \times 0.00) / 0.9070 = 3.837$, stars = 4
Main heating environmental impact $0.216 \times (1 + 0.29 \times 0.00) / 0.9070 = 0.2381$, stars = 4
Water heating energy efficiency $3.48 / 0.8442 = 4.122$, stars = 4
Water heating environmental impact $0.216 / 0.8442 = 0.2559$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	35.3400 (1b)	x 2.6800 (2b)	= 94.7112 (1b) - (3b)
First floor	36.8500 (1c)	x 2.7500 (2c)	= 101.3375 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.1900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 196.0487 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ 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				4 * 10 =	40.0000 (7a)							
Number of passive vents				0 * 10 =	0.0000 (7b)							
Number of flueless gas fires				0 * 40 =	0.0000 (7c)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)				40.0000 / (5) =	0.2040 (8)							
Pressure test				Yes								
Measured/design AP50				5.0000								
Infiltration rate				0.4540 (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) =		0.3859 (21)							
Wind speed	Jan 4.2000	Feb 4.0000	Mar 4.0000	Apr 3.7000	May 3.7000	Jun 3.3000	Jul 3.4000	Aug 3.2000	Sep 3.3000	Oct 3.5000	Nov 3.5000	Dec 3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.4052	0.3859	0.3859	0.3570	0.3570	0.3184	0.3280	0.3087	0.3184	0.3377	0.3377	0.3666 (22b)
Effective ac	0.5821	0.5745	0.5745	0.5637	0.5637	0.5507	0.5538	0.5477	0.5507	0.5570	0.5570	0.5672 (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					
Entrance door			2.1100	1.8000	3.7980		(26)					
Windows (Uw = 1.60)			19.2500	1.5038	28.9474		(27)					
Rooflights (Uw = 1.60)			2.1800	1.5038	3.2782		(27a)					
Heat Loss Floor			33.8300	0.1800	6.0894		(28a)					
Exposed floor			1.5100	0.2000	0.3020		(28b)					
External Wall	135.6900	21.3600	114.3300	0.1600	18.2928		(29a)					
External Roof	38.0600	2.1800	35.8800	0.1700	6.0996		(30)					
Total net area of external elements Aum(A, m ²)			209.0900				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	66.8074		(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)							13.8118 (36)					
Total fabric heat loss						(33) + (36) =	80.6192 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 37.6598	Feb 37.1659	Mar 37.1659	Apr 36.4703	May 36.4703	Jun 35.6272	Jul 35.8290	Aug 35.4315	Sep 35.6272	Oct 36.0367	Nov 36.0367	Dec 36.6962 (38)
Heat transfer coeff	118.2789	117.7851	117.7851	117.0895	117.0895	116.2464	116.4481	116.0506	116.2464	116.6559	116.6559	117.3153 (39)
Average = Sum(39)m / 12 =												116.9706 (39)
HLP	Jan 1.6384	Feb 1.6316	Mar 1.6316	Apr 1.6220	May 1.6220	Jun 1.6103	Jul 1.6131	Aug 1.6076	Sep 1.6103	Oct 1.6160	Nov 1.6160	Dec 1.6251 (40)
HLP (average)												1.6203 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.2981 (42)
Average daily hot water use (litres/day)												88.7798 (43)
Daily hot water use	97.6578	94.1066	90.5554	87.0042	83.4530	79.9018	79.9018	83.4530	87.0042	90.5554	94.1066	97.6578 (44)
Energy conte	144.8237	126.6637	130.7056	113.9523	109.3400	94.3521	87.4311	100.3284	101.5267	118.3195	129.1550	140.2540 (45)
Energy content (annual)										Total = Sum(45)m =		1396.8521 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.7236	18.9996	19.6058	17.0928	16.4010	14.1528	13.1147	15.0493	15.2290	17.7479	19.3733	21.0381 (46)
Water storage loss:												
Store volume												200.0000 (47)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

a) If manufacturer declared loss factor is known (kWh/day):													1.7500 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.9450 (55)
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month	197.3811	174.1349	183.2630	164.8143	161.8974	145.2141	139.9885	152.8858	152.3887	170.8769	180.0170	192.8114	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Output from w/h	197.3811	174.1349	183.2630	164.8143	161.8974	145.2141	139.9885	152.8858	152.3887	170.8769	180.0170	192.8114	(64)
Heat gains from water heating, kWh/month	90.1998	80.0926	85.5055	78.5787	78.4015	72.0617	71.1167	75.4051	74.4472	81.3872	83.6336	88.6804	(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	137.8858	137.8858	137.8858	137.8858	137.8858	137.8858	137.8858	137.8858	137.8858	137.8858	137.8858	137.8858	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	45.0999	40.0573	32.5768	24.6627	18.4357	15.5642	16.8176	21.8602	29.3407	37.2548	43.4819	46.3534	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	302.0201	305.1541	297.2565	280.4433	259.2198	239.2726	225.9467	222.8126	230.7103	247.5234	268.7470	288.6941	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.0867	51.0867	51.0867	51.0867	51.0867	51.0867	51.0867	51.0867	51.0867	51.0867	51.0867	51.0867	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	(71)
Water heating gains (Table 5)	121.2363	119.1855	114.9268	109.1371	105.3783	100.0856	95.5870	101.3510	103.3989	109.3914	116.1578	119.1941	(72)
Total internal gains	568.4049	564.4455	544.8087	514.2918	483.0824	454.9710	438.4000	446.0725	463.4986	494.2182	528.4353	554.2902	(73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	5.8900	12.9236	0.6300	0.7000	0.7700	23.2632 (75)
Southwest	13.3600	40.4699	0.6300	0.7000	0.7700	165.2382 (79)
Southeast	1.0900	36.7235	0.6300	0.7000	1.0000	15.8874 (82)
Northwest	1.0900	24.2711	0.6300	0.7000	1.0000	10.5002 (82)

Solar gains	214.8890	344.2495	502.3850	702.1093	817.2920	891.4723	840.7204	749.1095	611.4843	417.2484	266.8235	180.1363	(83)
Total gains	783.2938	908.6951	1047.1937	1216.4011	1300.3743	1346.4434	1279.1204	1195.1819	1074.9828	911.4666	795.2588	734.4265	(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	42.3845	42.5622	42.5622	42.8151	42.8151	43.1256	43.0509	43.1983	43.1256	42.9742	42.9742	42.7326	
alpha	3.8256	3.8375	3.8375	3.8543	3.8543	3.8750	3.8701	3.8799	3.8750	3.8649	3.8649	3.8488	
util living area	0.9792	0.9635	0.9223	0.8194	0.6489	0.4221	0.2807	0.3084	0.5844	0.8607	0.9590	0.9830	(86)
MIT	19.6696	19.8777	20.2392	20.6371	20.8887	20.9844	20.9977	20.9967	20.9448	20.6258	20.0960	19.6310	(87)
Th 2	19.5853	19.5902	19.5902	19.5973	19.5973	19.6058	19.6038	19.6078	19.6058	19.6017	19.6017	19.5950	(88)
util rest of house	0.9722	0.9516	0.8970	0.7658	0.5588	0.3090	0.1550	0.1754	0.4619	0.8038	0.9429	0.9772	(89)
MIT 2	17.9198	18.2184	18.7205	19.2395	19.5169	19.6003	19.6035	19.6074	19.5784	19.2490	18.5416	17.8714	(90)
Living area fraction									fLA = Living area / (4) =			0.3779	(91)
MIT	18.5811	18.8454	19.2944	19.7676	20.0353	20.1233	20.1304	20.1324	20.0948	19.7693	19.1289	18.5364	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.4311	18.6954	19.1444	19.6176	19.8853	19.9733	19.9804	19.9824	19.9448	19.6193	18.9789	18.3864	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9642	0.9415	0.8872	0.7667	0.5786	0.3395	0.1891	0.2115	0.4935	0.8047	0.9333	0.9700	(94)
Ext temp.	755.2144	855.5745	929.0230	932.5999	752.3869	457.0568	241.9415	252.7860	530.5176	733.4147	742.2499	712.4045	(95)
Heat loss rate W	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000	(96)
Month fracti	1576.7835	1542.4454	1383.3194	1137.8308	806.1996	461.8861	242.2552	253.2712	551.5628	935.4949	1280.7592	1558.6935	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating	611.2474	461.5773	337.9965	147.7662	40.0367	0.0000	0.0000	0.0000	0.0000	150.3477	387.7266	629.6391	(98)
Space heating per m ²												2766.3374	(98)
													(98) / (4) =
													38.3202 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

8c. Space cooling requirement

Not applicable

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3049.9862 (211)
Space heating requirement	611.2474	461.5773	337.9965	147.7662	40.0367	0.0000	0.0000	0.0000	0.0000	150.3477	387.7266	629.6391	(98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)
Space heating fuel (main heating system)	673.9222	508.9055	372.6533	162.9175	44.1418	0.0000	0.0000	0.0000	0.0000	165.7638	427.4825	694.1996	(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	197.3811	174.1349	183.2630	164.8143	161.8974	145.2141	139.9885	152.8858	152.3887	170.8769	180.0170	192.8114	(64)
Efficiency of water heater (217)m	87.8325	87.4945	86.6265	84.7250	81.9160	80.0000	80.0000	80.0000	80.0000	84.6754	87.0100	87.9425	(216)
Fuel for water heating, kWh/month	224.7245	199.0239	211.5553	194.5286	197.6383	181.5176	174.9856	191.1073	190.4858	201.8023	206.8923	219.2471	(219)
Water heating fuel used													2393.5085 (219)
Annual totals kWh/year													
Space heating fuel - main system													3049.9862 (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)													318.5913 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.20 * 1140 * 0.80) =										-875.5966			-875.5966 (233)
Total delivered energy for all uses													4961.4893 (238)

10a. Fuel costs - using BEDF prices (465)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3049.9862	3.9500	120.4745 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2393.5085	3.9500	94.5436 (247)
Pumps and fans for heating	75.0000	18.7000	14.0250 (249)
Energy for lighting	318.5913	18.7000	59.5766 (250)
Additional standing charges			91.0000 (251)
Energy saving/generation technologies			
PV Unit	-875.5966	18.7000	-163.7366 (252)
Total energy cost			215.8830 (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	3049.9862	0.2160	658.7970 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2393.5085	0.2160	516.9978 (264)
Space and water heating			1175.7948 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	318.5913	0.5190	165.3489 (268)
Energy saving/generation technologies			
PV Unit	-875.5966	0.5190	-454.4346 (269)
Total kg/year			925.6341 (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	3049.9862	1.2200	3720.9831 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2393.5085	1.2200	2920.0803 (264)
Space and water heating			6641.0635 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	318.5913	3.0700	978.0752 (268)
Energy saving/generation technologies			
PV Unit	-875.5966	3.0700	-2688.0816 (269)
Primary energy kWh/year			5161.3070 (272)
Primary energy kWh/m2/year			71.4961 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

 SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 86
 Current environmental impact rating: B 88

(For testing purposes):

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

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.8	-£ 40	-246 kg (26.6%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£40	3.41 kg/m ²	B 88 B 90
Total Savings	£40	3.41 kg/m²	

Potential energy efficiency rating: B 88
 Potential environmental impact rating: B 90

Fuel prices for cost data on this page from database revision number 465 TEST (04 Sep 2020)
 Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£74	£83	-£9
Mains gas	£306	£256	£50
Space heating	£225	£227	-£2
Water heating	£95	£52	£42
Lighting	£60	£60	£0
Generated (PV)	-£164	-£164	£0
Total cost of fuels	£216	£175	£41
Total cost of uses	£216	£175	£40
Delivered energy	69 kWh/m ²	52 kWh/m ²	17 kWh/m ²
Carbon dioxide emissions	0.9 tonnes	0.7 tonnes	0.2 tonnes
CO2 emissions per m ²	13 kg/m ²	9 kg/m ²	3 kg/m ²
Primary energy	71 kWh/m ²	52 kWh/m ²	19 kWh/m ²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	35.3400 (1b)	2.6800 (2b)	94.7112 (1b) - (3b)
First floor	36.8500 (1c)	2.7500 (2c)	101.3375 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.1900		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 196.0487 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ 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				4 * 10 =	40.0000 (7a)							
Number of passive vents				0 * 10 =	0.0000 (7b)							
Number of flueless gas fires				0 * 40 =	0.0000 (7c)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)				40.0000 / (5) =	0.2040 (8)							
Pressure test				Yes								
Measured/design AP50				5.0000								
Infiltration rate				0.4540 (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) =		0.3859 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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	0.4921	0.4824	0.4728	0.4245	0.4149	0.3666	0.3666	0.3570	0.3859	0.4149	0.4342	0.4535 (22b)
Effective ac	0.6211	0.6164	0.6118	0.5901	0.5861	0.5672	0.5672	0.5637	0.5745	0.5861	0.5943	0.6028 (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					
Entrance door			2.1100	1.8000	3.7980		(26)					
Windows (Uw = 1.60)			19.2500	1.5038	28.9474		(27)					
Rooflights (Uw = 1.60)			2.1800	1.5038	3.2782		(27a)					
Heat Loss Floor			33.8300	0.1800	6.0894		(28a)					
Exposed floor			1.5100	0.2000	0.3020		(28b)					
External Wall	135.6900	21.3600	114.3300	0.1600	18.2928		(29a)					
External Roof	38.0600	2.1800	35.8800	0.1700	6.0996		(30)					
Total net area of external elements Aum(A, m ²)			209.0900				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =		66.8074 (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)							13.8118 (36)					
Total fabric heat loss						(33) + (36) =	80.6192 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 40.1801	Feb 39.8760	Mar 39.5779	Apr 38.1777	May 37.9157	Jun 36.6962	Jul 36.6962	Aug 36.4703	Sep 37.1659	Oct 37.9157	Nov 38.4457	Dec 38.9997 (38)
Heat transfer coeff	120.7993	120.4951	120.1970	118.7968	118.5349	117.3153	117.3153	117.0895	117.7851	118.5349	119.0648	119.6189 (39)
Average = Sum(39)m / 12 =												118.7956 (39)
HLP	Jan 1.6734	Feb 1.6691	Mar 1.6650	Apr 1.6456	May 1.6420	Jun 1.6251	Jul 1.6251	Aug 1.6220	Sep 1.6316	Oct 1.6420	Nov 1.6493	Dec 1.6570 (40)
HLP (average)												1.6456 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.2981 (42)
Average daily hot water use (litres/day)												88.7798 (43)
Daily hot water use	97.6578	94.1066	90.5554	87.0042	83.4530	79.9018	79.9018	83.4530	87.0042	90.5554	94.1066	97.6578 (44)
Energy conte	144.8237	126.6637	130.7056	113.9523	109.3400	94.3521	87.4311	100.3284	101.5267	118.3195	129.1550	140.2540 (45)
Energy content (annual)												Total = Sum(45)m = 1396.8521 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	21.7236	18.9996	19.6058	17.0928	16.4010	14.1528	13.1147	15.0493	15.2290	17.7479	19.3733	21.0381 (46)
Store volume												200.0000 (47)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9727	0.9507	0.9069	0.8160	0.6691	0.4802	0.3255	0.3702	0.6154	0.8583	0.9528	0.9774	(94)
Useful gains	729.6729	852.3266	941.0309	961.2727	850.4289	603.8765	391.4791	411.4206	623.3874	747.4690	715.6601	690.4358	(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	1676.7665	1638.0552	1495.5031	1253.1186	958.1881	626.1017	395.1549	417.4588	680.0911	1046.3490	1383.4079	1666.2398	(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	704.6377	528.0096	412.5273	210.1291	80.1729	0.0000	0.0000	0.0000	0.0000	222.3667	480.7784	725.9982	(98)
Space heating													
Space heating per m2													(98) / (4) = 46.6078 (99)

8c. Space cooling requirement

Not applicable

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3709.6139 (211)
Space heating requirement	704.6377	528.0096	412.5273	210.1291	80.1729	0.0000	0.0000	0.0000	0.0000	222.3667	480.7784	725.9982	(98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)
Space heating fuel (main heating system)	776.8883	582.1495	454.8261	231.6748	88.3935	0.0000	0.0000	0.0000	0.0000	245.1673	530.0754	800.4390	(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	161.5592	122.7679	100.2968	52.8319	21.2501	7.0769	2.5952	30.7425	58.7697	105.5142	139.9264	161.0421	(64)
Efficiency of water heater (217)m	88.4924	88.4678	88.3879	88.3265	88.2276	80.0000	80.0000	80.0000	80.0000	86.9572	88.0453	88.5498	(216)
Fuel for water heating, kWh/month	182.5684	138.7712	113.4735	59.8144	24.0856	8.8462	3.2440	38.4281	73.4621	121.3404	158.9255	181.8661	(219)
Water heating fuel used													
Annual totals kWh/year													
Space heating fuel - main system													3709.6139 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
pump for solar water heating													50.0000 (230g)
Total electricity for the above, kWh/year													125.0000 (231)
Electricity for lighting (calculated in Appendix L)													318.5913 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.20 * 1080 * 0.80) =										-829.0749			-829.0749 (233)
Total delivered energy for all uses													4428.9557 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3709.6139	3.4800	129.0946	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1104.8254	3.4800	38.4479	(247)
Pumps and fans for heating	75.0000	13.1900	9.8925	(249)
Pump for solar water heating	50.0000	13.1900	6.5950	(249)
Energy for lighting	318.5913	13.1900	42.0222	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	-829.0749	13.1900	-109.3550	(252)
Total energy cost			236.6972	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.8483	(257)
SAP value		88.1662	
SAP rating (Section 12)		88	(258)
SAP band		B	

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3709.6139	0.2160	801.2766 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1104.8254	0.2160	238.6423 (264)
Space and water heating			1039.9189 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	318.5913	0.5190	165.3489 (268)
Energy saving/generation technologies			
PV Unit	-829.0749	0.5190	-430.2899 (269)
Total kg/year			839.8529 (272)
CO2 emissions per m2			11.6300 (273)
EI value			90.3968
EI rating			90 (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 (m2)	Storey height (m)	Volume (m3)
Ground floor	35.3400 (1b)	x 2.6800 (2b)	= 94.7112 (1b) - (3b)
First floor	36.8500 (1c)	x 2.7500 (2c)	= 101.3375 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.1900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 196.0487 (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				4 * 10 =	40.0000 (7a)							
Number of passive vents				0 * 10 =	0.0000 (7b)							
Number of flueless gas fires				0 * 40 =	0.0000 (7c)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)				40.0000 / (5) =	0.2040 (8)							
Pressure test				Yes								
Measured/design AP50				5.0000								
Infiltration rate				0.4540 (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) =		0.3859 (21)							
Wind speed	Jan 4.2000	Feb 4.0000	Mar 4.0000	Apr 3.7000	May 3.7000	Jun 3.3000	Jul 3.4000	Aug 3.2000	Sep 3.3000	Oct 3.5000	Nov 3.5000	Dec 3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.4052	0.3859	0.3859	0.3570	0.3570	0.3184	0.3280	0.3087	0.3184	0.3377	0.3377	0.3666 (22b)
Effective ac	0.5821	0.5745	0.5745	0.5637	0.5637	0.5507	0.5538	0.5477	0.5507	0.5570	0.5570	0.5672 (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					
Entrance door			2.1100	1.8000	3.7980		(26)					
Windows (Uw = 1.60)			19.2500	1.5038	28.9474		(27)					
Rooflights (Uw = 1.60)			2.1800	1.5038	3.2782		(27a)					
Heat Loss Floor			33.8300	0.1800	6.0894		(28a)					
Exposed floor			1.5100	0.2000	0.3020		(28b)					
External Wall	135.6900	21.3600	114.3300	0.1600	18.2928		(29a)					
External Roof	38.0600	2.1800	35.8800	0.1700	6.0996		(30)					
Total net area of external elements Aum(A, m2)			209.0900				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	66.8074		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.8118 (36)					
Total fabric heat loss						(33) + (36) =	80.6192 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 37.6598	Feb 37.1659	Mar 37.1659	Apr 36.4703	May 36.4703	Jun 35.6272	Jul 35.8290	Aug 35.4315	Sep 35.6272	Oct 36.0367	Nov 36.0367	Dec 36.6962 (38)
Heat transfer coeff	118.2789	117.7851	117.7851	117.0895	117.0895	116.2464	116.4481	116.0506	116.2464	116.6559	116.6559	117.3153 (39)
Average = Sum(39)m / 12 =												116.9706 (39)
HLP	Jan 1.6384	Feb 1.6316	Mar 1.6316	Apr 1.6220	May 1.6220	Jun 1.6103	Jul 1.6131	Aug 1.6076	Sep 1.6103	Oct 1.6160	Nov 1.6160	Dec 1.6251 (40)
HLP (average)												1.6203 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.2981 (42)
Average daily hot water use (litres/day)												88.7798 (43)
Daily hot water use	97.6578	94.1066	90.5554	87.0042	83.4530	79.9018	79.9018	83.4530	87.0042	90.5554	94.1066	97.6578 (44)
Energy conte	144.8237	126.6637	130.7056	113.9523	109.3400	94.3521	87.4311	100.3284	101.5267	118.3195	129.1550	140.2540 (45)
Energy content (annual)										Total = Sum(45)m =		1396.8521 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.7236	18.9996	19.6058	17.0928	16.4010	14.1528	13.1147	15.0493	15.2290	17.7479	19.3733	21.0381 (46)
Water storage loss:												
Store volume												200.0000 (47)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

a) If manufacturer declared loss factor is known (kWh/day):													1.7500 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.9450 (55)
Total storage loss													
	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	56)
If cylinder contains dedicated solar storage													
	18.3094	16.5375	18.3094	17.7188	18.3094	17.7188	18.3094	18.3094	17.7188	18.3094	17.7188	18.3094	57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624	59)
Total heat required for water heating calculated for each month													
	186.3955	164.2124	170.8816	147.4295	138.1174	121.9761	115.9759	129.8038	136.3545	158.4956	169.3858	181.8258	62)
Aperture area of solar collector													3.0000 (H1)
Zero-loss collector efficiency													0.7000 (H2)
Collector heat loss coefficient													1.8000 (H3)
Collector 2nd order heat loss coefficient													0.0050 (H3a)
Collector effective heat loss coefficient													1.8063 (H3b)
Collector performance ratio													2.5804 (H4)
Annual solar radiation per m2													1140.0998 (H5)
Overshading factor													0.8000 (H6)
Solar energy available													1915.3676 (H7)
Adjustment factor for showers													1.0000 (H7a)
Solar-to-load ratio													1.3712 (H8)
Utilisation factor													0.5177 (H9)
Collector performance factor													0.8793 (H10)
Dedicated solar storage volume													75.0000 (H11)
Effective solar volume													112.5000 (H13)
Daily hot water demand													88.7798 (H14)
Volume ratio Veff/V													1.2672 (H15)
Solar storage volume factor													1.0000 (H16)
Solar input													-871.9743 (H17)
Solar input	-26.8389	-40.3389	-67.9358	-93.9080	-113.0968	-119.0295	-116.1714	-103.7417	-80.9708	-55.0829	-32.6234	-22.2362	63)
Solar input (sum of months) = Sum(63)m =													-871.9743 (63)
Output from w/h													
	159.5565	123.8736	102.9459	53.5215	25.0206	2.9466	0.0000	26.0620	55.3838	103.4127	136.7624	159.5895	64)
Total per year (kWh/year) = Sum(64)m =													949.0750 (64)
Heat gains from water heating, kWh/month													
	81.4113	72.1546	75.6004	64.6709	59.3775	53.4713	51.9067	56.9395	61.6199	71.4821	75.1286	79.8919	65)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	137.8858	137.8858	137.8858	137.8858	137.8858	137.8858	137.8858	137.8858	137.8858	137.8858	137.8858	137.8858	66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	45.0999	40.0573	32.5768	24.6627	18.4357	15.5642	16.8176	21.8602	29.3407	37.2548	43.4819	46.3534	67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	302.0201	305.1541	297.2565	280.4433	259.2198	239.2726	225.9467	222.8126	230.7103	247.5234	268.7470	288.6941	68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	51.0867	51.0867	51.0867	51.0867	51.0867	51.0867	51.0867	51.0867	51.0867	51.0867	51.0867	51.0867	69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	70)
Losses e.g. evaporation (negative values) (Table 5)													
	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	-91.9239	71)
Water heating gains (Table 5)													
	109.4238	107.3730	101.6135	89.8206	79.8085	74.2657	69.7671	76.5315	85.5832	96.0781	104.3453	107.3816	72)
Total internal gains													
	556.5924	552.6330	531.4954	494.9753	457.5125	429.1511	412.5800	421.2530	445.6829	480.9049	516.6228	542.4777	73)

6. Solar gains

[Jan]			Area	Solar flux		g	FF		Access		Gains	
			m2	Table 6a	Specific data	Specific data	Specific data	Factor	Factor	Factor	W	
				W/m2	or Table 6b	or Table 6c	or Table 6c	Table 6d	Table 6d	Table 6d		
Northeast			5.8900	12.9236	0.6300	0.7000	0.7700				23.2632 (75)	
Southwest			13.3600	40.4699	0.6300	0.7000	0.7700				165.2382 (79)	
Southeast			1.0900	36.7235	0.6300	0.7000	1.0000				15.8874 (82)	
Northwest			1.0900	24.2711	0.6300	0.7000	1.0000				10.5002 (82)	
Solar gains	214.8890	344.2495	502.3850	702.1093	817.2920	891.4723	840.7204	749.1095	611.4843	417.2484	266.8235	180.1363 (83)
Total gains	771.4813	896.8826	1033.8804	1197.0846	1274.8045	1320.6234	1253.3004	1170.3625	1057.1671	898.1533	783.4463	722.6140 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, T _{hl} (C)													
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
alpha	42.3845	42.5622	42.5622	42.8151	42.8151	43.1256	43.0509	43.1983	43.1256	42.9742	42.9742	42.7326	
util living area	3.8256	3.8375	3.8375	3.8543	3.8543	3.8750	3.8701	3.8799	3.8750	3.8649	3.8649	3.8488	
	0.9802	0.9650	0.9249	0.8253	0.6582	0.4297	0.2864	0.3148	0.5923	0.8654	0.9608	0.9839 (86)	
MIT	19.6567	19.8656	20.2278	20.6266	20.8831	20.9835	20.9975	20.9964	20.9422	20.6170	20.0841	19.6179 (87)	
Th 2	19.5853	19.5902	19.5902	19.5973	19.5973	19.6058	19.6038	19.6078	19.6058	19.6017	19.6017	19.5950 (88)	
util rest of house													
	0.9735	0.9534	0.9003	0.7725	0.5680	0.3148	0.1582	0.1791	0.4689	0.8095	0.9453	0.9783 (89)	
MIT 2	17.9015	18.2015	18.7055	19.2276	19.5123	19.5999	19.6035	19.6074	19.5770	19.2391	18.5253	17.8526 (90)	
Living area fraction									f _{LA} = Living area / (4) =				
MIT	18.5648	18.8304	19.2807	19.7562	20.0303	20.1227	20.1303	20.1323	20.0929	19.7598	19.1143	18.5197 (92)	
Temperature adjustment												-0.1500	
adjusted MIT	18.4148	18.6804	19.1307	19.6062	19.8803	19.9727	19.9803	19.9823	19.9429	19.6098	18.9643	18.3697 (93)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9656	0.9435	0.8903	0.7729	0.5875	0.3458	0.1930	0.2159	0.5006	0.8099	0.9358	0.9714	(94)
Useful gains	744.9669	846.1860	920.4658	925.2135	748.9491	456.6633	241.9086	252.7351	529.2494	727.3750	733.1586	701.9266	(95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000	(96)
Heat loss rate W	1574.8550	1540.6719	1381.7059	1136.4988	805.6145	461.8151	242.2464	253.2583	551.3442	934.3928	1279.0529	1556.7394	(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	617.4368	466.6945	343.1626	152.1254	42.1590	0.0000	0.0000	0.0000	0.0000	154.0213	393.0439	635.9807	(98)
Space heating per m2													(98) / (4) = 38.8506 (99)

8c. Space cooling requirement

Not applicable

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3092.1988 (211)
Space heating requirement	617.4368	466.6945	343.1626	152.1254	42.1590	0.0000	0.0000	0.0000	0.0000	154.0213	393.0439	635.9807	(98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)
Space heating fuel (main heating system)	680.7462	514.5474	378.3491	167.7237	46.4818	0.0000	0.0000	0.0000	0.0000	169.8140	433.3450	701.1915	(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	159.5565	123.8736	102.9459	53.5215	25.0206	2.9466	0.0000	26.0620	55.3838	103.4127	136.7624	159.5895	(64)
Efficiency of water heater (217)m	88.2755	88.2249	87.9844	87.6490	86.3962	80.0000	80.0000	80.0000	80.0000	86.0753	87.6730	88.3301	(216)
Fuel for water heating, kWh/month	180.7485	140.4066	117.0047	61.0634	28.9603	3.6833	0.0000	32.5775	69.2297	120.1420	155.9914	180.6740	(219)
Water heating fuel used													1090.4814 (219)
Annual totals kWh/year													
Space heating fuel - main system													3092.1988 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
pump for solar water heating													50.0000 (230g)
Total electricity for the above, kWh/year													125.0000 (231)
Electricity for lighting (calculated in Appendix L)													318.5913 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.20 * 1140 * 0.80) =													-875.5966 (233)
Total delivered energy for all uses													3750.6748 (238)

10a. Fuel costs - using BEDF prices (465)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3092.1988	3.9500	122.1419	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1090.4814	3.9500	43.0740	(247)
Pumps and fans for heating	75.0000	18.7000	14.0250	(249)
Pump for solar water heating	50.0000	18.7000	9.3500	(249)
Energy for lighting	318.5913	18.7000	59.5766	(250)
Additional standing charges			91.0000	(251)
Energy saving/generation technologies				
PV Unit	-875.5966	18.7000	-163.7366	(252)
Total energy cost			175.4309	(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	3092.1988	0.2160	667.9149	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1090.4814	0.2160	235.5440	(264)
Space and water heating			903.4589	(265)
Pumps and fans	125.0000	0.5190	64.8750	(267)
Energy for lighting	318.5913	0.5190	165.3489	(268)
Energy saving/generation technologies				
PV Unit	-875.5966	0.5190	-454.4346	(269)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Total kg/year 679.2481 (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	3092.1988	1.2200	3772.4825 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1090.4814	1.2200	1330.3873 (264)
Space and water heating			5102.8698 (265)
Pumps and fans	125.0000	3.0700	383.7500 (267)
Energy for lighting	318.5913	3.0700	978.0752 (268)
Energy saving/generation technologies			
PV Unit	-875.5966	3.0700	-2688.0816 (269)
Primary energy kWh/year			3776.6133 (272)
Primary energy kWh/m2/year			52.3149 (273)

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

 Overheating Calculation Input Data

Dwelling type	Detached House
Number of storeys	2
Cross ventilation possible	Yes
SAP Region	Thames Valley
Front of dwelling faces	North East
Overshading	Average or unknown
Thermal mass parameter	250.0
Night ventilation	Yes
Ventilation rate during hot weather (ach)	4.00 (Windows half open)

 Overheating Calculation

Summer ventilation heat loss coefficient	258.78 (P1)
Transmission heat loss coefficient	80.62 (37)
Summer heat loss coefficient	339.40 (P2)

Overhangs	Ratio	Z_overhangs	Overhang type
Orientation			
North East	0.000	1.000	None
South West	0.000	1.000	None

Solar shading	Z blinds	Solar access	Z overhangs	Z summer
Orientation				
North East	0.850	0.90	1.000	0.765 (P8)
South East	1.000	1.00	1.000	1.000 (P8)
South West	0.850	0.90	1.000	0.765 (P8)
North West	1.000	1.00	1.000	1.000 (P8)

[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Shading	Gains W
North East	5.8900	98.8453	0.6300	0.7000	0.7650	176.7721
South West	13.3600	119.9223	0.6300	0.7000	0.7650	486.4622
South East	1.0900	205.5937	0.6300	0.7000	1.0000	88.9441
North West	1.0900	194.6439	0.6300	0.7000	1.0000	84.2071

 total: 836.3855

	Jun	Jul	Aug	
Solar gains	887	836	745	(P3)
Internal gains	452	435	443	
Total summer gains	1339	1272	1188	(P5)

Summer gain/loss ratio	3.94	3.75	3.50	(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	20.19	21.90	21.55	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	

 Assessment of likelihood of high internal temperature: Slight

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Designed)

Property Reference	1500	Issued on Date	22/09/2020
Assessment Reference	As design 2 bed	Prop Type Ref	
Property			

SAP Rating	86 B	DER	16.66	TER	21.16
Environmental	88 B	% DER<TER	21.28		
CO₂ Emissions (t/year)	0.93	DFEE	63.25	TFEE	66.01
General Requirements Compliance	Pass	% DFEE<TFEE	4.18		

Assessor Details	Mr. Carlos Val Escudero, Carlos Val, Tel: 01923 518923, carlos@rjacoustics.com	Assessor ID	H664-0001
Client	Formed Architects, 1500		

SUMMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	21.16	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.66	kgCO ₂ /m ²	Pass
	-4.50 (-21.3%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	66.01	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	63.25	kWh/m ² /yr	
	-2.8 (-4.2%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.16 (max. 0.70)	Pass
Floor	0.18 (max. 0.25)	0.20 (max. 0.70)	Pass
Roof	0.17 (max. 0.20)	0.17 (max. 0.35)	Pass
Openings	1.62 (max. 2.00)	1.80 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Boiler system with radiators or underfloor - Mains gas Data from database Worcester Greenstar 8000 Life GR8300iW 50 R NG Efficiency: 89.7% SEDBUK2009 Minimum: 88.0%	Pass
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BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Designed)

Secondary heating system

None

5 Cylinder insulation

Hot water storage

Measured cylinder loss: 1.75 kWh/day
Permitted by DBSCG 2.24

Pass

Primary pipework insulated

Yes

Pass

6 Controls

Space heating controls

Time and temperature zone control

Pass

Hot water controls

Cylinderstat

Pass

Independent timer for DHW

Pass

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100

%

Minimum

75

%

Pass

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)

Slight

Pass

Based on:

Overshading

Average

Windows facing North East

5.89 m², No overhang

Windows facing South West

13.36 m², No overhang

Air change rate

4.00 ach

Blinds/curtains

Light-coloured venetian blind, closed 50% of daylight hours

Criterion 4 – Building performance consistent with DER and DFEE rate

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

5.00 (design value)

Maximum

10.0

Pass

10 Key features

Photovoltaic array

1.20

kW

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Property Reference	1500	Issued on Date	22/09/2020
Assessment Reference	As design 2 bed	Prop Type Ref	
Property			

SAP Rating	86 B	DER	16.66	TER	21.16
Environmental	88 B	% DER<TER	21.28		
CO ₂ Emissions (t/year)	0.93	DFEE	63.25	TFEE	66.01
General Requirements Compliance	Pass	% DFEE<TFEE	4.18		

Assessor Details	Mr. Carlos Val Escudero, Carlos Val, Tel: 01923 518923, carlos@rjacoustics.com	Assessor ID	H664-0001
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Client	Formed Architects, 1500
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SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	North East
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	House, Detached
2.0 Number of Storeys	2
3.0 Date Built	2020
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	25.17 m	35.34 m ²	2.68 m
1st Storey:	25.17 m	36.85 m ²	2.75 m

7.0 Living Area	27.28	m ²
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8.0 Thermal Mass Parameter	Simple calculation - Medium	
Thermal Mass	250.00	kJ/m ² K

9.0 External Walls

Description	Type	Construction	U-Value (W/m ² K)	Gross Area (m ²)	Nett Area (m ²)
External Wall	Cavity Wall	Cavity wall; dense plaster, lightweight aggregate block, filled cavity, any outside structure	0.16	135.69	114.33

10.0 External Roofs

Description	Type	Construction	U-Value (W/m ² K)	Gross Area (m ²)	Nett Area (m ²)
External Roof	External Slope Roof	Plasterboard, insulated slope	0.17	38.06	35.88

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m ² K)	Area (m ²)
Heat Loss Floor	Ground Floor - Solid	Slab on ground, screed over insulation	0.18	33.83
Exposed floor	Exposed Floor - Timber	Timber exposed floor, insulation between joists	0.20	1.51

12.0 Opening Types

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m ² K)
Entrance door	Manufacturer	Solid Door							1.80
Windows	Manufacturer	Window	Double Low-E Soft	0.05		0.63		0.70	1.60
Rooflights	Manufacturer	Roof Window	Double Low-E Soft	0.05		0.63		0.70	1.60

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m ²)	Curtain Closed
Entrance	Solid Door	[1] External Wall	North East							2.11	
NE windows	Window	[1] External Wall	North East	Light-coloured venetian blind	0.00					5.89	50
SW windows	Window	[1] External Wall	South West	Light-coloured venetian blind	0.00					13.36	50
NW rooflight	Roof Window	[1] External Roof	North West	None						1.09	
SE rooflight	Roof Window	[1] External Roof	South East	None						1.09	

14.0 Conservatory

15.0 Draught Proofing

 %

16.0 Draught Lobby

17.0 Thermal Bridging

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	12.29	0.050	No	Catnic
Table K1 - Approved	E3 Sill	6.78	0.040	No	
Table K1 - Approved	E4 Jamb	23.58	0.050	No	
Table K1 - Approved	E5 Ground floor (normal)	25.17	0.160	No	
Table K1 - Default	E20 Exposed floor (normal)	6.25	0.320	No	
Table K1 - Approved	E6 Intermediate floor within a dwelling	22.05	0.070	No	
Table K1 - Approved	E11 Eaves (insulation at rafter level)	15.75	0.040	No	
Table K1 - Approved	E13 Gable (insulation at rafter level)	9.74	0.040	No	
Table K1 - Approved	E16 Corner (normal)	29.08	0.090	No	
Table K1 - Approved	E17 Corner (inverted – internal area greater than external area)	7.96	-0.090	No	
Table K1 - Default	R1 Head of roof window	2.28	0.080	No	
Table K1 - Default	R2 Sill of roof window	2.28	0.060	No	
Table K1 - Default	R3 Jamb of roof window	3.84	0.080	No	
Table K1 - Default	R4 Ridge (vaulted ceiling)	7.87	0.080	No	

Y-value W/m²K

18.0 Pressure Testing

Designed AP₅₀ m³/(h.m²) @ 50 Pa

Property Tested ?

As Built AP₅₀ m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather

Cross ventilation possible

Night Ventilation

Air change rate

Mechanical Ventilation

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Mechanical Ventilation System Present

20.0 Fans, Open Fireplaces, Flues

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

21.0 Fixed Cooling System

22.0 Lighting

Internal

Total number of light fittings	<input type="text" value="9"/>	
Total number of L.E.L. fittings	<input type="text" value="9"/>	
Percentage of L.E.L. fittings	<input type="text" value="100.00"/>	%

External

External lights fitted	<input type="text" value="Yes"/>
Light and motion sensor	<input type="text" value="Yes"/>

23.0 Electricity Tariff

24.0 Main Heating 1

Database	<input type="text" value="Database"/>	
Percentage of Heat	<input type="text" value="100"/>	%
Database Ref. No.	<input type="text" value="18627"/>	
Fuel Type	<input type="text" value="Mains gas"/>	
Main Heating	<input type="text" value="BGB"/>	
SAP Code	<input type="text" value="102"/>	
In Winter	<input type="text" value="90.7"/>	
In Summer	<input type="text" value="80.0"/>	
Controls	<input type="text" value="CBI Time and temperature zone control"/>	
PCDF Controls	<input type="text" value="0"/>	
Delayed Start Stat	<input type="text" value="Yes"/>	
Sap Code	<input type="text" value="2110"/>	
Flue Type	<input type="text" value="Balanced"/>	
Fan Assisted Flue	<input type="text" value="Yes"/>	
Is MHS Pumped	<input type="text" value="Pump in heated space"/>	
Heat Emitter	<input type="text" value="Radiators"/>	
Flow Temperature	<input type="text" value="Normal (> 45°C)"/>	

25.0 Main Heating 2

Community Heating

28.0 Water Heating

HWP From main heating 1	<input type="text" value="HWP From main heating 1"/>
Water Heating	<input type="text" value="Main Heating 1"/>
Flue Gas Heat Recovery System	<input type="text" value="No"/>
Waste Water Heat Recovery Instantaneous System 1	<input type="text" value="No"/>
Waste Water Heat Recovery Instantaneous System 2	<input type="text" value="No"/>

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Waste Water Heat Recovery Storage System	<input type="text" value="No"/>			
Solar Panel	<input type="text" value="No"/>			
Water use <= 125 litres/person/day	<input type="text" value="Yes"/>			
SAP Code	<input type="text" value="901"/>			
29.0 Hot Water Cylinder	<input type="text" value="Hot Water Cylinder"/>			
Cylinder Stat	<input type="text" value="Yes"/>			
Cylinder In Heated Space	<input type="text" value="Yes"/>			
Independent Time Control	<input type="text" value="Yes"/>			
Insulation Type	<input type="text" value="Measured Loss"/>			
Cylinder Volume	<input type="text" value="200.00"/>	L		
Loss	<input type="text" value="1.75"/>	kWh/day		
Pipes insulation	<input type="text" value="Fully insulated primary pipework"/>			
31.0 Thermal Store	<input type="text" value="None"/>			
32.0 Photovoltaic Unit	<input type="text" value="One Dwelling"/>			
PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
1.20	South	30°	Modest	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	£40	B 88	