



SAP Report Submission for Building Regulations Compliance

Client: Highwood Construction Ltd

Project: 96 Highwood Avenue, North Stoneham Park
EASTLEIGH, SO50 9QZ

Contact: Scott Spearing
Scott Spearing
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Report Issue Date: 31/01/2023

EXCELLENCE
IN ENERGY
ASSESSMENT

BLOCK COMPLIANCE

Calculation Type: New Build (As Built)

Block Reference	SAP-0796 (Stoneham) - 200-208	Issued on Date	31/01/2023
Block Name	3B4A - Plots 200-208		
Assessor Details	Mr. Scott Spearing, Scott Spearing, Tel: 01489 565920, scott@beatsolutions.co.uk	Assessor ID	p775-0001
Client	Highwood Construction Ltd, HIGHWOOD		

Block Compliance Report - DER

Block Reference: SAP-0796 (Stoneham) - 200-208		Block Name: 3B4A - Plots 200-208			
Property-Assessment Reference	Multiplier	Floor Area (m ²)	DER (kgCO ₂ /m ²)	TER (kgCO ₂ /m ²)	% DER/TER
SAP-0796 (3B4A) - Plot 200-AB	1	66.3	14.62	18.48	20.88 %
SAP-0796 (3B4A) - Plot 201-AB	1	47.74	16.37	19.99	18.13 %
SAP-0796 (3B4A) - Plot 202-AB	1	58.42	15.23	19.16	20.50 %
SAP-0796 (3B4A) - Plot 203-AB	1	66.3	11.99	16.40	26.89 %
SAP-0796 (3B4A) - Plot 204-AB	1	47.74	13.19	17.56	24.88 %
SAP-0796 (3B4A) - Plot 205-AB	1	58.42	11.95	16.17	26.11 %
SAP-0796 (3B4A) - Plot 206-AB	1	65.03	12.10	16.10	24.84 %
SAP-0796 (3B4A) - Plot 207-AB	1	47.74	14.69	19.09	23.06 %
SAP-0796 (3B4A) - Plot 208-AB	1	57.27	12.82	17.28	25.80 %
Totals:	9	514.96	122.96	160.23	
Average DER = 13.57 kgCO ₂ /m ²		% DER/TER	PASS		
Average TER = 17.70 kgCO ₂ /m ²		23.33 %			

Block Compliance Report - DFEE

Block Reference: SAP-0796 (Stoneham) - 200-208		Block Name: 3B4A - Plots 200-208			
Property-Assessment Reference	Multiplier	Floor Area (m ²)	DFEE (kWh/m ² /yr)	TFEE (kWh/m ² /yr)	% DFEE/TFEE
SAP-0796 (3B4A) - Plot 200-AB	1	66.3	40.90	45.37	9.87 %
SAP-0796 (3B4A) - Plot 201-AB	1	47.74	44.09	46.90	6.00 %
SAP-0796 (3B4A) - Plot 202-AB	1	58.42	43.10	48.06	10.32 %
SAP-0796 (3B4A) - Plot 203-AB	1	66.3	29.87	34.36	13.07 %
SAP-0796 (3B4A) - Plot 204-AB	1	47.74	31.27	34.56	9.51 %
SAP-0796 (3B4A) - Plot 205-AB	1	58.42	29.95	32.84	8.80 %
SAP-0796 (3B4A) - Plot 206-AB	1	65.03	30.52	32.85	7.08 %
SAP-0796 (3B4A) - Plot 207-AB	1	47.74	37.26	42.33	11.98 %
SAP-0796 (3B4A) - Plot 208-AB	1	57.27	33.15	38.10	13.00 %
Totals:	9	514.96	320.10	355.37	
Average DFEE = 35.38 kWh/m ² /yr		% DFEE/TFEE	PASS		
Average TFEE = 39.30 kWh/m ² /yr		9.97 %			

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Built)

Property Reference	SAP-0796 (3B4A) - Plot 203				Issued on Date	31/01/2023
Assessment Reference	AB	Prop Type Ref	2B4P Mid Floor			
Property	96 Highwood Avenue, North Stoneham Park, EASTLEIGH, SO50 9QZ					
SAP Rating	85 B	DER	11.99	TER	16.40	
Environmental	92 A	% DER<TER	26.89			
CO ₂ Emissions (t/year)	0.63	DFEE	29.87	TFEE	34.36	
General Requirements Compliance	Pass	% DFEE<TFEE	13.07			
Assessor Details	Mr. Scott Spearing, Scott Spearing, Tel: 01489 565920, scott@beatsolutions.co.uk				Assessor ID	p775-0001
Client	Highwood Construction Ltd, HIGHWOOD					

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)	16.40	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	11.99	kgCO ₂ /m ²	Pass
	-4.41 (-26.9%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	34.36	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	29.87	kWh/m ² /yr	
	-4.5 (-13.1%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.20 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	Pass
Openings	1.40 (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	2.66 (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 Ideal LOGIC COMBI ESP1 35 Combi boiler Efficiency: 89.6% SEDBUK2009 Minimum: 88.0%	Pass
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BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Built)

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Programmer, room thermostat and TRVs

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100

%

Minimum

75

%

Pass

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Southern England)

Not significant

Pass

Based on:

Overshading

Average

Windows facing North

3.56 m², No overhang

Windows facing South

2.58 m², No overhang

Air change rate

8.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

2.66 (measured in this dwelling)

Maximum

10.0

Pass

10 Key features

Party wall U-value

0.00

W/m²K

Roof U-value

0.10

W/m²K

Air permeability

2.7

m³/m²h

Photovoltaic array

421.47

kWh/Year

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

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

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Assessor Details	Mr. Scott Spearing, Scott Spearing, Tel: 01489 565920, scott@beatsolutions.co.uk				Assessor ID	p775-0001
Client	Highwood Construction Ltd, HIGHWOOD					

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

Orientation	South
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Urban
1.0 Property Type	Flat, End-Terrace
2.0 Number of Storeys	1
3.0 Date Built	2023
4.0 Sheltered Sides	1
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	25.38 m	66.30 m ²	2.35 m

7.0 Living Area	26.69	m ²
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8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	85.82	kJ/m ² K

9.0 External Walls

Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
External Wall	Timber Frame	Timber framed wall (one layer of plasterboard)	0.20	9.00	59.64	53.50

9.1 Party Walls

Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)
Party Wall	Filled Cavity with Edge Sealing	Double plasterboard on both sides, twin timber frame with/without sheathing board	0.00	20.00	22.60

9.2 Internal Walls

Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
Internal Walls	Plasterboard on timber frame	9.00	88.99

10.0 External Roofs

Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Bay Roof	External Flat Roof	Plasterboard, insulated flat roof	0.10	9.00	1.06	1.06

10.1 Party Ceilings

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceilings	Timber I-joists, carpeted	20.00	65.24

11.1 Party Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor	Timber I-joists, carpeted	30.00	66.30

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Windows	Manufacturer	Window	Double Low-E Soft 0.05			0.63		0.70	1.40

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
North	Window	[1] External Wall	North	None	0.00					3.56	
South	Window	[1] External Wall	South	None	0.00					2.58	

14.0 Conservatory

15.0 Draught Proofing

 %

16.0 Draught Lobby

17.0 Thermal Bridging

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported
Table K1 - Approved	E2 Other lintels (including other steel lintels)	5.22	0.300	Yes
Table K1 - Approved	E3 Sill	5.22	0.040	Yes
Table K1 - Approved	E4 Jamb	9.38	0.050	Yes
Table K1 - Approved	E7 Party floor between dwellings (in blocks of flats)	47.82	0.070	No
Table K1 - Default	E15 Flat roof with parapet	2.94	0.560	No
Table K1 - Approved	E16 Corner (normal)	9.40	0.090	No
Table K1 - Approved	E17 Corner (inverted – internal area greater than external area)	4.70	-0.090	No
Table K1 - Default	E25 Staggered party wall between dwellings	4.70	0.120	No
Table K1 - Default	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	19.24	0.000	No

Y-value	0.135	W/m²K
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18.0 Pressure Testing

Designed AP ₅₀	6.00	m³/(h.m²) @ 50 Pa
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Property Tested ?	Yes	
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As Built AP ₅₀	2.66	m³/(h.m²) @ 50 Pa
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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

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Number of open flues	0	0	0
Number of intermittent fans			2
Number of passive vents			0
Number of flueless gas fires			0

21.0 Fixed Cooling System

22.0 Lighting

Internal

Total number of light fittings	9	
Total number of L.E.L. fittings	9	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	No
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23.0 Electricity Tariff

24.0 Main Heating 1

	Database	
Description	Gas Boiler	
Percentage of Heat	100	%
Database Ref. No.	17929	
Fuel Type	Mains gas	
Main Heating	BGW	
SAP Code	104	
In Winter	90.5	
In Summer	87.3	
Controls	CBE Programmer, room thermostat and TRVs	
PCDF Controls	0	
Delayed Start Stat	No	
Sap Code	2106	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heat Emitter	Radiators	
Flow Temperature	Normal (> 45°C)	
Combi boiler type	Standard Combi	
Combi keep hot type	None	

25.0 Main Heating 2

Community Heating

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

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Water use <= 125 litres/person/day

SAP Code

29.0 Hot Water Cylinder

32.0 Photovoltaic Unit

Apportioned kWh/Year

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

U-VALUE CALCULATOR REPORT

Property Reference	SAP-0796 (3B4A) - Plot 203				Issued on Date	31/01/2023
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Calculation Type	New Build (As Built)					
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Environmental	92 A	% DER<TER	26.89			
CO ₂ Emissions (t/year)	0.63	DFEE	29.87	TFEE	34.36	
General Requirements Compliance	Pass	% DFEE<TFEE	13.07			
Assessor Details	Mr. Scott Spearing, Scott Spearing, Tel: 01489 565920, scott@beatsolutions.co.uk				Assessor ID	A808-0004
Client	Highwood Construction Ltd, HIGHWOOD					

Building Elements

Wall External Walls - Stoneham - TF

Wall Type: Timber framed Wall with I-beams

U-VALUE CALCULATOR REPORT

Layer	Description	Thickness (mm)	Conductivity (W/m²K)	Resistance (m²K/W)	Fraction (%)
Ext surface				0.2900	
Layer 1	Brick, outer leaf				
	Main construction	100	0.7700	0.0000	82.81
	Main construction	100	0.9407	0.0000	17.19
Layer 2	Standard cavity				
	Main construction	50	0.0000	0.0000	100.00
	Corrections - Cavity Ventilated, Emissivity: Low				
	Emissivity (BR443)				
Layer 3	Breather membrane				
	Main construction	1	0.0000	0.0000	100.00
Layer 4	Orientated Strand Board				
	Main construction	9	0.1300	0.0692	100.00
Layer 5	Timber Frame Void				
	Main construction	20	0.1143	0.1750	92.17
	Main construction	20	0.1300	0.1538	7.83
	Corrections - Cavity Unventilated, Emissivity: Low				
	Emissivity (BR443)				
Layer 6	Celotex GA4000				
	Main construction	100	0.0220	4.5455	92.17
	Main construction	100	0.1300	0.7692	7.83
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
Layer 7	Timber Frame Void				
	Main construction	20	0.1143	0.1750	92.17
	Main construction	20	0.1300	0.1538	7.83
	Corrections - Cavity Unventilated, Emissivity: Low				
	Emissivity (BR443)				
Layer 8	Polythene, 500 gauge				
	Main construction	1	0.0000	0.0000	100.00
Layer 9	Service Void				
	Main construction	25	0.0321	0.7800	89.63
	Main construction	25	0.1300	0.1923	10.37
	Corrections - Cavity Unventilated, Emissivity: Normal				
Layer 10	Plasterboard, standard				
	Main construction	12.5	0.2100	0.0595	100.00
Layer 11	Plaster, standard				
	Main construction	3	0.4000	0.0075	100.00
Int surface				0.1300	

Total resistance: Upper limit = 5.477 m² K/W Lower limit = 4.778 m² K/W Average = 5.128 m² K/W
Total correction = 0.0041 m² K/W U-value (unrounded) = 0.2 W/m² K

Unheated space: None

Total thickness: 342 mm

U-value: 0.20 W/m² K

Kappa: n/a

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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General Requirements Compliance	Pass	% DFEE<TFEE	13.07		
Assessor Details	Mr. Scott Spearing, Scott Spearing, Tel: 01489 565920, scott@beatsolutions.co.uk			Assessor ID	p775-0001
Client	Highwood Construction Ltd, HIGHWOOD				

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

Mid-floor flat, total floor area 66 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) 16.40 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 11.99 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)34.4 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)29.9 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.20 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.40 (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: 2.66 (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
Ideal LOGIC COMBI ESP1 35
Combi boiler
Efficiency: 89.6% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls:

No cylinder

Boiler interlock

Yes

OK

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Southern England): Not significant OK
Based on:
Overshading: Average
Windows facing North: 3.56 m², No overhang
Windows facing South: 2.58 m², No overhang
Air change rate: 8.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.10 W/m²K
Air permeability 2.7 m³/m²h
Photovoltaic array 421.47 kWh/Year

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	66.3000 (1b)	x 2.3500 (2b)	= 155.8050 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 155.8050 (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					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					20.0000 / (5) = 0.1284 (8)
Measured/design AP50					Yes
Infiltration rate					2.6600
Number of sides sheltered					0.2614 (18)
					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.2418 (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	0.3082	0.3022	0.2962	0.2659	0.2599	0.2297	0.2297	0.2236	0.2418	0.2599	0.2720	0.2841 (22b)
	0.5475	0.5457	0.5439	0.5354	0.5338	0.5264	0.5264	0.5250	0.5292	0.5338	0.5370	0.5403 (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
Windows (Uw = 1.40)			6.1400	1.3258	8.1402		(27)
External Wall	59.6400	6.1400	53.5000	0.2000	10.7000	9.0000	481.5000 (29a)
Bay Roof	1.0600		1.0600	0.1000	0.1060	9.0000	9.5400 (30)
Total net area of external elements Aum (m ²)			60.7000				(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =				18.9462		(33)
Party Wall			22.6000	0.0000	0.0000	20.0000	452.0000 (32)
Party Floor			66.3000			30.0000	1989.0000 (32d)
Party Ceilings			65.2400			30.0000	1957.2000 (32b)
Internal Walls			88.9900			9.0000	800.9100 (32c)
Heat capacity Cm = Sum (A x k)	(28)...(30) + (32) + (32a)...(32e) =						5690.1500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							85.8243 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.2246 (36)
Total fabric heat loss	(33) + (36) =						27.1708 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	28.1505	28.0556	27.9627	27.5260	27.4443	27.0639	27.0639	26.9935	27.2104	27.4443	27.6096	27.7824 (38)
Heat transfer coeff	55.3213	55.2264	55.1334	54.6967	54.6150	54.2347	54.2347	54.1642	54.3812	54.6150	54.7803	54.9531 (39)
Average = Sum(39)m / 12 =												54.6963 (39)
HLP	0.8344	0.8330	0.8316	0.8250	0.8238	0.8180	0.8180	0.8170	0.8202	0.8238	0.8262	0.8289 (40)
HLP (average)												0.8250 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1531 (42)
Average daily hot water use (litres/day)												85.3352 (43)
Daily hot water use	93.8687	90.4553	87.0419	83.6285	80.2151	76.8017	76.8017	80.2151	83.6285	87.0419	90.4553	93.8687 (44)
Energy conte	139.2046	121.7493	125.6343	109.5311	105.0977	90.6913	84.0388	96.4358	97.5875	113.7288	124.1439	134.8123 (45)
Energy content (annual)												1342.6553 (45)
Distribution loss (46)m = 0.15 x (45)m												
	20.8807	18.2624	18.8451	16.4297	15.7646	13.6037	12.6058	14.4654	14.6381	17.0593	18.6216	20.2218 (46)
Water storage loss:												
Total storage loss												

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
Combi loss	14.0702	12.6896	14.0190	13.5326	13.9589	13.4800	13.9115	13.9422	13.5087	13.9941	13.5823	14.0603 (61)
Total heat required for water heating calculated for each month	153.2748	134.4388	139.6533	123.0637	119.0565	104.1712	97.9503	110.3780	111.0962	127.7230	137.7262	148.8725 (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	153.2748	134.4388	139.6533	123.0637	119.0565	104.1712	97.9503	110.3780	111.0962	127.7230	137.7262	148.8725 (64)
Heat gains from water heating, kWh/month	49.8031	43.6540	45.2782	39.8022	38.4347	33.5248	31.4208	35.5504	35.8250	41.3134	44.6734	48.3401 (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	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.7167	17.5122	14.2419	10.7820	8.0597	6.8043	7.3523	9.5568	12.8271	16.2870	19.0093	20.2647	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	188.5123	190.4685	185.5390	175.0447	161.7976	149.3472	141.0295	139.0733	144.0028	154.4971	167.7442	180.1947	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653	(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)	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	(71)
Water heating gains (Table 5)	66.9396	64.9613	60.8578	55.2809	51.6595	46.5623	42.2322	47.7829	49.7570	55.5287	62.0464	64.9733	(72)
Total internal gains	333.4646	331.2380	318.9346	299.4036	279.8127	261.0097	248.9099	254.7089	264.8828	284.6087	307.0959	323.7286	(73)

6. Solar gains

[Jan]	Area m2				Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North	3.5600				10.6334	0.6300		0.7000		0.7700		11.5689
South	2.5800				46.7521	0.6300		0.7000		0.7700		36.8631 (74)
Solar gains	48.4321	82.4812	114.4720	147.2622	171.8631	174.1876	166.4122	147.1664	125.5042	91.4349	57.9672	41.4976 (83)
Total gains	381.8966	413.7191	433.4065	446.6657	451.6758	435.1973	415.3221	401.8753	390.3870	376.0436	365.0631	365.2262 (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	28.5712	28.6203	28.6686	28.8975	28.9407	29.1437	29.1437	29.1816	29.0651	28.9407	28.8534	28.7627	
alpha	2.9047	2.9080	2.9112	2.9265	2.9294	2.9429	2.9429	2.9454	2.9377	2.9294	2.9236	2.9175	
util living area	0.9534	0.9391	0.9152	0.8692	0.7875	0.6570	0.5206	0.5521	0.7311	0.8741	0.9357	0.9585	(86)
MIT	19.1272	19.3240	19.6508	20.0809	20.4883	20.7938	20.9245	20.9080	20.6976	20.1957	19.5903	19.0778	(87)
Th 2	20.2236	20.2248	20.2261	20.2317	20.2328	20.2377	20.2377	20.2387	20.2358	20.2328	20.2306	20.2284	(88)
util rest of house	0.9480	0.9321	0.9049	0.8520	0.7570	0.6042	0.4456	0.4786	0.6849	0.8544	0.9271	0.9537	(89)
MIT 2	18.4876	18.6824	19.0048	19.4280	19.8157	20.0934	20.1965	20.1862	20.0127	19.5444	18.9519	18.4424	(90)
Living area fraction									fLA = Living area / (4) =			0.4026	(91)
MIT	18.7450	18.9407	19.2648	19.6908	20.0865	20.3754	20.4896	20.4768	20.2884	19.8066	19.2089	18.6982	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7450	18.9407	19.2648	19.6908	20.0865	20.3754	20.4896	20.4768	20.2884	19.8066	19.2089	18.6982	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9352	0.9179	0.8898	0.8383	0.7507	0.6143	0.4713	0.5026	0.6883	0.8419	0.9132	0.9416	(94)
Ext temp.	357.1646	379.7482	385.6363	374.4181	339.0678	267.3250	195.7616	201.9904	268.7172	316.5729	333.3799	343.9010	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	799.1182	775.4174	703.7685	590.2232	458.0272	313.2253	210.9508	220.8145	336.5323	502.8195	663.3286	796.7206	(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	328.8135	265.8897	236.6904	155.3796	88.5058	0.0000	0.0000	0.0000	0.0000	138.5675	237.5631	336.8978	(98)
Space heating per m2												1788.3073	(98)
												26.9730	(99)

8c. Space cooling requirement

Not applicable

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Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1976.0301 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	328.8135	265.8897	236.6904	155.3796	88.5058	0.0000	0.0000	0.0000	0.0000	138.5675	237.5631	336.8978	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	363.3298	293.8008	261.5363	171.6902	97.7964	0.0000	0.0000	0.0000	0.0000	153.1132	262.5006	372.2627	(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	153.2748	134.4388	139.6533	123.0637	119.0565	104.1712	97.9503	110.3780	111.0962	127.7230	137.7262	148.8725	(64)
Efficiency of water heater (217)m	89.4575	89.3995	89.2855	89.0572	88.6364	87.3000	87.3000	87.3000	87.3000	88.9364	89.2988	89.4947	(216)
Fuel for water heating, kWh/month	171.3382	150.3798	156.4120	138.1850	134.3201	119.3256	112.1996	126.4352	127.2579	143.6116	154.2308	166.3480	(219)
Water heating fuel used												1700.0440	(219)
Annual totals kWh/year													
Space heating fuel - main system												1976.0301	(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)												348.2025	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses												4099.2766	(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	1976.0301	0.2160	426.8225 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1700.0440	0.2160	367.2095 (264)
Space and water heating			794.0320 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	348.2025	0.5190	180.7171 (268)
Energy saving/generation technologies			
PV Unit	-421.4700	0.5190	-218.7429 (269)
Total CO2, kg/year			794.9312 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			11.9900 (273)

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

DER			11.9900 ZC1
Total Floor Area		TFA	66.3000
Assumed number of occupants		N	2.1531
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			16.8489 ZC2
CO2 emissions from cooking, equation (L16)			2.5743 ZC3
Total CO2 emissions			31.4132 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			31.4132 ZC8

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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	66.3000 (1b)	x 2.3500 (2b)	= 155.8050 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 155.8050 (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					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					20.0000 / (5) = 0.1284 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3784 (18)
Number of sides sheltered					1 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3500 (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	0.4462	0.4375	0.4287	0.3850	0.3762	0.3325	0.3325	0.3237	0.3500	0.3762	0.3937	0.4112 (22b)
Effective ac	0.5996	0.5957	0.5919	0.5741	0.5708	0.5553	0.5553	0.5524	0.5612	0.5708	0.5775	0.5846 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opening Type (Uw = 1.40)			6.1400	1.3258	8.1402		(27)					
External Wall	59.6400	6.1400	53.5000	0.1800	9.6300		(29a)					
Bay Roof	1.0600		1.0600	0.1300	0.1378		(30)					
Total net area of external elements Aum(A, m2)			60.7000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		17.9080		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.6898 (36)					
Total fabric heat loss							(33) + (36) = 24.5978 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	30.8269	30.6281	30.4333	29.5181	29.3469	28.5498	28.5498	28.4022	28.8568	29.3469	29.6933	30.0554 (38)
	55.4247	55.2259	55.0310	54.1159	53.9446	53.1475	53.1475	52.9999	53.4546	53.9446	54.2910	54.6532 (39)
Average = Sum(39)m / 12 =												54.1150 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8360	0.8330	0.8300	0.8162	0.8136	0.8016	0.8016	0.7994	0.8063	0.8136	0.8189	0.8243 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1531 (42)
Average daily hot water use (litres/day)												85.3352 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	93.8687	90.4553	87.0419	83.6285	80.2151	76.8017	76.8017	80.2151	83.6285	87.0419	90.4553	93.8687 (44)
Energy content (annual)	139.2046	121.7493	125.6343	109.5311	105.0977	90.6913	84.0388	96.4358	97.5875	113.7288	124.1439	134.8123 (45)
Distribution loss (46)m = 0.15 x (45)m	20.8807	18.2624	18.8451	16.4297	15.7646	13.6037	12.6058	14.4654	14.6381	17.0593	18.6216	20.2218 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	47.8345	41.6342	44.3556	41.2415	40.8767	37.8748	39.1373	40.8767	41.2415	44.3556	44.6081	47.8345 (61)
Total heat required for water heating calculated for each month												

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Solar input	187.0391	163.3835	169.9899	150.7725	145.9744	128.5661	123.1761	137.3125	138.8290	158.0844	168.7520	182.6467 (62)
	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	187.0391	163.3835	169.9899	150.7725	145.9744	128.5661	123.1761	137.3125	138.8290	158.0844	168.7520	182.6467 (64)
Heat gains from water heating, kWh/month	58.2442	50.8902	52.8623	46.7294	45.1642	39.6236	37.7272	42.2841	42.7582	48.9037	52.4299	56.7837 (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	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.7167	17.5122	14.2419	10.7820	8.0597	6.8043	7.3523	9.5568	12.8271	16.2870	19.0093	20.2647 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	188.5123	190.4685	185.5390	175.0447	161.7976	149.3472	141.0295	139.0733	144.0028	154.4971	167.7442	180.1947 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653 (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)	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225 (71)
Water heating gains (Table 5)	78.2852	75.7294	71.0515	64.9020	60.7045	55.0327	50.7086	56.8334	59.3864	65.7308	72.8193	76.3222 (72)
Total internal gains	344.8101	342.0060	329.1283	309.0247	288.8577	269.4801	257.3864	263.7595	274.5122	294.8108	317.8687	335.0774 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W
North	3.5600	10.6334	0.6300		0.7000	0.7700	11.5689 (74)
South	2.5800	46.7521	0.6300		0.7000	0.7700	36.8631 (78)

Solar gains	48.4321	82.4812	114.4720	147.2622	171.8631	174.1876	166.4122	147.1664	125.5042	91.4349	57.9672	41.4976 (83)
Total gains	393.2422	424.4872	443.6003	456.2868	460.7208	443.6677	423.7986	410.9259	400.0165	386.2457	375.8359	376.5750 (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	83.0707	83.3697	83.6649	85.0798	85.3499	86.6299	86.6299	86.8712	86.1323	85.3499	84.8053	84.2434
alpha	6.5380	6.5580	6.5777	6.6720	6.6900	6.7753	6.7753	6.7914	6.7422	6.6900	6.6537	6.6162
util living area	0.9979	0.9959	0.9906	0.9710	0.9039	0.7328	0.5473	0.5862	0.8329	0.9728	0.9951	0.9984 (86)
MIT	20.1989	20.2989	20.4607	20.6806	20.8714	20.9773	20.9971	20.9956	20.9461	20.7204	20.4262	20.1835 (87)
Th 2	20.2223	20.2249	20.2274	20.2393	20.2415	20.2519	20.2519	20.2539	20.2479	20.2415	20.2370	20.2323 (88)
util rest of house	0.9972	0.9946	0.9873	0.9604	0.8700	0.6607	0.4567	0.4949	0.7717	0.9609	0.9933	0.9979 (89)
MIT 2	19.1432	19.2909	19.5280	19.8518	20.1091	20.2359	20.2508	20.2519	20.2038	19.9123	19.4865	19.1285 (90)
Living area fraction									fLA = Living area / (4) =			0.4026 (91)
MIT	19.5682	19.6967	19.9035	20.1854	20.4159	20.5343	20.5512	20.5513	20.5026	20.2376	19.8648	19.5532 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5682	19.6967	19.9035	20.1854	20.4159	20.5343	20.5512	20.5513	20.5026	20.2376	19.8648	19.5532 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9964	0.9934	0.9856	0.9595	0.8786	0.6890	0.4934	0.5318	0.7940	0.9608	0.9921	0.9972 (94)
Useful gains	391.8344	421.6863	437.2283	437.8156	404.8017	305.6782	209.0842	218.5368	317.6170	371.1045	372.8750	375.5376 (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	846.2343	817.1602	737.6066	610.7216	470.1779	315.3949	209.9979	220.0170	342.2496	519.8970	693.0145	839.1027 (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	338.0736	265.7585	223.4815	124.4923	48.6399	0.0000	0.0000	0.0000	0.0000	110.7016	230.5004	344.8924 (98)
Space heating												1686.5402 (98)
Space heating per m2										(98) / (4) =		25.4380 (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)

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Calculation Type: New Build (As Built)

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Efficiency of main space heating system 1 (in %)												93.4000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												1805.7175 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	338.0736	265.7585	223.4815	124.4923	48.6399	0.0000	0.0000	0.0000	0.0000	110.7016	230.5004	344.8924 (98)
Space heating efficiency (main heating system 1)	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000 (210)
Space heating fuel (main heating system)	361.9632	284.5380	239.2735	133.2894	52.0770	0.0000	0.0000	0.0000	0.0000	118.5242	246.7885	369.2638 (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	187.0391	163.3835	169.9899	150.7725	145.9744	128.5661	123.1761	137.3125	138.8290	158.0844	168.7520	182.6467 (64)
Efficiency of water heater	86.5237	86.2689	85.7409	84.5735	82.6067	80.3000	80.3000	80.3000	80.3000	84.1732	85.8367	80.3000 (216)
Fuel for water heating, kWh/month	216.1710	189.3887	198.2601	178.2740	176.7102	160.1072	153.3949	170.9994	172.8879	187.8084	196.5966	210.8413 (219)
Water heating fuel used												2211.4397 (219)
Annual totals kWh/year												
Space heating fuel - main system												1805.7175 (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)												348.2025 (232)
Total delivered energy for all uses												4440.3597 (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	1805.7175	0.2160	390.0350 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2211.4397	0.2160	477.6710 (264)
Space and water heating			867.7060 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	348.2025	0.5190	180.7171 (268)
Total CO2, kg/m2/year			1087.3480 (272)
Emissions per m2 for space and water heating			13.0876 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.7257 (272b)
Emissions per m2 for pumps and fans			0.5871 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.0876 * 1.00) + 2.7257 + 0.5871, rounded to 2 d.p.			16.4000 (273)

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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	66.3000 (1b)	x 2.3500 (2b)	= 155.8050 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 155.8050 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				2 * 10 =	20.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					20.0000 / (5) =
Measured/design AP50					Yes
Infiltration rate					2.6600
Number of sides sheltered					0.2614 (18)
					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.2418 (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	0.3082	0.3022	0.2962	0.2659	0.2599	0.2297	0.2297	0.2236	0.2418	0.2599	0.2720	0.2841 (22b)
	0.5475	0.5457	0.5439	0.5354	0.5338	0.5264	0.5264	0.5250	0.5292	0.5338	0.5370	0.5403 (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
Windows (Uw = 1.40)			6.1400	1.3258	8.1402		(27)
External Wall	59.6400	6.1400	53.5000	0.2000	10.7000	9.0000	481.5000 (29a)
Bay Roof	1.0600		1.0600	0.1000	0.1060	9.0000	9.5400 (30)
Total net area of external elements Aum (m ²)			60.7000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	18.9462			(33)
Party Wall			22.6000	0.0000	0.0000	20.0000	452.0000 (32)
Party Floor			66.3000			30.0000	1989.0000 (32d)
Party Ceilings			65.2400			20.0000	1304.8000 (32b)
Internal Walls			88.9900			9.0000	800.9100 (32c)
Heat capacity Cm = Sum (A x k)						(28)...(30) + (32) + (32a)...(32e) =	5037.7500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							75.9842 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.2246 (36)
Total fabric heat loss						(33) + (36) =	27.1708 (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	28.1505	28.0556	27.9627	27.5260	27.4443	27.0639	27.0639	26.9935	27.2104	27.4443	27.6096	27.7824 (38)
Heat transfer coeff	55.3213	55.2264	55.1334	54.6967	54.6150	54.2347	54.2347	54.1642	54.3812	54.6150	54.7803	54.9531 (39)
Average = Sum(39)m / 12 =												54.6963 (39)
HLP	0.8344	0.8330	0.8316	0.8250	0.8238	0.8180	0.8180	0.8170	0.8202	0.8238	0.8262	0.8289 (40)
HLP (average)												0.8250 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1531 (42)
Average daily hot water use (litres/day)												85.3352 (43)
Daily hot water use	93.8687	90.4553	87.0419	83.6285	80.2151	76.8017	76.8017	80.2151	83.6285	87.0419	90.4553	93.8687 (44)
Energy conte	139.2046	121.7493	125.6343	109.5311	105.0977	90.6913	84.0388	96.4358	97.5875	113.7288	124.1439	134.8123 (45)
Energy content (annual)												Total = Sum(45)m = 1342.6553 (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												

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If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Heat gains from water heating, kWh/month	29.5810	25.8717	26.6973	23.2753	22.3333	19.2719	17.8582	20.4926	20.7373	24.1674	26.3806	28.6476 (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	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.7167	17.5122	14.2419	10.7820	8.0597	6.8043	7.3523	9.5568	12.8271	16.2870	19.0093	20.2647 (67)
Appliances gains (calculated in Appendix L1, equation L13 or L13a), also see Table 5	188.5123	190.4685	185.5390	175.0447	161.7976	149.3472	141.0295	139.0733	144.0028	154.4971	167.7442	180.1947 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653 (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)	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225 (71)
Water heating gains (Table 5)	39.7594	38.4996	35.8835	32.3269	30.0178	26.7665	24.0030	27.5438	28.8019	32.4830	36.6397	38.5048 (72)
Total internal gains	303.2843	301.7762	290.9603	273.4495	255.1710	238.2139	227.6807	231.4699	240.9277	258.5630	278.6891	294.2601 (73)

6. Solar gains

[Jan]												Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W	
North												3.5600	10.6334		0.6300		0.7000		0.7700		11.5689	
South												2.5800	46.7521		0.6300		0.7000		0.7700		36.8631 (74)	
Solar gains	48.4321	82.4812	114.4720	147.2622	171.8631	174.1876	166.4122	147.1664	125.5042	91.4349	57.9672											41.4976 (83)
Total gains	351.7164	384.2573	405.4322	420.7117	427.0341	412.4015	394.0929	378.6362	366.4319	349.9979	336.6563											335.7577 (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	25.2954	25.3389	25.3816	25.5843	25.6225	25.8022	25.8022	25.8358	25.7327	25.6225	25.5452	25.4649
alpha	2.6864	2.6893	2.6921	2.7056	2.7082	2.7201	2.7201	2.7224	2.7155	2.7082	2.7030	2.6977
util living area	0.9524	0.9377	0.9137	0.8685	0.7901	0.6655	0.5333	0.5668	0.7395	0.8760	0.9354	0.9574 (86)
MIT	18.8733	19.0890	19.4488	19.9248	20.3812	20.7357	20.8965	20.8742	20.6210	20.0513	19.3813	18.8213 (87)
Th 2	20.2236	20.2248	20.2261	20.2317	20.2328	20.2377	20.2377	20.2387	20.2358	20.2328	20.2306	20.2284 (88)
util rest of house	0.9472	0.9309	0.9039	0.8522	0.7614	0.6149	0.4594	0.4949	0.6958	0.8576	0.9273	0.9528 (89)
MIT 2	18.2455	18.4591	18.8147	19.2841	19.7215	20.0479	20.1786	20.1639	19.9497	19.4128	18.7548	18.1976 (90)
Living area fraction	18.4982	18.7127	19.0700	19.5420	19.9871	20.3247	20.4676	20.4498	20.2199	19.6698	19.0070	18.4487 (92)
MIT	18.4982	18.7127	19.0700	19.5420	19.9871	20.3247	20.4676	20.4498	20.2199	19.6698	19.0070	18.4487 (93)
Temperature adjustment												0.0000
adjusted MIT	18.4982	18.7127	19.0700	19.5420	19.9871	20.3247	20.4676	20.4498	20.2199	19.6698	19.0070	18.4487 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9327	0.9147	0.8863	0.8354	0.7512	0.6211	0.4827	0.5159	0.6948	0.8418	0.9114	0.9392 (94)
Useful gains	328.0569	351.4833	359.3311	351.4651	320.7834	256.1227	190.2402	195.3294	254.5957	294.6355	306.8213	315.3325 (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	785.4646	762.8257	693.0263	582.0847	452.5988	310.4792	209.7588	219.3569	332.8089	495.3488	652.2708	783.0088 (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	340.3114	276.4222	248.2692	166.0461	98.0707	0.0000	0.0000	0.0000	0.0000	149.3307	248.7237	347.9512 (98)
Space heating												1875.1249 (98)
Space heating per m2												28.2824 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	509.8060	401.3366	411.6483	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7666	0.8289	0.8126	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	390.8273	332.6743	334.4890	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	563.4120	540.5160	524.1532	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	124.2610	154.6342	141.1102	0.0000	0.0000	0.0000	0.0000 (104)

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Space cooling												420.0054 (104)
Cooled fraction												1.0000 (105)
Intermittency factor (Table 10b)												
	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)	
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	31.0652	38.6586	35.2776	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												105.0014 (107)
Space cooling per m2												1.5837 (108)
Energy for space heating												28.2824 (99)
Energy for space cooling												1.5837 (108)
Total												29.8662 (109)
Dwelling Fabric Energy Efficiency (DFEE)												29.9 (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	66.3000 (1b)	x 2.3500 (2b)	= 155.8050 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 155.8050 (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					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					20.0000 / (5) = 0.1284 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3784 (18)
Number of sides sheltered					1 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3500 (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	0.4462	0.4375	0.4287	0.3850	0.3762	0.3325	0.3325	0.3237	0.3500	0.3762	0.3937	0.4112 (22b)
Effective ac	0.5996	0.5957	0.5919	0.5741	0.5708	0.5553	0.5553	0.5524	0.5612	0.5708	0.5775	0.5846 (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 Opening Type (Uw = 1.40)			6.1400	1.3258	8.1402		(27)
External Wall	59.6400	6.1400	53.5000	0.1800	9.6300		(29a)
Bay Roof	1.0600		1.0600	0.1300	0.1378		(30)
Total net area of external elements Aum(A, m ²)			60.7000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	17.9080		(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)							6.6898 (36)
Total fabric heat loss							(33) + (36) = 24.5978 (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	30.8269	30.6281	30.4333	29.5181	29.3469	28.5498	28.5498	28.4022	28.8568	29.3469	29.6933	30.0554 (38)
Heat transfer coeff	55.4247	55.2259	55.0310	54.1159	53.9446	53.1475	53.1475	52.9999	53.4546	53.9446	54.2910	54.6532 (39)
Average = Sum(39)m / 12 =												54.1150 (39)
HLP	0.8360	0.8330	0.8300	0.8162	0.8136	0.8016	0.8016	0.7994	0.8063	0.8136	0.8189	0.8243 (40)
HLP (average)												0.8162 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1531 (42)
Average daily hot water use (litres/day)												85.3352 (43)
Daily hot water use	93.8687	90.4553	87.0419	83.6285	80.2151	76.8017	76.8017	80.2151	83.6285	87.0419	90.4553	93.8687 (44)
Energy conte	139.2046	121.7493	125.6343	109.5311	105.0977	90.6913	84.0388	96.4358	97.5875	113.7288	124.1439	134.8123 (45)
Energy content (annual)										Total = Sum(45)m =		1342.6553 (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												

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29.5810 25.8717 26.6973 23.2753 22.3333 19.2719 17.8582 20.4926 20.7373 24.1674 26.3806 28.6476 (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	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.7167	17.5122	14.2419	10.7820	8.0597	6.8043	7.3523	9.5568	12.8271	16.2870	19.0093	20.2647	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	188.5123	190.4685	185.5390	175.0447	161.7976	149.3472	141.0295	139.0733	144.0028	154.4971	167.7442	180.1947	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653	(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)	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	(71)
Water heating gains (Table 5)	39.7594	38.4996	35.8835	32.3269	30.0178	26.7665	24.0030	27.5438	28.8019	32.4830	36.6397	38.5048	(72)
Total internal gains	303.2843	301.7762	290.9603	273.4495	255.1710	238.2139	227.6807	231.4699	240.9277	258.5630	278.6891	294.2601	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				3.5600	10.6334	0.6300	0.7000	0.7700	11.5689 (74)			
South				2.5800	46.7521	0.6300	0.7000	0.7700	36.8631 (78)			
Solar gains	48.4321	82.4812	114.4720	147.2622	171.8631	174.1876	166.4122	147.1664	125.5042	91.4349	57.9672	41.4976 (83)
Total gains	351.7164	384.2573	405.4322	420.7117	427.0341	412.4015	394.0929	378.6362	366.4319	349.9979	336.6563	335.7577 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)

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	83.0707	83.3697	83.6649	85.0798	85.3499	86.6299	86.6299	86.8712	86.1323	85.3499	84.8053	84.2434	21.0000 (85)
alpha	6.5380	6.5580	6.5777	6.6720	6.6900	6.7753	6.7753	6.7914	6.7422	6.6900	6.6537	6.6162	
util living area	0.9989	0.9977	0.9942	0.9807	0.9287	0.7743	0.5862	0.6320	0.8737	0.9836	0.9974	0.9992	(86)
MIT	20.1372	20.2397	20.4061	20.6347	20.8414	20.9685	20.9957	20.9932	20.9264	20.6729	20.3686	20.1226	(87)
Th 2	20.2223	20.2249	20.2274	20.2393	20.2415	20.2519	20.2519	20.2539	20.2479	20.2415	20.2370	20.2323	(88)
util rest of house	0.9985	0.9969	0.9922	0.9732	0.9006	0.7031	0.4904	0.5357	0.8189	0.9757	0.9964	0.9989	(89)
MIT 2	19.4240	19.5284	19.6962	19.9313	20.1265	20.2362	20.2507	20.2517	20.2047	19.9720	19.6675	19.4179	(90)
Living area fraction									fLA = Living area / (4) =			0.4026	(91)
MIT	19.7111	19.8147	19.9819	20.2145	20.4143	20.5310	20.5506	20.5502	20.4953	20.2542	19.9498	19.7016	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7111	19.8147	19.9819	20.2145	20.4143	20.5310	20.5506	20.5502	20.4953	20.2542	19.9498	19.7016	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9982	0.9964	0.9914	0.9729	0.9078	0.7311	0.5293	0.5747	0.8387	0.9759	0.9959	0.9987	(94)
Useful gains	351.0900	382.8721	401.9427	409.3057	387.6499	301.4926	208.5784	217.6204	307.3245	341.5619	335.2848	335.3133	(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	854.1560	823.6794	741.9252	612.2915	470.0909	315.2175	209.9659	219.9594	341.8560	520.7901	697.6265	847.2096	(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	374.2811	296.2225	252.9470	146.1498	61.3361	0.0000	0.0000	0.0000	0.0000	133.3457	260.8860	380.8508	(98)
Space heating												1906.0191	(98)
Space heating per m2												28.7484	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	499.5869	393.2918	402.7995	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9174	0.9655	0.9556	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	458.3234	379.7229	384.9064	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	563.4120	540.5160	524.1532	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	75.6639	119.6300	103.5997	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												298.8936	(104)
Cooled fraction												1.0000	(105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling kWh													

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Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	18.9160	29.9075	25.8999	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling per m2												74.7234 (107)
Energy for space heating												1.1270 (108)
Energy for space cooling												28.7484 (99)
Total												1.1270 (108)
Target Fabric Energy Efficiency (TFEE)												29.8755 (109)
												34.4 (109)

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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	66.3000 (1b)	x 2.3500 (2b)	= 155.8050 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 155.8050 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					20.0000 / (5) = 0.1284 (8)
Measured/design AP50					Yes
Infiltration rate					2.6600
Number of sides sheltered					0.2614 (18)
					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.2418 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.4000	4.1000	4.1000	3.9000	3.9000	3.7000	3.7000	3.5000	3.5000	3.8000	3.7000	3.9000 (22)
Wind factor	1.1000	1.0250	1.0250	0.9750	0.9750	0.9250	0.9250	0.8750	0.8750	0.9500	0.9250	0.9750 (22a)
Adj infilt rate												
Effective ac	0.2659	0.2478	0.2478	0.2357	0.2357	0.2236	0.2236	0.2115	0.2115	0.2297	0.2236	0.2357 (22b)
	0.5354	0.5307	0.5307	0.5278	0.5278	0.5250	0.5250	0.5224	0.5224	0.5264	0.5250	0.5278 (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
Windows (Uw = 1.40)			6.1400	1.3258	8.1402		(27)
External Wall	59.6400	6.1400	53.5000	0.2000	10.7000	9.0000	481.5000 (29a)
Bay Roof	1.0600		1.0600	0.1000	0.1060	9.0000	9.5400 (30)
Total net area of external elements Aum (m ²)			60.7000				(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =				18.9462		(33)
Party Wall			22.6000	0.0000	0.0000	20.0000	452.0000 (32)
Party Floor			66.3000			30.0000	1989.0000 (32d)
Party Ceilings			65.2400			30.0000	1957.2000 (32b)
Internal Walls			88.9900			9.0000	800.9100 (32c)
Heat capacity Cm = Sum (A x k)	(28)...(30) + (32) + (32a)...(32e) =						5690.1500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							85.8243 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.2246 (36)
Total fabric heat loss	(33) + (36) =						27.1708 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	27.5260	27.2865	27.2865	27.1362	27.1362	26.9935	26.9935	26.8583	26.8583	27.0639	26.9935	27.1362 (38)
Heat transfer coeff	54.6967	54.4573	54.4573	54.3070	54.3070	54.1642	54.1642	54.0290	54.0290	54.2347	54.1642	54.3070 (39)
Average = Sum(39)m / 12 =												54.2765 (39)
HLP	0.8250	0.8214	0.8214	0.8191	0.8191	0.8170	0.8170	0.8149	0.8149	0.8180	0.8170	0.8191 (40)
HLP (average)												0.8186 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1531 (42)
Average daily hot water use (litres/day)												85.3352 (43)
Daily hot water use	93.8687	90.4553	87.0419	83.6285	80.2151	76.8017	76.8017	80.2151	83.6285	87.0419	90.4553	93.8687 (44)
Energy conte	139.2046	121.7493	125.6343	109.5311	105.0977	90.6913	84.0388	96.4358	97.5875	113.7288	124.1439	134.8123 (45)
Energy content (annual)												1342.6553 (45)
Distribution loss (46)m = 0.15 x (45)m												
	20.8807	18.2624	18.8451	16.4297	15.7646	13.6037	12.6058	14.4654	14.6381	17.0593	18.6216	20.2218 (46)
Water storage loss:												
Total storage loss												

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If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
Combi loss	14.0702	12.6896	14.0190	13.5326	13.9589	13.4800	13.9115	13.9422	13.5087	13.9941	13.5823	14.0603 (61)
Total heat required for water heating calculated for each month	153.2748	134.4388	139.6533	123.0637	119.0565	104.1712	97.9503	110.3780	111.0962	127.7230	137.7262	148.8725 (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	153.2748	134.4388	139.6533	123.0637	119.0565	104.1712	97.9503	110.3780	111.0962	127.7230	137.7262	148.8725 (64)
RHI water heating demand												1507.4046 (64)
Heat gains from water heating, kWh/month	49.8031	43.6540	45.2782	39.8022	38.4347	33.5248	31.4208	35.5504	35.8250	41.3134	44.6734	48.3401 (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	129.1837	129.1837	129.1837	129.1837	129.1837	129.1837	129.1837	129.1837	129.1837	129.1837	129.1837	129.1837	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	49.2917	43.7804	35.6046	26.9550	20.1492	17.0108	18.3807	23.8920	32.0678	40.7174	47.5232	50.6616	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	281.3617	284.2814	276.9239	261.2608	241.4890	222.9062	210.4918	207.5721	214.9296	230.5927	250.3645	268.9473	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.0714	50.0714	50.0714	50.0714	50.0714	50.0714	50.0714	50.0714	50.0714	50.0714	50.0714	50.0714	(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)	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	(71)
Water heating gains (Table 5)	66.9396	64.9613	60.8578	55.2809	51.6595	46.5623	42.2322	47.7829	49.7570	55.5287	62.0464	64.9733	(72)
Total internal gains	493.7257	489.1558	469.5190	439.6294	409.4303	382.6119	367.2374	375.3796	392.8870	422.9715	456.0669	480.7149	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W	
North				3.5600	13.4839	0.6300		0.7000		0.7700		14.6702 (74)	
South				2.5800	56.7559	0.6300		0.7000		0.7700		44.7509 (78)	
Solar gains	59.4212	86.2974	121.5284	158.9820	176.8684	197.1193	181.4670	166.4596	140.2495	102.1014	70.9144	48.1847	(83)
Total gains	553.1468	575.4532	591.0474	598.6113	586.2988	579.7312	548.7044	541.8392	533.1364	525.0729	526.9813	528.8996	(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	28.8975	29.0245	29.0245	29.1049	29.1049	29.1816	29.1816	29.2546	29.2546	29.1437	29.1816	29.1049	
alpha	2.9265	2.9350	2.9350	2.9403	2.9403	2.9454	2.9454	2.9503	2.9503	2.9429	2.9454	2.9403	
util living area	0.8790	0.8604	0.8184	0.7454	0.6211	0.4468	0.3176	0.3206	0.5231	0.7185	0.8336	0.8871	(86)
MIT	19.7669	19.8992	20.1722	20.4909	20.7814	20.9420	20.9849	20.9846	20.9018	20.6265	20.1803	19.7452	(87)
Th 2	20.2317	20.2348	20.2348	20.2368	20.2368	20.2387	20.2387	20.2404	20.2404	20.2377	20.2387	20.2368	(88)
util rest of house	0.8666	0.8463	0.7995	0.7180	0.5786	0.3880	0.2474	0.2500	0.4659	0.6834	0.8145	0.8753	(89)
MIT 2	19.1168	19.2469	19.5096	19.8120	20.0739	20.2047	20.2327	20.2344	20.1779	19.9414	19.5240	19.1005	(90)
Living area fraction									fLA = Living area / (4) =			0.4026	(91)
MIT	19.3785	19.5095	19.7764	20.0853	20.3587	20.5015	20.5355	20.5364	20.4694	20.2172	19.7882	19.3600	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3785	19.5095	19.7764	20.0853	20.3587	20.5015	20.5355	20.5364	20.4694	20.2172	19.7882	19.3600	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	470.6999	478.3629	465.1788	426.3107	343.3641	236.9765	150.9673	150.5819	257.8871	358.2927	422.6302	454.7074	(94)
Ext temp.	5.4000	5.9000	7.6000	10.0000	13.1000	15.9000	17.7000	17.7000	15.3000	12.0000	8.4000	5.5000	(96)
Heat loss rate W	764.5784	741.1353	663.0915	547.7028	394.1995	249.2378	153.5842	153.2476	279.2953	445.6578	616.8321	752.6974	(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	218.6456	176.5831	147.2470	87.4023	37.8215	0.0000	0.0000	0.0000	0.0000	64.9996	139.8253	221.7046	(98)
Space heating												1094.2290	(98)
RHI space heating demand												1094	(98)

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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	66.3000 (1b)	x 2.3500 (2b)	= 155.8050 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 155.8050 (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					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					20.0000 / (5) = 0.1284 (8)
Measured/design AP50					Yes
Infiltration rate					2.6600
Number of sides sheltered					0.2614 (18)
					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.2418 (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	0.3082	0.3022	0.2962	0.2659	0.2599	0.2297	0.2297	0.2236	0.2418	0.2599	0.2720	0.2841 (22b)
	0.5475	0.5457	0.5439	0.5354	0.5338	0.5264	0.5264	0.5250	0.5292	0.5338	0.5370	0.5403 (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
Windows (Uw = 1.40)			6.1400	1.3258	8.1402		(27)
External Wall	59.6400	6.1400	53.5000	0.2000	10.7000	9.0000	481.5000 (29a)
Bay Roof	1.0600		1.0600	0.1000	0.1060	9.0000	9.5400 (30)
Total net area of external elements Aum (m ²)			60.7000				(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =				18.9462		(33)
Party Wall			22.6000	0.0000	0.0000	20.0000	452.0000 (32)
Party Floor			66.3000			30.0000	1989.0000 (32d)
Party Ceilings			65.2400			30.0000	1957.2000 (32b)
Internal Walls			88.9900			9.0000	800.9100 (32c)
Heat capacity Cm = Sum (A x k)					(28)...(30) + (32) + (32a)...(32e) =		5690.1500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							85.8243 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.2246 (36)
Total fabric heat loss					(33) + (36) =		27.1708 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	28.1505	28.0556	27.9627	27.5260	27.4443	27.0639	27.0639	26.9935	27.2104	27.4443	27.6096	27.7824 (38)
Heat transfer coeff	55.3213	55.2264	55.1334	54.6967	54.6150	54.2347	54.2347	54.1642	54.3812	54.6150	54.7803	54.9531 (39)
Average = Sum(39)m / 12 =												54.6963 (39)
HLP	0.8344	0.8330	0.8316	0.8250	0.8238	0.8180	0.8180	0.8170	0.8202	0.8238	0.8262	0.8289 (40)
HLP (average)												0.8250 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1531 (42)
Average daily hot water use (litres/day)												85.3352 (43)
Daily hot water use	93.8687	90.4553	87.0419	83.6285	80.2151	76.8017	76.8017	80.2151	83.6285	87.0419	90.4553	93.8687 (44)
Energy conte	139.2046	121.7493	125.6343	109.5311	105.0977	90.6913	84.0388	96.4358	97.5875	113.7288	124.1439	134.8123 (45)
Energy content (annual)										Total = Sum(45)m =		1342.6553 (45)
Distribution loss (46)m = 0.15 x (45)m												
	20.8807	18.2624	18.8451	16.4297	15.7646	13.6037	12.6058	14.4654	14.6381	17.0593	18.6216	20.2218 (46)
Water storage loss:												
Total storage loss												

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If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
Combi loss	14.0702	12.6896	14.0190	13.5326	13.9589	13.4800	13.9115	13.9422	13.5087	13.9941	13.5823	14.0603 (61)
Total heat required for water heating calculated for each month	153.2748	134.4388	139.6533	123.0637	119.0565	104.1712	97.9503	110.3780	111.0962	127.7230	137.7262	148.8725 (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	153.2748	134.4388	139.6533	123.0637	119.0565	104.1712	97.9503	110.3780	111.0962	127.7230	137.7262	148.8725 (64)
Heat gains from water heating, kWh/month	49.8031	43.6540	45.2782	39.8022	38.4347	33.5248	31.4208	35.5504	35.8250	41.3134	44.6734	48.3401 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	129.1837	129.1837	129.1837	129.1837	129.1837	129.1837	129.1837	129.1837	129.1837	129.1837	129.1837	129.1837	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	49.2917	43.7804	35.6046	26.9550	20.1492	17.0108	18.3807	23.8920	32.0678	40.7174	47.5232	50.6616	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	281.3617	284.2814	276.9239	261.2608	241.4890	222.9062	210.4918	207.5721	214.9296	230.5927	250.3645	268.9473	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.0714	50.0714	50.0714	50.0714	50.0714	50.0714	50.0714	50.0714	50.0714	50.0714	50.0714	50.0714	(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)	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	(71)
Water heating gains (Table 5)	66.9396	64.9613	60.8578	55.2809	51.6595	46.5623	42.2322	47.7829	49.7570	55.5287	62.0464	64.9733	(72)
Total internal gains	493.7257	489.1558	469.5190	439.6294	409.4303	382.6119	367.2374	375.3796	392.8870	422.9715	456.0669	480.7149	(73)

6. Solar gains

[Jan]	Area m2				Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North	3.5600				10.6334	0.6300		0.7000		0.7700		11.5689
South	2.5800				46.7521	0.6300		0.7000		0.7700		36.8631 (74)
Solar gains	48.4321	82.4812	114.4720	147.2622	171.8631	174.1876	166.4122	147.1664	125.5042	91.4349	57.9672	41.4976 (83)
Total gains	542.1577	571.6370	583.9909	586.8915	581.2934	556.7995	533.6496	522.5460	518.3912	514.4064	514.0340	522.2125 (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	28.5712	28.6203	28.6686	28.8975	28.9407	29.1437	29.1437	29.1816	29.0651	28.9407	28.8534	28.7627	
alpha	2.9047	2.9080	2.9112	2.9265	2.9294	2.9429	2.9429	2.9454	2.9377	2.9294	2.9236	2.9175	
util living area	0.8996	0.8798	0.8472	0.7882	0.6933	0.5542	0.4230	0.4471	0.6164	0.7812	0.8689	0.9077	(86)
MIT	19.5408	19.7069	19.9794	20.3307	20.6473	20.8702	20.9566	20.9476	20.8125	20.4415	19.9431	19.4934	(87)
Th 2	20.2236	20.2248	20.2261	20.2317	20.2328	20.2377	20.2377	20.2387	20.2358	20.2328	20.2306	20.2284	(88)
util rest of house	0.8895	0.8678	0.8315	0.7653	0.6583	0.5023	0.3570	0.3816	0.5673	0.7538	0.8541	0.8983	(89)
MIT 2	18.8898	19.0521	19.3176	19.6584	19.9527	20.1499	20.2149	20.2099	20.1026	19.7678	19.2896	18.8476	(90)
Living area fraction									fLA = Living area / (4) =			0.4026	(91)
MIT	19.1518	19.3157	19.5840	19.9290	20.2323	20.4399	20.5135	20.5069	20.3884	20.0390	19.5527	19.1076	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1518	19.3157	19.5840	19.9290	20.2323	20.4399	20.5135	20.5069	20.3884	20.0390	19.5527	19.1076	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.8733	0.8518	0.8169	0.7555	0.6583	0.5166	0.3814	0.4052	0.5776	0.7463	0.8393	0.8824	(94)
Ext temp.	473.4895	486.9036	477.0708	443.3813	382.6760	287.6191	203.5385	211.7533	299.4116	383.9056	431.4241	460.7906	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	821.6224	796.1296	721.3678	603.2519	465.9931	316.7233	212.2450	222.4466	341.9700	515.5138	682.1614	819.2182	(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 per m2	259.0108	207.7999	181.7570	115.1068	61.9880	0.0000	0.0000	0.0000	0.0000	97.9165	180.5308	266.6701	(98)
												1370.7799	(98)
												20.6754	(99)

8c. Space cooling requirement

Not applicable

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CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1514.6740 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	259.0108	207.7999	181.7570	115.1068	61.9880	0.0000	0.0000	0.0000	0.0000	97.9165	180.5308	266.6701	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	286.1998	229.6131	200.8364	127.1898	68.4950	0.0000	0.0000	0.0000	0.0000	108.1950	199.4816	294.6631	(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	153.2748	134.4388	139.6533	123.0637	119.0565	104.1712	97.9503	110.3780	111.0962	127.7230	137.7262	148.8725	(64)
Efficiency of water heater (217)m	89.2833	89.2154	89.0812	88.8178	88.3699	87.3000	87.3000	87.3000	87.3000	88.6604	89.0869	89.3269	(216)
Fuel for water heating, kWh/month	171.6724	150.6902	156.7708	138.5575	134.7253	119.3256	112.1996	126.4352	127.2579	144.0586	154.5977	166.6603	(219)
Water heating fuel used												1702.9511	(219)
Annual totals kWh/year													
Space heating fuel - main system												1514.6740	(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)												348.2025	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses												3640.8275	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1514.6740	3.4800	52.7107 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1702.9511	3.4800	59.2627 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	348.2025	13.1900	45.9279 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	0.0000	13.1900	0.0000 (252)
Total energy cost			287.7938 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.0860 (257)
SAP value		84.8501
SAP rating (Section 12)		85 (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	1514.6740	0.2160	327.1696 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1702.9511	0.2160	367.8374 (264)
Space and water heating			695.0070 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	348.2025	0.5190	180.7171 (268)
Energy saving/generation technologies			
PV Unit	-421.4700	0.5190	-218.7429 (269)
Total kg/year			695.9062 (272)
CO2 emissions per m2			10.5000 (273)
EI value			91.6216
EI rating			92 (274)
EI band			A

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9050 = 3.845$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9050 = 0.2387$, stars = 4
Water heating energy efficiency	$3.48 / 0.8842 = 3.936$, stars = 4
Water heating environmental impact	$0.216 / 0.8842 = 0.2443$, stars = 4

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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	66.3000 (1b)	x 2.3500 (2b)	= 155.8050 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 155.8050 (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					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					20.0000 / (5) = 0.1284 (8)
Pressure test					Yes
Measured/design AP50					2.6600
Infiltration rate					0.2614 (18)
Number of sides sheltered					1 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.2418 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.4000	4.1000	4.1000	3.9000	3.9000	3.7000	3.7000	3.5000	3.5000	3.8000	3.7000	3.9000 (22)
Wind factor	1.1000	1.0250	1.0250	0.9750	0.9750	0.9250	0.9250	0.8750	0.8750	0.9500	0.9250	0.9750 (22a)
Adj infilt rate												
Effective ac	0.2659	0.2478	0.2478	0.2357	0.2357	0.2236	0.2236	0.2115	0.2115	0.2297	0.2236	0.2357 (22b)
Effective ac	0.5354	0.5307	0.5307	0.5278	0.5278	0.5250	0.5250	0.5224	0.5224	0.5264	0.5250	0.5278 (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
Windows (Uw = 1.40)			6.1400	1.3258	8.1402		(27)
External Wall	59.6400	6.1400	53.5000	0.2000	10.7000	9.0000	481.5000 (29a)
Bay Roof	1.0600		1.0600	0.1000	0.1060	9.0000	9.5400 (30)
Total net area of external elements Aum (m ²)			60.7000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	18.9462			(33)
Party Wall			22.6000	0.0000	0.0000	20.0000	452.0000 (32)
Party Floor			66.3000			30.0000	1989.0000 (32d)
Party Ceilings			65.2400			30.0000	1957.2000 (32b)
Internal Walls			88.9900			9.0000	800.9100 (32c)
Heat capacity Cm = Sum (A x k)							(28)...(30) + (32) + (32a)...(32e) = 5690.1500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							85.8243 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.2246 (36)
Total fabric heat loss							(33) + (36) = 27.1708 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	27.5260	27.2865	27.2865	27.1362	27.1362	26.9935	26.9935	26.8583	26.8583	27.0639	26.9935	27.1362 (38)
Average = Sum(39)m / 12 =	54.6967	54.4573	54.4573	54.3070	54.3070	54.1642	54.1642	54.0290	54.0290	54.2347	54.1642	54.3070 (39)
												54.2765 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8250	0.8214	0.8214	0.8191	0.8191	0.8170	0.8170	0.8149	0.8149	0.8180	0.8170	0.8191 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												
Average daily hot water use (litres/day)												2.1531 (42)
												85.3352 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	93.8687	90.4553	87.0419	83.6285	80.2151	76.8017	76.8017	80.2151	83.6285	87.0419	90.4553	93.8687 (44)
Energy content (annual)	139.2046	121.7493	125.6343	109.5311	105.0977	90.6913	84.0388	96.4358	97.5875	113.7288	124.1439	134.8123 (45)
Distribution loss (46)m = 0.15 x (45)m												
	20.8807	18.2624	18.8451	16.4297	15.7646	13.6037	12.6058	14.4654	14.6381	17.0593	18.6216	20.2218 (46)
Water storage loss:												
Total storage loss												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
Combi loss	14.0702	12.6896	14.0190	13.5326	13.9589	13.4800	13.9115	13.9422	13.5087	13.9941	13.5823	14.0603 (61)
Total heat required for water heating calculated for each month	153.2748	134.4388	139.6533	123.0637	119.0565	104.1712	97.9503	110.3780	111.0962	127.7230	137.7262	148.8725 (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	153.2748	134.4388	139.6533	123.0637	119.0565	104.1712	97.9503	110.3780	111.0962	127.7230	137.7262	148.8725 (64)
Heat gains from water heating, kWh/month	49.8031	43.6540	45.2782	39.8022	38.4347	33.5248	31.4208	35.5504	35.8250	41.3134	44.6734	48.3401 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	129.1837	129.1837	129.1837	129.1837	129.1837	129.1837	129.1837	129.1837	129.1837	129.1837	129.1837	129.1837	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	49.2917	43.7804	35.6046	26.9550	20.1492	17.0108	18.3807	23.8920	32.0678	40.7174	47.5232	50.6616	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	281.3617	284.2814	276.9239	261.2608	241.4890	222.9062	210.4918	207.5721	214.9296	230.5927	250.3645	268.9473	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.0714	50.0714	50.0714	50.0714	50.0714	50.0714	50.0714	50.0714	50.0714	50.0714	50.0714	50.0714	(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)	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	(71)
Water heating gains (Table 5)	66.9396	64.9613	60.8578	55.2809	51.6595	46.5623	42.2322	47.7829	49.7570	55.5287	62.0464	64.9733	(72)
Total internal gains	493.7257	489.1558	469.5190	439.6294	409.4303	382.6119	367.2374	375.3796	392.8870	422.9715	456.0669	480.7149	(73)

6. Solar gains

[Jan]	Area m2				Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W	
North	3.5600				13.4839		0.6300		0.7000		0.7700		14.6702 (74)	
South	2.5800				56.7559		0.6300		0.7000		0.7700		44.7509 (78)	
Solar gains	59.4212	86.2974	121.5284	158.9820	176.8684	197.1193	181.4670	166.4596	140.2495	102.1014	70.9144	48.1847	(83)	
Total gains	553.1468	575.4532	591.0474	598.6113	586.2988	579.7312	548.7044	541.8392	533.1364	525.0729	526.9813	528.8996	(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	28.8975	29.0245	29.0245	29.1049	29.1049	29.1816	29.1816	29.2546	29.2546	29.1437	29.1816	29.1049	
alpha	2.9265	2.9350	2.9350	2.9403	2.9403	2.9454	2.9454	2.9503	2.9503	2.9429	2.9454	2.9403	
util living area	0.8790	0.8604	0.8184	0.7454	0.6211	0.4468	0.3176	0.3206	0.5231	0.7185	0.8336	0.8871	(86)
MIT	19.7669	19.8992	20.1722	20.4909	20.7814	20.9420	20.9849	20.9846	20.9018	20.6265	20.1803	19.7452	(87)
Th 2	20.2317	20.2348	20.2348	20.2368	20.2368	20.2387	20.2387	20.2404	20.2404	20.2377	20.2387	20.2368	(88)
util rest of house	0.8666	0.8463	0.7995	0.7180	0.5786	0.3880	0.2474	0.2500	0.4659	0.6834	0.8145	0.8753	(89)
MIT 2	19.1168	19.2469	19.5096	19.8120	20.0739	20.2047	20.2327	20.2344	20.1779	19.9414	19.5240	19.1005	(90)
Living area fraction	19.3785	19.5095	19.7764	20.0853	20.3587	20.5015	20.5355	20.5364	20.4694	20.2172	19.7882	19.3600	(92)
Temperature adjustment	19.3785	19.5095	19.7764	20.0853	20.3587	20.5015	20.5355	20.5364	20.4694	20.2172	19.7882	19.3600	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	470.6999	478.3629	465.1788	426.3107	343.3641	236.9765	150.9673	150.5819	257.8871	358.2927	422.6302	454.7074	(95)
Ext temp.	5.4000	5.9000	7.6000	10.0000	13.1000	15.9000	17.7000	17.7000	15.3000	12.0000	8.4000	5.5000	(96)
Heat loss rate W	764.5784	741.1353	663.0915	547.7028	394.1995	249.2378	153.5842	153.2476	279.2953	445.6578	616.8321	752.6974	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	218.6456	176.5831	147.2470	87.4023	37.8215	0.0000	0.0000	0.0000	0.0000	64.9996	139.8253	221.7046	(98)
Space heating												1094.2290	(98)
Space heating per m2												16.5042	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1209.0929 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	218.6456	176.5831	147.2470	87.4023	37.8215	0.0000	0.0000	0.0000	0.0000	64.9996	139.8253	221.7046	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	241.5973	195.1194	162.7039	96.5772	41.7917	0.0000	0.0000	0.0000	0.0000	71.8228	154.5031	244.9774	(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	153.2748	134.4388	139.6533	123.0637	119.0565	104.1712	97.9503	110.3780	111.0962	127.7230	137.7262	148.8725	(64)
Efficiency of water heater (217)m	89.1532	89.0885	88.9136	88.6010	88.0506	87.3000	87.3000	87.3000	87.3000	88.3537	88.8833	89.1867	(216)
Fuel for water heating, kWh/month	171.9229	150.9049	157.0664	138.8965	135.2138	119.3256	112.1996	126.4352	127.2579	144.5588	154.9517	166.9224	(219)
Water heating fuel used													1705.6557 (219)
Annual totals kWh/year													
Space heating fuel - main system													1209.0929 (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)													348.2025 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses													3337.9510 (238)

10a. Fuel costs - using BEDF prices (510)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1209.0929	4.2600	51.5074 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1705.6557	4.2600	72.6609 (247)
Pumps and fans for heating	75.0000	22.5500	16.9125 (249)
Energy for lighting	348.2025	22.5500	78.5197 (250)
Additional standing charges			96.0000 (251)
Energy saving/generation technologies			
PV Unit	0.0000	22.5500	0.0000 (252)
Total energy cost			315.6004 (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	1209.0929	0.2160	261.1641 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1705.6557	0.2160	368.4216 (264)
Space and water heating			629.5857 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	348.2025	0.5190	180.7171 (268)
Energy saving/generation technologies			
PV Unit	-421.4700	0.5190	-218.7429 (269)
Total kg/year			630.4848 (272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1209.0929	1.2200	1475.0933 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1705.6557	1.2200	2080.9000 (264)
Space and water heating			3555.9933 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	348.2025	3.0700	1068.9816 (268)
Energy saving/generation technologies			
PV Unit	-421.4700	3.0700	-1293.9129 (269)
Primary energy kWh/year			3561.3119 (272)
Primary energy kWh/m2/year			53.7151 (273)

SAP 2012 EPC IMPROVEMENTS

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Current energy efficiency rating: B 85
Current environmental impact rating: A 92

(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		Not applicable
O			Not considered
P			Not considered
R			Not considered
S			Not considered
T			Not considered
U	Solar photovoltaic panels		Not applicable
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:			
(none)	SAP change	Cost change	CO2 change

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0		0.00 kg/m²

Potential energy efficiency rating: B 85
Potential environmental impact rating: A 92

Fuel prices for cost data on this page from database revision number 510 TEST (21 Dec 2022)
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	£95	£95	£0
Mains gas	£220	£220	£0
Space heating	£164	£164	£0
Water heating	£73	£73	£0
Lighting	£79	£79	£0
Total cost of fuels	£315	£315	£0
Total cost of uses	£316	£316	£0
Delivered energy	50 kWh/m²	50 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.6 tonnes	0.6 tonnes	0.0 tonnes
CO2 emissions per m²	10 kg/m²	10 kg/m²	0 kg/m²
Primary energy	54 kWh/m²	54 kWh/m²	0 kWh/m²

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	EndTerrace Flat
Number of storeys	1
Cross ventilation possible	Yes
SAP Region	Southern England
Front of dwelling faces	South
Overshading	Average or unknown
Thermal mass parameter	85.8 (calculated from construction elements)
Night ventilation	Yes
Ventilation rate during hot weather (ach)	6.00 (Windows fully open)

Overheating Calculation

Summer ventilation heat loss coefficient	308.49 (P1)
Transmission heat loss coefficient	27.17 (37)
Summer heat loss coefficient	335.66 (P2)

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

Solar shading	Z blinds	Solar access	Z overhangs	Z summer
Orientation				
North	1.000	0.90	1.000	0.900 (P8)
South	1.000	0.90	1.000	0.900 (P8)

[Jul]	Area m2	Solar flux Table 6a W/m2	Specific data g or Table 6b	Specific data FF or Table 6c	Shading	Gains W
North	3.5600	87.1704	0.6300	0.7000	0.9000	110.8518
South	2.5800	118.5567	0.6300	0.7000	0.9000	109.2620
total:						220.1139

	Jun	Jul	Aug	
Solar gains	236	220	198	(P3)
Internal gains	380	364	372	
Total summer gains	616	584	570	(P5)
Summer gain/loss ratio	1.84	1.74	1.70	(P6)
Summer external temperature	15.40	17.30	17.30	
Thermal mass temperature increment (TMP = 85.8)	1.40	1.40	1.40	
Threshold temperature	18.63	20.44	20.40	(P7)
Likelihood of high internal temperature	Not significant	Not significant	Not significant	
Assessment of likelihood of high internal temperature:	Not significant			