



elmhurst
energy



SAP Report Submission for Building Regulations Compliance

Client: Millennium Homes (Eastern) Ltd
Revision B

Project: Unit 1 (LHS) Hamlyns Yard, Castle Street
Totnes

Contact: David Bartlett BSc MRICS
Chartered Surveyor and Energy Assessor
davidcbartlett@icloud.com

Report Issue Date: 28/11/2018

EXCELLENCE
IN ENERGY
ASSESSMENT

ASSESSMENT NOTES

Calculation Type: New Build (As Designed)

Property Reference	13064	Issued on Date	28/11/2018		
Assessment Reference	Revision B	Prop Type Ref			
Property	Unit 1 (LHS) Hamlyns Yard, Castle Street, Totnes				
SAP Rating	102 A	DER	21.47	TER	27.97
Environmental	84 B	% DER<TER	23.23		
CO ₂ Emissions (t/year)	0.98	DFEE	57.61	TFEE	60.05
General Requirements Compliance	Pass	% DFEE<TFEE	4.08		
Assessor	David Bartlett, Tel: 01752 894661, Fax: 01752 894661		Assessor ID	A066-0001	
Client	SNJ Architects				

ASSESSMENT NOTES - Last time updated on: 28.11.2018

Please read the following, the calculation 'As Designed SAP 2012 report' passes on the basis the list below is maintained or improved.

(In accordance with SNJ Architects Drawings + Specification).

Items are as illustration to enable DER pass and DFEE pass, Client or Agent to contact office if alternative options desired.

1. Primary heating systems generated from Electric Boiler feeding underfloor heating with delayed start stat, and boiler interlock, full zone time and temperature control + Full insulation to all primary pipework. Linked to 250 litre hot water cylinder with a maximum 24 hour heat loss of 2.00 kWh/24H. (Plumber to ensure boiler is appropriate for the building - if alternative boiler is required please ensure SAP assessor is contacted prior to installation as this may cause the calculation to fail). 4.00 kWp Photovoltaic system to be installed on the South East Elevation and linked to the dwellings electrical meter.
2. External Cavity Walls: Render, 100mm Dense Blockwork External Leaf, 50mm Cavity, 60mm Recticel or similar, 100mm Dense Blockwork inner leaf with 32.5mm Kingspan Kooltherm K18 Thermal board and plaster finish to achieve minimum U value of 0.23 W/m²K. Party walls to have mineral wool filled cavities.
3. Ground insulated with 120mm Celotex / Kingspan Thermafloor 70 or similar over slab and 22mm T and G finish to achieve minimum U Value of 0.14 W/m²K.
4. Horizontal ceilings insulated with 200mm mineral wool between joists and additional 250mm over to achieve minimum U value of 0.10 W/m²K.
5. 100 % of light fittings, fixed energy efficient, having an efficacy greater than 40 lumens per circuit watt.
6. Tripple glazed Windows to have minimum U Value 1.00 W/m²K - 16mm+ sealed unit cavity width(s), soft coat low e coating (en 0.05) - and draught stripped. Doors 1.40 W/m²K. French Doors 1.40 W/m²K.
7. Pressure test required to be carried out on completion of building works and pass the designed air leakage rate set at 5.00 m³/(h.m²) at 50 Pa.)
8. Accredited Construction Details - Ensure the building fabric is constructed so that there are no reasonably avoidable thermal bridges in the insulation layers caused by gaps within the various elements, at the joints between elements, and at the edges of elements such as those around window and door openings. - Follow guidance 'Limiting Thermal Bridging and Air Leakage' (ISBN 0 11 753 612 1).

Builder to complete accredited details during construction - please download from the following address:-
<http://www.planningportal.gov.uk/buildingregulations/approveddocuments/partl/bcassociateddocuments9/acd>

ASSESSMENT NOTES

Calculation Type: New Build (As Designed)



David C Bartlett BSc MRICS
Accredited Energy Assessor and Domestic Energy Assessors
Accreditation Certificate Number EES/00412

PREDICTED ENERGY ASSESSMENT

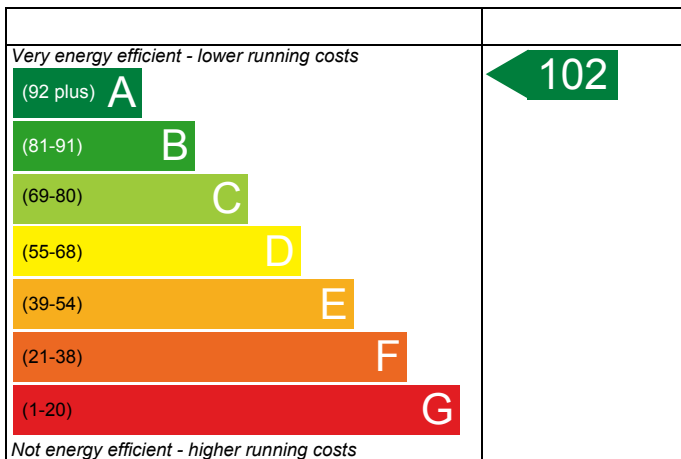
Unit 1 (LHS) Hamlyns Yard, Castle Street,
Totnes

Dwelling type: House, Semi-Detached
Date of assessment: 28/11/2018
Produced by: Bartlett Design Partnership
Total floor area: 89.96 m²
RRN: 5929-3978-8243

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

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

Energy Efficiency Rating

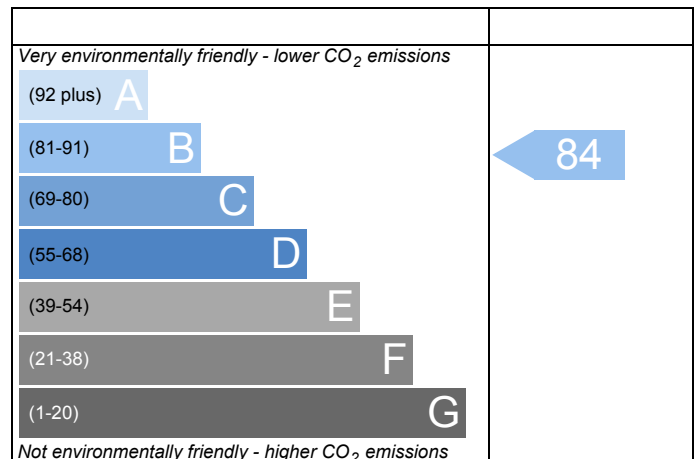


England

EU Directive
2002/91/EC

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

Environmental Impact (CO₂) Rating



England

EU Directive
2002/91/EC

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

This report has been produced by an accredited Elmhurst member whose work is subject to quality assurance audits. The data used to produce the report has been verified by the Elmhurst members' portal.



BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Designed)

Property Reference	13064	Issued on Date	28/11/2018
Assessment Reference	Revision B	Prop Type Ref	
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Environmental	84 B	TER	27.97
CO ₂ Emissions (t/year)	0.98	% DER<TER	23.23
General Requirements Compliance	Pass	DLEE	57.61
		TFEE	60.05
		% DLEE<TFEE	4.08
Assessor	David Bartlett, Tel: 01752 894661, Fax: 01752 894661	Assessor ID	A066-0001
Client	SNJ Architects		

SUMMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Electricity		
Fuel factor	1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	27.97	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	21.47	kgCO ₂ /m ²	Pass
	-6.50 (-23.2%)	kgCO ₂ /m ²	

1b TFEE and DLEE

Target Fabric Energy Efficiency (TFEE)	60.05	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DLEE)	57.61	kWh/m ² /yr	
	-2.5 (-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	0.23 (max. 0.30)	0.23 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.14 (max. 0.25)	0.14 (max. 0.70)	Pass
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	Pass
Openings	1.12 (max. 2.00)	1.40 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	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

Main heating system	Boiler system with radiators or underfloor - Electric Water storage boiler in heated space	
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BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Designed)

Secondary heating system

None

5 Cylinder insulation

Hot water storage

Measured cylinder loss: 2.00 kWh/day
Permitted by DBSCG 2.56

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

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 (South West England)

Not significant

Pass

Based on:

Overshading

Average

Windows facing South East

8.35 m², No overhang

Windows facing North West

10.30 m², No overhang

Air change rate

8.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00 W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

5.00 (design value)

Maximum

10.0

Pass

10 Key features

Party wall U-value

0.00 W/m²K

Roof U-value

0.10 W/m²K

Window U-value

1.00 W/m²K

Photovoltaic array

N/A

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BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Designed)

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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	Electricity		
Fuel factor	1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	27.97	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	21.47	kgCO ₂ /m ²	Pass
	-6.50 (-23.2%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	60.05	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	57.61	kWh/m ² /yr	
	-2.5 (-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	0.23 (max. 0.30)	0.23 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.14 (max. 0.25)	0.14 (max. 0.70)	Pass
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	Pass
Openings	1.12 (max. 2.00)	1.40 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Boiler system with radiators or underfloor - Electric Water storage boiler in heated space	
Secondary heating system	None	

5 Cylinder insulation

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Designed)

Hot water storage	Measured cylinder loss: 2.00 kWh/day Permitted by DBSCG 2.56	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

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 (South West England)	Not significant	Pass
Based on:		
Overshading	Average	
Windows facing South East	8.35 m ² , No overhang	
Windows facing North West	10.30 m ² , No overhang	
Air change rate	8.00 ach	
Blinds/curtains	None	

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type	U-value	W/m ² K	
Filled Cavity with Edge Sealing	0.00	W/m ² K	Pass

Air permeability and pressure testing

3 Air permeability

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

10 Key features

Party wall U-value	0.00	W/m ² K
Roof U-value	0.10	W/m ² K
Window U-value	1.00	W/m ² K
Photovoltaic array	N/A	

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)

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

Orientation	South East
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	House, Semi-Detached
2.0 Number of Storeys	2
3.0 Date Built	2018
4.0 Sheltered Sides	1
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	19.46 m	44.98 m ²	3.00 m
1st Storey:	19.46 m	44.98 m ²	2.84 m

7.0 Living Area m²

8.0 Thermal Mass Parameter
 Thermal Mass kJ/m²K

9.0 External Walls

Description	Type	Construction	U-Value (W/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Main Wall	Cavity Wall	Other	0.23	113.65	92.53

9.1 Party Walls

Description	Type	Construction	U-Value (W/m ² K)	Area (m ²)
Party Wall	Filled Cavity with Edge Sealing	Other	0.00	44.20

10.0 External Roofs

Description	Type	Construction	U-Value (W/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Main Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.10	44.98	44.98

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m ² K)	Area (m ²)
Ground Floor	Exposed Floor - Solid	Other	0.14	44.98

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)
Window	Manufacturer	Window	Triple Low-E Soft 0.05			0.57		0.70	1.00
Door	Manufacturer	Half Glazed Door	Double Low-E Soft 0.05			0.63		0.70	1.40
French Door	Manufacturer	Window	Double Low-E Soft 0.05			0.63		0.70	1.40

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m ²)	Curtain Closed
Front Elevation	Window	[1] Main Wall	South East	None	0.00					8.35	
Back Elevation	Window	[1] Main Wall	North West	None	0.00					6.50	
Entrance Door	Half Glazed Door	[1] Main Wall	South West							2.47	
French Door	Window	[1] Main Wall	North West	None	0.00					3.80	

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
Table K1 - Approved	E1 Steel lintel with perforated steel base plate	13.26	0.500	No
Table K1 - Approved	E3 Sill	8.17	0.040	No
Table K1 - Approved	E4 Jamb	39.12	0.050	No
Table K1 - Approved	E5 Ground floor (normal)	19.46	0.160	No
Table K1 - Approved	E6 Intermediate floor within a dwelling	19.46	0.070	No
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	19.46	0.060	No
Table K1 - Approved	E16 Corner (normal)	11.68	0.090	No
Table K1 - Approved	E18 Party wall between dwellings	11.68	0.060	No
Table K1 - Default	P1 Party wall - Ground floor	7.57	0.160	No
Table K1 - Default	P2 Party wall - Intermediate floor within a dwelling	7.57	0.000	No
Table K1 - Default	P4 Party wall - Roof (insulation at ceiling level)	7.57	0.240	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

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

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Number of flueless gas fires 0

21.0 Fixed Cooling System No

22.0 Lighting

Internal

Total number of light fittings 30
 Total number of L.E.L. fittings 30
 Percentage of L.E.L. fittings 100.00 %

External

External lights fitted Yes
 Light and motion sensor Yes

23.0 Electricity Tariff 7 Hour Off Peak

24.0 Main Heating 1

SAP table
 Percentage of Heat 100 %
 Main Heating BEC
 SAP Code 195
 Efficiency (SAP Table) 100.0 %
 Controls CBI Time and temperature zone control
 PCDF Controls 0
 Delayed Start Stat Yes
 Sap Code 2110
 Is MHS Pumped Pump in heated space
 Heat Emitter Underfloor
 Underfloor Heating Yes - Pipes in Wood

25.0 Main Heating 2 None

Community Heating None

28.0 Water Heating

HWP From main heating 1
 Water Heating Main Heating 1
 Flue Gas Heat Recovery System No
 Waste Water Heat Recovery Instantaneous System 1 No
 Waste Water Heat Recovery Instantaneous System 2 No
 Waste Water Heat Recovery Storage System No
 Solar Panel No
 Water use <= 125 litres/person/day Yes
 SAP Code 901

29.0 Hot Water Cylinder

Hot Water Cylinder
 Cylinder Stat Yes
 Cylinder In Heated Space Yes
 Independent Time Control Yes
 Insulation Type Measured Loss
 Cylinder Volume 250.00 L
 Loss 2.00 kWh/day

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Pipes insulation	Fully insulated primary pipework			
31.0 Thermal Store	None			
32.0 Photovoltaic Unit	One Dwelling			
PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
4.00	South East	30°	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar water heating	£4,000 - £6,000	£73	A 104	

THERMAL BRIDGING

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		% DFEE<TFEE	4.08
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	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E1 Steel lintel with perforated steel base plate	Table K1 - Approved	0.500	13.26	6.63	
External wall	E3 Sill	Table K1 - Approved	0.040	8.17	0.33	
External wall	E4 Jamb	Table K1 - Approved	0.050	39.12	1.96	
External wall	E5 Ground floor (normal)	Table K1 - Approved	0.160	19.46	3.11	
External wall	E6 Intermediate floor within a dwelling	Table K1 - Approved	0.070	19.46	1.36	
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	19.46	1.17	
External wall	E16 Corner (normal)	Table K1 - Approved	0.090	11.68	1.05	
External wall	E18 Party wall between dwellings	Table K1 - Approved	0.060	11.68	0.70	
Party wall	P1 Party wall - Ground floor	Table K1 - Default	0.160	7.57	1.21	
Party wall	P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	0.000	7.57	0.00	
Party wall	P4 Party wall - Roof (insulation at ceiling level)	Table K1 - Default	0.240	7.57	1.82	

Total: **19.34** W/mK:
 Y-Value: **0.095** W/m²K:

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

DWELLING AS DESIGNED

Semi-Detached House, total floor area 90 m²

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

1a TER and DER

Fuel for main heating:Electricity
Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 27.97 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 21.47 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 60.1 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 57.6 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.23 (max. 0.30)	0.23 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.14 (max. 0.25)	0.14 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.12 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Electric
Water storage boiler in heated space

Secondary heating system: None

5 Cylinder insulation

Hot water storage Measured cylinder loss: 2.00 kWh/day
Permitted by DBSCG 2.56 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

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 (South West England): Not significant OK

Based on:

Overshading: Average
Windows facing South East: 8.35 m², No overhang
Windows facing North West: 10.30 m², No overhang
Air change rate: 8.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.10 W/m²K
Window U-value 1.00 W/m²K
Photovoltaic array

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	44.9800 (1b)	x 3.0000 (2b)	= 134.9400 (1b) - (3b)
First floor	44.9800 (1c)	x 2.8400 (2c)	= 127.7432 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 262.6832 (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) =	0.1523 (8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate				0.4023 (18)	
Number of sides sheltered				1 (19)	
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3721 (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	0.4744	0.4651	0.4558	0.4093	0.4000	0.3535	0.3535	0.3442	0.3721	0.4000	0.4186	0.4372 (22b)
Effective ac	0.6125	0.6082	0.6039	0.5838	0.5800	0.5625	0.5625	0.5592	0.5692	0.5800	0.5876	0.5956 (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
Window (Uw = 1.00)			14.8500	0.9615	14.2788		(27)
Door			2.4700	1.4000	3.4580		(26a)
French Door (Uw = 1.40)			3.8000	1.3258	5.0379		(27)
Ground Floor			44.9800	0.1400	6.2972		(28b)
Main Wall	113.6500	21.1200	92.5300	0.2300	21.2819		(29a)
Main Roof	44.9800		44.9800	0.1000	4.4980		(30)
Total net area of external elements Aum(A, m ²)			203.6100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	54.8518		(33)
Party Wall			44.2000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							19.3362 (36)
Total fabric heat loss						(33) + (36) =	74.1880 (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	53.0986	52.7198	52.3484	50.6043	50.2780	48.7589	48.7589	48.4776	49.3440	50.2780	50.9381	51.6283 (38)
Heat transfer coeff	127.2866	126.9078	126.5364	124.7923	124.4660	122.9469	122.9469	122.6656	123.5320	124.4660	125.1261	125.8163 (39)
Average = Sum(39)m / 12 =												124.7908 (39)
HLP	1.4149	1.4107	1.4066	1.3872	1.3836	1.3667	1.3667	1.3636	1.3732	1.3836	1.3909	1.3986 (40)
HLP (average)												1.3872 (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												2.6252 (42)
Average daily hot water use (litres/day)												96.5479 (43)
Daily hot water use	106.2026	102.3407	98.4788	94.6169	90.7550	86.8931	86.8931	90.7550	94.6169	98.4788	102.3407	106.2026 (44)
Energy conte	157.4954	137.7465	142.1421	123.9229	118.9070	102.6077	95.0811	109.1069	110.4100	128.6722	140.4558	152.5259 (45)
Energy content (annual)												Total = Sum(45)m = 1519.0736 (45)
Distribution loss (46)m = 0.15 x (45)m												
23.6243	20.6620	21.3213	18.5884	17.8360	15.3912	14.2622	16.3660	16.5615	19.3008	21.0684	22.8789 (46)	
Water storage loss:												250.0000 (47)
Store volume												

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):												2.0000 (48)	
Temperature factor from Table 2b												0.5400 (49)	
Enter (49) or (54) in (55)												1.0800 (55)	
Total storage loss	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(56)
If cylinder contains dedicated solar storage	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(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	214.2378	188.9977	198.8845	178.8349	175.6494	157.5197	151.8235	165.8493	165.3220	185.4146	195.3678	209.2683	(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	214.2378	188.9977	198.8845	178.8349	175.6494	157.5197	151.8235	165.8493	165.3220	185.4146	195.3678	209.2683	(64)
Heat gains from water heating, kWh/month	97.7612	86.8017	92.6562	85.1340	84.9305	78.0467	77.0084	81.6720	80.6409	88.1774	90.6312	96.1088	(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	131.2586	131.2586	131.2586	131.2586	131.2586	131.2586	131.2586	131.2586	131.2586	131.2586	131.2586	131.2586	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.6425	19.2227	15.6330	11.8352	8.8469	7.4689	8.0705	10.4903	14.0800	17.8778	20.8661	22.2440	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	239.0041	241.4842	235.2344	221.9293	205.1340	189.3488	178.8033	176.3232	182.5730	195.8781	212.6734	228.4586	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1259	36.1259	36.1259	36.1259	36.1259	36.1259	36.1259	36.1259	36.1259	36.1259	36.1259	36.1259	(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)	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	(71)
Water heating gains (Table 5)	131.3994	129.1692	124.5378	118.2416	114.1539	108.3981	103.5059	109.7742	112.0013	118.5181	125.8766	129.1785	(72)
Total internal gains	457.4237	455.2537	440.7828	417.3837	393.5124	370.5935	355.7572	361.9652	374.0319	397.6516	424.7937	445.2588	(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						
Southeast		8.3500	36.7938	0.5700	0.7000	0.7700	84.9508 (77)						
Northwest		6.5000	11.2829	0.5700	0.7000	0.7700	20.2788 (81)						
Northwest		3.8000	11.2829	0.6300	0.7000	0.7700	13.1032 (81)						
Solar gains	118.3328	212.6527	320.4128	446.3733	545.0345	560.9131	532.5319	455.8961	363.5556	242.9676	143.7547	99.9616	(83)
Total gains	575.7565	667.9064	761.1957	863.7570	938.5469	931.5066	888.2891	817.8613	737.5876	640.6192	568.5484	545.2204	(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	49.0800	49.2265	49.3709	50.0610	50.1922	50.8124	50.8124	50.9289	50.5717	50.1922	49.9274	49.6535	
alpha	4.2720	4.2818	4.2914	4.3374	4.3461	4.3875	4.3875	4.3953	4.3714	4.3461	4.3285	4.3102	
util living area	0.9972	0.9944	0.9865	0.9600	0.8872	0.7400	0.5800	0.6415	0.8675	0.9757	0.9947	0.9978	(86)
MIT	19.4548	19.6256	19.9190	20.3187	20.6747	20.9020	20.9741	20.9602	20.7868	20.3297	19.8262	19.4323	(87)
Th 2	19.7519	19.7551	19.7583	19.7732	19.7760	19.7890	19.7890	19.7914	19.7839	19.7760	19.7703	19.7644	(88)
util rest of house	0.9963	0.9924	0.9813	0.9437	0.8397	0.6377	0.4345	0.4955	0.7933	0.9627	0.9924	0.9971	(89)
MIT 2	17.7197	17.9707	18.3988	18.9791	19.4576	19.7244	19.7800	19.7756	19.6120	19.0054	18.2745	17.6951	(90)
Living area fraction												FLA = Living area / (4) = 0.1681 (91)	
MIT	18.0113	18.2489	18.6543	19.2043	19.6622	19.9223	19.9807	19.9747	19.8094	19.2280	18.5353	17.9871	(92)
Temperature adjustment												-0.1500	
adjusted MIT	17.8613	18.0989	18.5043	19.0543	19.5122	19.7723	19.8307	19.8247	19.6594	19.0780	18.3853	17.8371	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9939	0.9882	0.9736	0.9306	0.8270	0.6361	0.4398	0.4999	0.7837	0.9517	0.9883	0.9951	(94)
Useful gains	572.2225	660.0101	741.0953	803.8457	776.2165	592.5721	390.6874	408.8514	578.0279	609.7081	561.8762	542.5567	(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	1726.1734	1675.0375	1518.9785	1267.1729	972.3477	635.9186	397.1993	420.0891	686.7674	1055.2236	1412.0883	1715.7632	(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	858.5395	682.0984	578.7450	333.5956	145.9216	0.0000	0.0000	0.0000	0.0000	331.4636	612.1527	872.8657	(98)
Space heating												4415.3821 (98)	
Space heating per m2												(98) / (4) = 49.0816 (99)	

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													4415.3821 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	858.5395	682.0984	578.7450	333.5956	145.9216	0.0000	0.0000	0.0000	0.0000	331.4636	612.1527	872.8657	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	858.5395	682.0984	578.7450	333.5956	145.9216	0.0000	0.0000	0.0000	0.0000	331.4636	612.1527	872.8657	(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	214.2378	188.9977	198.8845	178.8349	175.6494	157.5197	151.8235	165.8493	165.3220	185.4146	195.3678	209.2683	(64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(216)
Fuel for water heating, kWh/month	214.2378	188.9977	198.8845	178.8349	175.6494	157.5197	151.8235	165.8493	165.3220	185.4146	195.3678	209.2683	(219)
Water heating fuel used													2187.1696 (219)
Annual totals kWh/year													
Space heating fuel - main system													4415.3821 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
central heating pump													30.0000 (230c)
Total electricity for the above, kWh/year													30.0000 (231)
Electricity for lighting (calculated in Appendix L)													382.2139 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 4.00 * 1029 * 1.00) =										-3293.3975			-3293.3975 (233)
Total delivered energy for all uses													3721.3682 (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	4415.3821	0.5190	2291.5833 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2187.1696	0.5190	1135.1410 (264)
Space and water heating			3426.7244 (265)
Pumps and fans	30.0000	0.5190	15.5700 (267)
Energy for lighting	382.2139	0.5190	198.3690 (268)
Energy saving/generation technologies			
PV Unit (0.90*19.47 + 0.10*7.60)	-3293.3975	0.5190	-1709.2733 (269)
Total CO2, kg/year			1931.3901 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			21.4700 (273)

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

DER			21.4700 ZC1
Total Floor Area		TFA	89.9600
Assumed number of occupants		N	2.6252
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			15.7435 ZC2
CO2 emissions from cooking, equation (L16)			2.0232 ZC3
Total CO2 emissions			39.2367 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			39.2367 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	44.9800 (1b)	x 3.0000 (2b)	= 134.9400 (1b) - (3b)
First floor	44.9800 (1c)	x 2.8400 (2c)	= 127.7432 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.9600		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 262.6832 (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) =	0.1142 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.3642 (18)							
Number of sides sheltered					1 (19)							
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)							
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3369 (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	0.4295	0.4211	0.4127	0.3706	0.3622	0.3200	0.3200	0.3116	0.3369	0.3622	0.3790	0.3958 (22b)
Effective ac	0.5923	0.5887	0.5852	0.5687	0.5656	0.5512	0.5512	0.5486	0.5567	0.5656	0.5718	0.5783 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K					
TER Semi-glazed door			2.4700	1.2000	2.9640		(26a)					
TER Opening Type (Uw = 1.40)			18.6500	1.3258	24.7254		(27)					
Ground Floor			44.9800	0.1300	5.8474		(28b)					
Main Wall	113.6500	21.1200	92.5300	0.1800	16.6554		(29a)					
Main Roof	44.9800		44.9800	0.1300	5.8474		(30)					
Total net area of external elements Aum(A, m ²)			203.6100				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =		56.0396 (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)							10.5747 (36)					
Total fabric heat loss							(33) + (36) = 66.6143 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 51.3395	Feb 51.0290	Mar 50.7246	Apr 49.2950	May 49.0275	Jun 47.7823	Jul 47.7823	Aug 47.5517	Sep 48.2619	Oct 49.0275	Nov 49.5686	Dec 50.1343 (38)
Heat transfer coeff	117.9538	117.6432	117.3389	115.9092	115.6417	114.3966	114.3966	114.1660	114.8762	115.6417	116.1829	116.7486 (39)
Average = Sum(39)m / 12 =												115.9080 (39)
HLP	Jan 1.3112	Feb 1.3077	Mar 1.3043	Apr 1.2885	May 1.2855	Jun 1.2716	Jul 1.2716	Aug 1.2691	Sep 1.2770	Oct 1.2855	Nov 1.2915	Dec 1.2978 (40)
HLP (average)												1.2884 (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												2.6252 (42)
Average daily hot water use (litres/day)												96.5479 (43)
Daily hot water use	106.2026	102.3407	98.4788	94.6169	90.7550	86.8931	86.8931	90.7550	94.6169	98.4788	102.3407	106.2026 (44)
Energy content (annual)	157.4954	137.7465	142.1421	123.9229	118.9070	102.6077	95.0811	109.1069	110.4100	128.6722	140.4558	152.5259 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1519.0736 (45)
Water storage loss:												22.8789 (46)
Store volume												250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8903 (48)
Temperature factor from Table 2b												0.5400 (49)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Enter (49) or (54) in (55)												1.0208 (55)
Total storage loss												
	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444 (56)
If cylinder contains dedicated solar storage												
	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624 (59)
Total heat required for water heating calculated for each month												
	212.4022	187.3397	197.0489	177.0585	173.8138	155.7433	149.9879	164.0137	163.5456	183.5790	193.5914	207.4327 (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												
	212.4022	187.3397	197.0489	177.0585	173.8138	155.7433	149.9879	164.0137	163.5456	183.5790	193.5914	207.4327 (64)
	Total per year (kWh/year) = Sum(64)m =											2165.5568 (64)
Heat gains from water heating, kWh/month												
	96.2927	85.4753	91.1877	83.7128	83.4620	76.6255	75.5399	80.2035	79.2198	86.7090	89.2100	94.6403 (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
	131.2586	131.2586	131.2586	131.2586	131.2586	131.2586	131.2586	131.2586	131.2586	131.2586	131.2586	131.2586 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	21.3865	18.9953	15.4480	11.6951	8.7422	7.3806	7.9750	10.3662	13.9134	17.6663	20.6192	21.9809 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	239.0041	241.4842	235.2344	221.9293	205.1340	189.3488	178.8033	176.3232	182.5730	195.8781	212.6734	228.4586 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	36.1259	36.1259	36.1259	36.1259	36.1259	36.1259	36.1259	36.1259	36.1259	36.1259	36.1259	36.1259 (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)												
	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069 (71)
Water heating gains (Table 5)												
	129.4256	127.1954	122.5641	116.2678	112.1801	106.4244	101.5321	107.8004	110.0275	116.5443	123.9028	127.2047 (72)
Total internal gains	455.1938	453.0525	438.6241	415.2699	391.4340	368.5313	353.6880	359.8673	371.8916	395.4663	422.5730	443.0218 (73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains						
	m ²	Table 6a	Specific data	Specific data	factor	W						
		W/m ²	or Table 6b	or Table 6c	Table 6d							
Southeast	8.3500	36.7938	0.6300	0.7000	0.7700	93.8930 (77)						
Northwest	10.3000	11.2829	0.6300	0.7000	0.7700	35.5166 (81)						
Solar gains	129.4096	232.2296	349.0821	485.0527	591.2399	608.0518	577.4512	495.0069	395.6610	265.1121	157.1513	109.3575 (83)
Total gains	584.6034	685.2821	787.7062	900.3225	982.6739	976.5831	931.1392	854.8742	767.5525	660.5784	579.7243	552.3793 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	52.9633	53.1031	53.2409	53.8975	54.0222	54.6102	54.6102	54.7205	54.3822	54.0222	53.7706	53.5101
alpha	4.5309	4.5402	4.5494	4.5932	4.6015	4.6407	4.6407	4.6480	4.6255	4.6015	4.5847	4.5673
util living area	0.9971	0.9937	0.9836	0.9490	0.8564	0.6883	0.5258	0.5880	0.8352	0.9704	0.9941	0.9978 (86)
MIT	19.5934	19.7689	20.0591	20.4419	20.7617	20.9388	20.9860	20.9770	20.8453	20.4277	19.9430	19.5664 (87)
Th 2	19.8321	19.8348	19.8374	19.8499	19.8522	19.8631	19.8631	19.8651	19.8589	19.8522	19.8475	19.8426 (88)
util rest of house	0.9961	0.9915	0.9776	0.9297	0.8040	0.5897	0.3974	0.4557	0.7563	0.9554	0.9917	0.9970 (89)
MIT 2	17.9757	18.2332	18.6552	19.2053	19.6244	19.8240	19.8583	19.8562	19.7377	19.1974	18.4968	17.9434 (90)
Living area fraction	fLA = Living area / (4) =											0.1681 (91)
MIT	18.2476	18.4913	18.8912	19.4131	19.8156	20.0113	20.0478	20.0446	19.9239	19.4042	18.7399	18.2162 (92)
Temperature adjustment												0.0000
adjusted MIT	18.2476	18.4913	18.8912	19.4131	19.8156	20.0113	20.0478	20.0446	19.9239	19.4042	18.7399	18.2162 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9940	0.9877	0.9708	0.9203	0.8021	0.6036	0.4190	0.4778	0.7615	0.9474	0.9881	0.9953 (94)
Useful gains	581.1228	676.8448	764.7356	828.5714	788.1822	589.4545	390.1633	408.4375	584.5214	625.8053	572.8476	549.8074 (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	1645.1710	1598.9237	1453.9660	1218.5687	938.5009	619.0377	394.4181	416.0847	669.0258	1018.1325	1352.3516	1636.3661 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	791.6519	619.6370	512.7874	280.7981	111.8371	0.0000	0.0000	0.0000	0.0000	291.8914	561.2429	808.3997 (98)
Space heating												3978.2455 (98)
Space heating per m2												(98) / (4) = 44.2224 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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													4254.8080 (211)
Space heating requirement	791.6519	619.6370	512.7874	280.7981	111.8371	0.0000	0.0000	0.0000	0.0000	291.8914	561.2429	808.3997	(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)	846.6865	662.7133	548.4357	300.3188	119.6119	0.0000	0.0000	0.0000	0.0000	312.1834	600.2598	864.5986	(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	212.4022	187.3397	197.0489	177.0585	173.8138	155.7433	149.9879	164.0137	163.5456	183.5790	193.5914	207.4327	(64)
Efficiency of water heater (217)m	88.0038	87.7680	87.2523	86.0387	83.6732	79.8000	79.8000	79.8000	79.8000	86.0454	87.4913	88.0881	(216)
Fuel for water heating, kWh/month	241.3558	213.4489	225.8380	205.7894	207.7293	195.1670	187.9547	205.5310	204.9444	213.3514	221.2694	235.4832	(219)
Water heating fuel used													2557.8624 (219)
Annual totals kWh/year													
Space heating fuel - main system													4254.8080 (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)													377.6916 (232)
Total delivered energy for all uses													7265.3620 (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	4254.8080	0.2160	919.0385 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2557.8624	0.2160	552.4983 (264)
Space and water heating			1471.5368 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	377.6916	0.5190	196.0220 (268)
Total CO2, kg/m2/year			1706.4838 (272)
Emissions per m2 for space and water heating			16.3577 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.1790 (272b)
Emissions per m2 for pumps and fans			0.4327 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.3577 * 1.55) + 2.1790 + 0.4327, rounded to 2 d.p.			27.9700 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	13064	Issued on Date	28/11/2018	
Assessment Reference	Revision B	Prop Type Ref		
Property	Unit 1 (LHS) Hamlyns Yard, Castle Street, Totnes			
SAP Rating	102 A	DER	21.47	
TER		TER	27.97	
Environmental	84 B	% DER<TER	23.23	
CO ₂ Emissions (t/year)	0.98	DFEE	57.61	
TREE		TREE	60.05	
General Requirements Compliance	Pass	% DFEE<TFEE	4.08	
Assessor	David Bartlett, Tel: 01752 894661, Fax: 01752 894661		Assessor ID	A066-0001
Client	SNJ Architects			

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	44.9800 (1b)	x 3.0000 (2b)	= 134.9400 (1b) - (3b)
First floor	44.9800 (1c)	x 2.8400 (2c)	= 127.7432 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.9600		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 262.6832 (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) = 0.1142 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.3642 (18)							
Number of sides sheltered					1 (19)							
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.9250 (20)							
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3369 (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	0.4295	0.4211	0.4127	0.3706	0.3622	0.3200	0.3200	0.3116	0.3369	0.3622	0.3790	0.3958 (22b)
Effective ac	0.5923	0.5887	0.5852	0.5687	0.5656	0.5512	0.5512	0.5486	0.5567	0.5656	0.5718	0.5783 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	Net Area m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K					
Window (Uw = 1.00)			14.8500	0.9615	14.2788		(27)					
Door			2.4700	1.4000	3.4580		(26a)					
French Door (Uw = 1.40)			3.8000	1.3258	5.0379		(27)					
Ground Floor			44.9800	0.1400	6.2972		(28b)					
Main Wall	113.6500	21.1200	92.5300	0.2300	21.2819		(29a)					
Main Roof	44.9800		44.9800	0.1000	4.4980		(30)					
Total net area of external elements Aum(A, m ²)			203.6100				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 54.8518		(33)					
Party Wall			44.2000	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							19.3362 (36)					
Total fabric heat loss							(33) + (36) = 74.1880 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 51.3395	Feb 51.0290	Mar 50.7246	Apr 49.2950	May 49.0275	Jun 47.7823	Jul 47.7823	Aug 47.5517	Sep 48.2619	Oct 49.0275	Nov 49.5686	Dec 50.1343 (38)
Heat transfer coeff	125.5275	125.2170	124.9126	123.4830	123.2155	121.9703	121.9703	121.7397	122.4499	123.2155	123.7566	124.3223 (39)
Average = Sum(39)m / 12 =												123.4817 (39)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3954	1.3919	1.3885	1.3726	1.3697	1.3558	1.3558	1.3533	1.3612	1.3697	1.3757	1.3820 (40)
HLP (average)												1.3726 (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												2.6252 (42)
Average daily hot water use (litres/day)												96.5479 (43)
Daily hot water use	106.2026	102.3407	98.4788	94.6169	90.7550	86.8931	86.8931	90.7550	94.6169	98.4788	102.3407	106.2026 (44)
Energy content (annual)	157.4954	137.7465	142.1421	123.9229	118.9070	102.6077	95.0811	109.1069	110.4100	128.6722	140.4558	152.5259 (45)
Energy content (annual)												Total = Sum(45)m = 1519.0736 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Heat gains from water heating, kWh/month	33.4678	29.2711	30.2052	26.3336	25.2677	21.8041	20.2047	23.1852	23.4621	27.3429	29.8469	32.4118 (65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabolic gains (Table 5), Watts	131.2586	131.2586	131.2586	131.2586	131.2586	131.2586	131.2586	131.2586	131.2586	131.2586	131.2586	131.2586 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.6425	19.2227	15.6330	11.8352	8.8469	7.4689	8.0705	10.4903	14.0800	17.8778	20.8661	22.2440 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	239.0041	241.4842	235.2344	221.9293	205.1340	189.3488	178.8033	176.3232	182.5730	195.8781	212.6734	228.4586 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1259	36.1259	36.1259	36.1259	36.1259	36.1259	36.1259	36.1259	36.1259	36.1259	36.1259	36.1259 (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)	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069 (71)
Water heating gains (Table 5)	44.9836	43.5582	40.5984	36.5745	33.9620	30.2835	27.1569	31.1629	32.5863	36.7511	41.4540	43.5642 (72)
Total internal gains	368.0078	366.6428	353.8434	332.7165	310.3205	289.4789	276.4083	280.3540	291.6169	312.8847	337.3711	356.6445 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W					
Southeast	8.3500	36.7938	0.5700	0.7000	0.7700	84.9508 (77)						
Northwest	6.5000	11.2829	0.5700	0.7000	0.7700	20.2788 (81)						
Northwest	3.8000	11.2829	0.6300	0.7000	0.7700	13.1032 (81)						
Solar gains	118.3328	212.6527	320.4128	446.3733	545.0345	560.9131	532.5319	455.8961	363.5556	242.9676	143.7547	99.9616 (83)
Total gains	486.3407	579.2955	674.2562	779.0898	855.3550	850.3920	808.9401	736.2501	655.1726	555.8523	481.1258	456.6061 (84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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)												
tau	49.7678	49.8912	50.0127	50.5918	50.7016	51.2192	51.2192	51.3162	51.0186	50.7016	50.4799	50.2502
alpha	4.3179	4.3261	4.3342	4.3728	4.3801	4.4146	4.4146	4.4211	4.4012	4.3801	4.3653	4.3500
util living area	0.9986	0.9968	0.9913	0.9714	0.9111	0.7788	0.6225	0.6904	0.9018	0.9852	0.9972	0.9990 (86)
MIT	19.3905	19.5615	19.8566	20.2602	20.6320	20.8809	20.9667	20.9479	20.7446	20.2634	19.7562	19.3648 (87)
Th 2	19.7669	19.7695	19.7721	19.7844	19.7867	19.7974	19.7974	19.7993	19.7932	19.7867	19.7820	19.7772 (88)
util rest of house	0.9981	0.9956	0.9879	0.9591	0.8705	0.6803	0.4719	0.5419	0.8392	0.9769	0.9960	0.9986 (89)
MIT 2	18.3118	18.4845	18.7799	19.1856	19.5339	19.7416	19.7891	19.7844	19.6452	19.1955	18.6887	18.2941 (90)
Living area fraction									fLA = Living area / (4) =			0.1681 (91)
MIT	18.4931	18.6655	18.9608	19.3662	19.7184	19.9331	19.9870	19.9800	19.8299	19.3750	18.8682	18.4741 (92)
Temperature adjustment												0.0000
adjusted MIT	18.4931	18.6655	18.9608	19.3662	19.7184	19.9331	19.9870	19.9800	19.8299	19.3750	18.8682	18.4741 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9973	0.9940	0.9847	0.9535	0.8677	0.6930	0.4975	0.5667	0.8416	0.9729	0.9947	0.9980 (94)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Useful gains	485.0399	575.8465	663.9624	742.8648	742.1718	589.2995	402.4285	417.2300	551.4206	540.7811	478.5586	455.6812 (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	1781.6218	1723.6733	1556.5147	1292.3983	987.9972	650.4802	413.1152	435.8234	701.6315	1081.2144	1456.3863	1774.5838 (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	964.6569	771.3396	664.0589	395.6641	182.8941	0.0000	0.0000	0.0000	0.0000	402.0824	704.0359	981.2635 (98)
Space heating												5065.9955 (98)
Space heating per m2												(98) / (4) = 56.3139 (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	1146.5211	902.5804	925.2220	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7953	0.8689	0.8300	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	911.8695	784.2353	767.9103	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1093.0584	1042.5232	959.3028	0.0000	0.0000	0.0000	0.0000 (103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	130.4560	192.1662	142.3960	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												465.0182 (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	32.6140	48.0415	35.5990	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												116.2545 (107)
Space cooling per m2												1.2923 (108)
Energy for space heating												56.3139 (99)
Energy for space cooling												1.2923 (108)
Total												57.6062 (109)
Dwelling Fabric Energy Efficiency (DFEE)												57.6 (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	44.9800 (1b)	3.0000 (2b)	134.9400 (1b) - (3b)
First floor	44.9800 (1c)	2.8400 (2c)	127.7432 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.9600		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 262.6832 (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) =	0.1142 (8)							
Pressure test				Yes								
Measured/design AP50				5.0000								
Infiltration rate				0.3642 (18)								
Number of sides sheltered				1 (19)								
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)							
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3369 (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	0.4295	0.4211	0.4127	0.3706	0.3622	0.3200	0.3200	0.3116	0.3369	0.3622	0.3790	0.3958 (22b)
Effective ac	0.5923	0.5887	0.5852	0.5687	0.5656	0.5512	0.5512	0.5486	0.5567	0.5656	0.5718	0.5783 (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 Semi-glazed door			2.4700	1.2000	2.9640		(26a)					
TER Opening Type (Uw = 1.40)			18.6500	1.3258	24.7254		(27)					
Ground Floor			44.9800	0.1300	5.8474		(28b)					
Main Wall	113.6500	21.1200	92.5300	0.1800	16.6554		(29a)					
Main Roof	44.9800		44.9800	0.1300	5.8474		(30)					
Total net area of external elements Aum(A, m2)			203.6100				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 56.0396		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.5747 (36)					
Total fabric heat loss							(33) + (36) = 66.6143 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 51.3395	Feb 51.0290	Mar 50.7246	Apr 49.2950	May 49.0275	Jun 47.7823	Jul 47.7823	Aug 47.5517	Sep 48.2619	Oct 49.0275	Nov 49.5686	Dec 50.1343 (38)
Heat transfer coeff	117.9538	117.6432	117.3389	115.9092	115.6417	114.3966	114.3966	114.1660	114.8762	115.6417	116.1829	116.7486 (39)
Average = Sum(39)m / 12 =												115.9080 (39)
HLP	Jan 1.3112	Feb 1.3077	Mar 1.3043	Apr 1.2885	May 1.2855	Jun 1.2716	Jul 1.2716	Aug 1.2691	Sep 1.2770	Oct 1.2855	Nov 1.2915	Dec 1.2978 (40)
HLP (average)												1.2884 (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												2.6252 (42)
Average daily hot water use (litres/day)												96.5479 (43)
Daily hot water use	106.2026	102.3407	98.4788	94.6169	90.7550	86.8931	86.8931	90.7550	94.6169	98.4788	102.3407	106.2026 (44)
Energy conte	157.4954	137.7465	142.1421	123.9229	118.9070	102.6077	95.0811	109.1069	110.4100	128.6722	140.4558	152.5259 (45)
Energy content (annual)												Total = Sum(45)m = 1519.0736 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
If cylinder contains dedicated solar storage												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)	
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
	33.4678	29.2711	30.2052	26.3336	25.2677	21.8041	20.2047	23.1852	23.4621	27.3429	29.8469	32.4118	(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	131.2586	131.2586	131.2586	131.2586	131.2586	131.2586	131.2586	131.2586	131.2586	131.2586	131.2586	131.2586	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.3865	18.9953	15.4480	11.6951	8.7422	7.3806	7.9750	10.3662	13.9134	17.6663	20.6192	21.9809	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	239.0041	241.4842	235.2344	221.9293	205.1340	189.3488	178.8033	176.3232	182.5730	195.8781	212.6734	228.4586	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1259	36.1259	36.1259	36.1259	36.1259	36.1259	36.1259	36.1259	36.1259	36.1259	36.1259	36.1259	(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)	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	(71)
Water heating gains (Table 5)	44.9836	43.5582	40.5984	36.5745	33.9620	30.2835	27.1569	31.1629	32.5863	36.7511	41.4540	43.5642	(72)
Total internal gains	367.7518	366.4153	353.6584	332.5765	310.2159	289.3905	276.3128	280.2299	291.4503	312.6732	337.1242	356.3813	(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							
Southeast	8.3500	36.7938	0.6300	0.7000	0.7700	93.8930 (77)							
Northwest	10.3000	11.2829	0.6300	0.7000	0.7700	35.5166 (81)							
Solar gains	129.4096	232.2296	349.0821	485.0527	591.2399	608.0518	577.4512	495.0069	395.6610	265.1121	157.1513	109.3575	(83)
Total gains	497.1614	598.6450	702.7405	817.6292	901.4558	897.4423	853.7640	775.2367	687.1113	577.7852	494.2754	465.7388	(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	52.9633	53.1031	53.2409	53.8975	54.0222	54.6102	54.6102	54.7205	54.3822	54.0222	53.7706	53.5101		
alpha	4.5309	4.5402	4.5494	4.5932	4.6015	4.6407	4.6407	4.6480	4.6255	4.6015	4.5847	4.5673		
util living area	0.9985	0.9963	0.9894	0.9632	0.8856	0.7302	0.5676	0.6372	0.8755	0.9819	0.9969	0.9989	(86)	
MIT	19.5057	19.6832	19.9784	20.3738	20.7177	20.9216	20.9809	20.9681	20.8050	20.3527	19.8579	19.4790	(87)	
Th 2	19.8321	19.8348	19.8374	19.8499	19.8522	19.8631	19.8631	19.8651	19.8589	19.8522	19.8475	19.8426	(88)	
util rest of house	0.9980	0.9950	0.9854	0.9484	0.8394	0.6322	0.4319	0.4991	0.8063	0.9721	0.9956	0.9985	(89)	
MIT 2	18.4772	18.6563	18.9515	19.3471	19.6626	19.8276	19.8585	19.8563	19.7492	19.3344	18.8410	18.4588	(90)	
Living area fraction										fLA = Living area / (4) =		0.1681	(91)	
MIT	18.6501	18.8289	19.1240	19.5197	19.8400	20.0115	20.0471	20.0431	19.9267	19.5055	19.0119	18.6303	(92)	
Temperature adjustment												0.0000		
adjusted MIT	18.6501	18.8289	19.1240	19.5197	19.8400	20.0115	20.0471	20.0431	19.9267	19.5055	19.0119	18.6303	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	495.7961	594.7016	690.1186	770.9675	756.1184	579.9734	388.3730	404.9272	557.4528	559.3104	491.4350	464.7890	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1692.6463	1638.6359	1481.2916	1230.9155	941.3183	619.0571	394.3370	415.9226	669.3437	1029.8513	1383.9636	1684.7111	(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	890.4566	701.5238	588.6327	331.1625	137.7887	0.0000	0.0000	0.0000	0.0000	350.0824	642.6206	907.6220	(98)
Space heating												4549.8895	(98)
Space heating per m2										(98) / (4) =		50.5768	(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	1075.3278	846.5347	867.6615	0.0000	0.0000	0.0000	0.0000	(100)	
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8485	0.9102	0.8775	0.0000	0.0000	0.0000	0.0000	(101)	
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	912.4025	770.5141	761.3736	0.0000	0.0000	0.0000	0.0000	(102)	
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1147.9347	1094.7875	1004.7064	0.0000	0.0000	0.0000	0.0000	(103)	
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)	
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	169.5832	241.2595	181.0396	0.0000	0.0000	0.0000	0.0000	(104)	
Space cooling												591.8823	(104)	
Cooled fraction												fC = cooled area / (4) =	1.0000	(105)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	42.3958	60.3149	45.2599	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling											147.9706	(107)
Space cooling per m2											1.6448	(108)
Energy for space heating											50.5768	(99)
Energy for space cooling											1.6448	(108)
Total											52.2217	(109)
Target Fabric Energy Efficiency (TFEE)											60.1	(109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	13064	Issued on Date	28/11/2018	
Assessment Reference	Revision B	Prop Type Ref		
Property	Unit 1 (LHS) Hamlyns Yard, Castle Street, Totnes			
SAP Rating	102 A	DER	21.47	
TER		TER	27.97	
Environmental	84 B	% DER<TER	23.23	
CO ₂ Emissions (t/year)	0.98	DFEE	57.61	
TREE		TREE	60.05	
General Requirements Compliance	Pass	% DFEE<TFEE	4.08	
Assessor	David Bartlett, Tel: 01752 894661, Fax: 01752 894661		Assessor ID	A066-0001
Client	SNJ Architects			

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	44.9800 (1b)	x 3.0000 (2b)	= 134.9400 (1b) - (3b)
First floor	44.9800 (1c)	x 2.8400 (2c)	= 127.7432 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 262.6832 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour							
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)							
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)							
Number of intermittent fans					4 * 10 = 40.0000 (7a)							
Number of passive vents					0 * 10 = 0.0000 (7b)							
Number of flueless gas fires					0 * 40 = 0.0000 (7c)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					40.0000 / (5) = 0.1523 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.4023 (18)							
Number of sides sheltered					1 (19)							
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.9250 (20)							
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3721 (21)							
Wind speed	Jan 6.0000	Feb 5.6000	Mar 5.6000	Apr 5.0000	May 5.0000	Jun 4.4000	Jul 4.4000	Aug 4.3000	Sep 4.7000	Oct 5.4000	Nov 5.5000	Dec 5.9000 (22)
Wind factor	1.5000	1.4000	1.4000	1.2500	1.2500	1.1000	1.1000	1.0750	1.1750	1.3500	1.3750	1.4750 (22a)
Adj infilt rate	0.5582	0.5209	0.5209	0.4651	0.4651	0.4093	0.4093	0.4000	0.4372	0.5023	0.5116	0.5489 (22b)
Effective ac	0.6558	0.6357	0.6357	0.6082	0.6082	0.5838	0.5838	0.5800	0.5956	0.6262	0.6309	0.6506 (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					
Window (Uw = 1.00)			14.8500	0.9615	14.2788		(27)					
Door			2.4700	1.4000	3.4580		(26a)					
French Door (Uw = 1.40)			3.8000	1.3258	5.0379		(27)					
Ground Floor			44.9800	0.1400	6.2972		(28b)					
Main Wall	113.6500	21.1200	92.5300	0.2300	21.2819		(29a)					
Main Roof	44.9800		44.9800	0.1000	4.4980		(30)					
Total net area of external elements Aum(A, m ²)			203.6100				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 54.8518		(33)					
Party Wall			44.2000	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							19.3362 (36)					
Total fabric heat loss							(33) + (36) = 74.1880 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 56.8456	Feb 55.1053	Mar 55.1053	Apr 52.7198	May 52.7198	Jun 50.6043	Jul 50.6043	Aug 50.2780	Sep 51.6283	Oct 54.2801	Nov 54.6889	Dec 56.3993 (38)
Heat transfer coeff	131.0337	129.2933	129.2933	126.9078	126.9078	124.7923	124.7923	124.4660	125.8163	128.4681	128.8770	130.5873 (39)
Average = Sum(39)m / 12 =												127.6029 (39)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.4566	1.4372	1.4372	1.4107	1.4107	1.3872	1.3872	1.3836	1.3986	1.4281	1.4326	1.4516 (40)
HLP (average)												1.4184 (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												2.6252 (42)
Average daily hot water use (litres/day)												96.5479 (43)
Daily hot water use	106.2026	102.3407	98.4788	94.6169	90.7550	86.8931	86.8931	90.7550	94.6169	98.4788	102.3407	106.2026 (44)
Energy content (annual)	157.4954	137.7465	142.1421	123.9229	118.9070	102.6077	95.0811	109.1069	110.4100	128.6722	140.4558	152.5259 (45)
Energy content (annual)												Total = Sum(45)m = 1519.0736 (45)
Distribution loss (46)m = 0.15 x (45)m	23.6243	20.6620	21.3213	18.5884	17.8360	15.3912	14.2622	16.3660	16.5615	19.3008	21.0684	22.8789 (46)
Water storage loss:												250.0000 (47)
Store volume												2.0000 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												1.0800 (55)
Enter (49) or (54) in (55)												
Total storage loss	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800 (56)
If cylinder contains dedicated solar storage	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800 (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	214.2378	188.9977	198.8845	178.8349	175.6494	157.5197	151.8235	165.8493	165.3220	185.4146	195.3678	209.2683 (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	214.2378	188.9977	198.8845	178.8349	175.6494	157.5197	151.8235	165.8493	165.3220	185.4146	195.3678	209.2683 (64)
Total per year (kWh/year) = Sum(64)m =												2187.1696 (64)
RHI water heating demand												2187 (64)
Heat gains from water heating, kWh/month	97.7612	86.8017	92.6562	85.1340	84.9305	78.0467	77.0084	81.6720	80.6409	88.1774	90.6312	96.1088 (65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabolic gains (Table 5), Watts												
(66)m	157.5104	157.5104	157.5104	157.5104	157.5104	157.5104	157.5104	157.5104	157.5104	157.5104	157.5104	157.5104 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	54.1063	48.0568	39.0824	29.5879	22.1173	18.6723	20.1761	26.2257	35.2001	44.6946	52.1652	55.6101 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	356.7226	360.4242	351.0962	331.2378	306.1702	282.6102	266.8706	263.1689	272.4970	292.3554	317.4230	340.9830 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.3762	53.3762	53.3762	53.3762	53.3762	53.3762	53.3762	53.3762	53.3762	53.3762	53.3762	53.3762 (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)	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069 (71)
Water heating gains (Table 5)	131.3994	129.1692	124.5378	118.2416	114.1539	108.3981	103.5059	109.7742	112.0013	118.5181	125.8766	129.1785 (72)
Total internal gains	651.1080	646.5298	623.5961	587.9470	551.3210	518.5603	499.4323	508.0485	528.5781	564.4477	604.3445	634.6513 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b g	Specific data or Table 6c FF	Access factor Table 6d	Gains W						
Southeast	8.3500	47.2368	0.5700	0.7000	0.7700	109.0619 (77)						
Northwest	6.5000	15.4538	0.5700	0.7000	0.7700	27.7751 (81)						
Northwest	3.8000	15.4538	0.6300	0.7000	0.7700	17.9470 (81)						
Solar gains	154.7839	236.0111	357.4289	507.8287	590.7673	649.9638	570.8561	520.8698	417.6215	274.4647	181.3800	125.7324 (83)
Total gains	805.8919	882.5409	981.0250	1095.7757	1142.0883	1168.5241	1070.2884	1028.9183	946.1995	838.9124	785.7245	760.3837 (84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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)												
tau	47.6765	48.3182	48.3182	49.2265	49.2265	50.0610	50.0610	50.1922	49.6535	48.6286	48.4743	47.8394
alpha	4.1784	4.2212	4.2212	4.2818	4.2818	4.3374	4.3374	4.3461	4.3102	4.2419	4.2316	4.1893
util living area	0.9853	0.9781	0.9595	0.9107	0.8151	0.6433	0.5388	0.5464	0.7411	0.9187	0.9711	0.9871 (86)
MIT	19.8547	19.9836	20.2022	20.5148	20.7769	20.9406	20.9777	20.9772	20.8961	20.5914	20.2221	19.8560 (87)
Th 2	19.7202	19.7349	19.7349	19.7551	19.7551	19.7732	19.7732	19.7760	19.7644	19.7419	19.7384	19.7240 (88)
util rest of house	0.9799	0.9702	0.9449	0.8793	0.7519	0.5418	0.4111	0.4148	0.6374	0.8792	0.9585	0.9822 (89)
MIT 2	18.2792	18.4739	18.7833	19.2248	19.5534	19.7365	19.7645	19.7674	19.6962	19.3305	18.8210	18.2846 (90)
Living area fraction												fLA = Living area / (4) = 0.1681 (91)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

MIT	18.5440	18.7276	19.0218	19.4416	19.7590	19.9389	19.9684	19.9707	19.8979	19.5424	19.0565	18.5487 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.3940	18.5776	18.8718	19.2916	19.6090	19.7889	19.8184	19.8207	19.7479	19.3924	18.9065	18.3987 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9716	0.9599	0.9314	0.8647	0.7432	0.5432	0.4161	0.4198	0.6359	0.8648	0.9465	0.9745 (94)
Useful gains	782.9654	847.1319	913.7232	947.5628	848.8500	634.7061	445.3091	431.9818	601.6529	725.5241	743.6706	740.9987 (95)
Ext temp.	6.1000	6.4000	7.5000	9.3000	11.9000	14.5000	16.2000	16.3000	14.6000	11.8000	9.0000	6.4000 (96)
Heat loss rate W												
1610.9316	1574.4832	1470.2944	1268.0126	978.3377	660.0148	451.5530	438.2063	647.6888	975.3811	1276.7229	1566.8764 (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												
616.0069	488.7801	414.0890	230.7239	96.3389	0.0000	0.0000	0.0000	0.0000	185.8936	383.7977	614.4530 (98)	
Space heating												3030.0830 (98)
RHI space heating demand												3030 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	44.9800 (1b)	3.0000 (2b)	134.9400 (1b) - (3b)
First floor	44.9800 (1c)	2.8400 (2c)	127.7432 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.9600		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 262.6832 (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) =	0.1523 (8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate				0.4023 (18)	
Number of sides sheltered				1 (19)	
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3721 (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	0.4744	0.4651	0.4558	0.4093	0.4000	0.3535	0.3535	0.3442	0.3721	0.4000	0.4186	0.4372 (22b)
Effective ac	0.6125	0.6082	0.6039	0.5838	0.5800	0.5625	0.5625	0.5592	0.5692	0.5800	0.5876	0.5956 (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
Window (Uw = 1.00)			14.8500	0.9615	14.2788		(27)
Door			2.4700	1.4000	3.4580		(26a)
French Door (Uw = 1.40)			3.8000	1.3258	5.0379		(27)
Ground Floor			44.9800	0.1400	6.2972		(28b)
Main Wall	113.6500	21.1200	92.5300	0.2300	21.2819		(29a)
Main Roof	44.9800		44.9800	0.1000	4.4980		(30)
Total net area of external elements Aum(A, m2)			203.6100				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 54.8518		(33)
Party Wall			44.2000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							19.3362 (36)
Total fabric heat loss						(33) + (36) =	74.1880 (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	53.0986	52.7198	52.3484	50.6043	50.2780	48.7589	48.7589	48.4776	49.3440	50.2780	50.9381	51.6283 (38)
Heat transfer coeff	127.2866	126.9078	126.5364	124.7923	124.4660	122.9469	122.9469	122.6656	123.5320	124.4660	125.1261	125.8163 (39)
Average = Sum(39)m / 12 =												124.7908 (39)
HLP	1.4149	1.4107	1.4066	1.3872	1.3836	1.3667	1.3667	1.3636	1.3732	1.3836	1.3909	1.3986 (40)
HLP (average)												1.3872 (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												2.6252 (42)
Average daily hot water use (litres/day)												96.5479 (43)
Daily hot water use	106.2026	102.3407	98.4788	94.6169	90.7550	86.8931	86.8931	90.7550	94.6169	98.4788	102.3407	106.2026 (44)
Energy conte	157.4954	137.7465	142.1421	123.9229	118.9070	102.6077	95.0811	109.1069	110.4100	128.6722	140.4558	152.5259 (45)
Energy content (annual)												Total = Sum(45)m = 1519.0736 (45)
Distribution loss (46)m = 0.15 x (45)m												
23.6243	20.6620	21.3213	18.5884	17.8360	15.3912	14.2622	16.3660	16.5615	19.3008	21.0684	22.8789 (46)	
Water storage loss:												250.0000 (47)
Store volume												

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):												2.0000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0800 (55)
Total storage loss	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800 (56)
If cylinder contains dedicated solar storage	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800 (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	214.2378	188.9977	198.8845	178.8349	175.6494	157.5197	151.8235	165.8493	165.3220	185.4146	195.3678	209.2683 (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	214.2378	188.9977	198.8845	178.8349	175.6494	157.5197	151.8235	165.8493	165.3220	185.4146	195.3678	209.2683 (64)
Heat gains from water heating, kWh/month	97.7612	86.8017	92.6562	85.1340	84.9305	78.0467	77.0084	81.6720	80.6409	88.1774	90.6312	96.1088 (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	157.5104	157.5104	157.5104	157.5104	157.5104	157.5104	157.5104	157.5104	157.5104	157.5104	157.5104	157.5104 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	54.1063	48.0568	39.0824	29.5879	22.1173	18.6723	20.1761	26.2257	35.2001	44.6946	52.1652	55.6101 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	356.7226	360.4242	351.0962	331.2378	306.1702	282.6102	266.8706	263.1689	272.4970	292.3554	317.4230	340.9830 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.3762	53.3762	53.3762	53.3762	53.3762	53.3762	53.3762	53.3762	53.3762	53.3762	53.3762	53.3762 (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)	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069 (71)
Water heating gains (Table 5)	131.3994	129.1692	124.5378	118.2416	114.1539	108.3981	103.5059	109.7742	112.0013	118.5181	125.8766	129.1785 (72)
Total internal gains	651.1080	646.5298	623.5961	587.9470	551.3210	518.5603	499.4323	508.0485	528.5781	564.4477	604.3445	634.6513 (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						
Southeast	8.3500	36.7938	0.5700	0.7000	0.7700	84.9508 (77)						
Northwest	6.5000	11.2829	0.5700	0.7000	0.7700	20.2788 (81)						
Northwest	3.8000	11.2829	0.6300	0.7000	0.7700	13.1032 (81)						
Solar gains	118.3328	212.6527	320.4128	446.3733	545.0345	560.9131	532.5319	455.8961	363.5556	242.9676	143.7547	99.9616 (83)
Total gains	769.4408	859.1825	944.0089	1034.3202	1096.3555	1079.4734	1031.9642	963.9446	892.1337	807.4153	748.0992	734.6129 (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	49.0800	49.2265	49.3709	50.0610	50.1922	50.8124	50.8124	50.9289	50.5717	50.1922	49.9274	49.6535
alpha	4.2720	4.2818	4.2914	4.3374	4.3461	4.3875	4.3875	4.3953	4.3714	4.3461	4.3285	4.3102
util living area	0.9917	0.9857	0.9711	0.9296	0.8343	0.6686	0.5091	0.5609	0.7948	0.9474	0.9850	0.9931 (86)
MIT	19.6429	19.8077	20.0844	20.4511	20.7569	20.9346	20.9843	20.9763	20.8563	20.4698	19.9976	19.6176 (87)
Th 2	19.7519	19.7551	19.7583	19.7732	19.7760	19.7890	19.7890	19.7914	19.7839	19.7760	19.7703	19.7644 (88)
util rest of house	0.9889	0.9809	0.9611	0.9043	0.7761	0.5654	0.3765	0.4254	0.7057	0.9230	0.9792	0.9908 (89)
MIT 2	17.9928	18.2334	18.6329	19.1553	19.5496	19.7484	19.7838	19.7826	19.6774	19.1939	18.5210	17.9646 (90)
Living area fraction												fLA = Living area / (4) = 0.1681 (91)
MIT	18.2702	18.4980	18.8769	19.3731	19.7525	19.9478	19.9856	19.9833	19.8755	19.4084	18.7692	18.2424 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.1202	18.3480	18.7269	19.2231	19.6025	19.7978	19.8356	19.8333	19.7255	19.2584	18.6192	18.0924 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9833	0.9730	0.9495	0.8898	0.7664	0.5663	0.3818	0.4304	0.7007	0.9091	0.9710	0.9860 (94)
Useful gains	756.6234	835.9780	896.3491	920.3307	840.2140	611.2624	394.0531	414.8424	625.1485	733.9989	726.3887	724.3556 (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	1759.1230	1706.6539	1547.1425	1288.2383	983.5908	639.0485	397.8061	421.1432	694.9316	1077.6733	1441.3529	1747.8910 (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	745.8596	585.0942	484.1903	264.8935	106.6724	0.0000	0.0000	0.0000	0.0000	255.6938	514.7743	761.5104 (98)
Space heating												3718.6884 (98)
Space heating per m ²												(98) / (4) = 41.3371 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3718.6884 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	745.8596	585.0942	484.1903	264.8935	106.6724	0.0000	0.0000	0.0000	0.0000	255.6938	514.7743	761.5104	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	745.8596	585.0942	484.1903	264.8935	106.6724	0.0000	0.0000	0.0000	0.0000	255.6938	514.7743	761.5104	(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	214.2378	188.9977	198.8845	178.8349	175.6494	157.5197	151.8235	165.8493	165.3220	185.4146	195.3678	209.2683	(64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(216)
Fuel for water heating, kWh/month	214.2378	188.9977	198.8845	178.8349	175.6494	157.5197	151.8235	165.8493	165.3220	185.4146	195.3678	209.2683	(219)
Water heating fuel used													2187.1696 (219)
Annual totals kWh/year													
Space heating fuel - main system													3718.6884 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
central heating pump													30.0000 (230c)
Total electricity for the above, kWh/year													30.0000 (231)
Electricity for lighting (calculated in Appendix L)													382.2139 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 4.00 * 1029 * 1.00) =										-3293.3975			-3293.3975 (233)
Total delivered energy for all uses													3024.6745 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3718.6884	5.5000	204.5279 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2187.1696	5.5000	120.2943 (247)
Pumps and fans for heating (0.90*15.29 + 0.10*5.50)	30.0000	14.3110	4.2933 (249)
Energy for lighting (0.90*15.29 + 0.10*5.50)	382.2139	14.3110	54.6986 (250)
Additional standing charges			24.0000 (251)
Energy saving/generation technologies			
PV Unit (0.90*19.47 + 0.10*7.60)	-3293.3975	13.7505	-452.8586 (252)
Total energy cost			-45.0445 (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] =	-0.1402 (257)
SAP value		101.9555
SAP rating (Section 12)		102 (258)
SAP band		A

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3718.6884	0.5190	1929.9993 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2187.1696	0.5190	1135.1410 (264)
Space and water heating			3065.1403 (265)
Pumps and fans	30.0000	0.5190	15.5700 (267)
Energy for lighting	382.2139	0.5190	198.3690 (268)
Energy saving/generation technologies			
PV Unit (0.90*19.47 + 0.10*7.60)	-3293.3975	0.5190	-1709.2733 (269)
Total kg/year			1569.8061 (272)
CO2 emissions per m2			17.4500 (273)
EI value			84.4136
EI rating			84 (274)
EI band			B

Calculation of stars for heating and DHW

Main heating energy efficiency $5.50 \times (1 + 0.29 \times 0.00) / 1.0000 = 5.500$, stars = 3

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Main heating environmental impact $0.519 \times (1 + 0.29 \times 0.00) / 1.0000 = 0.5190$, stars = 2
Water heating energy efficiency $5.50 / 1.0000 = 5.500$, stars = 3
Water heating environmental impact $0.519 / 1.0000 = 0.5190$, stars = 2

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 (m2)	Storey height (m)	Volume (m3)
Ground floor	44.9800 (1b)	x 3.0000 (2b)	= 134.9400 (1b) - (3b)
First floor	44.9800 (1c)	x 2.8400 (2c)	= 127.7432 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 262.6832 (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) =	0.1523 (8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate				0.4023 (18)	
Number of sides sheltered				1 (19)	
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3721 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	6.0000	5.6000	5.6000	5.0000	5.0000	4.4000	4.4000	4.3000	4.7000	4.4000	5.5000	5.9000 (22)
Wind factor	1.5000	1.4000	1.4000	1.2500	1.2500	1.1000	1.1000	1.0750	1.1750	1.3500	1.3750	1.4750 (22a)
Adj infilt rate												
Effective ac	0.5582	0.5209	0.5209	0.4651	0.4651	0.4093	0.4093	0.4000	0.4372	0.5023	0.5116	0.5489 (22b)
	0.6558	0.6357	0.6357	0.6082	0.6082	0.5838	0.5838	0.5800	0.5956	0.6262	0.6309	0.6506 (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
Window (Uw = 1.00)			14.8500	0.9615	14.2788		(27)
Door			2.4700	1.4000	3.4580		(26a)
French Door (Uw = 1.40)			3.8000	1.3258	5.0379		(27)
Ground Floor			44.9800	0.1400	6.2972		(28b)
Main Wall	113.6500	21.1200	92.5300	0.2300	21.2819		(29a)
Main Roof	44.9800		44.9800	0.1000	4.4980		(30)
Total net area of external elements Aum(A, m2)			203.6100				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	54.8518	(33)
Party Wall			44.2000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							19.3362 (36)
Total fabric heat loss						(33) + (36) =	74.1880 (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	56.8456	55.1053	55.1053	52.7198	52.7198	50.6043	50.6043	50.2780	51.6283	54.2801	54.6889	56.3993 (38)
Heat transfer coeff	131.0337	129.2933	129.2933	126.9078	126.9078	124.7923	124.7923	124.4660	125.8163	128.4681	128.8770	130.5873 (39)
Average = Sum(39)m / 12 =												127.6029 (39)
HLP	1.4566	1.4372	1.4372	1.4107	1.4107	1.3872	1.3872	1.3836	1.3986	1.4281	1.4326	1.4516 (40)
HLP (average)												1.4184 (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												2.6252 (42)
Average daily hot water use (litres/day)												96.5479 (43)
Daily hot water use	106.2026	102.3407	98.4788	94.6169	90.7550	86.8931	86.8931	90.7550	94.6169	98.4788	102.3407	106.2026 (44)
Energy conte	157.4954	137.7465	142.1421	123.9229	118.9070	102.6077	95.0811	109.1069	110.4100	128.6722	140.4558	152.5259 (45)
Energy content (annual)												Total = Sum(45)m = 1519.0736 (45)
Distribution loss (46)m = 0.15 x (45)m												
	23.6243	20.6620	21.3213	18.5884	17.8360	15.3912	14.2622	16.3660	16.5615	19.3008	21.0684	22.8789 (46)
Water storage loss:												
Store volume												250.0000 (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):													2.0000 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													1.0800 (55)
Total storage loss	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800 (56)
If cylinder contains dedicated solar storage	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800 (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	214.2378	188.9977	198.8845	178.8349	175.6494	157.5197	151.8235	165.8493	165.3220	185.4146	195.3678	209.2683 (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	214.2378	188.9977	198.8845	178.8349	175.6494	157.5197	151.8235	165.8493	165.3220	185.4146	195.3678	209.2683 (64)	
Heat gains from water heating, kWh/month	97.7612	86.8017	92.6562	85.1340	84.9305	78.0467	77.0084	81.6720	80.6409	88.1774	90.6312	96.1088 (65)	
Solar input (sum of months) = Sum(63)m =												0.0000 (63)	
Total per year (kWh/year) = Sum(64)m =												2187.1696 (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	157.5104	157.5104	157.5104	157.5104	157.5104	157.5104	157.5104	157.5104	157.5104	157.5104	157.5104	157.5104	157.5104 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	54.1063	48.0568	39.0824	29.5879	22.1173	18.6723	20.1761	26.2257	35.2001	44.6946	52.1652	55.6101	55.6101 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	356.7226	360.4242	351.0962	331.2378	306.1702	282.6102	266.8706	263.1689	272.4970	292.3554	317.4230	340.9830	340.9830 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.3762	53.3762	53.3762	53.3762	53.3762	53.3762	53.3762	53.3762	53.3762	53.3762	53.3762	53.3762	53.3762 (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)	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069 (71)
Water heating gains (Table 5)	131.3994	129.1692	124.5378	118.2416	114.1539	108.3981	103.5059	109.7742	112.0013	118.5181	125.8766	129.1785	129.1785 (72)
Total internal gains	651.1080	646.5298	623.5961	587.9470	551.3210	518.5603	499.4323	508.0485	528.5781	564.4477	604.3445	634.6513	634.6513 (73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains						
	m ²	Table 6a	Specific data	Specific data	factor	W						
		W/m ²	or Table 6b	or Table 6c	Table 6d							
Southeast	8.3500	47.2368	0.5700	0.7000	0.7700	109.0619 (77)						
Northwest	6.5000	15.4538	0.5700	0.7000	0.7700	27.7751 (81)						
Northwest	3.8000	15.4538	0.6300	0.7000	0.7700	17.9470 (81)						
Solar gains	154.7839	236.0111	357.4289	507.8287	590.7673	649.9638	570.8561	520.8698	417.6215	274.4647	181.3800	125.7324 (83)
Total gains	805.8919	882.5409	981.0250	1095.7757	1142.0883	1168.5241	1070.2884	1028.9183	946.1995	838.9124	785.7245	760.3837 (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	47.6765	48.3182	48.3182	49.2265	49.2265	50.0610	50.0610	50.1922	49.6535	48.6286	48.4743	47.8394	47.8394
alpha	4.1784	4.2212	4.2212	4.2818	4.2818	4.3374	4.3374	4.3461	4.3102	4.2419	4.2316	4.1893	4.1893
util living area	0.9853	0.9781	0.9595	0.9107	0.8151	0.6433	0.5388	0.5464	0.7411	0.9187	0.9711	0.9871	0.9871 (86)
MIT	19.8547	19.9836	20.2022	20.5148	20.7769	20.9406	20.9777	20.9772	20.8961	20.5914	20.2221	19.8560	19.8560 (87)
Th 2	19.7202	19.7349	19.7349	19.7551	19.7551	19.7732	19.7732	19.7760	19.7644	19.7419	19.7384	19.7240	19.7240 (88)
util rest of house	0.9799	0.9702	0.9449	0.8793	0.7519	0.5418	0.4111	0.4148	0.6374	0.8792	0.9585	0.9822	0.9822 (89)
MIT 2	18.2792	18.4739	18.7833	19.2248	19.5534	19.7365	19.7645	19.7674	19.6962	19.3305	18.8210	18.2846	18.2846 (90)
Living area fraction	fLA = Living area / (4) =												0.1681 (91)
MIT	18.5440	18.7276	19.0218	19.4416	19.7590	19.9389	19.9684	19.9707	19.8979	19.5424	19.0565	18.5487	18.5487 (92)
Temperature adjustment													-0.1500
adjusted MIT	18.3940	18.5776	18.8718	19.2916	19.6090	19.7889	19.8184	19.8207	19.7479	19.3924	18.9065	18.3987	18.3987 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	0.9716	0.9599	0.9314	0.8647	0.7432	0.5432	0.4161	0.4198	0.6359	0.8648	0.9465	0.9745	0.9745 (94)	
Useful gains	782.9654	847.1319	913.7232	947.5628	848.8500	634.7061	445.3091	431.9818	601.6529	725.5241	743.6706	740.9987	740.9987 (95)	
Ext temp.	6.1000	6.4000	7.5000	9.3000	11.9000	14.5000	16.2000	16.3000	14.6000	11.8000	9.0000	6.4000	6.4000 (96)	
Heat loss rate W	1610.9316	1574.4832	1470.2944	1268.0126	978.3377	660.0148	451.5530	438.2063	647.6888	975.3811	1276.7229	1566.8764	1566.8764 (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	1.0000 (97a)	
Space heating kWh	616.0069	488.7801	414.0890	230.7239	96.3389	0.0000	0.0000	0.0000	0.0000	185.8936	383.7977	614.4530	614.4530 (98)	
Space heating													3030.0830 (98)	
Space heating per m ²													(98) / (4) =	33.6826 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Not applicable

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

	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 %)													100.0000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3030.0830 (211)
Space heating requirement	616.0069	488.7801	414.0890	230.7239	96.3389	0.0000	0.0000	0.0000	0.0000	185.8936	383.7977	614.4530	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	616.0069	488.7801	414.0890	230.7239	96.3389	0.0000	0.0000	0.0000	0.0000	185.8936	383.7977	614.4530	(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	214.2378	188.9977	198.8845	178.8349	175.6494	157.5197	151.8235	165.8493	165.3220	185.4146	195.3678	209.2683	(64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(216)
Fuel for water heating, kWh/month	214.2378	188.9977	198.8845	178.8349	175.6494	157.5197	151.8235	165.8493	165.3220	185.4146	195.3678	209.2683	(219)
Water heating fuel used													2187.1696 (219)
Annual totals kWh/year													3030.0830 (211)
Space heating fuel - main system													0.0000 (215)
Space heating fuel - secondary													
Electricity for pumps and fans: central heating pump													30.0000 (230c)
Total electricity for the above, kWh/year													30.0000 (231)
Electricity for lighting (calculated in Appendix L)													382.2139 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 4.00 * 1169 * 1.00) =										-3740.5833			-3740.5833 (233)
Total delivered energy for all uses													1888.8833 (238)

10a. Fuel costs - using BEDF prices (435)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3030.0830	7.6000	230.2863 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2187.1696	7.6000	166.2249 (247)
Pumps and fans for heating (0.90*19.47 + 0.10*7.60)	30.0000	18.2830	5.4849 (249)
Energy for lighting (0.90*19.47 + 0.10*7.60)	382.2139	18.2830	69.8802 (250)
Additional standing charges			8.0000 (251)
Energy saving/generation technologies			
PV Unit (0.90*19.47 + 0.10*7.60)	-3740.5833	17.4165	-651.4787 (252)
Total energy cost			-171.6024 (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	3030.0830	0.5190	1572.6131 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2187.1696	0.5190	1135.1410 (264)
Space and water heating			2707.7541 (265)
Pumps and fans	30.0000	0.5190	15.5700 (267)
Energy for lighting	382.2139	0.5190	198.3690 (268)
Energy saving/generation technologies			
PV Unit (0.90*19.47 + 0.10*7.60)	-3740.5833	0.5190	-1941.3627 (269)
Total kg/year			980.3304 (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	3030.0830	3.0700	9302.3549 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2187.1696	3.0700	6714.6108 (264)
Space and water heating			16016.9657 (265)
Pumps and fans	30.0000	3.0700	92.1000 (267)
Energy for lighting	382.2139	3.0700	1173.3968 (268)
Energy saving/generation technologies			
PV Unit (0.90*19.47 + 0.10*7.60)	-3740.5833	3.0700	-11483.5908 (269)
Primary energy kWh/year			5798.8717 (272)
Primary energy kWh/m2/year			64.4606 (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: A 102
 Current environmental impact rating: B 84

(For testing purposes):

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

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 2.2	-£ 73	-537 kg (54.8%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£73	5.97 kg/m ²	A 104 B 90
Total Savings	£73	5.97 kg/m²	

Potential energy efficiency rating: A 104
 Potential environmental impact rating: B 90

Fuel prices for cost data on this page from database revision number 435 TEST (16 Nov 2018)
 Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£480	£407	£73
Space heating	£244	£247	-£3
Water heating	£166	£90	£77
Lighting	£70	£70	£0
Generated (PV)	-£651	-£651	£0
Total cost of fuels	-£171	-£244	£73
Total cost of uses	-£171	-£244	£74
Delivered energy	21 kWh/m ²	9 kWh/m ²	12 kWh/m ²
Carbon dioxide emissions	1.0 tonnes	0.4 tonnes	0.5 tonnes
CO2 emissions per m ²	11 kg/m ²	5 kg/m ²	6 kg/m ²
Primary energy	64 kWh/m ²	29 kWh/m ²	35 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 (m2)	Storey height (m)	Volume (m3)
Ground floor	44.9800 (1b)	x 3.0000 (2b)	= 134.9400 (1b) - (3b)
First floor	44.9800 (1c)	x 2.8400 (2c)	= 127.7432 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.9600		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 262.6832 (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) =	0.1523 (8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate				0.4023 (18)	
Number of sides sheltered				1 (19)	
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3721 (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	0.4744	0.4651	0.4558	0.4093	0.4000	0.3535	0.3535	0.3442	0.3721	0.4000	0.4186	0.4372 (22b)
Effective ac	0.6125	0.6082	0.6039	0.5838	0.5800	0.5625	0.5625	0.5592	0.5692	0.5800	0.5876	0.5956 (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
Window (Uw = 1.00)			14.8500	0.9615	14.2788		(27)
Door			2.4700	1.4000	3.4580		(26a)
French Door (Uw = 1.40)			3.8000	1.3258	5.0379		(27)
Ground Floor			44.9800	0.1400	6.2972		(28b)
Main Wall	113.6500	21.1200	92.5300	0.2300	21.2819		(29a)
Main Roof	44.9800		44.9800	0.1000	4.4980		(30)
Total net area of external elements Aum(A, m2)			203.6100				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	54.8518	(33)
Party Wall			44.2000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							19.3362 (36)
Total fabric heat loss						(33) + (36) =	74.1880 (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	53.0986	52.7198	52.3484	50.6043	50.2780	48.7589	48.7589	48.4776	49.3440	50.2780	50.9381	51.6283 (38)
Heat transfer coeff	127.2866	126.9078	126.5364	124.7923	124.4660	122.9469	122.9469	122.6656	123.5320	124.4660	125.1261	125.8163 (39)
Average = Sum(39)m / 12 =												124.7908 (39)
HLP	1.4149	1.4107	1.4066	1.3872	1.3836	1.3667	1.3667	1.3636	1.3732	1.3836	1.3909	1.3986 (40)
HLP (average)												1.3872 (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												2.6252 (42)
Average daily hot water use (litres/day)												96.5479 (43)
Daily hot water use	106.2026	102.3407	98.4788	94.6169	90.7550	86.8931	86.8931	90.7550	94.6169	98.4788	102.3407	106.2026 (44)
Energy conte	157.4954	137.7465	142.1421	123.9229	118.9070	102.6077	95.0811	109.1069	110.4100	128.6722	140.4558	152.5259 (45)
Energy content (annual)												Total = Sum(45)m = 1519.0736 (45)
Distribution loss (46)m = 0.15 x (45)m												
23.6243	20.6620	21.3213	18.5884	17.8360	15.3912	14.2622	16.3660	16.5615	19.3008	21.0684	22.8789 (46)	
Water storage loss:												
Store volume												250.0000 (47)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

a) If manufacturer declared loss factor is known (kWh/day):												2.0000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0800 (55)
Total storage loss	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800 (56)
If cylinder contains dedicated solar storage												
Primary loss	23.4360	21.1680	23.4360	22.6800	23.4360	22.6800	23.4360	23.4360	22.6800	23.4360	22.6800	23.4360 (57)
Total heat required for water heating calculated for each month	204.1938	179.9257	187.4447	162.3613	152.8111	135.1930	128.7526	143.7089	150.1992	173.9749	185.6478	199.2243 (62)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.7000 (H2)
Collector heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0050 (H3a)
Collector effective heat loss coefficient												1.8063 (H3b)
Collector performance ratio												2.5804 (H4)
Annual solar radiation per m2												1079.5246 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												1813.6014 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.1939 (H8)
Utilisation factor												0.5673 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												127.5000 (H13)
Daily hot water demand												96.5479 (H14)
Volume ratio Veff/V												1.3206 (H15)
Solar storage volume factor												1.0000 (H16)
Solar input												-904.5905 (H17)
Solar input	-26.2313	-43.7725	-74.5496	-99.9112	-123.4319	-121.3532	-119.7495	-104.6257	-81.9429	-55.9574	-31.1141	-21.9511 (63)
Solar input (sum of months) = Sum(63)m =												-904.5905 (63)
Output from w/h	177.9625	136.1532	112.8951	62.4501	29.3792	13.8398	9.0031	39.0832	68.2562	118.0175	154.5337	177.2732 (64)
Total per year (kWh/year) = Sum(64)m =												1098.8468 (64)
Heat gains from water heating, kWh/month	89.7260	79.5441	83.5044	71.9551	66.6598	60.1853	58.5516	63.9596	68.5426	79.0256	82.8552	88.0736 (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	157.5104	157.5104	157.5104	157.5104	157.5104	157.5104	157.5104	157.5104	157.5104	157.5104	157.5104	157.5104 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	54.1063	48.0568	39.0824	29.5879	22.1173	18.6723	20.1761	26.2257	35.2001	44.6946	52.1652	55.6101 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	356.7226	360.4242	351.0962	331.2378	306.1702	282.6102	266.8706	263.1689	272.4970	292.3554	317.4230	340.9830 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.3762	53.3762	53.3762	53.3762	53.3762	53.3762	53.3762	53.3762	53.3762	53.3762	53.3762	53.3762 (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)	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069 (71)
Water heating gains (Table 5)	120.5994	118.3692	112.2370	99.9376	89.5965	83.5907	78.6984	85.9672	95.1981	106.2173	115.0766	118.3785 (72)
Total internal gains	640.3080	635.7298	611.2953	569.6430	526.7637	493.7528	474.6248	484.2415	511.7749	552.1469	593.5445	623.8513 (73)

6. Solar gains

[Jan]		Area	Solar flux	g	FF	Access	Gains					
		m2	Table 6a	Specific data	Specific data	factor	W					
			W/m2	or Table 6b	or Table 6c	Table 6d						
Southeast		8.3500	36.7938	0.5700	0.7000	0.7700	84.9508 (77)					
Northwest		6.5000	11.2829	0.5700	0.7000	0.7700	20.2788 (81)					
Northwest		3.8000	11.2829	0.6300	0.7000	0.7700	13.1032 (81)					
Solar gains	118.3328	212.6527	320.4128	446.3733	545.0345	560.9131	532.5319	455.8961	363.5556	242.9676	143.7547	99.9616 (83)
Total gains	758.6408	848.3825	931.7081	1016.0162	1071.7982	1054.6659	1007.1567	940.1376	875.3305	795.1145	737.2992	723.8129 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, T _{hl} (C)												21.0000 (85)
Utilisation factor for gains for living area, n _{l,m} (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	49.0800	49.2265	49.3709	50.0610	50.1922	50.8124	50.8124	50.9289	50.5717	50.1922	49.9274	49.6535
alpha	4.2720	4.2818	4.2914	4.3374	4.3461	4.3875	4.3875	4.3953	4.3714	4.3461	4.3285	4.3102
util living area	0.9921	0.9863	0.9724	0.9333	0.8428	0.6801	0.5203	0.5730	0.8029	0.9499	0.9858	0.9935 (86)
MIT	19.6326	19.7976	20.0736	20.4378	20.7455	20.9301	20.9829	20.9743	20.8499	20.4601	19.9875	19.6071 (87)
Th 2	19.7519	19.7551	19.7583	19.7732	19.7760	19.7890	19.7890	19.7914	19.7839	19.7760	19.7703	19.7644 (88)
util rest of house	0.9894	0.9817	0.9627	0.9089	0.7860	0.5767	0.3855	0.4356	0.7149	0.9264	0.9802	0.9913 (89)
MIT 2	17.9779	18.2190	18.6179	19.1379	19.5372	19.7452	19.7833	19.7818	19.6718	19.1812	18.5067	17.9495 (90)
Living area fraction												f _{LA} = Living area / (4) =
MIT	18.2560	18.4843	18.8625	19.3564	19.7403	19.9443	19.9849	19.9822	19.8698	19.3962	18.7556	18.2281 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.1060	18.3343	18.7125	19.2064	19.5903	19.7943	19.8349	19.8322	19.7198	19.2462	18.6056	18.0781 (93)

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	0.9841	0.9740	0.9514	0.8945	0.7758	0.5772	0.3908	0.4405	0.7094	0.9126	0.9723	0.9867	(94)
Useful gains	746.5810	826.3631	886.4085	908.8081	831.4867	608.7395	393.6161	414.1188	621.0013	725.6092	716.8589	714.2015	(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													
Month fracti	1757.3180	1704.9159	1545.3310	1286.1591	982.0728	638.6282	397.7269	421.0153	694.2217	1076.1568	1439.6463	1746.0867	(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	751.9883	590.3875	490.2383	271.6927	112.0361	0.0000	0.0000	0.0000	0.0000	260.8075	520.4069	767.7226	(98)
Space heating per m2												3765.2799	(98)
												(98) / (4) =	41.8550 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3765.2799 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	751.9883	590.3875	490.2383	271.6927	112.0361	0.0000	0.0000	0.0000	0.0000	260.8075	520.4069	767.7226	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	751.9883	590.3875	490.2383	271.6927	112.0361	0.0000	0.0000	0.0000	0.0000	260.8075	520.4069	767.7226	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	177.9625	136.1532	112.8951	62.4501	29.3792	13.8398	9.0031	39.0832	68.2562	118.0175	154.5337	177.2732	(64)
Efficiency of water heater	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month	177.9625	136.1532	112.8951	62.4501	29.3792	13.8398	9.0031	39.0832	68.2562	118.0175	154.5337	177.2732	(219)
Water heating fuel used													1098.8468 (219)
Annual totals kWh/year													
Space heating fuel - main system													3765.2799 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
central heating pump													30.0000 (230c)
pump for solar water heating													50.0000 (230g)
Total electricity for the above, kWh/year													80.0000 (231)
Electricity for lighting (calculated in Appendix L)													382.2139 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 4.00 * 1029 * 1.00) =										-3293.3975			-3293.3975 (233)
Total delivered energy for all uses													2032.9432 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3765.2799	5.5000	207.0904	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1098.8468	5.5000	60.4366	(247)
Pumps and fans for heating (0.90*15.29 + 0.10*5.50)	30.0000	14.3110	4.2933	(249)
Pump for solar water heating	50.0000	14.3110	7.1555	(249)
Energy for lighting (0.90*15.29 + 0.10*5.50)	382.2139	14.3110	54.6986	(250)
Additional standing charges			24.0000	(251)
Energy saving/generation technologies				
PV Unit (0.90*19.47 + 0.10*7.60)			-452.8586	(252)
Total energy cost		-3293.3975	13.7505	-95.1842 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)		-0.2962 (257)
SAP value	[(255) x (256)] / [(4) + 45.0] =	104.1322
SAP rating (Section 12)		104 (258)
SAP band		A

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Space heating - main system 1	3765.2799	0.5190	1954.1803 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1098.8468	0.5190	570.3015 (264)
Space and water heating			2524.4818 (265)
Pumps and fans	80.0000	0.5190	41.5200 (267)
Energy for lighting	382.2139	0.5190	198.3690 (268)
Energy saving/generation technologies			
PV Unit (0.90*19.47 + 0.10*7.60)	-3293.3975	0.5190	-1709.2733 (269)
Total kg/year			1055.0975 (272)
CO2 emissions per m2			11.7300 (273)
EI value			89.5241
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	44.9800 (1b)	x 3.0000 (2b)	= 134.9400 (1b) - (3b)
First floor	44.9800 (1c)	x 2.8400 (2c)	= 127.7432 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 262.6832 (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) =	0.1523 (8)							
Pressure test				Yes								
Measured/design AP50				5.0000								
Infiltration rate				0.4023 (18)								
Number of sides sheltered				1 (19)								
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)							
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3721 (21)							
Wind speed	Jan 6.0000	Feb 5.6000	Mar 5.6000	Apr 5.0000	May 5.0000	Jun 4.4000	Jul 4.4000	Aug 4.3000	Sep 4.7000	Oct 4.4000	Nov 5.5000	Dec 5.9000 (22)
Wind factor	1.5000	1.4000	1.4000	1.2500	1.2500	1.1000	1.1000	1.0750	1.1750	1.3500	1.3750	1.4750 (22a)
Adj infilt rate	0.5582	0.5209	0.5209	0.4651	0.4651	0.4093	0.4093	0.4000	0.4372	0.5023	0.5116	0.5489 (22b)
Effective ac	0.6558	0.6357	0.6357	0.6082	0.6082	0.5838	0.5838	0.5800	0.5956	0.6262	0.6309	0.6506 (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					
Window (Uw = 1.00)			14.8500	0.9615	14.2788		(27)					
Door			2.4700	1.4000	3.4580		(26a)					
French Door (Uw = 1.40)			3.8000	1.3258	5.0379		(27)					
Ground Floor			44.9800	0.1400	6.2972		(28b)					
Main Wall	113.6500	21.1200	92.5300	0.2300	21.2819		(29a)					
Main Roof	44.9800		44.9800	0.1000	4.4980		(30)					
Total net area of external elements Aum(A, m2)			203.6100				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	54.8518		(33)					
Party Wall			44.2000	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							19.3362 (36)					
Total fabric heat loss						(33) + (36) =	74.1880 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 56.8456	Feb 55.1053	Mar 55.1053	Apr 52.7198	May 52.7198	Jun 50.6043	Jul 50.6043	Aug 50.2780	Sep 51.6283	Oct 54.2801	Nov 54.6889	Dec 56.3993 (38)
Heat transfer coeff	131.0337	129.2933	129.2933	126.9078	126.9078	124.7923	124.7923	124.4660	125.8163	128.4681	128.8770	130.5873 (39)
Average = Sum(39)m / 12 =												127.6029 (39)
HLP	Jan 1.4566	Feb 1.4372	Mar 1.4372	Apr 1.4107	May 1.4107	Jun 1.3872	Jul 1.3872	Aug 1.3836	Sep 1.3986	Oct 1.4281	Nov 1.4326	Dec 1.4516 (40)
HLP (average)												1.4184 (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												2.6252 (42)
Average daily hot water use (litres/day)												96.5479 (43)
Daily hot water use	106.2026	102.3407	98.4788	94.6169	90.7550	86.8931	86.8931	90.7550	94.6169	98.4788	102.3407	106.2026 (44)
Energy conte	157.4954	137.7465	142.1421	123.9229	118.9070	102.6077	95.0811	109.1069	110.4100	128.6722	140.4558	152.5259 (45)
Energy content (annual)												Total = Sum(45)m = 1519.0736 (45)
Distribution loss (46)m = 0.15 x (45)m												
23.6243	20.6620	21.3213	18.5884	17.8360	15.3912	14.2622	16.3660	16.5615	19.3008	21.0684	22.8789 (46)	
Water storage loss:												
Store volume												250.0000 (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):													2.0000 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													1.0800 (55)
Total storage loss	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800 (56)
If cylinder contains dedicated solar storage													
Primary loss	23.4360	21.1680	23.4360	22.6800	23.4360	22.6800	23.4360	23.4360	22.6800	23.4360	22.6800	23.4360	23.4360 (57)
Total heat required for water heating calculated for each month	204.1938	179.9257	187.4447	162.3613	152.8111	135.1930	128.7526	143.7089	150.1992	173.9749	185.6478	199.2243	199.2243 (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													1220.6462 (H5)
Overshading factor													0.8000 (H6)
Solar energy available													2050.6856 (H7)
Adjustment factor for showers													1.0000 (H7a)
Solar-to-load ratio													1.3500 (H8)
Utilisation factor													0.5233 (H9)
Collector performance factor													0.8793 (H10)
Dedicated solar storage volume													75.0000 (H11)
Effective solar volume													127.5000 (H13)
Daily hot water demand													96.5479 (H14)
Volume ratio Veff/V													1.3206 (H15)
Solar storage volume factor													1.0000 (H16)
Solar input													-943.5012 (H17)
Solar input	-32.0153	-45.1726	-76.8045	-104.2449	-122.3166	-128.4987	-117.3185	-109.4439	-86.6669	-58.6392	-36.5993	-25.7808	-25.7808 (63)
Solar input (sum of months) = Sum(63)m =													-943.5012 (63)
Output from w/h	172.1785	134.7531	110.6402	58.1164	30.4945	6.6942	11.4341	34.2650	63.5323	115.3357	149.0485	173.4435	173.4435 (64)
Total per year (kWh/year) = Sum(64)m =													1059.9361 (64)
Heat gains from water heating, kWh/month	89.7260	79.5441	83.5044	71.9551	66.6598	60.1853	58.5516	63.9596	68.5426	79.0256	82.8552	88.0736	88.0736 (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	157.5104	157.5104	157.5104	157.5104	157.5104	157.5104	157.5104	157.5104	157.5104	157.5104	157.5104	157.5104	157.5104 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	54.1063	48.0568	39.0824	29.5879	22.1173	18.6723	20.1761	26.2257	35.2001	44.6946	52.1652	55.6101	55.6101 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	356.7226	360.4242	351.0962	331.2378	306.1702	282.6102	266.8706	263.1689	272.4970	292.3554	317.4230	340.9830	340.9830 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.3762	53.3762	53.3762	53.3762	53.3762	53.3762	53.3762	53.3762	53.3762	53.3762	53.3762	53.3762	53.3762 (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)	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069	-105.0069 (71)
Water heating gains (Table 5)	120.5994	118.3692	112.2370	99.9376	89.5965	83.5907	78.6984	85.9672	95.1981	106.2173	115.0766	118.3785	118.3785 (72)
Total internal gains	640.3080	635.7298	611.2953	569.6430	526.7637	493.7528	474.6248	484.2415	511.7749	552.1469	593.5445	623.8513	623.8513 (73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains							
	m2	Table 6a	Specific data	Specific data	factor	W							
		W/m2	or Table 6b	or Table 6c	Table 6d								
Southeast	8.3500	47.2368	0.5700	0.7000	0.7700	109.0619 (77)							
Northwest	6.5000	15.4538	0.5700	0.7000	0.7700	27.7751 (81)							
Northwest	3.8000	15.4538	0.6300	0.7000	0.7700	17.9470 (81)							
Solar gains	154.7839	236.0111	357.4289	507.8287	590.7673	649.9638	570.8561	520.8698	417.6215	274.4647	181.3800	125.7324	125.7324 (83)
Total gains	795.0919	871.7409	968.7242	1077.4717	1117.5310	1143.7167	1045.4809	1005.1114	929.3963	826.6116	774.9245	749.5837	749.5837 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.6765	48.3182	48.3182	49.2265	49.2265	50.0610	50.0610	50.1922	49.6535	48.6286	48.4743	47.8394	47.8394 (86)
alpha	4.1784	4.2212	4.2212	4.2818	4.2818	4.3374	4.3374	4.3461	4.3102	4.2419	4.2316	4.1893	4.1893 (87)
util living area	0.9860	0.9790	0.9611	0.9148	0.8237	0.6539	0.5499	0.5575	0.7494	0.9221	0.9725	0.9878	0.9878 (86)
MIT	19.8447	19.9739	20.1921	20.5026	20.7665	20.9367	20.9759	20.9753	20.8914	20.5830	20.2127	19.8459	19.8459 (87)
Th 2	19.7202	19.7349	19.7349	19.7551	19.7551	19.7732	19.7732	19.7760	19.7644	19.7419	19.7384	19.7240	19.7240 (88)
util rest of house	0.9808	0.9714	0.9470	0.8844	0.7617	0.5519	0.4204	0.4241	0.6463	0.8837	0.9603	0.9831	0.9831 (89)
MIT 2	18.2650	18.4602	18.7693	19.2094	19.5425	19.7339	19.7638	19.7666	19.6925	19.3201	18.8080	18.2701	18.2701 (90)
Living area fraction													fLA = Living area / (4) = 0.1681 (91)
MIT	18.5305	18.7146	19.0085	19.4267	19.7482	19.9360	19.9675	19.9697	19.8940	19.5324	19.0441	18.5350	18.5350 (92)
Temperature adjustment													-0.1500
adjusted MIT	18.3805	18.5646	18.8585	19.2767	19.5982	19.7860	19.8175	19.8197	19.7440	19.3824	18.8941	18.3850	18.3850 (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	0.9727	0.9613	0.9337	0.8698	0.7526	0.5531	0.4253	0.4291	0.6443	0.8692	0.9485	0.9756	(94)
Useful gains	773.3874	838.0090	904.4688	937.1831	841.0228	632.5591	444.6414	431.3173	598.8171	718.5281	735.0306	731.3053	(95)
Ext temp.	6.1000	6.4000	7.5000	9.3000	11.9000	14.5000	16.2000	16.3000	14.6000	11.8000	9.0000	6.4000	(96)
Heat loss rate W													
Month fracti	1609.1558	1572.7987	1468.5738	1266.1246	976.9664	659.6554	451.4350	438.0884	647.2026	974.0924	1275.1237	1565.0873	(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	621.8117	493.7787	419.6941	236.8379	101.1421	0.0000	0.0000	0.0000	0.0000	190.1398	388.8670	620.3339	(98)
Space heating per m2												3072.6050	(98)
												(98) / (4) =	34.1552 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3072.6050 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	621.8117	493.7787	419.6941	236.8379	101.1421	0.0000	0.0000	0.0000	0.0000	190.1398	388.8670	620.3339	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	621.8117	493.7787	419.6941	236.8379	101.1421	0.0000	0.0000	0.0000	0.0000	190.1398	388.8670	620.3339	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	172.1785	134.7531	110.6402	58.1164	30.4945	6.6942	11.4341	34.2650	63.5323	115.3357	149.0485	173.4435	(64)
Efficiency of water heater	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month	172.1785	134.7531	110.6402	58.1164	30.4945	6.6942	11.4341	34.2650	63.5323	115.3357	149.0485	173.4435	(219)
Water heating fuel used													1059.9361 (219)
Annual totals kWh/year													
Space heating fuel - main system													3072.6050 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
central heating pump													30.0000 (230c)
pump for solar water heating													50.0000 (230g)
Total electricity for the above, kWh/year													80.0000 (231)
Electricity for lighting (calculated in Appendix L)													382.2139 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 4.00 * 1169 * 1.00) =										-3740.5833			-3740.5833 (233)
Total delivered energy for all uses													854.1717 (238)

10a. Fuel costs - using BEDF prices (435)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3072.6050	7.6000	233.5180 (240)	
Space heating - secondary	0.0000	0.0000	0.0000 (242)	
Water heating (other fuel)	1059.9361	7.6000	80.5551 (247)	
Pumps and fans for heating (0.90*19.47 + 0.10*7.60)	30.0000	18.2830	5.4849 (249)	
Pump for solar water heating	50.0000	18.2830	9.1415 (249)	
Energy for lighting (0.90*19.47 + 0.10*7.60)	382.2139	18.2830	69.8802 (250)	
Additional standing charges			8.0000 (251)	
Energy saving/generation technologies				
PV Unit (0.90*19.47 + 0.10*7.60)		-3740.5833	17.4165	-651.4787 (252)
Total energy cost				-244.8990 (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	3072.6050	0.5190	1594.6820 (261)	
Space heating - secondary	0.0000	0.0000	0.0000 (263)	
Water heating (other fuel)	1059.9361	0.5190	550.1068 (264)	
Space and water heating			2144.7888 (265)	
Pumps and fans	80.0000	0.5190	41.5200 (267)	
Energy for lighting	382.2139	0.5190	198.3690 (268)	
Energy saving/generation technologies				
PV Unit (0.90*19.47 + 0.10*7.60)		-3740.5833	0.5190	-1941.3627 (269)
Total kg/year				443.3151 (272)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

 13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	3072.6050	3.0700	9432.8974 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1059.9361	3.0700	3254.0037 (264)
Space and water heating			12686.9011 (265)
Pumps and fans	80.0000	3.0700	245.6000 (267)
Energy for lighting	382.2139	3.0700	1173.3968 (268)
Energy saving/generation technologies			
PV Unit (0.90*19.47 + 0.10*7.60)	-3740.5833	3.0700	-11483.5908 (269)
Primary energy kWh/year			2622.3071 (272)
Primary energy kWh/m2/year			29.1497 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	13064	Issued on Date	28/11/2018	
Assessment Reference	Revision B	Prop Type Ref		
Property	Unit 1 (LHS) Hamlyns Yard, Castle Street, Totnes			
SAP Rating	102 A	DER	21.47	
Environmental	84 B	TER	27.97	
CO ₂ Emissions (t/year)	0.98	% DER<TER	23.23	
General Requirements Compliance	Pass	DFEE	57.61	
		TFEE	60.05	
		% DFEE<TFEE	4.08	
Assessor	David Bartlett, Tel: 01752 894661, Fax: 01752 894661		Assessor ID	A066-0001
Client	SNJ Architects			

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

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

Overheating Calculation Input Data

Dwelling type	SemiDetached House
Number of storeys	2
Cross ventilation possible	Yes
SAP Region	South West England
Front of dwelling faces	South East
Overshading	Average or unknown
Thermal mass parameter	250.0
Night ventilation	No
Ventilation rate during hot weather (ach)	8.00 (Windows fully open)

Overheating Calculation

Summer ventilation heat loss coefficient	693.48 (P1)
Transmission heat loss coefficient	74.19 (37)
Summer heat loss coefficient	767.67 (P2)

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

Solar shading Orientation	Z blinds	Solar access	Z overhangs	Z summer
South East	1.000	0.90	1.000	0.900 (P8)
North West	1.000	0.90	1.000	0.900 (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
South East	8.3500	119.2277	0.5700	0.7000	0.9000	321.7523
North West	6.5000	99.9042	0.5700	0.7000	0.9000	209.8723
North West	3.8000	99.9042	0.6300	0.7000	0.9000	135.6098

total: 667.2344

	Jun	Jul	Aug	
Solar gains	760	667	609	(P3)
Internal gains	516	496	505	
Total summer gains	1275	1164	1114	(P5)

	1.66	1.52	1.45	(P6)
Summer gain/loss ratio	1.66	1.52	1.45	(P6)
Summer external temperature	14.50	16.20	16.30	
Thermal mass temperature increment (TMP = 250.0)	0.25	0.25	0.25	
Threshold temperature	16.41	17.97	18.00	(P7)
Likelihood of high internal temperature	Not significant	Not significant	Not significant	

Assessment of likelihood of high internal temperature: Not significant