



elmhurst
energy



SAP Report Submission for Building Regulations Compliance

Client: Alfred Homes Ltd

Project: 1 Kilmeston Close
Winchester, SO22 6TL

Contact: Scott Spearing | BEAT Solutions
[REDACTED]

Report Issue Date: 10/10/2023

EXCELLENCE
IN ENERGY
ASSESSMENT

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Built)

Property Reference	SAP-1260 - Plot 1	Issued on Date	10/10/2023
Assessment Reference	AB	Prop Type Ref	
Property	1 Kilmeston Close, Winchester, SO22 6TL		

SAP Rating	91 B	DER	11.45	TER	14.70
Environmental	88 B	% DER<TER	22.13		
CO ₂ Emissions (t/year)	2.16	DFEE	53.84	TFEE	60.21
General Requirements Compliance	Pass	% DFEE<TFEE	10.58		

Assessor Details	Mr. Sco Spearing, Sco Spearing, Tel: 01489 565920, sco@beatsolutions.co.uk	Assessor ID	p775-0001
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Client	Alfred Homes Ltd, ALFRED HOMES LTD
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SUMMARY FOR INPUT DATA FOR New Build (As Built)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	14.70	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	11.45	kgCO ₂ /m ²	Pass
	-3.25 (-22.1%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	60.21	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	53.84	kWh/m ² /yr	
	-6.4 (-10.6%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.21 (max. 0.70)	Pass
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	Pass
Roof	0.11 (max. 0.20)	0.16 (max. 0.35)	Pass
Openings	1.23 (max. 2.00)	1.40 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.98 (measured in this dwelling)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Boiler system with radiators or underfloor - Mains gas Data from database Worcester Greenstar 4000 GR4700iW 24 S NG Efficiency: 89.4% SEDBUK2009 Minimum: 88.0%	Pass
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Secondary heating system	None	
5 Cylinder insulation		
Hot water storage	Measured cylinder loss: 1.82 kWh/day Permitted by DBSCG 2.81	Pass
Primary pipework insulated	Yes	Pass
6 Controls		
Space heating controls	Time and temperature zone control	Pass
Hot water controls	Cylinderstat	Pass
	Independent timer for DHW	Pass
Boiler interlock	Yes	Pass
7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100	%
Minimum	75	% Pass
8 Mechanical ventilation		
Not applicable		

Criterion 3 – Limiting the effects of heat gains in summer

9 Summer room temperature

Overheating risk (Southern England)	Not significant	Pass
Based on:		
Overshading	Average	
Windows facing North East	19.19 m ² , No overhang	
Windows facing South East	4.51 m ² , No overhang	
Windows facing South West	16.16 m ² , No overhang	
Windows facing North West	3.33 m ² , No overhang	
Air change rate	8.00 ach	
Blinds/curtains	None	

Criterion 4 – Building performance consistent with DER and DFEE rate

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals	4.98 (measured in this dwelling)	
Maximum	10.0	Pass

10 Key features

Roof U-value	0.10	W/m ² K
Floor U-value	0.12	W/m ² K
Photovoltaic array	3.80	kW

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

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

Orientation	South West						
Property Tenure	Unknown						
Transaction Type	New dwelling						
Terrain Type	Suburban						
1.0 Property Type	House, Detached						
2.0 Number of Storeys	3						
3.0 Date Built	2023						
4.0 Sheltered Sides	0						
5.0 Sunlight/Shade	Average or unknown						
6.0 Measurements		Heat Loss Perimeter	Internal Floor Area	Average Storey Height			
	Ground Floor:	42.80 m	99.23 m ²	2.82 m			
	1st Storey:	39.44 m	96.84 m ²	3.12 m			
	2nd Storey:	36.79 m	70.61 m ²	2.41 m			
7.0 Living Area	21.63		m ²				
8.0 Thermal Mass Parameter	Precise calculation						
Thermal Mass	236.48		kJ/m ² K				
9.0 External Walls	Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Net Area (m ²)
	External Walls - 100mm Block	Cavity Wall	Cavity wall; plasterboard on dabs or base, lightweight aggregate block, filled cavity, any outside structure	0.19	110.00	255.15	222.64
	External Walls - 215mm Block	Cavity Wall	Cavity wall; plasterboard on dabs or base, lightweight aggregate block, filled cavity, any outside structure	0.19	110.00	26.24	13.23
	Ashlar & Dormer Walls	Timber Frame	Timber framed wall (one layer of plasterboard)	0.21	9.00	42.03	39.19
9.2 Internal Walls	Description	Construction			Kappa (kJ/m ² K)	Area (m ²)	
	Internal Wall - Masonry	Dense block, plasterboard on dabs			75.00	119.10	
	Internal Wall - Timber	Plasterboard on timber frame			9.00	284.00	
10.0 External Roofs							

SUMMARY FOR INPUT DATA

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Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Net Area (m ²)
Flat Bay Roofs	External Flat Roof	Plasterboard, insulated flat roof	0.14	9.00	3.48	3.48
Pitched Cold Roof Areas	External Plane Roof	Plasterboard, insulated at ceiling level	0.10	9.00	72.82	72.82
Sloping Roofs	External Slope Roof	Plasterboard, insulated slope	0.15	9.00	25.45	22.69
Flat Dormer Roofs	External Flat Roof	Plasterboard, insulated flat roof	0.16	9.00	4.48	4.48

10.2 Internal Ceilings

Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
Internal Ceiling	Other	75.00	95.75
Internal Ceiling	Plasterboard ceiling, carpeted chipboard floor	9.00	70.61

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)
Ground Floor	Ground Floor - Solid	Suspended concrete floor, carpeted	0.12	75.00	99.23

11.2 Internal Floors

Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
Internal Floor	Other	75.00	95.75
Internal Floor	Plasterboard ceiling, carpeted chipboard floor	18.00	70.61

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m ² K)
Front Door	Manufacturer	Solid Door							1.40
Windows	Manufacturer	Window	Double Low-E SoD 0.05			0.63		0.70	1.20
Velux Windows	Manufacturer	Roof Window	Double Low-E SoD 0.05			0.63		0.70	1.40
Side Door	Manufacturer	Half Glazed Door	Double Low-E SoD 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 Door	Solid Door	[1] External Walls - 100mm Block	South West							2.72	
Front Elevation	Window	[1] External Walls - 100mm Block	South West	None	0.00					13.32	
Front Dormers	Window	[3] Ashlar & Dormer Walls	South West	None	0.00					2.84	
Side Elevation	Window	[1] External Walls - 100mm Block	North West	None	0.00					3.33	
Rear Elevation - 215	Window	[2] External Walls - 215mm Block	North East	None	0.00					13.01	
Rear Elevation - 100	Window	[1] External Walls - 100mm Block	North East	None	0.00					6.18	
Rear Rooftops	Roof Window	[3] Sloping Roofs	North East	None						2.76	
Side Elevation	Window	[1] External Walls - 100mm Block	South East	None	0.00					4.51	
Side Door	Half Glazed Door	[1] External Walls - 100mm Block	South East							2.45	

14.0 Conservatory

15.0 Draught Proofing

 %

16.0 Draught Lobby

17.0 Thermal Bridging

17.1 List of Bridges

SUMMARY FOR INPUT DATA

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Source Type	Bridge Type	Length	Psi	Imported
Table K1 - Approved	E2 Other lintels (including other steel lintels)	26.71	0.300	Yes
Table K1 - Approved	E3 Sill	24.55	0.040	Yes
Table K1 - Approved	E4 Jamb	69.60	0.050	No
Table K1 - Approved	E5 Ground floor (normal)	42.80	0.160	Yes
Table K1 - Approved	E6 Intermediate floor within a dwelling	76.23	0.070	Yes
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	18.48	0.060	No
Table K1 - Approved	E12 Gable (insulation at ceiling level)	15.66	0.240	No
Table K1 - Approved	E13 Gable (insulation at raft level)	6.20	0.040	No
Table K1 - Default	E14 Flat roof	15.52	0.080	No
Table K1 - Approved	E16 Corner (normal)	50.16	0.090	No
Table K1 - Approved	E17 Corner (inverted – internal area greater than external area)	10.32	-0.090	No
Table K1 - Default	R1 Head of roof window	2.82	0.080	Yes
Table K1 - Default	R2 Sill of roof window	2.82	0.060	Yes
Table K1 - Default	R3 Jamb of roof window	5.88	0.080	Yes
Table K1 - Default	R6 Flat ceiling	18.48	0.060	No
Table K1 - Default	R7 Flat ceiling (inverted)	2.04	0.040	No
Table K1 - Default	R8 Roof to wall (raft)	16.42	0.060	No
Table K1 - Default	R9 Roof to wall (flat ceiling)	2.04	0.040	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 fires	0		0	0
Number of intermittent fans				7
Number of passive vents				0
Number of fuelless gas fires				0

21.0 Fixed Cooling System

22.0 Lighting

Internal

Total number of light fittings

Total number of L.E.L. fittings

Percentage of L.E.L. fittings %

External

External lights fitted

23.0 Electricity Tariff

24.0 Main Heating

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Description	Gas Boiler			
Percentage of Heat	100			%
Database Ref. No.	18909			
Fuel Type	Mains gas			
Main Heating	BGB			
SAP Code	102			
In Winter	90.4			
In Summer	79.7			
Controls	CBI Time and temperature zone control			
PCDF Controls	0			
Delayed Start Stat	Yes			
Sap Code	2110			
Flue Type	Balanced			
Fan Assisted Flue	Yes			
Is MHS Pumped	Pump in heated space			
Heat Emitter	Radiators and Underfloor			
Underfloor Heating	Yes - Pipes in thin screed			
Flow Temperature	36° - 45°C			
<hr/>				
25.0 Main Heating 2	None			
<hr/>				
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			
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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	292.00			L
Loss	1.82			kWh/day
Pipes insulation	Fully insulated primary pipework			
<hr/>				
31.0 Thermal Store	None			
<hr/>				
32.0 Photovoltaic Unit	One Dwelling			
PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
3.80	North East	45°	None Or Little	Yes

SUMMARY FOR INPUT DATA

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Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

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Building Elements

Roof Flat Bay Roofs

Roof Type: Flat Roof standard (no precipitation)

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)
Ext surface				0.0400	
Layer 1	Celotex XR4000 Main construction Corrections - Air Gap: Level 1, Fasteners: None or plastic	165	0.0220	7.5000	100.00
Layer 2	Joist Void Main construction Corrections - Cavity Unvented, Emissivity: Normal	125	0.7813	0.1600	100.00
Layer 3	Plasterboard, standard Main construction	15	0.2100	0.0714	100.00
Int surface				0.1000	

Total resistance: Upper limit = 7.871 m² K/W Lower limit = 7.871 m² K/W Average = 7.871 m² K/W
Total correction = 0.0091 m² K/W U-value (unrounded) = 0.14 W/m² K

Unheated space: None

Total thickness: 305 mm

U-value: 0.14 W/m² K

Kappa: n/a

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Building Elements

Roof Pitched Cold Roof

Roof Type: Pitched Roof, insulated Nat ceiling

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)
Ext surface				0.0400	
Layer 1	Mineral wool Main construction Corrections - Air Gap: Level 0, Fasteners: None or plastic	200	0.0400	5.0000	100.00
Layer 2	Mineral wool Main construction Main construction Corrections - Air Gap: Level 1, Fasteners: None or plastic	200 200	0.0400 0.1300	5.0000 1.5385	91.67 8.33
Layer 3	Plasterboard, standard Main construction	12.5	0.2100	0.0595	100.00
Layer 4	Plaster, standard Main construction	3	0.4000	0.0075	100.00
Int surface				0.1000	

Total resistance: Upper limit = 9.788 m² K/W Lower limit = 9.418 m² K/W Average = 9.603 m² K/W
 Total correction = 0.0019 m² K/W U-value (unrounded) = 0.1 W/m² K

Unheated space: None

Total thickness: 416 mm

U-value: 0.10 W/m² K

Kappa: n/a

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Building Elements

Roof Sloping Roofs

Roof Type: Pitched Roof, insulated sloping ceiling

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)
Ext surface				0.0400	
Layer 1	Celotex GA4000				
	Main construction	100	0.0220	4.5455	91.67
	Main construction	100	0.1300	0.7692	8.33
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
Layer 2	Celotex GA4000				
	Main construction	60	0.0220	2.7273	100.00
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
Layer 3	Plasterboard, standard				
	Main construction	12.5	0.2100	0.0595	100.00
Int surface				0.1000	

Total resistance: Upper limit = 6.886 m² K/W Lower limit = 6.153 m² K/W Average = 6.519 m² K/W
 Total correction = 0.0042 m² K/W U-value (unrounded) = 0.15 W/m² K

Unheated space: None

Total thickness: 173 mm

U-value: 0.15 W/m² K

Kappa: n/a

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Building Elements

Roof Flat Dormer Roofs

Roof Type: Flat Roof standard (no precipitation)

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)
Ext surface				0.0400	
Layer 1	Celotex XR4000				
	Main construction	200	0.0220	9.0909	91.67
	Main construction	200	0.1300	1.5385	8.33
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
Layer 2	Plasterboard, standard				
	Main construction	12.5	0.2100	0.0595	100.00
Int surface				0.1000	

Total resistance: Upper limit = 6.821 m² K/W Lower limit = 6.651 m² K/W Average = 6.736 m² K/W
 Total correction = 0.0092 m² K/W U-value (unrounded) = 0.16 W/m² K

Unheated space: None

Total thickness: 213 mm

U-value: 0.16 W/m² K

Kappa: n/a

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Building Elements

Wall External Walls - 100mm Block

Wall Type: Standard Wall

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)
Ext surface				0.0400	
Layer 1	Brick, outer leaf				
	Main construction	102.5	0.7700	0.1331	82.81
	Main construction	102.5	0.9407	0.1090	17.19
Layer 2	Plenum EcoBead				
	Main construction	150	0.0330	4.5455	100.00
	Corrections - Air Gap: Level 0, Fasteners: None or plastic				
Layer 3	Masterlite Pro				
	Main construction	100	0.5700	0.1754	93.43
	Main construction	100	0.8803	0.1136	6.57
Layer 4	airspace/plaster dabs				
	Main construction	15	0.0882	0.1700	80.00
	Main construction	15	0.0882	0.1700	20.00
	Corrections - Cavity Unvented, Emissivity: Normal				
Layer 5	Plasterboard, standard				
	Main construction	12.5	0.2100	0.0595	100.00
Int surface				0.1300	

Total resistance: Upper limit = 5.245 m² K/W Lower limit = 5.243 m² K/W Average = 5.244 m² K/W
 Total correction = 0.0000 m² K/W U-value (unrounded) = 0.19 W/m² K

Unheated space: None
Total thickness: 380 mm U-value: 0.19 W/m ² K Kappa: n/a

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Building Elements

Wall External Walls - 215mm Block

Wall Type: Standard Wall

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)
Ext surface				0.0400	
Layer 1	Brick, outer leaf				
	Main construction	102.5	0.7700	0.1331	82.81
	Main construction	102.5	0.9407	0.1090	17.19
Layer 2	Plenum EcoBead				
	Main construction	150	0.0330	4.5455	100.00
	Corrections - Air Gap: Level 1, Fasteners: None or placed				
Layer 3	Masterlite Pro				
	Main construction	215	0.5700	0.3772	93.43
	Main construction	215	0.8803	0.2442	6.57
Layer 4	airspace/plaster dabs				
	Main construction	15	0.0882	0.1700	80.00
	Main construction	15	0.0882	0.1700	20.00
	Corrections - Cavity Unvented, Emissivity: Normal				
Layer 5	Plasterboard, standard				
	Main construction	12.5	0.2100	0.0595	100.00
Int surface				0.1300	

Total resistance: Upper limit = 5.442 m² K/W Lower limit = 5.437 m² K/W Average = 5.440 m² K/W
 Total correction = 0.0070 m² K/W U-value (unrounded) = 0.19 W/m² K

Unheated space: None
Total thickness: 495 mm U-value: 0.19 W/m ² K Kappa: n/a

U-VALUE CALCULATOR REPORT

Property Reference	SAP-1260 - Plot 1		Issued on Date	10/10/2023
Assessment Reference	AB	Prop Type Ref		
Project	1 Kilmeston Close, Winchester, SO22 6TL			
Calculation Type	New Build (As Built)			

SAP Rating	91 B	DER	11.45	TER	14.70
Environmental	88 B	% DER<TER	22.13		
CO ₂ Emissions (t/year)	2.16	DFEE	53.84	TFEE	60.21
General Requirements Compliance	Pass	% DFEE<TFEE	10.58		

Assessor Details	Mr. ScoΣ Spearing, ScoΣ Spearing, Tel: 01489 565920, scoΣ@beatsolutions.co.uk	Assessor ID	p775-0001
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Client	Alfred Homes Ltd, ALFRED HOMES LTD
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Building Elements

Wall Ashlar & Dormer Walls

Wall Type: Timber framed Wall with I-beams

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)
Ext surface				0.0400	
Layer 1	Celotex GA4000				
	Main construction	100	0.0220	4.5455	91.67
	Main construction	100	0.1300	0.7692	8.33
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
Layer 2	Celotex TB4000				
	Main construction	25	0.0220	1.1364	100.00
	Corrections - Air Gap: Level 0, Fasteners: None or plastic				
Layer 3	Plasterboard, standard				
	Main construction	12.5	0.2100	0.0595	100.00
Int surface				0.1300	

Total resistance: Upper limit = 5.152 m² K/W Lower limit = 4.592 m² K/W Average = 4.872 m² K/W
 Total correction = 0.0044 m² K/W U-value (unrounded) = 0.21 W/m² K

Unheated space: None

Total thickness: 138 mm

U-value: 0.21 W/m² K

Kappa: n/a

U-VALUE CALCULATOR REPORT

Property Reference	SAP-1260 - Plot 1		Issued on Date	10/10/2023
Assessment Reference	AB	Prop Type Ref		
Project	1 Kilmeston Close, Winchester, SO22 6TL			
Calculation Type	New Build (As Built)			

SAP Rating	91 B	DER	11.45	TER	14.70
Environmental	88 B	% DER<TER	22.13		
CO ₂ Emissions (t/year)	2.16	DFEE	53.84	TFEE	60.21
General Requirements Compliance	Pass	% DFEE<TFEE	10.58		

Assessor Details	Mr. ScoΣ Spearing, ScoΣ Spearing, Tel: 01489 565920, scoΣ @beatsolutions.co.uk	Assessor ID	p775-0001
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Client	Alfred Homes Ltd, ALFRED HOMES LTD
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Building Elements

Floor Ground Floor

Floor Type: Suspended Floor

Area = 99.23 m², Perimeter = 42.80 m, Wall thickness = 320.00 mm, Soil: Unknown

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

Floor height above ground: h = 0.200 m

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

Ventilation openings per perimeter length: e = 0.0015 %

Mean wind speed: v = 5.000 m/s

Resistance on solum: R_g = 0.000 m²K/W

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)
Ext surface				0.1700	
Layer 1	Blockwork, dense				
	Main construction	100	1.5900	0.0629	82.95
Layer 2	Celotex XR4000				
	Main construction	100	2.3000	0.0435	17.05
Layer 3	Celotex XR4000				
	Main construction	150	0.0220	6.8182	100.00
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
Layer 3	Screed				
	Main construction	75	1.1500	0.0652	100.00
Int surface				0.1700	

Total resistance: Upper limit = 7.283 m² K/W Lower limit = 7.282 m² K/W Average = 7.282 m² K/W

Total correction = 0.0088 m² K/W

U-value (unrounded) = 0.12 W/m² K

Unheated space: None

Total thickness: 325 mm

U-value: 0.12 W/m² K

Kappa: n/a

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	SAP-1260 - Plot 1			Issued on Date	10/10/2023
Assessment Reference	AB	Prop Type Ref			
Property	1 Kilmeston Close, Winchester, SO22 6TL				
SAP Rating	91 B	DER	11.45	TER	14.70
Environmental	88 B	% DER<TER	22.13		
CO ₂ Emissions (t/year)	2.16	DFEE	53.84	TFEE	60.21
General Requirements Compliance	Pass	% DFEE<TFEE	10.58		
Assessor Details	Mr. ScoΣ Spearing, ScoΣ Spearing, Tel: 01489 565920, scoΣ@beatsolutions.co.uk			Assessor ID	p775-0001
Client	Alfred Homes Ltd, ALFRED HOMES LTD				

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

DWELLING AS BUILT

Detached House, total floor area 267 m²

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

1a TER and DER

Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 14.70 kgCO/m²
Dwelling Carbon Dioxide Emission Rate (DER) 11.45 kgCO/m²OK

1b TPFE and DFEE

Target Fabric Energy Efficiency (TPFE)60.2 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)53.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.21 (max. 0.70)	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	0.11 (max. 0.20)	0.16 (max. 0.35)	OK
Openings	1.23 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 4.98 (measured in this dwelling)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from database
Worcester Greenstar 4000 GR4700iW 24 S NG

Efficiency: 89.4% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage Measured cylinder loss: 1.82 kWh/day
Permitted by DBSCG 2.81 OK
Primary pipework insulated: Yes OK

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls:

Cylinderstat OK
Independent timer for DHW OK

Boiler interlock

Yes OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Southern England): Not significant OK

Based on:

Overshading: Average
Windows facing North East: 19.19 m², No overhang
Windows facing South East: 4.51 m², No overhang
Windows facing South West: 16.16 m², No overhang
Windows facing North West: 3.33 m², No overhang
Air change rate: 8.00 ach
Blinds/curtains: None

10 Key features

Roof U-value 0.10 W/m²K
Floor U-value 0.12 W/m²K
Photovoltaic array 3.80 kW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	99.2300 (1b)	x 2.8200 (2b)	= 279.8286 (1b) - (3b)
First floor	96.8400 (1c)	x 3.1200 (2c)	= 302.1408 (1c) - (3c)
Second floor	70.6100 (1d)	x 2.4100 (2d)	= 170.1701 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	266.6800		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 752.1395 (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					7 * 10 = 70.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
					Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					70.0000 / (5) = 0.0931 (8)
Pressure test					Yes
Measured/design AP50					4.9800
Infiltration rate					0.3421 (18)
Number of sides sheltered					0 (19)
					Shelter factor
Infiltration rate adjusted to include shelter factor					(20) = 1 - [0.075 x (19)] = 1.0000 (20) (21) = (18) x (20) = 0.3421 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4361	0.4276	0.4190	0.3763	0.3677	0.3250	0.3250	0.3164	0.3421	0.3677	0.3848	0.4019 (22b)
	0.5951	0.5914	0.5878	0.5708	0.5676	0.5528	0.5528	0.5501	0.5585	0.5676	0.5740	0.5808 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.7200	1.4000	3.8080		(26)
Windows (Uw = 1.20)			43.1900	1.1450	49.4542		(27)
Side Door			2.4500	1.4000	3.4300		(26a)
Velux Windows (Uw = 1.40)			2.7600	1.3258	3.6591		(27a)
Ground Floor			99.2300	0.1200	11.9076	75.0000	7442.2500 (28a)
External Walls - 100mm Block	255.1500	32.5100	222.6400	0.1900	42.3016	110.0000	24490.4000 (29a)
External Walls - 215mm Block	26.2400	13.0100	13.2300	0.1900	2.5137	110.0000	1455.3000 (29a)
Ashlar & Dormer Walls	42.0300	2.8400	39.1900	0.2100	8.2299	9.0000	352.7100 (29a)
Flat Bay Roofs	3.4800		3.4800	0.1400	0.4872	9.0000	31.3200 (30)
Pitched Cold Roof Areas	72.8200		72.8200	0.1000	7.2820	9.0000	655.3800 (30)
Sloping Roofs	25.4500	2.7600	22.6900	0.1500	3.4035	9.0000	204.2100 (30)
Flat Dormer Roofs	4.4800		4.4800	0.1600	0.7168	9.0000	40.3200 (30)
Total net area of external elements Aum(A, m ²)			528.8800				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 137.1936		(33)
Internal Wall - Masonry			119.1000			75.0000	8932.5000 (32c)
Internal Wall - Timber			284.0000			9.0000	2556.0000 (32c)
Internal Floor			95.7500			75.0000	7181.2500 (32d)
Internal Floor			70.6100			18.0000	1270.9800 (32d)
Internal Ceiling			95.7500			75.0000	7181.2500 (32e)
Internal Ceiling			70.6100			18.0000	1270.9800 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 63064.8500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							236.4814 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							37.7239 (36)
Total fabric heat loss							(33) + (36) = 174.9175 (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	147.7093	146.7926	145.8941	141.6738	140.8842	137.2085	137.2085	136.5278	138.6244	140.8842	142.4816	144.1515 (38)
Heat transfer coeff												
Average = Sum(39)m / 12 =	322.6268	321.7101	320.8116	316.5913	315.8017	312.1260	312.1260	311.4453	313.5419	315.8017	317.3991	319.0690 (39)
												316.5876 (39)
HLP	1.2098	1.2064	1.2030	1.1872	1.1842	1.1704	1.1704	1.1679	1.1757	1.1842	1.1902	1.1964 (40)
HLP (average)												1.1871 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Assumed occupancy												3.0886 (42)
Average daily hot water use (litres/day)												107.5546 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	118.3100	114.0079	109.7057	105.4035	101.1013	96.7991	96.7991	101.1013	105.4035	109.7057	114.0079	118.3100
Energy content	175.4504	153.3467	158.3467	138.0505	132.4627	114.3052	105.9206	121.5455	122.9971	143.3413	156.4682	169.9143
Energy content (annual)												Total = Sum(45)m = 1692.2524 (45)
Distribution loss (46)m = 0.15 x (45)m	26.3176	23.0175	23.7520	20.7076	19.8694	17.1458	15.8881	18.2318	18.4496	21.5012	23.4702	25.4871
Water storage loss:												
Store volume												292.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8200 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9828 (55)
Total storage loss	30.4668	27.5184	30.4668	29.4840	30.4668	29.4840	30.4668	30.4668	29.4840	30.4668	29.4840	30.4668
If cylinder contains dedicated solar storage	30.4668	27.5184	30.4668	29.4840	30.4668	29.4840	30.4668	30.4668	29.4840	30.4668	29.4840	30.4668
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
Total heat required for water heating calculated for each month	229.1796	201.9796	212.0759	190.0465	186.1919	166.3012	159.6498	175.2747	174.9931	197.0705	208.4642	223.6435
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
Output from w/h	229.1796	201.9796	212.0759	190.0465	186.1919	166.3012	159.6498	175.2747	174.9931	197.0705	208.4642	223.6435
Heat gains from water heating, kWh/month	101.3206	89.8458	95.6336	87.4986	87.0272	79.6033	78.2020	83.3972	82.4933	90.6443	93.6225	99.4799
											Total per year (kWh/year) = Sum(64)m = 2324.8704 (64)	

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
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	39.4214	35.0137	28.4751	21.5575	16.1145	13.6045	14.7001	19.1078	25.6465	32.5641	38.0071	40.5170
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	430.6872	435.1564	423.8942	399.9183	369.6530	341.2079	322.2049	317.7357	328.9979	352.9738	383.2390	411.6841
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.4431	38.4431	38.4431	38.4431	38.4431	38.4431	38.4431	38.4431	38.4431	38.4431	38.4431	38.4431
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
Losses e.g. evaporation (negative values) (Table 5)	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446
Water heating gains (Table 5)	136.1836	133.6991	128.5398	121.5258	116.9721	110.5601	105.1102	112.0930	114.5741	121.8338	130.0312	133.7095
Total internal gains	678.6214	676.1984	653.2383	615.3307	575.0687	537.7018	514.3444	521.2657	541.5476	579.7008	623.6065	658.2399

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
Northeast	19.1900	11.2829	0.6300	0.7000	0.7700	66.1712 (75)						
Southeast	4.5100	36.7938	0.6300	0.7000	0.7700	50.7135 (77)						
Southwest	16.1600	36.7938	0.6300	0.7000	0.7700	181.7139 (79)						
Northwest	3.3300	11.2829	0.6300	0.7000	0.7700	11.4826 (81)						
Northeast	2.7600	16.8560	0.6300	0.7000	1.0000	18.4648 (82)						
Solar gains	328.5460	592.2714	897.5880	1259.2069	1545.2641	1593.5715	1511.6070	1288.9913	1021.3082	678.0508	399.4529	277.3363
Total gains	1007.1674	1268.4698	1550.8262	1874.5376	2120.3329	2131.2733	2025.9514	1810.2570	1562.8558	1257.7516	1023.0594	935.5762

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	54.2981	54.4528	54.6053	55.3332	55.4716	56.1248	56.1248	56.2475	55.8714	55.4716	55.1924	54.9035
alpha	4.6199	4.6302	4.6404	4.6889	4.6981	4.7417	4.7417	4.7498	4.7248	4.6981	4.6795	4.6602
util living area	0.9996	0.9989	0.9959	0.9818	0.9287	0.7981	0.6392	0.7179	0.9293	0.9932	0.9992	0.9998
MIT	19.7461	19.8734	20.0928	20.3968	20.6770	20.8613	20.9213	20.9063	20.7474	20.3844	20.0139	19.7316
Th 2	19.9122	19.9149	19.9176	19.9303	19.9327	19.9437	19.9437	19.9458	19.9395	19.9327	19.9279	19.9228
util rest of house	0.9995	0.9985	0.9944	0.9742	0.8970	0.7121	0.5042	0.5859	0.8837	0.9894	0.9988	0.9997
MIT 2	18.2158	18.4042	18.7268	19.1771	19.5679	19.7995	19.8510	19.8446	19.6745	19.1644	18.6199	18.2027
Living area fraction												fLA = Living area / (4) = 0.0811 (91)
MIT	18.3400	18.5233	18.8376	19.2760	19.6578	19.8856	19.9378	19.9307	19.7615	19.2634	18.7330	18.3267
Temperature adjustment												-0.1500
adjusted MIT	18.1900	18.3733	18.6876	19.1260	19.5078	19.7356	19.7878	19.7807	19.6115	19.1134	18.5830	18.1767

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Utilisation	0.9992	0.9976	0.9917	0.9660	0.8805	0.6921	0.4824	0.5622	0.8641	0.9848	0.9981	0.9995 (94)
Useful gains	1006.3775	1265.4331	1537.9463	1810.8165	1866.9221	1475.1246	977.3151	1017.7615	1350.4069	1238.6349	1021.1311	935.0654 (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	4481.2713	4334.5111	3909.9267	3237.4654	2465.7313	1602.9676	994.9985	1052.8973	1728.0967	2688.5380	3644.6791	4459.5281 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating	2585.3210	2062.4204	1764.7535	1027.1872	445.5140	0.0000	0.0000	0.0000	0.0000	1078.7279	1888.9545	2622.2002 (98)
Space heating per m2												13475.0788 (98)
												(98) / (4) = 50.5290 (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 %)												92.8000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												14520.5591 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	2585.3210	2062.4204	1764.7535	1027.1872	445.5140	0.0000	0.0000	0.0000	0.0000	1078.7279	1888.9545	2622.2002 (98)
Space heating efficiency (main heating system 1)	92.8000	92.8000	92.8000	92.8000	92.8000	0.0000	0.0000	0.0000	0.0000	92.8000	92.8000	92.8000 (210)
Space heating fuel (main heating system)	2785.9063	2222.4358	1901.6740	1106.8828	480.0798	0.0000	0.0000	0.0000	0.0000	1162.4223	2035.5114	2825.6468 (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	229.1796	201.9796	212.0759	190.0465	186.1919	166.3012	159.6498	175.2747	174.9931	197.0705	208.4642	223.6435 (64)
Efficiency of water heater	89.4224	89.3303	89.1165	88.5440	86.9590	79.7000	79.7000	79.7000	79.7000	88.5634	89.2096	79.7000 (216)
Fuel for water heating, kWh/month	256.2887	226.1044	237.9761	214.6350	214.1146	208.6590	200.3134	219.9180	219.5647	222.5191	233.6790	250.0034 (219)
Water heating fuel used												2703.7754 (219)
Annual totals kWh/year												
Space heating fuel - main system												14520.5591 (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)												696.1939 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 3.80 * 677 * 1.00) =										-2056.5747		-2056.5747 (233)
Total delivered energy for all uses												15938.9537 (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	14520.5591	0.2160	3136.4408 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2703.7754	0.2160	584.0155 (264)
Space and water heating			3720.4563 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	696.1939	0.5190	361.3246 (268)
Energy saving/generation technologies			
PV Unit	-2056.5747	0.5190	-1067.3623 (269)
Total CO2, kg/year			3053.3436 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			11.4500 (273)

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

DER		11.4500 ZC1
Total Floor Area		266.6800
Assumed number of occupants		3.0886
CO2 emission factor in Table 12 for electricity displaced from grid		0.5190
CO2 emissions from appliances, equation (L14)		9.5701 ZC2
CO2 emissions from cooking, equation (L16)		0.7242 ZC3
Total CO2 emissions		21.7443 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		21.7443 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (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	99.2300 (1b)	x 2.8200 (2b)	= 279.8286 (1b) - (3b)
First floor	96.8400 (1c)	x 3.1200 (2c)	= 302.1408 (1c) - (3c)
Second floor	70.6100 (1d)	x 2.4100 (2d)	= 170.1701 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	266.6800		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 752.1395 (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)
					Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) = 0.0532 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3032 (18)
Number of sides sheltered					0 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3032 (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	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2804	0.3032	0.3259	0.3411	0.3562 (22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.7200	1.0000	2.7200		(26)
TER Semi-glazed door			2.4500	1.2000	2.9400		(26a)
TER Opening Type (Uw = 1.40)			43.1900	1.3258	57.2595		(27)
TER Room Window (Uw = 1.70)			2.7600	1.5918	4.3933		(27a)
Ground Floor			99.2300	0.1300	12.8999		(28a)
External Walls - 100mm Block	255.1500	32.5100	222.6400	0.1800	40.0752		(29a)
External Walls - 215mm Block	26.2400	13.0100	13.2300	0.1800	2.3814		(29a)
Ashlar & Dormer Walls	42.0300	2.8400	39.1900	0.1800	7.0542		(29a)
Flat Bay Roofs	3.4800		3.4800	0.1300	0.4524		(30)
Pitched Cold Roof Areas	72.8200		72.8200	0.1300	9.4666		(30)
Sloping Roofs	25.4500	2.7600	22.6900	0.1300	2.9497		(30)
Flat Dormer Roofs	4.4800		4.4800	0.1300	0.5824		(30)
Total net area of external elements Aum(A, m ²)			528.8800				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 143.1745		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							23.3850 (36)
Total fabric heat loss							(33) + (36) = 166.5595 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	142.6472	141.9271	141.2213	137.9060	137.2857	134.3982	134.3982	133.8635	135.5105	137.2857	138.5406	139.8524 (38)
Heat transfer coeff	309.2068	308.4867	307.7808	304.4655	303.8453	300.9578	300.9578	300.4230	302.0700	303.8453	305.1001	306.4119 (39)
Average = Sum(39)m / 12 =												304.4626 (39)
HLP	1.1595	1.1568	1.1541	1.1417	1.1394	1.1285	1.1285	1.1265	1.1327	1.1394	1.1441	1.1490 (40)
HLP (average)												1.1417 (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												3.0886 (42)
Average daily hot water use (litres/day)												107.5546 (43)
Daily hot water use	118.3100	114.0079	109.7057	105.4035	101.1013	96.7991	96.7991	101.1013	105.4035	109.7057	114.0079	118.3100 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Energy content (annual)	175.4504	153.4500	158.3467	138.0505	132.4627	114.3052	105.9206	121.5455	122.9971	143.3413	156.4682	169.9143 (45)
Energy content (annual)	Total = Sum(45)m =											1692.2524 (45)
Distribution loss (46)m = 0.15 x (45)m	26.3176	23.0175	23.7520	20.7076	19.8694	17.1458	15.8881	18.2318	18.4496	21.5012	23.4702	25.4871 (46)
Water storage loss:												
Store volume												292.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												2.0780 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.1221 (55)
Total storage loss	34.7857	31.4193	34.7857	33.6636	34.7857	33.6636	34.7857	34.7857	33.6636	34.7857	33.6636	34.7857 (56)
If cylinder contains dedicated solar storage	34.7857	31.4193	34.7857	33.6636	34.7857	33.6636	34.7857	34.7857	33.6636	34.7857	33.6636	34.7857 (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	233.4984	205.8805	216.3947	194.2260	190.5108	170.4808	163.9687	179.5935	179.1726	201.3893	212.6437	227.9624 (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	233.4984	205.8805	216.3947	194.2260	190.5108	170.4808	163.9687	179.5935	179.1726	201.3893	212.6437	227.9624 (64)
Heat gains from water heating, kWh/month	104.7757	92.9665	99.0887	90.8422	90.4823	82.9469	81.6571	86.8523	85.8370	94.0994	96.9661	102.9350 (65)
											Total per year (kWh/year) = Sum(64)m =	2375.7216 (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	154.4307	154.4307	154.4307	154.4307	154.4307	154.4307	154.4307	154.4307	154.4307	154.4307	154.4307	154.4307 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	39.4214	35.0137	28.4751	21.5575	16.1145	13.6045	14.7001	19.1078	25.6465	32.5641	38.0071	40.5170 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	430.6872	435.1564	423.8942	399.9183	369.6530	341.2079	322.2049	317.7357	328.9979	352.9738	383.2390	411.6841 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.4431	38.4431	38.4431	38.4431	38.4431	38.4431	38.4431	38.4431	38.4431	38.4431	38.4431	38.4431 (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)	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446 (71)
Water heating gains (Table 5)	140.8276	138.3431	133.1838	126.1697	121.6160	115.2041	109.7541	116.7370	119.2180	126.4777	134.6752	138.3534 (72)
Total internal gains	683.2653	680.8424	657.8822	619.9747	579.7127	542.3457	518.9883	525.9097	546.1916	584.3448	628.2505	662.8838 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
Northeast	19.1900	11.2829	0.6300	0.7000	0.7700	66.1712 (75)						
Southeast	4.5100	36.7938	0.6300	0.7000	0.7700	50.7135 (77)						
Southwest	16.1600	36.7938	0.6300	0.7000	0.7700	181.7139 (79)						
Northwest	3.3300	11.2829	0.6300	0.7000	0.7700	11.4826 (81)						
Northeast	2.7600	16.8560	0.6300	0.7000	1.0000	18.4648 (82)						
Solar gains	328.5460	592.2714	897.5880	1259.2069	1545.2641	1593.5715	1511.6070	1288.9913	1021.3082	678.0508	399.4529	277.3363 (83)
Total gains	1011.8113	1273.1138	1555.4702	1879.1815	2124.9768	2135.9172	2030.5954	1814.9009	1567.4998	1262.3956	1027.7034	940.2201 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	59.8934	60.0332	60.1709	60.8261	60.9502	61.5350	61.5350	61.6446	61.3085	60.9502	60.6996	60.4397
alpha	4.9929	5.0022	5.0114	5.0551	5.0633	5.1023	5.1023	5.1096	5.0872	5.0633	5.0466	5.0293
util living area	0.9998	0.9992	0.9967	0.9834	0.9288	0.7901	0.6245	0.7058	0.9293	0.9942	0.9994	0.9998 (86)
MIT	19.5403	19.7005	19.9751	20.3524	20.6993	20.9156	20.9802	20.9643	20.7783	20.3279	19.8670	19.5179 (87)
Th 2	19.9526	19.9547	19.9569	19.9669	19.9688	19.9776	19.9776	19.9792	19.9742	19.9688	19.9650	19.9610 (88)
util rest of house	0.9997	0.9989	0.9954	0.9762	0.8965	0.7031	0.4932	0.5751	0.8829	0.9909	0.9991	0.9998 (89)
MIT 2	17.9813	18.2173	18.6202	19.1740	19.6549	19.9172	19.9698	19.9629	19.7722	19.1441	18.4684	17.9545 (90)
Living area fraction												fLA = Living area / (4) =
MIT	18.1077	18.3376	18.7301	19.2695	19.7396	19.9982	20.0517	20.0441	19.8538	19.2401	18.5819	18.0813 (92)
Temperature adjustment												0.0000
adjusted MIT	18.1077	18.3376	18.7301	19.2695	19.7396	19.9982	20.0517	20.0441	19.8538	19.2401	18.5819	18.0813 (93)

8. Space heating requirement

Utilisation	0.9994	0.9981	0.9930	0.9693	0.8874	0.7051	0.5033	0.5843	0.8757	0.9871	0.9985	0.9996 (94)
Useful gains	1011.2282	1270.7078	1544.5290	1821.4613	1885.7007	1506.0116	1021.9421	1060.3900	1372.6200	1246.1174	1026.2121	939.8503 (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	4269.4410	4145.3331	3764.1753	3157.1673	2442.7871	1624.6218	1038.8259	1094.7809	1738.0382	2625.2578	3503.1233	4253.4061 (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												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Space heating	2424.1103	1931.7482	1651.4168	961.7084	414.4723	0.0000	0.0000	0.0000	0.0000	1026.0804	1783.3761	2465.2855 (98)
Space heating per m2												12658.1981 (98)
												(98) / (4) = 47.4659 (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 %)												93.5000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												13538.1797 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	2424.1103	1931.7482	1651.4168	961.7084	414.4723	0.0000	0.0000	0.0000	0.0000	1026.0804	1783.3761	2465.2855 (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)	2592.6314	2066.0409	1766.2212	1028.5651	443.2859	0.0000	0.0000	0.0000	0.0000	1097.4122	1907.3541	2636.6690 (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	233.4984	205.8805	216.3947	194.2260	190.5108	170.4808	163.9687	179.5935	179.1726	201.3893	212.6437	227.9624 (64)
Efficiency of water heater (217)m	89.4463	89.3462	89.1156	88.5060	86.8336	79.8000	79.8000	79.8000	79.8000	88.5519	89.2254	79.8000 (216)
Fuel for water heating, kWh/month	261.0489	230.4302	242.8246	219.4496	219.3976	213.6351	205.4745	225.0545	224.5271	227.4251	238.3218	254.7509 (219)
Water heating fuel used												2762.3400 (219)
Annual totals kWh/year												
Space heating fuel - main system												13538.1797 (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)												696.1939 (232)
Total delivered energy for all uses												17071.7137 (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	13538.1797	0.2160	2924.2468 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2762.3400	0.2160	596.6654 (264)
Space and water heating			3520.9123 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	696.1939	0.5190	361.3246 (268)
Total CO2, kg/m2/year			3921.1619 (272)
Emissions per m2 for space and water heating			13.2028 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			1.3549 (272b)
Emissions per m2 for pumps and fans			0.1460 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.2028 * 1.00) + 1.3549 + 0.1460, rounded to 2 d.p.			14.7000 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	99.2300 (1b)	x 2.8200 (2b)	= 279.8286 (1b) - (3b)
First floor	96.8400 (1c)	x 3.1200 (2c)	= 302.1408 (1c) - (3c)
Second floor	70.6100 (1d)	x 2.4100 (2d)	= 170.1701 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	266.6800		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 752.1395 (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)
Air changes per hour					
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				40.0000 / (5) =	0.0532 (8)
Pressure test				Yes	
Measured/design AP50				4.9800	
Infiltration rate				0.3022 (18)	
Number of sides sheltered				0 (19)	
Shelter factor					
Infiltration rate adjusted to include shelter factor				(20) = 1 - [0.075 x (19)] =	1.0000 (20)
				(21) = (18) x (20) =	0.3022 (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	0.3853	0.3777	0.3702	0.3324	0.3248	0.2871	0.2871	0.2795	0.3022	0.3248	0.3400	0.3551 (22b)
Effective ac	0.5742	0.5713	0.5685	0.5552	0.5528	0.5412	0.5412	0.5391	0.5457	0.5528	0.5578	0.5630 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.7200	1.4000	3.8080		(26)
Windows (Uw = 1.20)			43.1900	1.1450	49.4542		(27)
Side Door			2.4500	1.4000	3.4300		(26a)
Velux Windows (Uw = 1.40)			2.7600	1.3258	3.6591		(27a)
Ground Floor			99.2300	0.1200	11.9076	75.0000	7442.2500 (28a)
External Walls - 100mm Block	255.1500	32.5100	222.6400	0.1900	42.3016	110.0000	24490.4000 (29a)
External Walls - 215mm Block	26.2400	13.0100	13.2300	0.1900	2.5137	110.0000	1455.3000 (29a)
Ashlar & Dormer Walls	42.0300	2.8400	39.1900	0.2100	8.2299	9.0000	352.7100 (29a)
Flat Bay Roofs	3.4800		3.4800	0.1400	0.4872	9.0000	31.3200 (30)
Pitched Cold Roof Areas	72.8200		72.8200	0.1000	7.2820	9.0000	655.3800 (30)
Sloping Roofs	25.4500	2.7600	22.6900	0.1500	3.4035	9.0000	204.2100 (30)
Flat Dormer Roofs	4.4800		4.4800	0.1600	0.7168	9.0000	40.3200 (30)
Total net area of external elements Aum(A, m ²)			528.8800				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 137.1936		(33)
Internal Wall - Masonry			119.1000			75.0000	8932.5000 (32c)
Internal Wall - Timber			284.0000			9.0000	2556.0000 (32c)
Internal Floor			95.7500			75.0000	7181.2500 (32d)
Internal Floor			70.6100			18.0000	1270.9800 (32d)
Internal Ceiling			95.7500			75.0000	7181.2500 (32e)
Internal Ceiling			70.6100			9.0000	635.4900 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 62429.3600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							234.0984 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							37.7239 (36)
Total fabric heat loss							(33) + (36) = 174.9175 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	142.5251	141.8098	141.1086	137.8151	137.1989	134.3304	134.3304	133.7992	135.4353	137.1989	138.4455	139.7487 (38)
Heat transfer coeff	317.4426	316.7272	316.0261	312.7326	312.1164	309.2479	309.2479	308.7167	310.3528	312.1164	313.3630	314.6662 (39)
Average = Sum(39)m / 12 =												312.7297 (39)
HLP	1.1904	1.1877	1.1850	1.1727	1.1704	1.1596	1.1596	1.1576	1.1638	1.1704	1.1751	1.1799 (40)
HLP (average)												1.1727 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Assumed occupancy											3.0886 (42)	
Average daily hot water use (litres/day)											107.5546 (43)	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	118.3100	114.0079	109.7057	105.4035	101.1013	96.7991	96.7991	101.1013	105.4035	109.7057	114.0079	118.3100 (44)
Energy content	175.4504	153.4500	158.3467	138.0505	132.4627	114.3052	105.9206	121.5455	122.9971	143.3413	156.4682	169.9143 (45)
Energy content (annual)											Total = Sum(45)m =	1692.2524 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	37.2832	32.6081	33.6487	29.3357	28.1483	24.2899	22.5081	25.8284	26.1369	30.4600	33.2495	36.1068 (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	154.4307	154.4307	154.4307	154.4307	154.4307	154.4307	154.4307	154.4307	154.4307	154.4307	154.4307	154.4307 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	39.4214	35.0137	28.4751	21.5575	16.1145	13.6045	14.7001	19.1078	25.6465	32.5641	38.0071	40.5170 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	430.6872	435.1564	423.8942	399.9183	369.6530	341.2079	322.2049	317.7357	328.9979	352.9738	383.2390	411.6841 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.4431	38.4431	38.4431	38.4431	38.4431	38.4431	38.4431	38.4431	38.4431	38.4431	38.4431	38.4431 (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)	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446 (71)
Water heating gains (Table 5)	50.1118	48.5240	45.2267	40.7441	37.8338	33.7359	30.2529	34.7156	36.3012	40.9409	46.1798	48.5306 (72)
Total internal gains	589.5496	588.0233	566.9251	531.5490	492.9304	457.8776	436.4871	440.8883	460.2748	495.8079	536.7552	570.0610 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W				
Northeast	19.1900	11.2829	0.6300	0.7000	0.7000	0.7700	66.1712 (75)					
Southeast	4.5100	36.7938	0.6300	0.7000	0.7000	0.7700	50.7135 (77)					
Southwest	16.1600	36.7938	0.6300	0.7000	0.7000	0.7700	181.7139 (79)					
Northwest	3.3300	11.2829	0.6300	0.7000	0.7000	0.7700	11.4826 (81)					
Northeast	2.7600	16.8560	0.6300	0.7000	0.7000	1.0000	18.4648 (82)					
Solar gains	328.5460	592.2714	897.5880	1259.2069	1545.2641	1593.5715	1511.6070	1288.9913	1021.3082	678.0508	399.4529	277.3363 (83)
Total gains	918.0956	1180.2947	1464.5131	1790.7559	2038.1946	2051.4491	1948.0941	1729.8796	1481.5830	1173.8587	936.2081	847.3973 (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	54.6287	54.7521	54.8736	55.4515	55.5610	56.0763	56.0763	56.1728	55.8767	55.5610	55.3399	55.1107
alpha	4.6419	4.6501	4.6582	4.6968	4.7041	4.7384	4.7384	4.7449	4.7251	4.7041	4.6893	4.6740
util living area	0.9998	0.9991	0.9966	0.9841	0.9349	0.8106	0.6544	0.7359	0.9385	0.9946	0.9994	0.9998 (86)
MIT	19.3871	19.5568	19.8498	20.2535	20.6317	20.8829	20.9682	20.9456	20.7223	20.2323	19.7379	19.3633 (87)
Th 2	19.9277	19.9299	19.9320	19.9419	19.9438	19.9524	19.9524	19.9540	19.9491	19.9438	19.9400	19.9361 (88)
util rest of house	0.9997	0.9989	0.9954	0.9774	0.9055	0.7273	0.5193	0.6054	0.8976	0.9917	0.9992	0.9998 (89)
MIT 2	18.4400	18.6114	18.9054	19.3132	19.6751	19.8920	19.9432	19.9356	19.7696	19.2965	18.8004	18.4228 (90)
Living area fraction											fLA = Living area / (4) =	0.0811 (91)
MIT	18.5168	18.6880	18.9820	19.3895	19.7527	19.9724	20.0263	20.0175	19.8468	19.3724	18.8764	18.4991 (92)
Temperature adjustment												0.0000
adjusted MIT	18.5168	18.6880	18.9820	19.3895	19.7527	19.9724	20.0263	20.0175	19.8468	19.3724	18.8764	18.4991 (93)

8. Space heating requirement

Utilisation	0.9995	0.9983	0.9938	0.9727	0.8988	0.7291	0.5296	0.6144	0.8923	0.9893	0.9988	0.9997 (94)
Useful gains	917.6449	1178.3304	1455.3666	1741.8356	1832.0191	1495.6999	1031.7535	1062.7784	1321.9876	1161.2786	935.0832	847.1165 (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	4513.0231	4367.0500	3944.6331	3280.4038	2513.3771	1661.3946	1059.5741	1116.7775	1783.5477	2738.0234	3690.2872	4499.4396 (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	2674.9614	2142.8196	1852.0142	1107.7691	506.9304	0.0000	0.0000	0.0000	0.0000	1173.0982	1983.7469	2717.3284 (98)
Space heating											14158.6681 (98)	
Space heating per m ²											(98) / (4) =	53.0924 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

 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	0.0000	2906.9304	2288.4346	2346.2470	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7636	0.8456	0.7901	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	2219.7130	1935.1785	1853.7154	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	2528.1424	2405.2474	2159.8247	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	0.0000	222.0692	349.7313	227.7453	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												
Cooled fraction												799.5458 (104)
Intermittency factor (Table 10b)												1.0000 (105)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	55.5173	87.4328	56.9363	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												
Space cooling per m2												199.8865 (107)
Energy for space heating												0.7495 (108)
Energy for space cooling												53.0924 (99)
Total												0.7495 (108)
Dwelling Fabric Energy Efficiency (DFEE)												53.8419 (109)
												53.8 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	99.2300 (1b)	x 2.8200 (2b)	= 279.8286 (1b) - (3b)
First floor	96.8400 (1c)	x 3.1200 (2c)	= 302.1408 (1c) - (3c)
Second floor	70.6100 (1d)	x 2.4100 (2d)	= 170.1701 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	266.6800		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 752.1395 (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)
					Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) = 0.0532 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3032 (18)
Number of sides sheltered					0 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3032 (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	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2804	0.3032	0.3259	0.3411	0.3562 (22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K	
TER Opaque door			2.7200	1.0000	2.7200		(26)	
TER Semi-glazed door			2.4500	1.2000	2.9400		(26a)	
TER Opening Type (Uw = 1.40)			43.1900	1.3258	57.2595		(27)	
TER Room Window (Uw = 1.70)			2.7600	1.5918	4.3933		(27a)	
Ground Floor			99.2300	0.1300	12.8999		(28a)	
External Walls - 100mm Block	255.1500	32.5100	222.6400	0.1800	40.0752		(29a)	
External Walls - 215mm Block	26.2400	13.0100	13.2300	0.1800	2.3814		(29a)	
Ashlar & Dormer Walls	42.0300	2.8400	39.1900	0.1800	7.0542		(29a)	
Flat Bay Roofs	3.4800		3.4800	0.1300	0.4524		(30)	
Pitched Cold Roof Areas	72.8200		72.8200	0.1300	9.4666		(30)	
Sloping Roofs	25.4500	2.7600	22.6900	0.1300	2.9497		(30)	
Flat Dormer Roofs	4.4800		4.4800	0.1300	0.5824		(30)	
Total net area of external elements Aum(A, m ²)			528.8800				(31)	
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 143.1745		(33)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K								250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								23.3850 (36)
Total fabric heat loss								(33) + (36) = 166.5595 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	142.6472	141.9271	141.2213	137.9060	137.2857	134.3982	134.3982	133.8635	135.5105	137.2857	138.5406	139.8524 (38)
Heat transfer coeff	309.2068	308.4867	307.7808	304.4655	303.8453	300.9578	300.9578	300.4230	302.0700	303.8453	305.1001	306.4119 (39)
Average = Sum(39)m / 12 =												304.4626 (39)
HLP	1.1595	1.1568	1.1541	1.1417	1.1394	1.1285	1.1285	1.1265	1.1327	1.1394	1.1441	1.1490 (40)
HLP (average)												1.1417 (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												3.0886 (42)
Average daily hot water use (litres/day)												107.5546 (43)
Daily hot water use	118.3100	114.0079	109.7057	105.4035	101.1013	96.7991	96.7991	101.1013	105.4035	109.7057	114.0079	118.3100 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Energy content (annual)	175.4504	153.4500	158.3467	138.0505	132.4627	114.3052	105.9206	121.5455	122.9971	143.3413	156.4682	169.9143 (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	37.2832	32.6081	33.6487	29.3357	28.1483	24.2899	22.5081	25.8284	26.1369	30.4600	33.2495	36.1068 (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	154.4307	154.4307	154.4307	154.4307	154.4307	154.4307	154.4307	154.4307	154.4307	154.4307	154.4307	154.4307 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	39.4214	35.0137	28.4751	21.5575	16.1145	13.6045	14.7001	19.1078	25.6465	32.5641	38.0071	40.5170 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	430.6872	435.1564	423.8942	399.9183	369.6530	341.2079	322.2049	317.7357	328.9979	352.9738	383.2390	411.6841 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.4431	38.4431	38.4431	38.4431	38.4431	38.4431	38.4431	38.4431	38.4431	38.4431	38.4431	38.4431 (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)	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446 (71)
Water heating gains (Table 5)	50.1118	48.5240	45.2267	40.7441	37.8338	33.7359	30.2529	34.7156	36.3012	40.9409	46.1798	48.5306 (72)
Total internal gains	589.5496	588.0233	566.9251	531.5490	492.9304	457.8776	436.4871	440.8883	460.2748	495.8079	536.7552	570.0610 (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
Northeast	19.1900	11.2829	0.6300	0.7000	0.7700	66.1712 (75)	
Southeast	4.5100	36.7938	0.6300	0.7000	0.7700	50.7135 (77)	
Southwest	16.1600	36.7938	0.6300	0.7000	0.7700	181.7139 (79)	
Northwest	3.3300	11.2829	0.6300	0.7000	0.7700	11.4826 (81)	
Northeast	2.7600	16.8560	0.6300	0.7000	1.0000	18.4648 (82)	

Solar gains	328.5460	592.2714	897.5880	1259.2069	1545.2641	1593.5715	1511.6070	1288.9913	1021.3082	678.0508	399.4529	277.3363 (83)
Total gains	918.0956	1180.2947	1464.5131	1790.7559	2038.1946	2051.4491	1948.0941	1729.8796	1481.5830	1173.8587	936.2081	847.3973 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, T _{hl} (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor for gains for living area, nil,m (see Table 9a)												21.0000 (85)
tau	59.8934	60.0332	60.1709	60.8261	60.9502	61.5350	61.5350	61.6446	61.3085	60.9502	60.6996	60.4397
alpha	4.9929	5.0022	5.0114	5.0551	5.0633	5.1023	5.1023	5.1096	5.0872	5.0633	5.0466	5.0293
util living area	0.9999	0.9994	0.9975	0.9864	0.9382	0.8087	0.6462	0.7305	0.9418	0.9958	0.9996	0.9999 (86)
MIT	19.5073	19.6680	19.9436	20.3237	20.6776	20.9056	20.9769	20.9582	20.7566	20.2975	19.8348	19.4853 (87)
Th 2	19.9526	19.9547	19.9569	19.9669	19.9688	19.9776	19.9776	19.9792	19.9742	19.9688	19.9650	19.9610 (88)
util rest of house												
0.9998	0.9992	0.9965	0.9804	0.9089	0.7240	0.5126	0.5997	0.9011	0.9933	0.9995	0.9999 (89)	
MIT 2	18.5738	18.7360	19.0129	19.3977	19.7360	19.9305	19.9713	19.9658	19.8190	19.3758	18.9111	18.5584 (90)
Living area fraction									fLA = Living area / (4) =			0.0811 (91)
MIT	18.6495	18.8116	19.0884	19.4728	19.8124	20.0096	20.0528	20.0463	19.8950	19.4506	18.9860	18.6336 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6495	18.8116	19.0884	19.4728	19.8124	20.0096	20.0528	20.0463	19.8950	19.4506	18.9860	18.6336 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	917.8163	1178.9515	1457.5414	1748.5587	1841.2209	1491.4078	1019.0857	1053.9819	1328.8047	1163.8468	935.4602	847.2288 (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												
4436.9542	4291.5535	3874.4697	3219.0599	2464.9032	1628.0522	1039.1540	1095.4341	1750.5034	2689.2007	3626.4234	4422.6227 (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												
2618.2387	2091.6685	1798.1946	1058.7609	464.0196	0.0000	0.0000	0.0000	0.0000	1134.8634	1937.4935	2660.0930 (98)	
Space heating												13763.3322 (98)
Space heating per m2												(98) / (4) = 51.6099 (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
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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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	2829.0029	2227.0874	2283.2151	0.0000	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7858	0.8665	0.8122	0.0000	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	2223.0230	1929.8535	1854.5207	0.0000	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	2528.1424	2405.2474	2159.8247	0.0000	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	0.0000 (103a)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	219.6860	353.6931	227.1462	0.0000	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling Cooled fraction													800.5253 (104)
													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	0.0000 (106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	54.9215	88.4233	56.7866	0.0000	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling Energy for space heating													200.1313 (107)
													0.7505 (108)
Energy for space heating													51.6099 (99)
Energy for space cooling													0.7505 (108)
Total													52.3604 (109)
Target Fabric Energy Efficiency (TFEE)													60.2 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	99.2300 (1b)	x 2.8200 (2b)	= 279.8286 (1b) - (3b)
First floor	96.8400 (1c)	x 3.1200 (2c)	= 302.1408 (1c) - (3c)
Second floor	70.6100 (1d)	x 2.4100 (2d)	= 170.1701 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	266.6800		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 752.1395 (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					7 * 10 = 70.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
					Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					70.0000 / (5) = 0.0931 (8)
Pressure test					Yes
Measured/design AP50					4.9800
Infiltration rate					0.3421 (18)
Number of sides sheltered					0 (19)
					Shelter factor
Infiltration rate adjusted to include shelter factor					(20) = 1 - [0.075 x (19)] = 1.0000 (20) (21) = (18) x (20) = 0.3421 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.1000	3.8000	3.9000	3.7000	3.6000	3.3000	3.3000	3.2000	3.2000	3.4000	3.3000	3.7000 (22)
Wind factor	1.0250	0.9500	0.9750	0.9250	0.9000	0.8250	0.8250	0.8000	0.8000	0.8500	0.8250	0.9250 (22a)
Adj infilt rate												
Effective ac	0.3506	0.3250	0.3335	0.3164	0.3079	0.2822	0.2822	0.2737	0.2737	0.2908	0.2822	0.3164 (22b)
	0.5615	0.5528	0.5556	0.5501	0.5474	0.5398	0.5398	0.5374	0.5374	0.5423	0.5398	0.5501 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.7200	1.4000	3.8080		(26)
Windows (Uw = 1.20)			43.1900	1.1450	49.4542		(27)
Side Door			2.4500	1.4000	3.4300		(26a)
Velux Windows (Uw = 1.40)			2.7600	1.3258	3.6591		(27a)
Ground Floor			99.2300	0.1200	11.9076	75.0000	7442.2500 (28a)
External Walls - 100mm Block	255.1500	32.5100	222.6400	0.1900	42.3016	110.0000	24490.4000 (29a)
External Walls - 215mm Block	26.2400	13.0100	13.2300	0.1900	2.5137	110.0000	1455.3000 (29a)
Ashlar & Dormer Walls	42.0300	2.8400	39.1900	0.2100	8.2299	9.0000	352.7100 (29a)
Flat Bay Roofs	3.4800		3.4800	0.1400	0.4872	9.0000	31.3200 (30)
Pitched Cold Roof Areas	72.8200		72.8200	0.1000	7.2820	9.0000	655.3800 (30)
Sloping Roofs	25.4500	2.7600	22.6900	0.1500	3.4035	9.0000	204.2100 (30)
Flat Dormer Roofs	4.4800		4.4800	0.1600	0.7168	9.0000	40.3200 (30)
Total net area of external elements Aum(A, m ²)			528.8800				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 137.1936		(33)
Internal Wall - Masonry			119.1000			75.0000	8932.5000 (32c)
Internal Wall - Timber			284.0000			9.0000	2556.0000 (32c)
Internal Floor			95.7500			75.0000	7181.2500 (32d)
Internal Floor			70.6100			18.0000	1270.9800 (32d)
Internal Ceiling			95.7500			75.0000	7181.2500 (32e)
Internal Ceiling			70.6100			18.0000	1270.9800 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 63064.8500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							236.4814 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							37.7239 (36)
Total fabric heat loss							(33) + (36) = 174.9175 (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	139.3595	137.2085	137.9074	136.5278	135.8653	133.9866	133.9866	133.3967	133.3967	134.5947	133.9866	136.5278 (38)
Heat transfer coeff												
Average = Sum(39)m / 12 =	314.2770	312.1260	312.8249	311.4453	310.7828	308.9041	308.9041	308.3142	308.3142	309.5122	308.9041	311.4453 (39)
												310.4795 (39)
HLP	1.1785	1.1704	1.1730	1.1679	1.1654	1.1583	1.1583	1.1561	1.1561	1.1606	1.1583	1.1679 (40)
HLP (average)												1.1642 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Assumed occupancy											3.0886 (42)	
Average daily hot water use (litres/day)											107.5546 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	30.4668	27.5184	30.4668	29.4840	30.4668	29.4840	30.4668	30.4668	29.4840	30.4668	29.4840	30.4668
Energy content	118.3100	114.0079	109.7057	105.4035	101.1013	96.7991	96.7991	101.1013	105.4035	109.7057	114.0079	118.3100
Energy content (annual)	175.4504	153.4500	158.3467	138.0505	132.4627	114.3052	105.9206	121.5455	122.9971	143.3413	156.4682	169.9143
Distribution loss (46)m = 0.15 x (45)m	Total = Sum(45)m = 1692.2524 (45)											
	26.3176	23.0175	23.7520	20.7076	19.8694	17.1458	15.8881	18.2318	18.4496	21.5012	23.4702	25.4871
Water storage loss:												
Store volume												
a) If manufacturer declared loss factor is known (kWh/day):												
Temperature factor from Table 2b												
Enter (49) or (54) in (55)												
Total storage loss												
	30.4668	27.5184	30.4668	29.4840	30.4668	29.4840	30.4668	30.4668	29.4840	30.4668	29.4840	30.4668
If cylinder contains dedicated solar storage												
	30.4668	27.5184	30.4668	29.4840	30.4668	29.4840	30.4668	30.4668	29.4840	30.4668	29.4840	30.4668
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
Total heat required for water heating calculated for each month	229.1796	201.9796	212.0759	190.0465	186.1919	166.3012	159.6498	175.2747	174.9931	197.0705	208.4642	223.6435
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
	Solar input (sum of months) = Sum(63)m = 0.0000 (63)											
Output from w/h	229.1796	201.9796	212.0759	190.0465	186.1919	166.3012	159.6498	175.2747	174.9931	197.0705	208.4642	223.6435
	Total per year (kWh/year) = Sum(64)m = 2324.8704 (64)											
	2325 (64)											
RHI water heating demand												
Heat gains from water heating, kWh/month	101.3206	89.8458	95.6336	87.4986	87.0272	79.6033	78.2020	83.3972	82.4933	90.6443	93.6225	99.4799

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	185.3168	185.3168	185.3168	185.3168	185.3168	185.3168	185.3168	185.3168	185.3168	185.3168	185.3168	185.3168
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	98.5535	87.5343	71.1877	53.8937	40.2861	34.0113	36.7504	47.7695	64.1161	81.4102	95.0177	101.2926
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	642.8167	649.4871	632.6779	596.8929	551.7209	509.2656	480.9028	474.2324	491.0416	526.8265	571.9986	614.4539
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	56.6203	56.6203	56.6203	56.6203	56.6203	56.6203	56.6203	56.6203	56.6203	56.6203	56.6203	56.6203
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
Losses e.g. evaporation (negative values) (Table 5)	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446
Water heating gains (Table 5)	136.1836	133.6991	128.5398	121.5258	116.9721	110.5601	105.1102	112.0930	114.5741	121.8338	130.0312	133.7095
Total internal gains	998.9463	992.1131	953.7979	893.7050	830.3717	775.2295	744.1559	755.4875	791.1244	851.4630	918.4400	970.8486

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	19.1900	14.6223	0.6300	0.7000	0.7700	85.7558 (75)
Southeast	4.5100	45.2918	0.6300	0.7000	0.7700	62.4263 (77)
Southwest	16.1600	45.2918	0.6300	0.7000	0.7700	223.6827 (79)
Northwest	3.3300	14.6223	0.6300	0.7000	0.7700	14.8810 (81)
Northeast	2.7600	21.9592	0.6300	0.7000	1.0000	24.0551 (82)

Solar gains	410.8009	632.8633	964.0994	1365.2551	1591.5862	1786.6209
Total gains	1409.7472	1624.9764	1917.8974	2258.9601	2421.9579	2561.8505

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	55.7407	56.1248	55.9994	56.2475	56.3674	56.7102	56.7102	56.8187	56.8187	56.5988	56.7102	56.2475
alpha	4.7160	4.7417	4.7333	4.7498	4.7578	4.7807	4.7807	4.7879	4.7879	4.7733	4.7807	4.7498
util living area	0.9982	0.9961	0.9876	0.9527	0.8513	0.6286	0.4435	0.5055	0.8127	0.9727	0.9957	0.9988
MIT	19.9487	20.0666	20.2857	20.5669	20.8006	20.9189	20.9397	20.9368	20.8610	20.5688	20.2224	19.9293
Th 2	19.9373	19.9437	19.9416	19.9458	19.9478	19.9535	19.9535	19.9553	19.9553	19.9516	19.9535	19.9458
util rest of house	0.9976	0.9948	0.9830	0.9344	0.7951	0.5239	0.3139	0.3685	0.7247	0.9583	0.9939	0.9983
MIT 2	18.5314	18.7084	19.0251	19.4271	19.7326	19.8569	19.8696	19.8705	19.8125	19.4415	18.9440	18.5096
Living area fraction	fLA = Living area / (4) =											
MIT	18.6464	18.8186	19.1273	19.5195	19.8192	19.9430	19.9563	19.9570	19.8976	19.5329	19.0477	18.6248
Temperature adjustment												
adjusted MIT	18.4964	18.6686	18.9773	19.3695	19.6692	19.7930	19.8063	19.8070	19.7476	19.3829	18.8977	18.4748

8. Space heating requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9963	0.9923	0.9769	0.9211	0.7772	0.5067	0.2952	0.3483	0.7036	0.9469	0.9910	0.9974 (94)
Useful gains	1404.5186	1612.4712	1873.6420	2080.8092	1882.3124	1298.0329	710.9533	769.6419	1369.5087	1538.8391	1392.5850	1295.3545 (95)
Ext temp.	5.0000	5.6000	7.3000	9.7000	12.7000	15.5000	17.5000	17.3000	14.9000	11.5000	8.0000	5.0000 (96)
Heat loss rate W												
	4241.5948	4079.0411	3652.9580	3011.5310	2165.9119	1326.1252	712.4399	772.9383	1494.5693	2439.8599	3366.3520	4196.6567 (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												
	2110.7847	1657.5350	1323.8111	670.1197	210.9980	0.0000	0.0000	0.0000	0.0000	670.3595	1421.1123	2158.5689 (98)
Space heating												10223.2891 (98)
RHI space heating demand												10223 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	99.2300 (1b)	x 2.8200 (2b)	= 279.8286 (1b) - (3b)
First floor	96.8400 (1c)	x 3.1200 (2c)	= 302.1408 (1c) - (3c)
Second floor	70.6100 (1d)	x 2.4100 (2d)	= 170.1701 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	266.6800		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 752.1395 (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					7 * 10 = 70.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
					Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					70.0000 / (5) = 0.0931 (8)
Pressure test					Yes
Measured/design AP50					4.9800
Infiltration rate					0.3421 (18)
Number of sides sheltered					0 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3421 (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	0.4361	0.4276	0.4190	0.3763	0.3677	0.3250	0.3250	0.3164	0.3421	0.3677	0.3848	0.4019 (22b)
Effective ac	0.5951	0.5914	0.5878	0.5708	0.5676	0.5528	0.5528	0.5501	0.5585	0.5676	0.5740	0.5808 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.7200	1.4000	3.8080		(26)
Windows (Uw = 1.20)			43.1900	1.1450	49.4542		(27)
Side Door			2.4500	1.4000	3.4300		(26a)
Velux Windows (Uw = 1.40)			2.7600	1.3258	3.6591		(27a)
Ground Floor			99.2300	0.1200	11.9076	75.0000	7442.2500 (28a)
External Walls - 100mm Block	255.1500	32.5100	222.6400	0.1900	42.3016	110.0000	24490.4000 (29a)
External Walls - 215mm Block	26.2400	13.0100	13.2300	0.1900	2.5137	110.0000	1455.3000 (29a)
Ashlar & Dormer Walls	42.0300	2.8400	39.1900	0.2100	8.2299	9.0000	352.7100 (29a)
Flat Bay Roofs	3.4800		3.4800	0.1400	0.4872	9.0000	31.3200 (30)
Pitched Cold Roof Areas	72.8200		72.8200	0.1000	7.2820	9.0000	655.3800 (30)
Sloping Roofs	25.4500	2.7600	22.6900	0.1500	3.4035	9.0000	204.2100 (30)
Flat Dormer Roofs	4.4800		4.4800	0.1600	0.7168	9.0000	40.3200 (30)
Total net area of external elements Aum(A, m ²)			528.8800				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 137.1936		(33)
Internal Wall - Masonry			119.1000			75.0000	8932.5000 (32c)
Internal Wall - Timber			284.0000			9.0000	2556.0000 (32c)
Internal Floor			95.7500			75.0000	7181.2500 (32d)
Internal Floor			70.6100			18.0000	1270.9800 (32d)
Internal Ceiling			95.7500			75.0000	7181.2500 (32e)
Internal Ceiling			70.6100			18.0000	1270.9800 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 63064.8500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							236.4814 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							37.7239 (36)
Total fabric heat loss							(33) + (36) = 174.9175 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	147.7093	146.7926	145.8941	141.6738	140.8842	137.2085	137.2085	136.5278	138.6244	140.8842	142.4816	144.1515 (38)
Heat transfer coeff	322.6268	321.7101	320.8116	316.5913	315.8017	312.1260	312.1260	311.4453	313.5419	315.8017	317.3991	319.0690 (39)
Average = Sum(39)m / 12 =												316.5876 (39)
HLP	1.2098	1.2064	1.2030	1.1872	1.1842	1.1704	1.1704	1.1679	1.1757	1.1842	1.1902	1.1964 (40)
HLP (average)												1.1871 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Assumed occupancy											3.0886 (42)	
Average daily hot water use (litres/day)											107.5546 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	118.3100	114.0079	109.7057	105.4035	101.1013	96.7991	96.7991	101.1013	105.4035	109.7057	114.0079	118.3100 (44)
Energy content	175.4504	153.4500	158.3467	138.0505	132.4627	114.3052	105.9206	121.5455	122.9971	143.3413	156.4682	169.9143 (45)
Energy content (annual)											Total = Sum(45)m = 1692.2524 (45)	
Distribution loss (46)m = 0.15 x (45)m	26.3176	23.0175	23.7520	20.7076	19.8694	17.1458	15.8881	18.2318	18.4496	21.5012	23.4702	25.4871 (46)
Water storage loss:												
Store volume												292.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8200 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9828 (55)
Total storage loss	30.4668	27.5184	30.4668	29.4840	30.4668	29.4840	30.4668	30.4668	29.4840	30.4668	29.4840	30.4668 (56)
If cylinder contains dedicated solar storage	30.4668	27.5184	30.4668	29.4840	30.4668	29.4840	30.4668	30.4668	29.4840	30.4668	29.4840	30.4668 (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	229.1796	201.9796	212.0759	190.0465	186.1919	166.3012	159.6498	175.2747	174.9931	197.0705	208.4642	223.6435 (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	229.1796	201.9796	212.0759	190.0465	186.1919	166.3012	159.6498	175.2747	174.9931	197.0705	208.4642	223.6435 (64)
Heat gains from water heating, kWh/month	101.3206	89.8458	95.6336	87.4986	87.0272	79.6033	78.2020	83.3972	82.4933	90.6443	93.6225	99.4799 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	185.3168	185.3168	185.3168	185.3168	185.3168	185.3168	185.3168	185.3168	185.3168	185.3168	185.3168	185.3168 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	98.5535	87.5343	71.1877	53.8937	40.2861	34.0113	36.7504	47.7695	64.1161	81.4102	95.0177	101.2926 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	642.8167	649.4871	632.6779	596.8929	551.7209	509.2656	480.9028	474.2324	491.0416	526.8265	571.9986	614.4539 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	56.6203	56.6203	56.6203	56.6203	56.6203	56.6203	56.6203	56.6203	56.6203	56.6203	56.6203	56.6203 (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)	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446 (71)
Water heating gains (Table 5)	136.1836	133.6991	128.5398	121.5258	116.9721	110.5601	105.1102	112.0930	114.5741	121.8338	130.0312	133.7095 (72)
Total internal gains	998.9463	992.1131	953.7979	893.7050	830.3717	775.2295	744.1559	755.4875	791.1244	851.4630	918.4400	970.8486 (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			
Northeast	19.1900		11.2829		0.6300		0.7000		0.7700		66.1712 (75)	
Southeast	4.5100		36.7938		0.6300		0.7000		0.7700		50.7135 (77)	
Southwest	16.1600		36.7938		0.6300		0.7000		0.7700		181.7139 (79)	
Northwest	3.3300		11.2829		0.6300		0.7000		0.7700		11.4826 (81)	
Northeast	2.7600		16.8560		0.6300		0.7000		1.0000		18.4648 (82)	
Solar gains	328.5460	592.2714	897.5880	1259.2069	1545.2641	1593.5715	1511.6070	1288.9913	1021.3082	678.0508	399.4529	277.3363 (83)
Total gains	1327.4923	1584.3845	1851.3859	2152.9118	2375.6358	2368.8010	2255.7629	2044.4788	1812.4326	1529.5138	1317.8929	1248.1849 (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	54.2981	54.4528	54.6053	55.3332	55.4716	56.1248	56.1248	56.2475	55.8714	55.4716	55.1924	54.9035
alpha	4.6199	4.6302	4.6404	4.6889	4.6981	4.7417	4.7417	4.7498	4.7248	4.6981	4.6795	4.6602
util living area	0.9988	0.9971	0.9916	0.9695	0.8994	0.7489	0.5848	0.6563	0.8897	0.9851	0.9975	0.9991 (86)
MIT	19.8332	19.9588	20.1723	20.4645	20.7229	20.8814	20.9279	20.9179	20.7913	20.4550	20.0940	19.8168 (87)
Th 2	19.9122	19.9149	19.9176	19.9303	19.9327	19.9437	19.9437	19.9458	19.9395	19.9327	19.9279	19.9228 (88)
util rest of house	0.9984	0.9961	0.9885	0.9576	0.8595	0.6586	0.4562	0.5264	0.8295	0.9774	0.9965	0.9989 (89)
MIT 2	18.3432	18.5288	18.8421	19.2716	19.6241	19.8165	19.8541	19.8509	19.7237	19.2650	18.7368	18.3275 (90)
Living area fraction												fLA = Living area / (4) = 0.0811 (91)
MIT	18.4640	18.6448	18.9500	19.3683	19.7132	19.9029	19.9412	19.9374	19.8103	19.3615	18.8469	18.4483 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.3140	18.4948	18.8000	19.2183	19.5632	19.7529	19.7912	19.7874	19.6603	19.2115	18.6969	18.2983 (93)

8. Space heating requirement												

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Utilisation	0.9975	0.9942	0.9839	0.9468	0.8422	0.6400	0.4364	0.5050	0.8089	0.9696	0.9947	0.9982 (94)
Useful gains	1324.2289	1575.1773	1821.6363	2038.3128	2000.8787	1516.0120	984.4059	1032.4490	1466.1025	1482.9515	1310.9539	1245.8901 (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	4521.3067	4373.5835	3945.9727	3266.6871	2483.2162	1608.3542	996.0444	1054.9957	1743.3803	2719.5305	3680.8347	4498.3170 (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	2378.6259	1880.5290	1580.5062	884.4295	358.8591	0.0000	0.0000	0.0000	0.0000	920.0148	1706.3141	2419.8057 (98)
Space heating												12129.0843 (98)
Space heating per m2												(98) / (4) = 45.4818 (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 %)												92.8000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												13070.1339 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	2378.6259	1880.5290	1580.5062	884.4295	358.8591	0.0000	0.0000	0.0000	0.0000	920.0148	1706.3141	2419.8057 (98)
Space heating efficiency (main heating system 1)	92.8000	92.8000	92.8000	92.8000	92.8000	0.0000	0.0000	0.0000	0.0000	92.8000	92.8000	92.8000 (210)
Space heating fuel (main heating system)	2563.1745	2026.4321	1703.1317	953.0490	386.7016	0.0000	0.0000	0.0000	0.0000	991.3952	1838.7006	2607.5492 (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	229.1796	201.9796	212.0759	190.0465	186.1919	166.3012	159.6498	175.2747	174.9931	197.0705	208.4642	223.6435 (64)
Efficiency of water heater (217)m	89.3459	89.2380	88.9866	88.3032	86.4359	79.7000	79.7000	79.7000	79.7000	88.3085	89.0977	79.7000 (216)
Fuel for water heating, kWh/month	256.5083	226.3381	238.3234	215.2205	215.4104	208.6590	200.3134	219.9180	219.5647	223.1614	233.9725	250.2032 (219)
Water heating fuel used												2707.5930 (219)
Annual totals kWh/year												
Space heating fuel - main system												13070.1339 (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)												696.1939 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 3.80 * 677 * 1.00) =										-2056.5747		-2056.5747 (233)
Total delivered energy for all uses												14492.3461 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	13070.1339	3.4800	454.8407 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2707.5930	3.4800	94.2242 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	696.1939	13.1900	91.8280 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-2056.5747	13.1900	-271.2622 (252)
Total energy cost			499.5232 (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] =	0.6731 (257)
SAP value		90.6099
SAP rating (Section 12)		91 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	13070.1339	0.2160	2823.1489 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2707.5930	0.2160	584.8401 (264)
Space and water heating			3407.9890 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Energy for lighting	696.1939	0.5190	361.3246 (268)
Energy saving/generation technologies			
PV Unit	-2056.5747	0.5190	-1067.3623 (269)
Total kg/year			2740.8764 (272)
CO2 emissions per m2			10.2800 (273)
EI value			88.2162
EI rating			88 (274)
EI band			B

 Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.25) / 0.9040 = 4.129$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.25) / 0.9040 = 0.2563$, stars = 4
Water heating energy efficiency	$3.48 / 0.8566 = 4.063$, stars = 4
Water heating environmental impact	$0.216 / 0.8566 = 0.2522$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	99.2300 (1b)	x 2.8200 (2b)	= 279.8286 (1b) - (3b)
First floor	96.8400 (1c)	x 3.1200 (2c)	= 302.1408 (1c) - (3c)
Second floor	70.6100 (1d)	x 2.4100 (2d)	= 170.1701 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	266.6800		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 752.1395 (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					7 * 10 = 70.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
					Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					70.0000 / (5) = 0.0931 (8)
Pressure test					Yes
Measured/design AP50					4.9800
Infiltration rate					0.3421 (18)
Number of sides sheltered					0 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3421 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.1000	3.8000	3.9000	3.7000	3.6000	3.3000	3.3000	3.2000	3.2000	3.4000	3.3000	3.7000 (22)
Wind factor	1.0250	0.9500	0.9750	0.9250	0.9000	0.8250	0.8250	0.8000	0.8000	0.8500	0.8250	0.9250 (22a)
Adj infilt rate												
Effective ac	0.3506	0.3250	0.3335	0.3164	0.3079	0.2822	0.2822	0.2737	0.2737	0.2908	0.2822	0.3164 (22b)
	0.5615	0.5528	0.5556	0.5501	0.5474	0.5398	0.5398	0.5374	0.5374	0.5423	0.5398	0.5501 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.7200	1.4000	3.8080		(26)
Windows (Uw = 1.20)			43.1900	1.1450	49.4542		(27)
Side Door			2.4500	1.4000	3.4300		(26a)
Velux Windows (Uw = 1.40)			2.7600	1.3258	3.6591		(27a)
Ground Floor			99.2300	0.1200	11.9076	75.0000	7442.2500 (28a)
External Walls - 100mm Block	255.1500	32.5100	222.6400	0.1900	42.3016	110.0000	24490.4000 (29a)
External Walls - 215mm Block	26.2400	13.0100	13.2300	0.1900	2.5137	110.0000	1455.3000 (29a)
Ashlar & Dormer Walls	42.0300	2.8400	39.1900	0.2100	8.2299	9.0000	352.7100 (29a)
Flat Bay Roofs	3.4800		3.4800	0.1400	0.4872	9.0000	31.3200 (30)
Pitched Cold Roof Areas	72.8200		72.8200	0.1000	7.2820	9.0000	655.3800 (30)
Sloping Roofs	25.4500	2.7600	22.6900	0.1500	3.4035	9.0000	204.2100 (30)
Flat Dormer Roofs	4.4800		4.4800	0.1600	0.7168	9.0000	40.3200 (30)
Total net area of external elements Aum(A, m ²)			528.8800				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 137.1936		(33)
Internal Wall - Masonry			119.1000			75.0000	8932.5000 (32c)
Internal Wall - Timber			284.0000			9.0000	2556.0000 (32c)
Internal Floor			95.7500			75.0000	7181.2500 (32d)
Internal Floor			70.6100			18.0000	1270.9800 (32d)
Internal Ceiling			95.7500			75.0000	7181.2500 (32e)
Internal Ceiling			70.6100			18.0000	1270.9800 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 63064.8500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							236.4814 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							37.7239 (36)
Total fabric heat loss							(33) + (36) = 174.9175 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	139.3595	137.2085	137.9074	136.5278	135.8653	133.9866	133.9866	133.3967	133.3967	134.5947	133.9866	136.5278 (38)
Heat transfer coeff												
Average = Sum(39)m / 12 =	314.2770	312.1260	312.8249	311.4453	310.7828	308.9041	308.9041	308.3142	308.3142	309.5122	308.9041	311.4453 (39)
												310.4795 (39)
HLP	1.1785	1.1704	1.1730	1.1679	1.1654	1.1583	1.1583	1.1561	1.1561	1.1606	1.1583	1.1679 (40)
HLP (average)												1.1642 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Assumed occupancy												3.0886 (42)
Average daily hot water use (litres/day)												107.5546 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	118.3100	114.0079	109.7057	105.4035	101.1013	96.7991	96.7991	101.1013	105.4035	109.7057	114.0079	118.3100
Energy content	175.4504	153.4500	158.3467	138.0505	132.4627	114.3052	105.9206	121.5455	122.9971	143.3413	156.4682	169.9143
Energy content (annual)												Total = Sum(45)m = 1692.2524 (45)
Distribution loss (46)m = 0.15 x (45)m	26.3176	23.0175	23.7520	20.7076	19.8694	17.1458	15.8881	18.2318	18.4496	21.5012	23.4702	25.4871
Water storage loss:												
Store volume												292.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8200 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9828 (55)
Total storage loss	30.4668	27.5184	30.4668	29.4840	30.4668	29.4840	30.4668	30.4668	29.4840	30.4668	29.4840	30.4668
If cylinder contains dedicated solar storage	30.4668	27.5184	30.4668	29.4840	30.4668	29.4840	30.4668	30.4668	29.4840	30.4668	29.4840	30.4668
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
Total heat required for water heating calculated for each month	229.1796	201.9796	212.0759	190.0465	186.1919	166.3012	159.6498	175.2747	174.9931	197.0705	208.4642	223.6435
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
Output from w/h	229.1796	201.9796	212.0759	190.0465	186.1919	166.3012	159.6498	175.2747	174.9931	197.0705	208.4642	223.6435
Heat gains from water heating, kWh/month	101.3206	89.8458	95.6336	87.4986	87.0272	79.6033	78.2020	83.3972	82.4933	90.6443	93.6225	99.4799

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

Metabolic gains (Table 5), Watts												
(66)m	185.3168	185.3168	185.3168	185.3168	185.3168	185.3168	185.3168	185.3168	185.3168	185.3168	185.3168	185.3168
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	98.5535	87.5343	71.1877	53.8937	40.2861	34.0113	36.7504	47.7695	64.1161	81.4102	95.0177	101.2926
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	642.8167	649.4871	632.6779	596.8929	551.7209	509.2656	480.9028	474.2324	491.0416	526.8265	571.9986	614.4539
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	56.6203	56.6203	56.6203	56.6203	56.6203	56.6203	56.6203	56.6203	56.6203	56.6203	56.6203	56.6203
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
Losses e.g. evaporation (negative values) (Table 5)	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446	-123.5446
Water heating gains (Table 5)	136.1836	133.6991	128.5398	121.5258	116.9721	110.5601	105.1102	112.0930	114.5741	121.8338	130.0312	133.7095
Total internal gains	998.9463	992.1131	953.7979	893.7050	830.3717	775.2295	744.1559	755.4875	791.1244	851.4630	918.4400	970.8486

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			
Northeast	19.1900		14.6223		0.6300		0.7000		0.7700		85.7558 (75)	
Southeast	4.5100		45.2918		0.6300		0.7000		0.7700		62.4263 (77)	
Southwest	16.1600		45.2918		0.6300		0.7000		0.7700		223.6827 (79)	
Northwest	3.3300		14.6223		0.6300		0.7000		0.7700		14.8810 (81)	
Northeast	2.7600		21.9592		0.6300		0.7000		1.0000		24.0551 (82)	
Solar gains	410.8009	632.8633	964.0994	1365.2551	1591.5862	1786.6209	1663.8992	1454.1595	1155.2884	773.6454	486.7935	327.9242
Total gains	1409.7472	1624.9764	1917.8974	2258.9601	2421.9579	2561.8505	2408.0551	2209.6470	1946.4128	1625.1085	1405.2336	1298.7727

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	55.7407	56.1248	55.9994	56.2475	56.3674	56.7102	56.7102	56.8187	56.8187	56.5988	56.7102	56.2475
alpha	4.7160	4.7417	4.7333	4.7498	4.7578	4.7807	4.7807	4.7879	4.7879	4.7733	4.7807	4.7498
util living area	0.9982	0.9961	0.9876	0.9527	0.8513	0.6286	0.4435	0.5055	0.8127	0.9727	0.9957	0.9988
MIT	19.9487	20.0666	20.2857	20.5669	20.8006	20.9189	20.9397	20.9368	20.8610	20.5688	20.2224	19.9293
Th 2	19.9373	19.9437	19.9416	19.9458	19.9478	19.9535	19.9535	19.9553	19.9553	19.9516	19.9535	19.9458
util rest of house	0.9976	0.9948	0.9830	0.9344	0.7951	0.5239	0.3139	0.3685	0.7247	0.9583	0.9939	0.9983
MIT 2	18.5314	18.7084	19.0251	19.4271	19.7326	19.8569	19.8696	19.8705	19.8125	19.4415	18.9440	18.5096
Living area fraction												fLA = Living area / (4) = 0.0811 (91)
MIT	18.6464	18.8186	19.1273	19.5195	19.8192	19.9430	19.9563	19.9570	19.8976	19.5329	19.0477	18.6248
Temperature adjustment												-0.1500
adjusted MIT	18.4964	18.6686	18.9773	19.3695	19.6692	19.7930	19.8063	19.8070	19.7476	19.3829	18.8977	18.4748

8. Space heating requirement												

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Utilisation	0.9963	0.9923	0.9769	0.9211	0.7772	0.5067	0.2952	0.3483	0.7036	0.9469	0.9910	0.9974 (94)
Useful gains	1404.5186	1612.4712	1873.6420	2080.8092	1882.3124	1298.0329	710.9533	769.6419	1369.5087	1538.8391	1392.5850	1295.3545 (95)
Ext temp.	5.0000	5.6000	7.3000	9.7000	12.7000	15.5000	17.5000	17.3000	14.9000	11.5000	8.0000	5.0000 (96)
Heat loss rate W	4241.5948	4079.0411	3652.9580	3011.5310	2165.9119	1326.1252	712.4399	772.9383	1494.5693	2439.8599	3366.3520	4196.6567 (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	2110.7847	1657.5350	1323.8111	670.1197	210.9980	0.0000	0.0000	0.0000	0.0000	670.3595	1421.1123	2158.5689 (98)
Space heating												10223.2891 (98)
Space heating per m2												(98) / (4) = 38.3354 (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 %)												92.8000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												11016.4753 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	2110.7847	1657.5350	1323.8111	670.1197	210.9980	0.0000	0.0000	0.0000	0.0000	670.3595	1421.1123	2158.5689 (98)
Space heating efficiency (main heating system 1)	92.8000	92.8000	92.8000	92.8000	92.8000	0.0000	0.0000	0.0000	0.0000	92.8000	92.8000	92.8000 (210)
Space heating fuel (main heating system)	2274.5524	1786.1368	1426.5206	722.1118	227.3686	0.0000	0.0000	0.0000	0.0000	722.3701	1531.3710	2326.0440 (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	229.1796	201.9796	212.0759	190.0465	186.1919	166.3012	159.6498	175.2747	174.9931	197.0705	208.4642	223.6435 (64)
Efficiency of water heater (217)m	89.2268	89.1007	88.7547	87.7958	85.0476	79.7000	79.7000	79.7000	79.7000	87.7243	88.8736	89.2748 (217)
Fuel for water heating, kWh/month	256.8507	226.6869	238.9461	216.4642	218.9268	208.6590	200.3134	219.9180	219.5647	224.6474	234.5624	250.5114 (219)
Water heating fuel used												2716.0512 (219)
Annual totals kWh/year												
Space heating fuel - main system												11016.4753 (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)												696.1939 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 3.80 * 768 * 1.00) =										-2334.2342		-2334.2342 (233)
Total delivered energy for all uses												12169.4862 (238)

10a. Fuel costs - using BEDF prices (528)

	Energy kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	11016.4753	10.2300	1126.9854 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2716.0512	10.2300	277.8520 (247)
Pumps and fans for heating	75.0000	36.7200	27.5400 (249)
Energy for lighting	696.1939	36.7200	255.6424 (250)
Additional standing charges			103.0000 (251)
Energy saving/generation technologies			
PV Unit	-2334.2342	36.7200	-857.1308 (252)
Total energy cost			933.8891 (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	11016.4753	0.2160	2379.5587 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2716.0512	0.2160	586.6671 (264)
Space and water heating			2966.2257 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	696.1939	0.5190	361.3246 (268)
Energy saving/generation technologies			
PV Unit	-2334.2342	0.5190	-1211.4676 (269)
Total kg/year			2155.0078 (272)

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	11016.4753	1.2200	13440.0999 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2716.0512	1.2200	3313.5824 (264)
Space and water heating			16753.6823 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	696.1939	3.0700	2137.3153 (268)
Energy saving/generation technologies			
PV Unit	-2334.2342	3.0700	-7166.0991 (269)
Primary energy kWh/year			11955.1486 (272)
Primary energy kWh/m ² /year			44.8296 (273)

SAP 2012 EPC IMPROVEMENTS

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

(For testing purposes):

A	Not considered
B	Not considered
C	Not considered
D	Not considered
E Low energy lighting	Already installed
F	Not considered
G	Not considered
H	Not considered
I	Not considered
J	Not considered
K	Not considered
M	Not considered
N Solar water heating	SAP increase too small
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
 (none)

Measures omitted - SAP change or cost saving too small:
 N Solar water heating + 0.7 -£ 120 -266 kg (12.3%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)	Total Savings £0		0.00 kg/m ²

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

Fuel prices for cost data on this page from database revision number 528 TEST (04 Oct 2023)
 Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£283	£283	£0
Mains gas	£1508	£1508	£0
Space heating	£1258	£1258	£0
Water heating	£278	£278	£0
Lighting	£256	£256	£0
Generated (PV)	-£857	-£857	£0
Total cost of fuels	£934	£934	£0
Total cost of uses	£935	£935	£0
Delivered energy	46 kWh/m ²	46 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	2.2 tonnes	2.2 tonnes	0.0 tonnes
CO2 emissions per m ²	8 kg/m ²	8 kg/m ²	0 kg/m ²
Primary energy	45 kWh/m ²	45 kWh/m ²	0 kWh/m ²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

No improvements selected / applicable

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

Overheating Calculation Input Data

Dwelling type	Detached House
Number of storeys	3
Cross ventilation possible	Yes
SAP Region	Southern England
Front of dwelling faces	South West
Overshading	Average or unknown
Thermal mass parameter	236.5 (calculated from construction elements)
Night ventilation	Yes
Ventilation rate during hot weather (ach)	8.00 (Windows fully open)

Overheating Calculation

Summer ventilation heat loss coefficient	1985.65 (P1)
Transmission heat loss coefficient	174.92 (37)
Summer heat loss coefficient	2160.57 (P2)

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

Solar shading	Z blinds	Solar access	Z overhangs	Z summer
Orientation				
North East	1.000	0.90	1.000	0.900 (P8)
North East	1.000	1.00	1.000	1.000 (P8)
South East	1.000	0.90	1.000	0.900 (P8)
South West	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
North East	19.1900	106.0502	0.6300	0.7000	0.9000	726.9594
South East	4.5100	127.3119	0.6300	0.7000	0.9000	205.1016
South West	16.1600	127.3119	0.6300	0.7000	0.9000	734.9094
North West	3.3300	106.0502	0.6300	0.7000	0.9000	126.1477
North East	2.7600	176.1235	0.6300	0.7000	1.0000	192.9334
total:						1986.0515

	Jun	Jul	Aug	
Solar gains	2145	1986	1729	(P3)
Internal gains	772	741	752	
Total summer gains	2917	2727	2481	(P5)
Summer gain/loss ratio	1.35	1.26	1.15	(P6)
Summer external temperature	15.40	17.30	17.30	
Thermal mass temperature increment (TMP = 236.5)	0.34	0.34	0.34	
Threshold temperature	17.09	18.91	18.79	(P7)
Likelihood of high internal temperature	Not significant	Not significant	Not significant	
Assessment of likelihood of high internal temperature:	Not significant			