



SAP Report Submission for Building Regulations Compliance

Client: Highwood Construction Ltd

Project: 8, Rowe Way
EASTLEIGH, Hampshire, SO50 9RG

Contact: Scott Spearing
Scott Spearing
scott@beatsolutions.co.uk

Report Issue Date: 20/02/2020

EXCELLENCE
IN ENERGY
ASSESSMENT

BLOCK COMPLIANCE

Calculation Type: New Build (As Built)

Block Reference	SAP-0796 (Stoneham) - Block G	Issued on Date	20/02/2020
Block Name	3B4A Plots 297-305 (Flats)		
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) - Block G		Block Name: 3B4A Plots 297-305 (Flats)		
Property-Assessment Reference	Multiplier	Floor Area (m²)	DER (kgCO₂/m²)	TER (kgCO₂/m²)
SAP-0796 (3B4A) - Plot 297-AB	1	61.72	15.71	18.98
SAP-0796 (3B4A) - Plot 298-AB	1	69.98	14.53	17.91
SAP-0796 (3B4A) - Plot 299-AB	1	50.67	15.38	18.69
SAP-0796 (3B4A) - Plot 300-AB	1	60.9	13.57	17.46
SAP-0796 (3B4A) - Plot 301-AB	1	69.15	12.57	16.44
SAP-0796 (3B4A) - Plot 302-AB	1	50.67	13.57	17.27
SAP-0796 (3B4A) - Plot 303-AB	1	60.9	13.36	17.22
SAP-0796 (3B4A) - Plot 304-AB	1	69.15	12.56	16.33
SAP-0796 (3B4A) - Plot 305-AB	1	50.67	15.05	18.79
Totals:	9	543.81	126.30	159.09
Average DER = 13.96 kgCO₂/m²			PASS	
Average TER = 17.61 kgCO₂/m²				

Block Compliance Report - DFEE

Block Reference: SAP-0796 (Stoneham) - Block G		Block Name: 3B4A Plots 297-305 (Flats)		
Property-Assessment Reference	Multiplier	Floor Area (m²)	DFEE (kWh/m²/yr)	TFEE (kWh/m²/yr)
SAP-0796 (3B4A) - Plot 297-AB	1	61.72	44.84	48.80
SAP-0796 (3B4A) - Plot 298-AB	1	69.98	40.03	43.80
SAP-0796 (3B4A) - Plot 299-AB	1	50.67	39.92	41.96
SAP-0796 (3B4A) - Plot 300-AB	1	60.9	35.43	40.09
SAP-0796 (3B4A) - Plot 301-AB	1	69.15	31.92	36.00
SAP-0796 (3B4A) - Plot 302-AB	1	50.67	32.64	34.73
SAP-0796 (3B4A) - Plot 303-AB	1	60.9	34.62	38.90
SAP-0796 (3B4A) - Plot 304-AB	1	69.15	31.85	35.46
SAP-0796 (3B4A) - Plot 305-AB	1	50.67	38.55	42.46
Totals:	9	543.81	329.79	362.20
Average DFEE = 36.55 kWh/m²/yr			PASS	
Average TFEE = 40.21 kWh/m²/yr				

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Built)

Property Reference	SAP-0796 (3B4A) - Plot 299				Issued on Date	20/02/2020
Assessment Reference	AB	Prop Type Ref	Flats A - 1B2P Ground Floor			
Property	8, Rowe Way, EASTLEIGH, Hampshire, SO50 9RG					
SAP Rating	83 B	DER	15.38	TER	18.69	
Environmental	90 B	% DER<TER	17.70			
CO ₂ Emissions (t/year)	0.61	DFEE	39.92	TFEE	41.96	
General Requirements Compliance	Pass	% DFEE<TFEE	4.85			
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)	18.69	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	15.38	kgCO ₂ /m ²	Pass
	-3.31 (-17.7%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	41.96	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	39.92	kWh/m ² /yr	
	-2.1 (-5.0%)	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
Floor	0.15 (max. 0.25)	0.15 (max. 0.70)	Pass
Openings	1.20 (max. 2.00)	1.20 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	5.33 (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)

Slight

Pass

Based on:

Overshading

Average

Windows facing South

3.24 m², No overhang

Windows facing West

4.50 m², No overhang

Air change rate

8.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

5.33 (measured in this dwelling)

Maximum

10.0

Pass

10 Key features

Party wall U-value

0.00

W/m²K

Door U-value

0.60

W/m²K

Photovoltaic array

287.47

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)

Property Reference	SAP-0796 (3B4A) - Plot 299				Issued on Date	20/02/2020
Assessment Reference	AB		Prop Type Ref	Flats A - 1B2P Ground Floor		
Property	8, Rowe Way, EASTLEIGH, Hampshire, SO50 9RG					
SAP Rating		83 B	DER	15.38	TER	18.69
Environmental		90 B	% DER<TER	17.70		
CO ₂ Emissions (t/year)		0.61	DFEE	39.92	TFEE	41.96
General Requirements Compliance		Pass	% DFEE<TFEE	4.85		
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	East
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Urban
1.0 Property Type	Flat, Mid-Terrace
2.0 Number of Storeys	1
3.0 Date Built	2020
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	15.40 m	50.67 m ²	2.40 m

7.0 Living Area	24.21	m ²
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8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	133.96	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	36.96	29.22

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 f rame with/without sheathing board	0.00	20.00	32.64

9.2 Internal Walls

Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
Internal Walls	Plasterboard on timber frame	9.00	61.29

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
Party Ceilings	Timber I-joists, carpeted	20.00	50.67

11.0 Heat Loss Floors

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)
Heat Loss Floor	Ground Floor - Solid	Suspended concrete floor, carpeted	0.15	75.00	50.67

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	1.20
Front Door	Manufacturer	Solid Door							0.60

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
Rear Elevation	Window	[1] External Wall	West	None	0.00					4.50	
Side Elevation	Window	[1] External Wall	South	None	0.00					3.24	

14.0 Conservatory

None

15.0 Draught Proofing

100 %

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported
Table K1 - Approved	E2 Other lintels (including other steel lintels)	6.00	0.300	Yes
Table K1 - Approved	E3 Sill	6.00	0.040	Yes
Table K1 - Approved	E4 Jamb	12.90	0.050	Yes
Table K1 - Approved	E5 Ground floor (normal)	15.40	0.160	Yes
Table K1 - Approved	E7 Party floor between dwellings (in blocks of flats)	15.40	0.070	No
Table K1 - Approved	E16 Corner (normal)	7.20	0.090	No
Table K1 - Approved	E17 Corner (inverted – internal area greater than external area)	2.40	-0.090	No
Table K1 - Approved	E18 Party wall between dwellings	2.40	0.060	No
Table K1 - Default	E25 Staggered party wall between dwellings	2.40	0.120	No
Table K1 - Default	P1 Party wall - Ground floor	13.60	0.160	No
Table K1 - Default	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.60	0.000	No

Y-value	0.106	W/m²K
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18.0 Pressure Testing

Designed AP ₅₀	Yes	
Property Tested ?	4.00	m³/(h.m²) @ 50 Pa
As Built AP ₅₀	Yes	
	5.33	m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Windows fully open
Cross ventilation possible	Yes
Night Ventilation	Yes
Air change rate	8.00

Mechanical Ventilation

Mechanical Ventilation System Present	No
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20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

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	7	
Total number of L.E.L. fittings	7	
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	None
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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	Yes
SAP Code	901
29.0 Hot Water Cylinder	None
32.0 Photovoltaic Unit	More Dwellings, One Block
Apportioned	287.47
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 299		Issued on Date	20/02/2020
Assessment Reference	AB	Prop Type Ref	Flats A - 1B2P Ground Floor	
Project	8, Rowe Way, EASTLEIGH, Hampshire, SO50 9RG			
Calculation Type	New Build (As Built)			

SAP Rating	83 B	DER	15.38	TER	18.69
Environmental	90 B	% DER<TER	17.70		
CO ₂ Emissions (t/year)	0.61	DFEE	39.92	TFEE	41.96
General Requirements Compliance	Pass	% DFEE<TFEE	4.85		

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

Building Elements

Wall 000001 - Stoneham - TF

Wall Type: Timber framed Wall with I-beams

U-VALUE CALCULATOR REPORT

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/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

U-VALUE CALCULATOR REPORT

Property Reference	SAP-0796 (3B4A) - Plot 299	Issued on Date	20/02/2020
Assessment Reference	AB	Prop Type Ref	Flats A - 1B2P Ground Floor
Project	8, Rowe Way, EASTLEIGH, Hampshire, SO50 9RG		
Calculation Type	New Build (As Built)		

SAP Rating	83 B	DER	15.38	TER	18.69
Environmental	90 B	% DER<TER	17.70		
CO ₂ Emissions (t/year)	0.61	DFEE	39.92	TFEE	41.96
General Requirements Compliance	Pass	% DFEE<TFEE	4.85		

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

Floor Ground Floor - Stoneham - Ground Floor

Floor Type: Suspended Floor

Area = 50.67 m², Perimeter = 15.40 m, Wall thickness = 275.00 mm, Soil: Unknown

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

Floor height above ground: h = 0.200 m

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

Ventilation openings per perimeter length: e = 0.0015 %

Mean wind speed: v = 5.000 m/s

Resistance on solum: R_g = 0.000 m²K/W

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)
Ext surface				0.1700	
Layer 1	Blockwork, dense				
	Main construction	100	1.5900	0.0629	82.95
	Main construction	100	2.2000	0.0455	17.05
Layer 2	Jablite Jabfloor (HP)				
	Main construction	150	0.0320	4.6875	100.00
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
Layer 3	Screed				
	Main construction	75	1.1500	0.0652	100.00
Int surface				0.1700	

Total resistance: Upper limit = 5.153 m² K/W Lower limit = 5.152 m² K/W Average = 5.152 m² K/W

Total correction = 0.0083 m² K/W

U-value (unrounded) = 0.15 W/m² K

Unheated space: None

Total thickness: 325 mm

U-value: 0.15 W/m² K

Kappa: n/a

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	SAP-0796 (3B4A) - Plot 299			Issued on Date	20/02/2020
Assessment Reference	AB	Prop Type Ref	Flats A - 1B2P Ground Floor		
Property	8, Rowe Way, EASTLEIGH, Hampshire, SO50 9RG				
SAP Rating	83 B	DER	15.38	TER	18.69
Environmental	90 B	% DER<TER	17.70		
CO ₂ Emissions (t/year)	0.61	DFEE	39.92	TFEE	41.96
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Assessor Details	Mr. Scott Spearing, Scott Spearing, Tel: 01489 565920, scott@beatsolutions.co.uk			Assessor ID	p775-0001
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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

Ground-floor flat, total floor area 51 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) 18.69 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.38 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 42.0 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 39.9 kWh/m²/yr OK

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	0.15 (max. 0.25)	0.15 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.20 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 5.33 (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): Slight OK

Based on:

Overshading: Average
Windows facing South: 3.24 m², No overhang
Windows facing West: 4.50 m², No overhang
Air change rate: 8.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value: 0.00 W/m²K
Door U-value: 0.60 W/m²K
Photovoltaic array: 287.47 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	50.6700 (1b)	x 2.4000 (2b)	= 121.6080 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.6700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 121.6080 (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 20.0000 / (5) = 0.1645 (8)
Pressure test					Yes
Measured/design AP50					5.3300
Infiltration rate					0.4310 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3663 (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	0.4671	0.4579	0.4487	0.4030	0.3938	0.3480	0.3480	0.3388	0.3663	0.3938	0.4121	0.4304 (22b)
Effective ac	0.6091	0.6048	0.6007	0.5812	0.5775	0.5606	0.5606	0.5574	0.5671	0.5775	0.5849	0.5926 (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 = 1.20)			7.7400	1.1450	8.8626		(27)
Heat Loss Floor			50.6700	0.1500	7.6005	75.0000	3800.2500 (28a)
External Wall	36.9600	7.7400	29.2200	0.2000	5.8440	9.0000	262.9800 (29a)
Total net area of external elements Aum(A, m ²)			87.6300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	22.3071			(33)
Party Wall			32.6400	0.0000	0.0000	20.0000	652.8000 (32)
Party Ceilings			50.6700			30.0000	1520.1000 (32b)
Internal Walls			61.2900			9.0000	551.6100 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	6787.7400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							133.9597 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.2670 (36)
Total fabric heat loss						(33) + (36) =	31.5741 (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	24.4424	24.2724	24.1058	23.3233	23.1769	22.4953	22.4953	22.3691	22.7579	23.1769	23.4731	23.7827 (38)
Heat transfer coeff	56.0165	55.8465	55.6799	54.8974	54.7510	54.0694	54.0694	53.9432	54.3320	54.7510	55.0472	55.3568 (39)
Average = Sum(39)m / 12 =												54.8967 (39)
HLP	1.1055	1.1022	1.0989	1.0834	1.0805	1.0671	1.0671	1.0646	1.0723	1.0805	1.0864	1.0925 (40)
HLP (average)												1.0834 (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												1.7098 (42)
Average daily hot water use (litres/day)												74.8087 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	82.2896	79.2972	76.3049	73.3125	70.3202	67.3278	67.3278	70.3202	73.3125	76.3049	79.2972	82.2896 (44)
Energy content (annual)	122.0331	106.7309	110.1367	96.0199	92.1334	79.5041	73.6722	84.5399	85.5496	99.6998	108.8302	118.1825 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1177.0324 (45)
Water storage loss:	18.3050	16.0096	16.5205	14.4030	13.8200	11.9256	11.0508	12.6810	12.8324	14.9550	16.3245	17.7274 (46)
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)

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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 (57)
Combi loss	13.9976	12.6284	13.9583	13.4817	13.9121	13.4413	13.8756	13.8992	13.4633	13.9391	13.5199	13.9900 (61)
Total heat required for water heating calculated for each month	136.0306	119.3593	124.0950	109.5016	106.0454	92.9453	87.5478	98.4392	99.0129	113.6390	122.3501	132.1725 (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	136.0306	119.3593	124.0950	109.5016	106.0454	92.9453	87.5478	98.4392	99.0129	113.6390	122.3501	132.1725 (64)
Heat gains from water heating, kWh/month	44.0754	38.6451	40.1100	35.2970	34.1124	29.7954	27.9649	31.5843	31.8111	36.6350	39.5660	42.7932 (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	85.4920	85.4920	85.4920	85.4920	85.4920	85.4920	85.4920	85.4920	85.4920	85.4920	85.4920	85.4920 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.9864	12.4226	10.1027	7.6484	5.7173	4.8268	5.2155	6.7793	9.0992	11.5535	13.4846	14.3751 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	148.9739	150.5198	146.6243	138.3310	127.8623	118.0232	111.4501	109.9042	113.7998	122.0930	132.5617	142.4008 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5492	31.5492	31.5492	31.5492	31.5492	31.5492	31.5492	31.5492	31.5492	31.5492	31.5492	31.5492 (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)	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936 (71)
Water heating gains (Table 5)	59.2411	57.5076	53.9113	49.0237	45.8499	41.3825	37.5872	42.4521	44.1821	49.2406	54.9528	57.5177 (72)
Total internal gains	273.8491	272.0977	262.2859	246.6507	231.0772	215.8801	205.9005	210.7832	218.7286	234.5347	252.6467	265.9413 (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
South					3.2400	46.7521	0.6300	0.7000	0.7700			46.2932 (78)
West					4.5000	19.6403	0.6300	0.7000	0.7700			27.0104 (80)

Solar gains	73.3037	128.6546	183.5936	236.0616	269.2755	268.6773	258.5305	234.0689	202.0900	144.4720	88.5521	62.2137 (83)
Total gains	347.1528	400.7522	445.8795	482.7123	500.3526	484.5574	464.4309	444.8521	420.8186	379.0067	341.1989	328.1550 (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	33.6594	33.7619	33.8629	34.3456	34.4374	34.8715	34.8715	34.9531	34.7030	34.4374	34.2521	34.0605	
alpha	3.2440	3.2508	3.2575	3.2897	3.2958	3.3248	3.3248	3.3302	3.3135	3.2958	3.2835	3.2707	
util living area	0.9744	0.9586	0.9297	0.8718	0.7739	0.6272	0.4836	0.5194	0.7220	0.8942	0.9597	0.9783 (86)	
MIT	19.2288	19.4712	19.8327	20.2733	20.6356	20.8737	20.9601	20.9488	20.7872	20.3113	19.6945	19.1871 (87)	
Th 2	19.9963	19.9991	20.0018	20.0144	20.0168	20.0278	20.0278	20.0298	20.0235	20.0168	20.0120	20.0070 (88)	
util rest of house	0.9697	0.9512	0.9168	0.8476	0.7299	0.5548	0.3875	0.4237	0.6569	0.8690	0.9512	0.9743 (89)	
MIT 2	18.3871	18.6274	18.9825	19.4143	19.7474	19.9538	20.0117	20.0078	19.8875	19.4604	18.8601	18.3538 (90)	
Living area fraction									fLA = Living area / (4) =			0.4778 (91)	
MIT	18.7892	19.0306	19.3887	19.8248	20.1718	20.3933	20.4649	20.4574	20.3174	19.8670	19.2588	18.7520 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.7892	19.0306	19.3887	19.8248	20.1718	20.3933	20.4649	20.4574	20.3174	19.8670	19.2588	18.7520 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9626	0.9424	0.9075	0.8423	0.7374	0.5833	0.4320	0.4673	0.6779	0.8646	0.9432	0.9679 (94)
Ext temp.	334.1630	377.6621	404.6134	406.5985	368.9362	282.6372	200.6296	207.8830	285.2664	327.6824	321.8111	317.6177 (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	811.6368	789.1444	717.6430	599.7418	463.8382	313.2416	208.9723	218.8695	337.8022	507.3767	669.3069	805.5502 (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	355.2406	276.5161	232.8940	139.0632	70.6071	0.0000	0.0000	0.0000	0.0000	133.6926	250.1970	363.0218 (98)
Space heating per m2												1821.2324 (98)
												35.9430 (99)

8c. Space cooling requirement

Not applicable

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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													2012.4115 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	355.2406	276.5161	232.8940	139.0632	70.6071	0.0000	0.0000	0.0000	0.0000	133.6926	250.1970	363.0218	(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)	392.5310	305.5427	257.3415	153.6610	78.0189	0.0000	0.0000	0.0000	0.0000	147.7266	276.4608	401.1290	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	136.0306	119.3593	124.0950	109.5016	106.0454	92.9453	87.5478	98.4392	99.0129	113.6390	122.3501	132.1725	(64)
Efficiency of water heater (217)m	89.5907	89.5107	89.3614	89.0618	88.5515	87.3000	87.3000	87.3000	87.3000	89.0011	89.4235	87.3000	(216)
Fuel for water heating, kWh/month	151.8357	133.3464	138.8687	122.9501	119.7557	106.4666	100.2839	112.7597	113.4169	127.6827	136.8209	147.4758	(219)
Water heating fuel used												1511.6630	(219)
Annual totals kWh/year													
Space heating fuel - main system												2012.4115	(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)												247.0042	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses												3846.0787	(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	2012.4115	0.2160	434.6809 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1511.6630	0.2160	326.5192 (264)
Space and water heating			761.2001 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	247.0042	0.5190	128.1952 (268)
Energy saving/generation technologies			
PV Unit	-287.4700	0.5190	-149.1969 (269)
Total CO2, kg/year			779.1233 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			15.3800 (273)

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

DER			15.3800 ZC1
Total Floor Area		TFA	50.6700
Assumed number of occupants		N	1.7098
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			17.4223 ZC2
CO2 emissions from cooking, equation (L16)			3.1584 ZC3
Total CO2 emissions			35.9607 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			35.9607 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	50.6700 (1b)	x 2.4000 (2b)	= 121.6080 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.6700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 121.6080 (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 20.0000 / (5) = 0.1645 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4145 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3523 (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	0.4492	0.4404	0.4316	0.3875	0.3787	0.3347	0.3347	0.3259	0.3523	0.3787	0.3963	0.4139 (22b)
Effective ac	0.6009	0.5970	0.5931	0.5751	0.5717	0.5560	0.5560	0.5531	0.5621	0.5717	0.5785	0.5857 (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)			7.7400	1.3258	10.2614		(27)					
Heat Loss Floor			50.6700	0.1300	6.5871		(28a)					
External Wall	36.9600	7.7400	29.2200	0.1800	5.2596		(29a)					
Total net area of external elements Aum(A, m2)			87.6300				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		22.1081		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.5950 (36)					
Total fabric heat loss						(33) + (36) =	28.7031 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 24.1136	Feb 23.9564	Mar 23.8024	Apr 23.0786	May 22.9432	Jun 22.3128	Jul 22.3128	Aug 22.1961	Sep 22.5556	Oct 22.9432	Nov 23.2171	Dec 23.5035 (38)
Heat transfer coeff	52.8167	52.6595	52.5054	51.7817	51.6463	51.0159	51.0159	50.8992	51.2587	51.6463	51.9202	52.2066 (39)
Average = Sum(39)m / 12 =												51.7810 (39)
HLP	Jan 1.0424	Feb 1.0393	Mar 1.0362	Apr 1.0219	May 1.0193	Jun 1.0068	Jul 1.0068	Aug 1.0045	Sep 1.0116	Oct 1.0193	Nov 1.0247	Dec 1.0303 (40)
HLP (average)												1.0219 (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												1.7098 (42)
Average daily hot water use (litres/day)												74.8087 (43)
Daily hot water use	Jan 82.2896	Feb 79.2972	Mar 76.3049	Apr 73.3125	May 70.3202	Jun 67.3278	Jul 67.3278	Aug 70.3202	Sep 73.3125	Oct 76.3049	Nov 79.2972	Dec 82.2896 (44)
Energy conte	122.0331	106.7309	110.1367	96.0199	92.1334	79.5041	73.6722	84.5399	85.5496	99.6998	108.8302	118.1825 (45)
Energy content (annual)												Total = Sum(45)m = 1177.0324 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3050	16.0096	16.5205	14.4030	13.8200	11.9256	11.0508	12.6810	12.8324	14.9550	16.3245	17.7274 (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	41.9339	36.4985	38.8841	36.1541	35.8344	33.2028	34.3095	35.8344	36.1541	38.8841	39.1055	41.9339 (61)
Total heat required for water heating calculated for each month												

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Solar input	163.9669	143.2294	149.0209	132.1740	127.9678	112.7069	107.9817	120.3743	121.7038	138.5840	147.9357	160.1164 (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	163.9669	143.2294	149.0209	132.1740	127.9678	112.7069	107.9817	120.3743	121.7038	138.5840	147.9357	160.1164 (64)
Heat gains from water heating, kWh/month	51.0595	44.6126	46.3415	40.9651	39.5929	34.7358	33.0734	37.0681	37.4838	42.8712	45.9624	49.7792 (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	85.4920	85.4920	85.4920	85.4920	85.4920	85.4920	85.4920	85.4920	85.4920	85.4920	85.4920	85.4920 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.9864	12.4226	10.1027	7.6484	5.7173	4.8268	5.2155	6.7793	9.0992	11.5535	13.4846	14.3751 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	148.9739	150.5198	146.6243	138.3310	127.8623	118.0232	111.4501	109.9042	113.7998	122.0930	132.5617	142.4008 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5492	31.5492	31.5492	31.5492	31.5492	31.5492	31.5492	31.5492	31.5492	31.5492	31.5492	31.5492 (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)	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936 (71)
Water heating gains (Table 5)	68.6283	66.3879	62.2870	56.8960	53.2163	48.2442	44.4535	49.8228	52.0608	57.6226	63.8367	66.9075 (72)
Total internal gains	283.2363	280.9779	270.6616	254.5231	238.4435	222.7418	212.7667	218.1539	226.6074	242.9167	261.5306	275.3310 (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	
South													3.2400	46.7521		0.6300		0.7000		0.7700		46.2932 (78)	
West													4.5000	19.6403		0.6300		0.7000		0.7700		27.0104 (80)	
Solar gains	73.3037	128.6546	183.5936	236.0616	269.2755	268.6773	258.5305	234.0689	202.0900	144.4720	88.5521			62.2137 (83)									
Total gains	356.5400	409.6324	454.2551	490.5846	507.7190	491.4190	471.2972	452.2228	428.6974	387.3887	350.0827			337.5447 (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	66.6219	66.8208	67.0169	67.9536	68.1317	68.9736	68.9736	69.1318	68.6469	68.1317	67.7723	67.4005
alpha	5.4415	5.4547	5.4678	5.5302	5.5421	5.5982	5.5982	5.6088	5.5765	5.5421	5.5182	5.4934
util living area	0.9957	0.9901	0.9752	0.9297	0.8227	0.6402	0.4723	0.5114	0.7562	0.9483	0.9904	0.9968 (86)
MIT	20.0036	20.1635	20.3974	20.6765	20.8811	20.9773	20.9965	20.9946	20.9439	20.6777	20.2888	19.9756 (87)
Th 2	20.0482	20.0507	20.0533	20.0651	20.0673	20.0776	20.0776	20.0796	20.0737	20.0673	20.0628	20.0581 (88)
util rest of house	0.9943	0.9870	0.9671	0.9072	0.7716	0.5580	0.3754	0.4124	0.6792	0.9269	0.9868	0.9957 (89)
MIT 2	18.7266	18.9605	19.2984	19.6951	19.9549	20.0630	20.0763	20.0774	20.0318	19.7061	19.1528	18.6933 (90)
Living area fraction	19.3368	19.5353	19.8235	20.1640	20.3975	20.4999	20.5160	20.5156	20.4676	20.1703	19.6956	19.3060 (92)
MIT	19.3368	19.5353	19.8235	20.1640	20.3975	20.4999	20.5160	20.5156	20.4676	20.1703	19.6956	19.3060 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3368	19.5353	19.8235	20.1640	20.3975	20.4999	20.5160	20.5156	20.4676	20.1703	19.6956	19.3060 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9929	0.9848	0.9648	0.9099	0.7909	0.5966	0.4219	0.4599	0.7137	0.9297	0.9850	0.9946 (94)
Useful gains	354.0096	403.4199	438.2488	446.3619	401.5449	293.1826	198.8310	207.9707	305.9651	360.1476	344.8196	335.7127 (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	794.1928	770.6852	699.5573	583.2692	449.1913	300.9881	199.7769	209.4812	326.3944	494.2727	653.9638	788.6321 (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	327.4963	246.8023	194.4135	98.5733	35.4489	0.0000	0.0000	0.0000	0.0000	99.7891	222.5838	336.9720 (98)
Space heating												1562.0792 (98)
Space heating per m2										(98) / (4) =		30.8285 (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)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Efficiency of main space heating system 1 (in %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1672.4617 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	327.4963	246.8023	194.4135	98.5733	35.4489	0.0000	0.0000	0.0000	0.0000	99.7891	222.5838	336.9720	(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)	350.6385	264.2423	208.1515	105.5389	37.9538	0.0000	0.0000	0.0000	0.0000	106.8406	238.3124	360.7838	(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	163.9669	143.2294	149.0209	132.1740	127.9678	112.7069	107.9817	120.3743	121.7038	138.5840	147.9357	160.1164	(64)
Efficiency of water heater	86.7593	86.4089	85.7216	84.3247	82.2945	80.3000	80.3000	80.3000	80.3000	84.2400	86.0773	86.8801	(216)
Fuel for water heating, kWh/month	188.9907	165.7577	173.8429	156.7442	155.4998	140.3572	134.4729	149.9058	151.5613	164.5109	171.8637	184.2958	(219)
Water heating fuel used												1937.8029	(219)
Annual totals kWh/year													
Space heating fuel - main system												1672.4617	(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)												247.0042	(232)
Total delivered energy for all uses												3932.2688	(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	1672.4617	0.2160	361.2517 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1937.8029	0.2160	418.5654 (264)
Space and water heating			779.8172 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	247.0042	0.5190	128.1952 (268)
Total CO2, kg/m2/year			946.9373 (272)
Emissions per m2 for space and water heating			15.3901 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.5300 (272b)
Emissions per m2 for pumps and fans			0.7682 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.3901 * 1.00) + 2.5300 + 0.7682, rounded to 2 d.p.			18.6900 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.6700 (1b)	x 2.4000 (2b)	= 121.6080 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.6700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 121.6080 (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) = 0.1645 (8)
Measured/design AP50					Yes
Infiltration rate					5.3300
Number of sides sheltered					0.4310 (18)
					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3663 (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	0.4671	0.4579	0.4487	0.4030	0.3938	0.3480	0.3480	0.3388	0.3663	0.3938	0.4121	0.4304 (22b)
Effective ac	0.6091	0.6048	0.6007	0.5812	0.5775	0.5606	0.5606	0.5574	0.5671	0.5775	0.5849	0.5926 (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 = 1.20)			7.7400	1.1450	8.8626		(27)
Heat Loss Floor			50.6700	0.1500	7.6005	75.0000	3800.2500 (28a)
External Wall	36.9600	7.7400	29.2200	0.2000	5.8440	9.0000	262.9800 (29a)
Total net area of external elements Aum(A, m ²)			87.6300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	22.3071			(33)
Party Wall			32.6400	0.0000	0.0000	20.0000	652.8000 (32)
Party Ceilings			50.6700			20.0000	1013.4000 (32b)
Internal Walls			61.2900			9.0000	551.6100 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	6281.0400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							123.9597 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.2670 (36)
Total fabric heat loss						(33) + (36) =	31.5741 (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	24.4424	24.2724	24.1058	23.3233	23.1769	22.4953	22.4953	22.3691	22.7579	23.1769	23.4731	23.7827 (38)
Heat transfer coeff	56.0165	55.8465	55.6799	54.8974	54.7510	54.0694	54.0694	53.9432	54.3320	54.7510	55.0472	55.3568 (39)
Average = Sum(39)m / 12 =												54.8967 (39)
HLP	1.1055	1.1022	1.0989	1.0834	1.0805	1.0671	1.0671	1.0646	1.0723	1.0805	1.0864	1.0925 (40)
HLP (average)												1.0834 (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												1.7098 (42)
Average daily hot water use (litres/day)												74.8087 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	82.2896	79.2972	76.3049	73.3125	70.3202	67.3278	67.3278	70.3202	73.3125	76.3049	79.2972	82.2896 (44)
Energy content (annual)	122.0331	106.7309	110.1367	96.0199	92.1334	79.5041	73.6722	84.5399	85.5496	99.6998	108.8302	118.1825 (45)
Distribution loss (46)m = 0.15 x (45)m												1177.0324 (45)
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Total storage loss	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)

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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	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Heat gains from water heating, kWh/month	25.9320	22.6803	23.4041	20.4042	19.5783	16.8946	15.6553	17.9647	18.1793	21.1862	23.1264	(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	85.4920	85.4920	85.4920	85.4920	85.4920	85.4920	85.4920	85.4920	85.4920	85.4920	85.4920	85.4920	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.9864	12.4226	10.1027	7.6484	5.7173	4.8268	5.2155	6.7793	9.0992	11.5535	13.4846	14.3751	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	148.9739	150.5198	146.6243	138.3310	127.8623	118.0232	111.4501	109.9042	113.7998	122.0930	132.5617	142.4008	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5492	31.5492	31.5492	31.5492	31.5492	31.5492	31.5492	31.5492	31.5492	31.5492	31.5492	31.5492	(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)	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936	(71)
Water heating gains (Table 5)	34.8549	33.7505	31.4571	28.3392	26.3150	23.4647	21.0421	24.1462	25.2490	28.4761	32.1200	33.7551	(72)
Total internal gains	246.4628	245.3405	236.8317	222.9663	208.5422	194.9624	186.3553	189.4773	196.7956	210.7702	226.8140	239.1786	(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						
South			3.2400	46.7521	0.6300	0.7000	0.7700	46.2932 (78)						
West			4.5000	19.6403	0.6300	0.7000	0.7700	27.0104 (80)						
Solar gains			73.3037	128.6546	183.5936	236.0616	269.2755	268.6773	258.5305	234.0689	202.0900	144.4720	88.5521	62.2137 (83)
Total gains			319.7665	373.9951	420.4252	459.0278	477.8176	463.6396	444.8858	423.5461	398.8856	355.2422	315.3661	301.3923 (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	31.1468	31.2416	31.3351	31.7817	31.8667	32.2684	32.2684	32.3439	32.1125	31.8667	31.6952	31.5179	
alpha	3.0765	3.0828	3.0890	3.1188	3.1244	3.1512	3.1512	3.1563	3.1408	3.1244	3.1130	3.1012	
util living area	0.9755	0.9598	0.9314	0.8752	0.7811	0.6393	0.4974	0.5355	0.7345	0.8995	0.9618	0.9793 (86)	
MIT	19.0521	19.3109	19.6985	20.1743	20.5719	20.8430	20.9474	20.9326	20.7415	20.2134	19.5488	19.0089 (87)	
Th 2	19.9963	19.9991	20.0018	20.0144	20.0168	20.0278	20.0278	20.0298	20.0235	20.0168	20.0120	20.0070 (88)	
util rest of house	0.9712	0.9529	0.9193	0.8523	0.7390	0.5683	0.4008	0.4396	0.6720	0.8763	0.9540	0.9756 (89)	
MIT 2	18.2198	18.4767	18.8584	19.3259	19.6949	19.9330	20.0056	19.9994	19.8537	19.3736	18.7240	18.1848 (90)	
Living area fraction									fLA = Living area / (4) =				0.4778 (91)
MIT	18.6175	18.8752	19.2598	19.7312	20.1139	20.3678	20.4556	20.4453	20.2779	19.7749	19.1180	18.5786 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.6175	18.8752	19.2598	19.7312	20.1139	20.3678	20.4556	20.4453	20.2779	19.7749	19.1180	18.5786 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9636	0.9433	0.9086	0.8448	0.7435	0.5945	0.4447	0.4823	0.6896	0.8696	0.9453	0.9688 (94)
Useful gains	308.1335	352.7759	381.9821	387.7997	355.2706	275.6128	197.8484	204.2876	275.0619	308.9060	298.1049	292.0018 (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	802.0164	780.4689	710.4636	594.6073	460.6720	311.8629	208.4690	218.2157	335.6570	502.3350	661.5596	795.9514 (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	367.4489	287.4097	244.3903	148.9015	78.4186	0.0000	0.0000	0.0000	0.0000	143.9112	261.6874	374.9385 (98)
Space heating												1907.1060 (98)
Space heating per m2										(98) / (4) =		37.6378 (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	508.2527	400.1139	409.9685	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8217	0.8791	0.8621	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	417.6092	351.7551	353.4407	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	606.8898	583.7685	559.8832	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	136.2820	172.6180	153.5932	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												462.4932 (104)

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Cooled fraction	FC = cooled area / (4) =										1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	34.0705	43.1545	38.3983	0.0000	0.0000	0.0000 (107)
Space cooling											115.6233 (107)
Space cooling per m2											2.2819 (108)
Energy for space heating											37.6378 (99)
Energy for space cooling											2.2819 (108)
Total											39.9197 (109)
Dwelling Fabric Energy Efficiency (DFEE)											39.9 (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	50.6700 (1b)	x 2.4000 (2b)	= 121.6080 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.6700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 121.6080 (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) = 0.1645 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4145 (18)
Number of sides sheltered					2 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3523 (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	0.4492	0.4404	0.4316	0.3875	0.3787	0.3347	0.3347	0.3259	0.3523	0.3787	0.3963	0.4139 (22b)
Effective ac	0.6009	0.5970	0.5931	0.5751	0.5717	0.5560	0.5560	0.5531	0.5621	0.5717	0.5785	0.5857 (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)			7.7400	1.3258	10.2614		(27)					
Heat Loss Floor			50.6700	0.1300	6.5871		(28a)					
External Wall	36.9600	7.7400	29.2200	0.1800	5.2596		(29a)					
Total net area of external elements Aum(A, m2)			87.6300				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		22.1081		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.5950 (36)					
Total fabric heat loss							(33) + (36) = 28.7031 (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	24.1136	23.9564	23.8024	23.0786	22.9432	22.3128	22.3128	22.1961	22.5556	22.9432	23.2171	23.5035 (38)
	52.8167	52.6595	52.5054	51.7817	51.6463	51.0159	51.0159	50.8992	51.2587	51.6463	51.9202	52.2066 (39)
Average = Sum(39)m / 12 =												51.7810 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0424	1.0393	1.0362	1.0219	1.0193	1.0068	1.0068	1.0045	1.0116	1.0193	1.0247	1.0303 (40)
Days in month												1.0219 (40)
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7098 (42)
Average daily hot water use (litres/day)												74.8087 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	82.2896	79.2972	76.3049	73.3125	70.3202	67.3278	67.3278	70.3202	73.3125	76.3049	79.2972	82.2896 (44)
Energy conte	122.0331	106.7309	110.1367	96.0199	92.1334	79.5041	73.6722	84.5399	85.5496	99.6998	108.8302	118.1825 (45)
Energy content (annual)												Total = Sum(45)m = 1177.0324 (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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25.9320 22.6803 23.4041 20.4042 19.5783 16.8946 15.6553 17.9647 18.1793 21.1862 23.1264 25.1138 (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	85.4920	85.4920	85.4920	85.4920	85.4920	85.4920	85.4920	85.4920	85.4920	85.4920	85.4920	85.4920	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.9864	12.4226	10.1027	7.6484	5.7173	4.8268	5.2155	6.7793	9.0992	11.5535	13.4846	14.3751	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	148.9739	150.5198	146.6243	138.3310	127.8623	118.0232	111.4501	109.9042	113.7998	122.0930	132.5617	142.4008	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5492	31.5492	31.5492	31.5492	31.5492	31.5492	31.5492	31.5492	31.5492	31.5492	31.5492	31.5492	(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)	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936	(71)
Water heating gains (Table 5)	34.8549	33.7505	31.4571	28.3392	26.3150	23.4647	21.0421	24.1462	25.2490	28.4761	32.1200	33.7551	(72)
Total internal gains	246.4628	245.3405	236.8317	222.9663	208.5422	194.9624	186.3553	189.4773	196.7956	210.7702	226.8140	239.1786	(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			
South				3.2400	46.7521	0.6300	0.7000	0.7700	46.2932 (78)			
West				4.5000	19.6403	0.6300	0.7000	0.7700	27.0104 (80)			
Solar gains	73.3037	128.6546	183.5936	236.0616	269.2755	268.6773	258.5305	234.0689	202.0900	144.4720	88.5521	62.2137 (83)
Total gains	319.7665	373.9951	420.4252	459.0278	477.8176	463.6396	444.8858	423.5461	398.8856	355.2422	315.3661	301.3923 (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)													21.0000 (85)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	66.6219	66.8208	67.0169	67.9536	68.1317	68.9736	68.9736	69.1318	68.6469	68.1317	67.7723	67.4005	
alpha	5.4415	5.4547	5.4678	5.5302	5.5421	5.5982	5.5982	5.6088	5.5765	5.5421	5.5182	5.4934	
util living area	0.9974	0.9935	0.9822	0.9449	0.8493	0.6718	0.4991	0.5437	0.7927	0.9633	0.9941	0.9981	(86)
MIT	19.9355	20.0991	20.3406	20.6341	20.8586	20.9714	20.9954	20.9927	20.9287	20.6299	20.2258	19.9082	(87)
Th 2	20.0482	20.0507	20.0533	20.0651	20.0673	20.0776	20.0776	20.0796	20.0737	20.0673	20.0628	20.0581	(88)
util rest of house	0.9966	0.9914	0.9762	0.9261	0.8016	0.5881	0.3974	0.4396	0.7181	0.9469	0.9918	0.9975	(89)
MIT 2	19.0782	19.2429	19.4832	19.7747	19.9740	20.0648	20.0765	20.0775	20.0361	19.7776	19.3795	19.0591	(90)
Living area fraction									fLA = Living area / (4) =				
MIT	19.4878	19.6520	19.8928	20.1853	20.3967	20.4979	20.5155	20.5148	20.4626	20.1848	19.7839	19.4648	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4878	19.6520	19.8928	20.1853	20.3967	20.4979	20.5155	20.5148	20.4626	20.1848	19.7839	19.4648	(93)

8. Space heating requirement

Utilisation	0.9960	0.9903	0.9750	0.9289	0.8198	0.6275	0.4462	0.4896	0.7515	0.9493	0.9910	0.9970	(94)
Useful gains	318.4734	370.3651	409.8938	426.3720	391.6959	290.9269	198.5027	207.3803	299.7721	337.2392	312.5165	300.4932	(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	802.1683	776.8339	703.1969	584.3715	449.1501	300.8888	199.7531	209.4387	326.1378	495.0208	658.5487	796.9220	(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	359.8690	273.1470	218.2175	113.7596	42.7459	0.0000	0.0000	0.0000	0.0000	117.3895	249.1432	369.3430	(98)
Space heating												1743.6147	(98)
Space heating per m ²												34.4112	(99)

8c. Space cooling requirement

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

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	479.5494	377.5176	386.8336	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9288	0.9674	0.9574	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	445.4083	365.2003	370.3733	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	606.8898	583.7685	559.8832	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	116.2667	162.6147	140.9954	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												419.8768	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling kWh													

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	0.0000	0.0000	0.0000	0.0000	0.0000	29.0667	40.6537	35.2488	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling													104.9692 (107)
Space cooling per m2													2.0716 (108)
Energy for space heating													34.4112 (99)
Energy for space cooling													2.0716 (108)
Total													36.4828 (109)
Target Fabric Energy Efficiency (TFEE)													42.0 (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	50.6700 (1b)	x 2.4000 (2b)	= 121.6080 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.6700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 121.6080 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) = 0.1645 (8)
Pressure test					Yes
Measured/design AP50					5.3300
Infiltration rate					0.4310 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3663 (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	0.4030	0.3755	0.3755	0.3572	0.3572	0.3388	0.3388	0.3205	0.3205	0.3480	0.3388	0.3572 (22b)
Effective ac	0.5812	0.5705	0.5705	0.5638	0.5638	0.5574	0.5574	0.5514	0.5514	0.5606	0.5574	0.5638 (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 = 1.20)			7.7400	1.1450	8.8626		(27)
Heat Loss Floor			50.6700	0.1500	7.6005	75.0000	3800.2500 (28a)
External Wall	36.9600	7.7400	29.2200	0.2000	5.8440	9.0000	262.9800 (29a)
Total net area of external elements Aum(A, m ²)			87.6300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	22.3071			(33)
Party Wall			32.6400	0.0000	0.0000	20.0000	652.8000 (32)
Party Ceilings			50.6700			30.0000	1520.1000 (32b)
Internal Walls			61.2900			9.0000	551.6100 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 6787.7400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							133.9597 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.2670 (36)
Total fabric heat loss							(33) + (36) = 31.5741 (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	23.3233	22.8942	22.8942	22.6249	22.6249	22.3691	22.3691	22.1268	22.1268	22.4953	22.3691	22.6249 (38)
Heat transfer coeff	54.8974	54.4683	54.4683	54.1990	54.1990	53.9432	53.9432	53.7009	53.7009	54.0694	53.9432	54.1990 (39)
Average = Sum(39)m / 12 =												54.1443 (39)
HLP	1.0834	1.0750	1.0750	1.0696	1.0696	1.0646	1.0646	1.0598	1.0598	1.0671	1.0646	1.0696 (40)
HLP (average)												1.0686 (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												1.7098 (42)
Average daily hot water use (litres/day)												74.8087 (43)
Daily hot water use	82.2896	79.2972	76.3049	73.3125	70.3202	67.3278	67.3278	70.3202	73.3125	76.3049	79.2972	82.2896 (44)
Energy conte	122.0331	106.7309	110.1367	96.0199	92.1334	79.5041	73.6722	84.5399	85.5496	99.6998	108.8302	118.1825 (45)
Energy content (annual)												Total = Sum(45)m = 1177.0324 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3050	16.0096	16.5205	14.4030	13.8200	11.9256	11.0508	12.6810	12.8324	14.9550	16.3245	17.7274 (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)

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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	(57)
Combi loss	13.9976	12.6284	13.9583	13.4817	13.9121	13.4413	13.8756	13.8992	13.4633	13.9391	13.5199	13.9900 (61)
Total heat required for water heating calculated for each month	136.0306	119.3593	124.0950	109.5016	106.0454	92.9453	87.5478	98.4392	99.0129	113.6390	122.3501	132.1725 (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	136.0306	119.3593	124.0950	109.5016	106.0454	92.9453	87.5478	98.4392	99.0129	113.6390	122.3501	132.1725 (64)
RHI water heating demand	44.0754	38.6451	40.1100	35.2970	34.1124	29.7954	27.9649	31.5843	31.8111	36.6350	39.5660	42.7932 (65)
Heat gains from water heating, kWh/month												1341 (64)
												1341 (64)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	102.5904	102.5904	102.5904	102.5904	102.5904	102.5904	102.5904	102.5904	102.5904	102.5904	102.5904	102.5904	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.9660	31.0565	25.2568	19.1210	14.2932	12.0669	13.0387	16.9483	22.7479	28.8837	33.7115	35.9378	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	222.3492	224.6565	218.8422	206.4642	190.8393	176.1541	166.3434	164.0361	169.8504	182.2284	197.8533	212.5385	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.9689	46.9689	46.9689	46.9689	46.9689	46.9689	46.9689	46.9689	46.9689	46.9689	46.9689	46.9689	(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)	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936	(71)
Water heating gains (Table 5)	59.2411	57.5076	53.9113	49.0237	45.8499	41.3825	37.5872	42.4521	44.1821	49.2406	54.9528	57.5177	(72)
Total internal gains	400.7220	397.3863	382.1760	358.7746	335.1481	313.7692	301.1351	307.6022	320.9461	344.5183	370.6833	390.1598	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF			Access factor Table 6d	Gains W	
South					3.2400	56.7559		0.6300		0.7000			0.7700	56.1989
West					4.5000	25.1925		0.6300		0.7000			0.7700	34.6463 (80)

Solar gains	90.8451	135.7101	195.4583	253.6761	274.6735	301.0775	279.2556	262.9694	225.7899	162.3807	109.3831		72.9888	(83)
Total gains	491.5671	533.0964	577.6343	612.4507	609.8216	614.8467	580.3907	570.5715	546.7360	506.8991	480.0664		463.1486	(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	34.3456	34.6162	34.6162	34.7881	34.7881	34.9531	34.9531	35.1108	35.1108	34.8715	34.9531	34.7881	
alpha	3.2897	3.3077	3.3077	3.3192	3.3192	3.3302	3.3302	3.3407	3.3407	3.3248	3.3302	3.3192	
util living area	0.9244	0.9008	0.8485	0.7580	0.6195	0.4299	0.3025	0.3063	0.5213	0.7528	0.8814	0.9327	(86)
MIT	19.8001	19.9759	20.2825	20.6046	20.8490	20.9677	20.9927	20.9926	20.9366	20.6850	20.2300	19.7768	(87)
Th 2	20.0144	20.0213	20.0213	20.0257	20.0257	20.0298	20.0298	20.0338	20.0338	20.0278	20.0298	20.0257	(88)
util rest of house	0.9119	0.8850	0.8245	0.7206	0.5616	0.3544	0.2155	0.2186	0.4450	0.7060	0.8596	0.9213	(89)
MIT 2	18.9577	19.1315	19.4219	19.7198	19.9272	20.0152	20.0280	20.0319	20.0009	19.7993	19.3855	18.9450	(90)
Living area fraction	19.3602	19.5350	19.8331	20.1425	20.3676	20.4703	20.4890	20.4909	20.4480	20.2225	19.7890	19.3424	(92)
Temperature adjustment	19.3602	19.5350	19.8331	20.1425	20.3676	20.4703	20.4890	20.4909	20.4480	20.2225	19.7890	19.3424	(93)
adjusted MIT	19.3602	19.5350	19.8331	20.1425	20.3676	20.4703	20.4890	20.4909	20.4480	20.2225	19.7890	19.3424	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	443.5159	467.0127	473.3166	444.2480	355.3751	239.3571	149.1990	148.6008	261.6812	362.9655	409.7470	422.3191	(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	766.3770	742.6722	666.3164	549.7158	393.8994	246.5349	150.4455	149.8747	276.4513	444.5855	614.3593	750.2467	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	240.2087	185.2432	143.5919	75.9368	28.6621	0.0000	0.0000	0.0000	0.0000	60.7253	147.3208	243.9782	(98)
Space heating												1125.6669	(98)
RHI space heating demand												1126	(98)

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1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.6700 (1b)	x 2.4000 (2b)	= 121.6080 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.6700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 121.6080 (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) = 0.1645 (8)
Measured/design AP50					Yes
Infiltration rate					5.3300
Number of sides sheltered					0.4310 (18)
					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3663 (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	0.4671	0.4579	0.4487	0.4030	0.3938	0.3480	0.3480	0.3388	0.3663	0.3938	0.4121	0.4304 (22b)
Effective ac	0.6091	0.6048	0.6007	0.5812	0.5775	0.5606	0.5606	0.5574	0.5671	0.5775	0.5849	0.5926 (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 = 1.20)			7.7400	1.1450	8.8626		(27)
Heat Loss Floor			50.6700	0.1500	7.6005	75.0000	3800.2500 (28a)
External Wall	36.9600	7.7400	29.2200	0.2000	5.8440	9.0000	262.9800 (29a)
Total net area of external elements Aum(A, m ²)			87.6300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	22.3071			(33)
Party Wall			32.6400	0.0000	0.0000	20.0000	652.8000 (32)
Party Ceilings			50.6700			30.0000	1520.1000 (32b)
Internal Walls			61.2900			9.0000	551.6100 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 6787.7400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							133.9597 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.2670 (36)
Total fabric heat loss							(33) + (36) = 31.5741 (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	24.4424	24.2724	24.1058	23.3233	23.1769	22.4953	22.4953	22.3691	22.7579	23.1769	23.4731	23.7827 (38)
Heat transfer coeff	56.0165	55.8465	55.6799	54.8974	54.7510	54.0694	54.0694	53.9432	54.3320	54.7510	55.0472	55.3568 (39)
Average = Sum(39)m / 12 =												54.8967 (39)
HLP	1.1055	1.1022	1.0989	1.0834	1.0805	1.0671	1.0671	1.0646	1.0723	1.0805	1.0864	1.0925 (40)
HLP (average)												1.0834 (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												1.7098 (42)
Average daily hot water use (litres/day)												74.8087 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	82.2896	79.2972	76.3049	73.3125	70.3202	67.3278	67.3278	70.3202	73.3125	76.3049	79.2972	82.2896 (44)
Energy content (annual)	122.0331	106.7309	110.1367	96.0199	92.1334	79.5041	73.6722	84.5399	85.5496	99.6998	108.8302	118.1825 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3050	16.0096	16.5205	14.4030	13.8200	11.9256	11.0508	12.6810	12.8324	14.9550	16.3245	17.7274 (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)

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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 (57)
Combi loss	13.9976	12.6284	13.9583	13.4817	13.9121	13.4413	13.8756	13.8992	13.4633	13.9391	13.5199	13.9900 (61)
Total heat required for water heating calculated for each month	136.0306	119.3593	124.0950	109.5016	106.0454	92.9453	87.5478	98.4392	99.0129	113.6390	122.3501	132.1725 (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	136.0306	119.3593	124.0950	109.5016	106.0454	92.9453	87.5478	98.4392	99.0129	113.6390	122.3501	132.1725 (64)
Heat gains from water heating, kWh/month	44.0754	38.6451	40.1100	35.2970	34.1124	29.7954	27.9649	31.5843	31.8111	36.6350	39.5660	42.7932 (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	102.5904	102.5904	102.5904	102.5904	102.5904	102.5904	102.5904	102.5904	102.5904	102.5904	102.5904	102.5904 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.9660	31.0565	25.2568	19.1210	14.2932	12.0669	13.0387	16.9483	22.7479	28.8837	33.7115	35.9378 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	222.3492	224.6565	218.8422	206.4642	190.8393	176.1541	166.3434	164.0361	169.8504	182.2284	197.8533	212.5385 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.9689	46.9689	46.9689	46.9689	46.9689	46.9689	46.9689	46.9689	46.9689	46.9689	46.9689	46.9689 (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)	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936 (71)
Water heating gains (Table 5)	59.2411	57.5076	53.9113	49.0237	45.8499	41.3825	37.5872	42.4521	44.1821	49.2406	54.9528	57.5177 (72)
Total internal gains	400.7220	397.3863	382.1760	358.7746	335.1481	313.7692	301.1351	307.6022	320.9461	344.5183	370.6833	390.1598 (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		
South			3.2400	46.7521		0.6300		0.7000	0.7700	46.2932 (78)		
West			4.5000	19.6403		0.6300		0.7000	0.7700	27.0104 (80)		
Solar gains	73.3037	128.6546	183.5936	236.0616	269.2755	268.6773	258.5305	234.0689	202.0900	144.4720	88.5521	62.2137 (83)
Total gains	474.0257	526.0408	565.7696	594.8362	604.4236	582.4465	559.6656	541.6710	523.0361	488.9904	459.2355	452.3735 (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	33.6594	33.7619	33.8629	34.3456	34.4374	34.8715	34.8715	34.9531	34.7030	34.4374	34.2521	34.0605
alpha	3.2440	3.2508	3.2575	3.2897	3.2958	3.3248	3.3248	3.3302	3.3135	3.2958	3.2835	3.2707
util living area	0.9424	0.9191	0.8795	0.8073	0.6977	0.5464	0.4105	0.4390	0.6284	0.8219	0.9157	0.9490 (86)
MIT	19.5505	19.7660	20.0796	20.4506	20.7387	20.9166	20.9755	20.9690	20.8616	20.4995	19.9722	19.5094 (87)
Th 2	19.9963	19.9991	20.0018	20.0144	20.0168	20.0278	20.0278	20.0298	20.0235	20.0168	20.0120	20.0070 (88)
util rest of house	0.9330	0.9063	0.8603	0.7765	0.6495	0.4769	0.3255	0.3536	0.5613	0.7871	0.9003	0.9406 (89)
MIT 2	18.7004	18.9110	19.2142	19.5719	19.8293	19.9806	20.0183	20.0170	19.9389	19.6263	19.1253	18.6688 (90)
Living area fraction	19.1065	19.3196	19.6277	19.9917	20.2638	20.4279	20.4757	20.4719	20.3798	20.0435	19.5299	19.0704 (92)
MIT	19.1065	19.3196	19.6277	19.9917	20.2638	20.4279	20.4757	20.4719	20.3798	20.0435	19.5299	19.0704 (93)
Temperature adjustment												0.0000
adjusted MIT	19.1065	19.3196	19.6277	19.9917	20.2638	20.4279	20.4757	20.4719	20.3798	20.0435	19.5299	19.0704 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9231	0.8961	0.8523	0.7758	0.6623	0.5064	0.3654	0.3933	0.5869	0.7881	0.8916	0.9311 (94)
Ext temp.	437.5516	471.4026	482.1786	461.4548	400.3091	294.9332	204.4803	213.0540	306.9730	385.3933	409.4327	421.1963 (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	829.4109	805.2821	730.9492	608.9081	468.8763	315.1090	209.5545	219.6491	341.1935	517.0433	684.2334	823.1796 (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	291.5433	224.3670	185.0854	106.1664	51.0140	0.0000	0.0000	0.0000	0.0000	97.9476	197.8565	299.0756 (98)
Space heating per m2												1453.0557 (98)
										(98) / (4) =		28.6768 (99)

8c. Space cooling requirement

Not applicable

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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													1605.5864 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	291.5433	224.3670	185.0854	106.1664	51.0140	0.0000	0.0000	0.0000	0.0000	97.9476	197.8565	299.0756	(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)	322.1472	247.9194	204.5142	117.3109	56.3691	0.0000	0.0000	0.0000	0.0000	108.2294	218.6259	330.4702	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	136.0306	119.3593	124.0950	109.5016	106.0454	92.9453	87.5478	98.4392	99.0129	113.6390	122.3501	132.1725	(64)
Efficiency of water heater	89.4568	89.3625	89.1878	88.8465	88.3143	87.3000	87.3000	87.3000	87.3000	88.7527	89.2500	87.3000	(216)
(217)m													89.4946 (217)
Fuel for water heating, kWh/month	152.0630	133.5675	139.1389	123.2481	120.0773	106.4666	100.2839	112.7597	113.4169	128.0400	137.0870	147.6877	(219)
Water heating fuel used													1513.8365 (219)
Annual totals kWh/year													
Space heating fuel - main system													1605.5864 (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)													247.0042 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses													3441.4270 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1605.5864	3.4800	55.8744 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1513.8365	3.4800	52.6815 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	247.0042	13.1900	32.5799 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	0.0000	13.1900	0.0000 (252)
Total energy cost			271.0283 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.1898 (257)
SAP value		83.4017
SAP rating (Section 12)		83 (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	1605.5864	0.2160	346.8067 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1513.8365	0.2160	326.9887 (264)
Space and water heating			673.7953 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	247.0042	0.5190	128.1952 (268)
Energy saving/generation technologies			
PV Unit	-287.4700	0.5190	-149.1969 (269)
Total kg/year			691.7186 (272)
CO2 emissions per m2			13.6500 (273)
EI value			90.3115
EI rating			90 (274)
EI band			B

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	$3.48 / 0.8849 = 3.933$, stars = 4
Water heating environmental impact	$0.216 / 0.8849 = 0.2441$, stars = 4

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

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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	50.6700 (1b)	x 2.4000 (2b)	= 121.6080 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.6700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 121.6080 (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 20.0000 / (5) = 0.1645 (8)
Pressure test					Yes
Measured/design AP50					5.3300
Infiltration rate					0.4310 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3663 (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	0.4030	0.3755	0.3755	0.3572	0.3572	0.3388	0.3388	0.3205	0.3205	0.3480	0.3388	0.3572 (22b)
Effective ac	0.5812	0.5705	0.5705	0.5638	0.5638	0.5574	0.5574	0.5514	0.5514	0.5606	0.5574	0.5638 (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 = 1.20)			7.7400	1.1450	8.8626		(27)
Heat Loss Floor			50.6700	0.1500	7.6005	75.0000	3800.2500 (28a)
External Wall	36.9600	7.7400	29.2200	0.2000	5.8440	9.0000	262.9800 (29a)
Total net area of external elements Aum(A, m ²)			87.6300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	22.3071			(33)
Party Wall			32.6400	0.0000	0.0000	20.0000	652.8000 (32)
Party Ceilings			50.6700			30.0000	1520.1000 (32b)
Internal Walls			61.2900			9.0000	551.6100 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 6787.7400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							133.9597 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.2670 (36)
Total fabric heat loss							(33) + (36) = 31.5741 (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	23.3233	22.8942	22.8942	22.6249	22.6249	22.3691	22.3691	22.1268	22.1268	22.4953	22.3691	22.6249 (38)
Heat transfer coeff	54.8974	54.4683	54.4683	54.1990	54.1990	53.9432	53.9432	53.7009	53.7009	54.0694	53.9432	54.1990 (39)
Average = Sum(39)m / 12 =												54.1443 (39)
HLP	1.0834	1.0750	1.0750	1.0696	1.0696	1.0646	1.0646	1.0598	1.0598	1.0671	1.0646	1.0696 (40)
HLP (average)												1.0686 (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												1.7098 (42)
Average daily hot water use (litres/day)												74.8087 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	82.2896	79.2972	76.3049	73.3125	70.3202	67.3278	67.3278	70.3202	73.3125	76.3049	79.2972	82.2896 (44)
Energy content (annual)	122.0331	106.7309	110.1367	96.0199	92.1334	79.5041	73.6722	84.5399	85.5496	99.6998	108.8302	118.1825 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3050	16.0096	16.5205	14.4030	13.8200	11.9256	11.0508	12.6810	12.8324	14.9550	16.3245	17.7274 (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)

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 (57)
Combi loss	13.9976	12.6284	13.9583	13.4817	13.9121	13.4413	13.8756	13.8992	13.4633	13.9391	13.5199	13.9900 (61)
Total heat required for water heating calculated for each month	136.0306	119.3593	124.0950	109.5016	106.0454	92.9453	87.5478	98.4392	99.0129	113.6390	122.3501	132.1725 (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	136.0306	119.3593	124.0950	109.5016	106.0454	92.9453	87.5478	98.4392	99.0129	113.6390	122.3501	132.1725 (64)
Heat gains from water heating, kWh/month	44.0754	38.6451	40.1100	35.2970	34.1124	29.7954	27.9649	31.5843	31.8111	36.6350	39.5660	42.7932 (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	102.5904	102.5904	102.5904	102.5904	102.5904	102.5904	102.5904	102.5904	102.5904	102.5904	102.5904	102.5904 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.9660	31.0565	25.2568	19.1210	14.2932	12.0669	13.0387	16.9483	22.7479	28.8837	33.7115	35.9378 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	222.3492	224.6565	218.8422	206.4642	190.8393	176.1541	166.3434	164.0361	169.8504	182.2284	197.8533	212.5385 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.9689	46.9689	46.9689	46.9689	46.9689	46.9689	46.9689	46.9689	46.9689	46.9689	46.9689	46.9689 (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)	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936	-68.3936 (71)
Water heating gains (Table 5)	59.2411	57.5076	53.9113	49.0237	45.8499	41.3825	37.5872	42.4521	44.1821	49.2406	54.9528	57.5177 (72)
Total internal gains	400.7220	397.3863	382.1760	358.7746	335.1481	313.7692	301.1351	307.6022	320.9461	344.5183	370.6833	390.1598 (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
South					3.2400	56.7559	0.6300	0.7000			0.7700	56.1989 (78)
West					4.5000	25.1925	0.6300	0.7000			0.7700	34.6463 (80)

Solar gains	90.8451	135.7101	195.4583	253.6761	274.6735	301.0775	279.2556	262.9694	225.7899	162.3807	109.3831	72.9888 (83)
Total gains	491.5671	533.0964	577.6343	612.4507	609.8216	614.8467	580.3907	570.5715	546.7360	506.8991	480.0664	463.1486 (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	34.3456	34.6162	34.6162	34.7881	34.7881	34.9531	34.9531	35.1108	35.1108	34.8715	34.9531	34.7881
alpha	3.2897	3.3077	3.3077	3.3192	3.3192	3.3302	3.3302	3.3407	3.3407	3.3248	3.3302	3.3192
util living area	0.9244	0.9008	0.8485	0.7580	0.6195	0.4299	0.3025	0.3063	0.5213	0.7528	0.8814	0.9327 (86)
MIT	19.8001	19.9759	20.2825	20.6046	20.8490	20.9677	20.9927	20.9926	20.9366	20.6850	20.2300	19.7768 (87)
Th 2	20.0144	20.0213	20.0213	20.0257	20.0257	20.0298	20.0298	20.0338	20.0338	20.0278	20.0298	20.0257 (88)
util rest of house	0.9119	0.8850	0.8245	0.7206	0.5616	0.3544	0.2155	0.2186	0.4450	0.7060	0.8596	0.9213 (89)
MIT 2	18.9577	19.1315	19.4219	19.7198	19.9272	20.0152	20.0280	20.0319	20.0009	19.7993	19.3855	18.9450 (90)
Living area fraction	19.3602	19.5350	19.8331	20.1425	20.3676	20.4703	20.4890	20.4909	20.4480	20.2225	19.7890	19.3424 (92)
MIT	19.3602	19.5350	19.8331	20.1425	20.3676	20.4703	20.4890	20.4909	20.4480	20.2225	19.7890	19.3424 (93)
Temperature adjustment												0.0000
adjusted MIT	19.3602	19.5350	19.8331	20.1425	20.3676	20.4703	20.4890	20.4909	20.4480	20.2225	19.7890	19.3424 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9022	0.8760	0.8194	0.7254	0.5828	0.3893	0.2571	0.2604	0.4786	0.7161	0.8535	0.9118 (94)
Ext temp.	443.5159	467.0127	473.3166	444.2480	355.3751	239.3571	149.1990	148.6008	261.6812	362.9655	409.7470	422.3191 (95)
Heat loss rate W	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)
Month fracti	766.3770	742.6722	666.3164	549.7158	393.8994	246.5349	150.4455	149.8747	276.4513	444.5855	614.3593	750.2467 (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	240.2087	185.2432	143.5919	75.9368	28.6621	0.0000	0.0000	0.0000	0.0000	60.7253	147.3208	243.9782 (98)
Space heating per m2												1125.6669 (98)
										(98) / (4) =		22.2156 (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													1243.8308 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	240.2087	185.2432	143.5919	75.9368	28.6621	0.0000	0.0000	0.0000	0.0000	60.7253	147.3208	243.9782	(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)	265.4240	204.6887	158.6651	83.9081	31.6708	0.0000	0.0000	0.0000	0.0000	67.0997	162.7854	269.5891	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	136.0306	119.3593	124.0950	109.5016	106.0454	92.9453	87.5478	98.4392	99.0129	113.6390	122.3501	132.1725	(64)
Efficiency of water heater	89.3163	89.2185	88.9879	88.5826	87.9618	87.3000	87.3000	87.3000	87.3000	88.3885	89.0196	87.3000	(216)
Fuel for water heating, kWh/month	152.3021	133.7831	139.4516	123.6152	120.5585	106.4666	100.2839	112.7597	113.4169	128.5677	137.4418	147.9280	(219)
Water heating fuel used												1516.5751	(219)
Annual totals kWh/year													
Space heating fuel - main system												1243.8308	(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)													247.0042 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses													3082.4102 (238)

10a. Fuel costs - using BEDF prices (455)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1243.8308	3.9700	49.3801 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1516.5751	3.9700	60.2080 (247)
Pumps and fans for heating	75.0000	18.2700	13.7025 (249)
Energy for lighting	247.0042	18.2700	45.1277 (250)
Additional standing charges			90.0000 (251)
Energy saving/generation technologies			
PV Unit	0.0000	18.2700	0.0000 (252)
Total energy cost			258.4183 (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	1243.8308	0.2160	268.6675 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1516.5751	0.2160	327.5802 (264)
Space and water heating			596.2477 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	247.0042	0.5190	128.1952 (268)
Energy saving/generation technologies			
PV Unit	-287.4700	0.5190	-149.1969 (269)
Total kg/year			614.1709 (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	1243.8308	1.2200	1517.4736 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1516.5751	1.2200	1850.2217 (264)
Space and water heating			3367.6953 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	247.0042	3.0700	758.3029 (268)
Energy saving/generation technologies			
PV Unit	-287.4700	3.0700	-882.5329 (269)
Primary energy kWh/year			3473.7153 (272)
Primary energy kWh/m2/year			68.5557 (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 83
Current environmental impact rating: B 90

(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:	SAP change	Cost change	CO2 change
(none)			

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

Potential energy efficiency rating: B 83
Potential environmental impact rating: B 90

Fuel prices for cost data on this page from database revision number 455 TEST (23 Jan 2020)
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	£59	£59	£0
Mains gas	£200	£200	£0
Space heating	£153	£153	£0
Water heating	£60	£60	£0
Lighting	£45	£45	£0
Total cost of fuels	£259	£259	£0
Total cost of uses	£258	£258	£0
Delivered energy	61 kWh/m²	61 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.6 tonnes	0.6 tonnes	0.0 tonnes
CO2 emissions per m²	12 kg/m²	12 kg/m²	0 kg/m²
Primary energy	69 kWh/m²	69 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	MidTerrace Flat
Number of storeys	1
Cross ventilation possible	Yes
SAP Region	Southern England
Front of dwelling faces	East
Overshading	Average or unknown
Thermal mass parameter	134.0 (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	240.78 (P1)
Transmission heat loss coefficient	31.57 (37)
Summer heat loss coefficient	272.36 (P2)

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

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

[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Shading	Gains W
South	3.2400	118.5567	0.6300	0.7000	0.9000	137.2128
West	4.5000	125.2818	0.6300	0.7000	0.9000	201.3836
total:						338.5964

Solar gains	Jun	Jul	Aug	
	361	339	312	(P3)
Internal gains	311	298	305	
Total summer gains	672	637	617	(P5)
Summer gain/loss ratio	2.47	2.34	2.26	(P6)
Summer external temperature	15.40	17.30	17.30	
Thermal mass temperature increment (TMP = 134.0)	1.06	1.06	1.06	
Threshold temperature	18.93	20.70	20.63	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	
Assessment of likelihood of high internal temperature:	Slight			