



SAP Report Submission for Building Regulations Compliance

Client: Highwood Construction Ltd

Project: 97 Highwood Avenue
EASTLEIGH, SO50 9QY

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

Report Issue Date: 31/01/2023

EXCELLENCE
IN ENERGY
ASSESSMENT

BLOCK COMPLIANCE

Calculation Type: New Build (As Built)

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

Block Compliance Report - DER

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

Block Compliance Report - DFEE

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

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Built)

Property Reference	SAP-0796 (3B4A) - Plot 202	Issued on Date	31/01/2023
Assessment Reference	AB	Prop Type Ref	2B3P Ground Floor
Property	97 Highwood Avenue, EASTLEIGH, SO50 9QY		
SAP Rating	83 B	DER	15.23
Environmental	90 B	TER	19.16
CO ₂ Emissions (t/year)	0.70	% DER<TER	20.50
General Requirements Compliance	Pass	DFEE	43.10
		TFEE	48.06
		% DFEE<TFEE	10.32
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)	19.16	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	15.23	kgCO ₂ /m ²	Pass
	-3.93 (-20.5%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	48.06	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	43.10	kWh/m ² /yr	
	-5.0 (-10.4%)	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	0.16 (max. 0.25)	0.16 (max. 0.70)	Pass
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	2.13 (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 East

3.24 m², No overhang

Windows facing West

5.55 m², No overhang

Air change rate

8.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

2.13 (measured in this dwelling)

Maximum

10.0

Pass

10 Key features

Party wall U-value

0.00

W/m²K

Air permeability

2.1

m³/m²h

Photovoltaic array

371.38

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 202	Issued on Date	31/01/2023
Assessment Reference	AB	Prop Type Ref	2B3P Ground Floor
Property	97 Highwood Avenue, EASTLEIGH, SO50 9QY		

SAP Rating	83 B	DER	15.23	TER	19.16
Environmental	90 B	% DER<TER	20.50		
CO ₂ Emissions (t/year)	0.70	DFEE	43.10	TFEE	48.06
General Requirements Compliance	Pass	% DFEE<TFEE	10.32		

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

6.0 Measurements				
	Ground Floor:	Heat Loss Perimeter 24.10 m	Internal Floor Area 58.42 m ²	Average Storey Height 2.35 m

7.0 Living Area	21.94	m ²
8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	131.92	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	56.64	47.85

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	17.08	

9.2 Internal Walls						
Description	Construction			Kappa (kJ/m ² K)	Area (m ²)	
Internal Walls	Plasterboard on timber frame			9.00	88.92	

10.1 Party Ceilings						
Description	Construction			Kappa (kJ/m ² K)	Area (m ²)	
Party Ceilings	Timber I-joists, carpeted			20.00	58.42	

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	0.16	75.00	58.42

12.0 Opening Types

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

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
East	Window	[1] External Wall	East	None	0.00					3.24	
West	Window	[1] External Wall	West	None	0.00					5.55	

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)	6.46	0.300	Yes
Table K1 - Approved	E3 Sill	6.46	0.040	Yes
Table K1 - Approved	E4 Jamb	13.60	0.050	Yes
Table K1 - Approved	E5 Ground floor (normal)	24.10	0.160	Yes
Table K1 - Approved	E7 Party floor between dwellings (in blocks of flats)	24.10	0.070	No
Table K1 - Approved	E16 Corner (normal)	9.40	0.090	No
Table K1 - Approved	E17 Corner (inverted – internal area greater than external area)	4.70	-0.090	No
Table K1 - Approved	E18 Party wall between dwellings	4.70	0.060	Yes
Table K1 - Default	P1 Party wall - Ground floor	7.43	0.160	No
Table K1 - Default	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.43	0.000	No

Y-value	0.090	W/m²K
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18.0 Pressure Testing

Designed AP ₅₀	Yes	
Property Tested ?	6.00	m³/(h.m²) @ 50 Pa
As Built AP ₅₀	Yes	
	2.13	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
Number of intermittent fans				2
Number of passive vents				0
Number of flueless gas fires				0

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

21.0 Fixed Cooling System

No

22.0 Lighting

Internal

Total number of light fittings

9

Total number of L.E.L. fittings

9

Percentage of L.E.L. fittings

100.00

%

External

External lights fitted

No

23.0 Electricity Tariff

Standard

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

None

Community Heating

None

28.0 Water Heating

HWP From main heating 1

Water Heating

Main Heating 1

Flue Gas Heat Recovery System

No

Waste Water Heat Recovery

No

Instantaneous System 1

Waste Water Heat Recovery

No

Instantaneous System 2

Waste Water Heat Recovery

No

Storage System

Solar Panel

No

Water use <= 125 litres/person/day

Yes

SAP Code

901

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)



29.0 Hot Water Cylinder	None	
32.0 Photovoltaic Unit	More Dwellings, One Block	
Apportioned	371.38	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 202		Issued on Date	31/01/2023
Assessment Reference	AB	Prop Type Ref	2B3P Ground Floor	
Project	97 Highwood Avenue, EASTLEIGH, SO50 9QY			
Calculation Type	New Build (As Built)			

SAP Rating	83 B	DER	15.23	TER	19.16
Environmental	90 B	% DER<TER	20.50		
CO ₂ Emissions (t/year)	0.70	DFEE	43.10	TFEE	48.06
General Requirements Compliance	Pass	% DFEE<TFEE	10.32		

Assessor Details	Mr. Scott Spearing, Scott Spearing, Tel: 01489 565920, scott@beatsolutions.co.uk	Assessor ID	A808-0004
Client	Highwood Construction Ltd, HIGHWOOD		

Building Elements

Wall External Walls - Stoneham - TF

Wall Type: Timber framed Wall with I-beams

U-VALUE CALCULATOR REPORT

Layer	Description	Thickness (mm)	Conductivity (W/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 202	Issued on Date	31/01/2023
Assessment Reference	AB	Prop Type Ref	2B3P Ground Floor
Project	97 Highwood Avenue, EASTLEIGH, SO50 9QY		
Calculation Type	New Build (As Built)		

SAP Rating	83 B	DER	15.23	TER	19.16
Environmental	90 B	% DER<TER	20.50		
CO ₂ Emissions (t/year)	0.70	DFEE	43.10	TFEE	48.06
General Requirements Compliance	Pass	% DFEE<TFEE	10.32		

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Building Elements

Floor Ground Floor - Stoneham - Ground Floor

Floor Type: Suspended Floor

Area = 58.42 m², Perimeter = 24.10 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) = 0.16 W/m² K

Unheated space: None

Total thickness: 325 mm

U-value: 0.16 W/m² K

Kappa: n/a

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	SAP-0796 (3B4A) - Plot 202				Issued on Date	31/01/2023
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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 58 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) 19.16 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.23 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)48.1 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)43.1 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.20 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.16 (max. 0.25)	0.16 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 2.13 (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 East: 3.24 m², No overhang
Windows facing West: 5.55 m², No overhang
Air change rate: 8.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Air permeability 2.1 m³/m²h
Photovoltaic array 371.38 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	58.4200 (1b)	x 2.3500 (2b)	= 137.2870 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	58.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 137.2870 (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) = 0.1457 (8)
Pressure test					Yes
Measured/design AP50					2.1300
Infiltration rate					0.2522 (18)
Number of sides sheltered					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.2333 (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	0.2974	0.2916	0.2858	0.2566	0.2508	0.2216	0.2216	0.2158	0.2333	0.2508	0.2624	0.2741 (22b)
	0.5442	0.5425	0.5408	0.5329	0.5314	0.5246	0.5246	0.5233	0.5272	0.5314	0.5344	0.5376 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.40)			8.7900	1.3258	11.6534		(27)
Heat Loss Floor			58.4200	0.1600	9.3472	75.0000	4381.5000 (28a)
External Wall	56.6400	8.7900	47.8500	0.2000	9.5700	9.0000	430.6500 (29a)
Total net area of external elements Aum(A, m ²)			115.0600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	30.5706			(33)
Party Wall			17.0800	0.0000	0.0000	20.0000	341.6000 (32)
Party Ceilings			58.4200			30.0000	1752.6000 (32b)
Internal Walls			88.9200			9.0000	800.2800 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	7706.6300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							131.9177 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.3132 (36)
Total fabric heat loss						(33) + (36) =	40.8838 (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	24.6561	24.5783	24.5020	24.1438	24.0768	23.7648	23.7648	23.7070	23.8849	24.0768	24.2124	24.3541 (38)
Heat transfer coeff	65.5399	65.4621	65.3858	65.0276	64.9606	64.6486	64.6486	64.5908	64.7688	64.9606	65.0962	65.2379 (39)
Average = Sum(39)m / 12 =												65.0273 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1219	1.1205	1.1192	1.1131	1.1120	1.1066	1.1066	1.1056	1.1087	1.1120	1.1143	1.1167 (40)
HLP (average)												1.1131 (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												1.9366 (42)
Average daily hot water use (litres/day)												80.1949 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	88.2144	85.0066	81.7988	78.5910	75.3832	72.1754	72.1754	75.3832	78.5910	81.7988	85.0066	88.2144 (44)
Energy conte	130.8194	114.4155	118.0665	102.9332	98.7669	85.2283	78.9766	90.6268	91.7091	106.8782	116.6659	126.6916 (45)
Energy content (annual)										Total = Sum(45)m =		1261.7778 (45)
Distribution loss (46)m = 0.15 x (45)m	19.6229	17.1623	17.7100	15.4400	14.8150	12.7842	11.8465	13.5940	13.7564	16.0317	17.4999	19.0037 (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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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	14.0335	12.6587	13.9883	13.5070	13.9352	13.4604	13.8934	13.9205	13.4858	13.9664	13.5508	14.0248 (61)
Total heat required for water heating calculated for each month	144.8529	127.0742	132.0548	116.4402	112.7021	98.6888	92.8699	104.5473	105.1949	120.8445	130.2167	140.7164 (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	144.8529	127.0742	132.0548	116.4402	112.7021	98.6888	92.8699	104.5473	105.1949	120.8445	130.2167	140.7164 (64)
Heat gains from water heating, kWh/month	47.0058	41.2078	42.7542	37.6020	36.3238	31.7035	29.7330	33.6135	33.8647	39.0286	42.1791	45.6311 (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	96.8313	96.8313	96.8313	96.8313	96.8313	96.8313	96.8313	96.8313	96.8313	96.8313	96.8313	96.8313 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.9113	14.1323	11.4931	8.7010	6.5041	5.4911	5.9333	7.7123	10.3515	13.1435	15.3405	16.3535 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	168.9453	170.6984	166.2806	156.8756	145.0034	133.8453	126.3910	124.6379	129.0557	138.4607	150.3328	161.4910 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.6831	32.6831	32.6831	32.6831	32.6831	32.6831	32.6831	32.6831	32.6831	32.6831	32.6831	32.6831 (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)	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651 (71)
Water heating gains (Table 5)	63.1799	61.3212	57.4653	52.2251	48.8223	44.0327	39.9638	45.1795	47.0344	52.4578	58.5821	61.3322 (72)
Total internal gains	303.0858	301.2012	290.2884	272.8511	255.3793	238.4185	227.3375	232.5791	241.4909	259.1114	279.3048	294.2261 (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		
East					3.2400	19.6403	0.6300	0.7000	0.7700	19.4475 (76)		
West					5.5500	19.6403	0.6300	0.7000	0.7700	33.3129 (80)		

Solar gains	52.7604	103.2105	169.9730	247.8955	303.8053	310.9988	296.0835	254.3313	197.6857	122.4680	65.7860	43.3876 (83)
Total gains	355.8462	404.4118	460.2615	520.7466	559.1846	549.4172	523.4210	486.9104	439.1766	381.5794	345.0908	337.6137 (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	32.6630	32.7018	32.7400	32.9203	32.9543	33.1133	33.1133	33.1430	33.0519	32.9543	32.8857	32.8142
alpha	3.1775	3.1801	3.1827	3.1947	3.1970	3.2076	3.2076	3.2095	3.2035	3.1970	3.1924	3.1876
util living area	0.9808	0.9702	0.9458	0.8901	0.7903	0.6456	0.5054	0.5545	0.7687	0.9229	0.9710	0.9837 (86)
MIT	19.0716	19.2880	19.6725	20.1615	20.5792	20.8466	20.9483	20.9295	20.7162	20.1610	19.5229	19.0210 (87)
Th 2	19.9830	19.9841	19.9852	19.9901	19.9911	19.9954	19.9954	19.9962	19.9938	19.9911	19.9892	19.9872 (88)
util rest of house	0.9773	0.9646	0.9354	0.8681	0.7473	0.5715	0.4040	0.4528	0.7062	0.9029	0.9646	0.9806 (89)
MIT 2	18.2238	18.4384	18.8171	19.2923	19.6778	19.9050	19.9745	19.9655	19.8079	19.3022	18.6770	18.1767 (90)
Living area fraction	18.5422	18.7574	19.1383	19.6187	20.0163	20.2586	20.3402	20.3276	20.1490	19.6247	18.9947	18.4938 (92)
Temperature adjustment	18.5422	18.7574	19.1383	19.6187	20.0163	20.2586	20.3402	20.3276	20.1490	19.6247	18.9947	18.4938 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9706	0.9560	0.9247	0.8588	0.7484	0.5922	0.4402	0.4881	0.7169	0.8941	0.9565	0.9746 (94)
Ext temp.	345.3802	386.6359	425.6050	447.2135	418.5160	325.3462	230.4325	237.6636	314.8578	341.1589	330.0881	329.0442 (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	933.4308	907.1363	826.3678	697.0136	540.2348	365.8218	241.7997	253.6841	391.7865	586.2521	774.2978	932.4978 (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	437.5096	349.7762	298.1675	179.8561	90.5588	0.0000	0.0000	0.0000	0.0000	182.3493	319.8310	448.9694 (98)
Space heating per m2												2307.0181 (98)
										(98) / (4) =		39.4902 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2549.1912 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	437.5096	349.7762	298.1675	179.8561	90.5588	0.0000	0.0000	0.0000	0.0000	182.3493	319.8310	448.9694	(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)	483.4360	386.4931	329.4669	198.7360	100.0650	0.0000	0.0000	0.0000	0.0000	201.4909	353.4045	496.0988	(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	144.8529	127.0742	132.0548	116.4402	112.7021	98.6888	92.8699	104.5473	105.1949	120.8445	130.2167	140.7164	(64)
Efficiency of water heater (217)m	89.6823	89.6245	89.4931	89.2149	88.6973	87.3000	87.3000	87.3000	87.3000	89.1969	89.5502	87.3000	(216)
Fuel for water heating, kWh/month	161.5178	141.7850	147.5587	130.5166	127.0638	113.0455	106.3802	119.7563	120.4982	135.4807	145.4119	156.8477	(219)
Water heating fuel used													1605.8624 (219)
Annual totals kWh/year													
Space heating fuel - main system													2549.1912 (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)													280.9987 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses													4511.0523 (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	2549.1912	0.2160	550.6253 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1605.8624	0.2160	346.8663 (264)
Space and water heating			897.4916 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	280.9987	0.5190	145.8383 (268)
Energy saving/generation technologies			
PV Unit	-371.3800	0.5190	-192.7462 (269)
Total CO2, kg/year			889.5087 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			15.2300 (273)

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

DER			15.2300 ZC1
Total Floor Area		TFA	58.4200
Assumed number of occupants		N	1.9366
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			17.1368 ZC2
CO2 emissions from cooking, equation (L16)			2.8326 ZC3
Total CO2 emissions			35.1994 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			35.1994 ZC8

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Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	58.4200 (1b)	x 2.3500 (2b)	= 137.2870 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	58.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 137.2870 (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) = 0.1457 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3957 (18)
Number of sides sheltered					1 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3660 (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	0.4667	0.4575	0.4484	0.4026	0.3935	0.3477	0.3477	0.3386	0.3660	0.3935	0.4118	0.4301 (22b)
Effective ac	0.6089	0.6047	0.6005	0.5810	0.5774	0.5604	0.5604	0.5573	0.5670	0.5774	0.5848	0.5925 (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)			8.7900	1.3258	11.6534		(27)					
Heat Loss Floor			58.4200	0.1300	7.5946		(28a)					
External Wall	56.6400	8.7900	47.8500	0.1800	8.6130		(29a)					
Total net area of external elements Aum(A, m2)			115.0600				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =			27.8610	(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.1684 (36)					
Total fabric heat loss							(33) + (36) = 36.0294 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 27.5853	Feb 27.3937	Mar 27.2060	Apr 26.3241	May 26.1591	Jun 25.3910	Jul 25.3910	Aug 25.2487	Sep 25.6868	Oct 26.1591	Nov 26.4929	Dec 26.8418 (38)
Heat transfer coeff	63.6147	63.4232	63.2354	62.3535	62.1885	61.4204	61.4204	61.2781	61.7163	62.1885	62.5223	62.8713 (39)
Average = Sum(39)m / 12 =												62.3527 (39)
HLP	Jan 1.0889	Feb 1.0856	Mar 1.0824	Apr 1.0673	May 1.0645	Jun 1.0514	Jul 1.0514	Aug 1.0489	Sep 1.0564	Oct 1.0645	Nov 1.0702	Dec 1.0762 (40)
HLP (average)												1.0673 (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											1.9366 (42)	
Average daily hot water use (litres/day)											80.1949 (43)	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	88.2144	85.0066	81.7988	78.5910	75.3832	72.1754	72.1754	75.3832	78.5910	81.7988	85.0066	88.2144 (44)
Energy conte	130.8194	114.4155	118.0665	102.9332	98.7669	85.2283	78.9766	90.6268	91.7091	106.8782	116.6659	126.6916 (45)
Energy content (annual)	Total = Sum(45)m =										1261.7778 (45)	
Distribution loss (46)m = 0.15 x (45)m	19.6229	17.1623	17.7100	15.4400	14.8150	12.7842	11.8465	13.5940	13.7564	16.0317	17.4999	19.0037 (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	44.9531	39.1263	41.6838	38.7572	38.4144	35.5933	36.7798	38.4144	38.7572	41.6838	41.9211	44.9531 (61)
Total heat required for water heating calculated for each month												

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Solar input	175.7724	153.5418	159.7503	141.6904	137.1813	120.8217	115.7564	129.0412	130.4663	148.5619	158.5869	171.6447 (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	175.7724	153.5418	159.7503	141.6904	137.1813	120.8217	115.7564	129.0412	130.4663	148.5619	158.5869	171.6447 (64)
Heat gains from water heating, kWh/month	54.7357	47.8247	49.6781	43.9146	42.4436	37.2368	35.4547	39.7370	40.1826	45.9579	49.2717	53.3632 (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	96.8313	96.8313	96.8313	96.8313	96.8313	96.8313	96.8313	96.8313	96.8313	96.8313	96.8313	96.8313 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.9113	14.1323	11.4931	8.7010	6.5041	5.4911	5.9333	7.7123	10.3515	13.1435	15.3405	16.3535 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	168.9453	170.6984	166.2806	156.8756	145.0034	133.8453	126.3910	124.6379	129.0557	138.4607	150.3328	161.4910 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.6831	32.6831	32.6831	32.6831	32.6831	32.6831	32.6831	32.6831	32.6831	32.6831	32.6831	32.6831 (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)	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651 (71)
Water heating gains (Table 5)	73.5695	71.1677	66.7716	60.9925	57.0479	51.7177	47.6541	53.4100	55.8091	61.7714	68.4329	71.7248 (72)
Total internal gains	313.4755	311.0478	299.5947	281.6185	263.6048	246.1035	235.0278	240.8096	250.2657	268.4251	289.1556	304.6186 (73)

6. Solar gains

[Jan				Area m2	Solar flux Table 6a W/m2	g	Specific data or Table 6b	Specific data or Table 6c	FF		Access factor Table 6d	Gains W
East				3.2400	19.6403		0.6300		0.7000		0.7700	19.4475 (76)
West				5.5500	19.6403		0.6300		0.7000		0.7700	33.3129 (80)

Solar gains	52.7604	103.2105	169.9730	247.8955	303.8053	310.9988	296.0835	254.3313	197.6857	122.4680	65.7860	43.3876 (83)
Total gains	366.2359	414.2583	469.5677	529.5141	567.4101	557.1023	531.1113	495.1409	447.9514	390.8930	354.9416	348.0062 (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	63.7737	63.9663	64.1562	65.0636	65.2363	66.0521	66.0521	66.2054	65.7354	65.2363	64.8880	64.5278
alpha	5.2516	5.2644	5.2771	5.3376	5.3491	5.4035	5.4035	5.4137	5.3824	5.3491	5.3259	5.3019
util living area	0.9976	0.9948	0.9855	0.9496	0.8504	0.6702	0.5023	0.5574	0.8212	0.9721	0.9950	0.9981 (86)
MIT	19.8669	20.0094	20.2608	20.5893	20.8435	20.9678	20.9943	20.9903	20.9052	20.5644	20.1584	19.8449 (87)
Th 2	20.0099	20.0126	20.0152	20.0276	20.0299	20.0408	20.0408	20.0428	20.0366	20.0299	20.0252	20.0203 (88)
util rest of house	0.9967	0.9931	0.9804	0.9317	0.8018	0.5841	0.3963	0.4475	0.7481	0.9588	0.9930	0.9975 (89)
MIT 2	18.4995	18.7091	19.0753	19.5483	19.8790	20.0197	20.0387	20.0388	19.9616	19.5237	18.9365	18.4750 (90)
Living area fraction									fLA = Living area / (4) =			0.3756 (91)
MIT	19.0130	19.1975	19.5205	19.9393	20.2412	20.3757	20.3975	20.3961	20.3160	19.9145	19.3954	18.9894 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0130	19.1975	19.5205	19.9393	20.2412	20.3757	20.3975	20.3961	20.3160	19.9145	19.3954	18.9894 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9956	0.9911	0.9771	0.9298	0.8134	0.6154	0.4363	0.4890	0.7714	0.9568	0.9912	0.9966 (94)
Useful gains	364.6163	410.5916	458.8327	492.3389	461.5435	342.8426	231.7054	242.1098	345.5542	373.9964	351.8012	346.8151 (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	935.9643	906.7897	823.3593	688.3365	531.1674	354.7487	233.2466	244.8767	383.6274	579.2558	768.7356	929.8307 (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	425.0829	333.4451	271.2078	141.1183	51.8002	0.0000	0.0000	0.0000	0.0000	152.7130	300.1928	433.7636 (98)
Space heating												2109.3237 (98)
Space heating per m2										(98) / (4) =		36.1062 (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													2258.3765	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	425.0829	333.4451	271.2078	141.1183	51.8002	0.0000	0.0000	0.0000	0.0000	152.7130	300.1928	433.7636	(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)	455.1209	357.0076	290.3724	151.0903	55.4606	0.0000	0.0000	0.0000	0.0000	163.5043	321.4055	464.4150	(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	175.7724	153.5418	159.7503	141.6904	137.1813	120.8217	115.7564	129.0412	130.4663	148.5619	158.5869	171.6447	(64)	
Efficiency of water heater (217)m	87.1918	86.9518	86.3729	85.0410	82.8368	80.3000	80.3000	80.3000	80.3000	85.1206	86.6334	87.2873	(216)	
Fuel for water heating, kWh/month	201.5929	176.5826	184.9541	166.6142	165.6043	150.4628	144.1549	160.6989	162.4736	174.5311	183.0553	196.6434	(217)	
Water heating fuel used												2067.3681	(219)	
Annual totals kWh/year														
Space heating fuel - main system												2258.3765	(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)													280.9987	(232)
Total delivered energy for all uses													4681.7433	(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	2258.3765	0.2160	487.8093 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2067.3681	0.2160	446.5515 (264)
Space and water heating			934.3608 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	280.9987	0.5190	145.8383 (268)
Total CO2, kg/m2/year			1119.1242 (272)
Emissions per m2 for space and water heating			15.9939 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4964 (272b)
Emissions per m2 for pumps and fans			0.6663 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.9939 * 1.00) + 2.4964 + 0.6663, rounded to 2 d.p.			19.1600 (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	58.4200 (1b)	x 2.3500 (2b)	= 137.2870 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	58.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 137.2870 (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) = 0.1457 (8)
Measured/design AP50					Yes
Infiltration rate					2.1300
Number of sides sheltered					0.2522 (18)
					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.2333 (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	0.2974	0.2916	0.2858	0.2566	0.2508	0.2216	0.2216	0.2158	0.2333	0.2508	0.2624	0.2741 (22b)
	0.5442	0.5425	0.5408	0.5329	0.5314	0.5246	0.5246	0.5233	0.5272	0.5314	0.5344	0.5376 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.40)			8.7900	1.3258	11.6534		(27)
Heat Loss Floor			58.4200	0.1600	9.3472	75.0000	4381.5000 (28a)
External Wall	56.6400	8.7900	47.8500	0.2000	9.5700	9.0000	430.6500 (29a)
Total net area of external elements Aum(A, m ²)			115.0600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.5706		(33)
Party Wall			17.0800	0.0000	0.0000	20.0000	341.6000 (32)
Party Ceilings			58.4200			20.0000	1168.4000 (32b)
Internal Walls			88.9200			9.0000	800.2800 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		7122.4300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							121.9177 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.3132 (36)
Total fabric heat loss					(33) + (36) =		40.8838 (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	24.6561	24.5783	24.5020	24.1438	24.0768	23.7648	23.7648	23.7070	23.8849	24.0768	24.2124	24.3541 (38)
Heat transfer coeff	65.5399	65.4621	65.3858	65.0276	64.9606	64.6486	64.6486	64.5908	64.7688	64.9606	65.0962	65.2379 (39)
Average = Sum(39)m / 12 =												65.0273 (39)
HLP	1.1219	1.1205	1.1192	1.1131	1.1120	1.1066	1.1066	1.1056	1.1087	1.1120	1.1143	1.1167 (40)
HLP (average)												1.1131 (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												1.9366 (42)
Average daily hot water use (litres/day)												80.1949 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	88.2144	85.0066	81.7988	78.5910	75.3832	72.1754	72.1754	75.3832	78.5910	81.7988	85.0066	88.2144 (44)
Energy content (annual)	130.8194	114.4155	118.0665	102.9332	98.7669	85.2283	78.9766	90.6268	91.7091	106.8782	116.6659	126.6916 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1261.7778 (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	27.7991	24.3133	25.0891	21.8733	20.9880	18.1110	16.7825	19.2582	19.4882	22.7116	24.7915	26.9220 (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	96.8313	96.8313	96.8313	96.8313	96.8313	96.8313	96.8313	96.8313	96.8313	96.8313	96.8313	96.8313	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.9113	14.1323	11.4931	8.7010	6.5041	5.4911	5.9333	7.7123	10.3515	13.1435	15.3405	16.3535	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	168.9453	170.6984	166.2806	156.8756	145.0034	133.8453	126.3910	124.6379	129.0557	138.4607	150.3328	161.4910	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.6831	32.6831	32.6831	32.6831	32.6831	32.6831	32.6831	32.6831	32.6831	32.6831	32.6831	32.6831	(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)	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651	(71)
Water heating gains (Table 5)	37.3644	36.1805	33.7220	30.3796	28.2096	25.1542	22.5572	25.8847	27.0669	30.5264	34.4326	36.1854	(72)
Total internal gains	274.2704	273.0606	263.5451	248.0056	231.7666	216.5400	206.9309	210.2843	218.5235	234.1800	252.1553	266.0793	(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	
East				3.2400	19.6403	0.6300		0.7000		0.7700	19.4475 (76)	
West				5.5500	19.6403	0.6300		0.7000		0.7700	33.3129 (80)	
Solar gains	52.7604	103.2105	169.9730	247.8955	303.8053	310.9988	296.0835	254.3313	197.6857	122.4680	65.7860	43.3876 (83)
Total gains	327.0308	376.2711	433.5181	495.9012	535.5719	527.5387	503.0143	464.6156	416.2092	356.6480	317.9413	309.4669 (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	30.1870	30.2229	30.2581	30.4248	30.4562	30.6032	30.6032	30.6306	30.5464	30.4562	30.3928	30.3267	
alpha	3.0125	3.0149	3.0172	3.0283	3.0304	3.0402	3.0402	3.0420	3.0364	3.0304	3.0262	3.0218	
util living area	0.9814	0.9707	0.9465	0.8918	0.7952	0.6550	0.5172	0.5687	0.7783	0.9263	0.9722	0.9842	(86)
MIT	18.8918	19.1223	19.5332	20.0583	20.5127	20.8133	20.9335	20.9099	20.6635	20.0562	19.3726	18.8396	(87)
Th 2	19.9830	19.9841	19.9852	19.9901	19.9911	19.9954	19.9954	19.9962	19.9938	19.9911	19.9892	19.9872	(88)
util rest of house	0.9781	0.9655	0.9367	0.8710	0.7540	0.5828	0.4159	0.4676	0.7188	0.9077	0.9664	0.9814	(89)
MIT 2	18.0535	18.2824	18.6877	19.1997	19.6226	19.8821	19.9672	19.9551	19.7679	19.2084	18.5365	18.0048	(90)
Living area fraction									fLA = Living area / (4) =			0.3756	(91)
MIT	18.3683	18.5978	19.0052	19.5221	19.9569	20.2318	20.3301	20.3137	20.1042	19.5268	18.8505	18.3183	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3683	18.5978	19.0052	19.5221	19.9569	20.2318	20.3301	20.3137	20.1042	19.5268	18.8505	18.3183	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9711	0.9563	0.9249	0.8597	0.7524	0.6010	0.4513	0.5015	0.7262	0.8973	0.9578	0.9751	(94)
Ext temp.	317.5877	359.8392	400.9473	426.3078	402.9901	317.0357	226.9921	233.0057	302.2346	320.0102	304.5107	301.7596	(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	922.0347	896.6872	817.6638	690.7318	536.3730	364.0901	241.1472	252.7893	388.8875	579.8895	764.9106	921.0499	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating	449.7085	360.7619	310.0371	190.3852	99.2369	0.0000	0.0000	0.0000	0.0000	193.3502	331.4880	460.7519	(98)
Space heating per m2												2395.7196	(98)
										(98) / (4) =		41.0086	(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	607.6966	478.3995	490.8901	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7978	0.8576	0.8304	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	484.7959	410.2572	407.6115	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	689.4450	659.3942	615.7515	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	147.3473	185.3579	154.8561	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												487.5614	(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	36.8368	46.3395	38.7140	0.0000	0.0000	0.0000 (107)
Space cooling											121.8904 (107)
Space cooling per m2											2.0864 (108)
Energy for space heating											41.0086 (99)
Energy for space cooling											2.0864 (108)
Total											43.0950 (109)
Dwelling Fabric Energy Efficiency (DFEE)											43.1 (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	58.4200 (1b)	x 2.3500 (2b)	= 137.2870 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	58.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 137.2870 (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) = 0.1457 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3957 (18)
					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3660 (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												
	0.4667	0.4575	0.4484	0.4026	0.3935	0.3477	0.3477	0.3386	0.3660	0.3935	0.4118	0.4301 (22b)
Effective ac	0.6089	0.6047	0.6005	0.5810	0.5774	0.5604	0.5604	0.5573	0.5670	0.5774	0.5848	0.5925 (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)			8.7900	1.3258	11.6534		(27)					
Heat Loss Floor			58.4200	0.1300	7.5946		(28a)					
External Wall	56.6400	8.7900	47.8500	0.1800	8.6130		(29a)					
Total net area of external elements Aum(A, m2)			115.0600				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =			27.8610	(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.1684 (36)					
Total fabric heat loss						(33) + (36) =	36.0294 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	27.5853	27.3937	27.2060	26.3241	26.1591	25.3910	25.3910	25.2487	25.6868	26.1591	26.4929	26.8418 (38)
Average = Sum(39)m / 12 =	63.6147	63.4232	63.2354	62.3535	62.1885	61.4204	61.4204	61.2781	61.7163	62.1885	62.5223	62.8713 (39)
												62.3527 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0889	1.0856	1.0824	1.0673	1.0645	1.0514	1.0514	1.0489	1.0564	1.0645	1.0702	1.0762 (40)
Days in month												1.0673 (40)
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.9366 (42)
Average daily hot water use (litres/day)												80.1949 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	88.2144	85.0066	81.7988	78.5910	75.3832	72.1754	72.1754	75.3832	78.5910	81.7988	85.0066	88.2144 (44)
Energy content (annual)	130.8194	114.4155	118.0665	102.9332	98.7669	85.2283	78.9766	90.6268	91.7091	106.8782	116.6659	126.6916 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1261.7778 (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)
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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27.7991 24.3133 25.0891 21.8733 20.9880 18.1110 16.7825 19.2582 19.4882 22.7116 24.7915 26.9220 (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	96.8313	96.8313	96.8313	96.8313	96.8313	96.8313	96.8313	96.8313	96.8313	96.8313	96.8313	96.8313	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.9113	14.1323	11.4931	8.7010	6.5041	5.4911	5.9333	7.7123	10.3515	13.1435	15.3405	16.3535	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	168.9453	170.6984	166.2806	156.8756	145.0034	133.8453	126.3910	124.6379	129.0557	138.4607	150.3328	161.4910	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.6831	32.6831	32.6831	32.6831	32.6831	32.6831	32.6831	32.6831	32.6831	32.6831	32.6831	32.6831	(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)	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651	(71)
Water heating gains (Table 5)	37.3644	36.1805	33.7220	30.3796	28.2096	25.1542	22.5572	25.8847	27.0669	30.5264	34.4326	36.1854	(72)
Total internal gains	274.2704	273.0606	263.5451	248.0056	231.7666	216.5400	206.9309	210.2843	218.5235	234.1800	252.1553	266.0793	(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			
East				3.2400	19.6403	0.6300	0.7000	0.7700	19.4475 (76)			
West				5.5500	19.6403	0.6300	0.7000	0.7700	33.3129 (80)			
Solar gains	52.7604	103.2105	169.9730	247.8955	303.8053	310.9988	296.0835	254.3313	197.6857	122.4680	65.7860	43.3876 (83)
Total gains	327.0308	376.2711	433.5181	495.9012	535.5719	527.5387	503.0143	464.6156	416.2092	356.6480	317.9413	309.4669 (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	63.7737	63.9663	64.1562	65.0636	65.2363	66.0521	66.0521	66.2054	65.7354	65.2363	64.8880	64.5278	
alpha	5.2516	5.2644	5.2771	5.3376	5.3491	5.4035	5.4035	5.4137	5.3824	5.3491	5.3259	5.3019	
util living area	0.9986	0.9967	0.9898	0.9608	0.8730	0.6995	0.5284	0.5901	0.8528	0.9810	0.9970	0.9989	(86)
MIT	19.8038	19.9490	20.2060	20.5462	20.8191	20.9605	20.9927	20.9874	20.8840	20.5152	20.0994	19.7826	(87)
Th 2	20.0099	20.0126	20.0152	20.0276	20.0299	20.0408	20.0408	20.0428	20.0366	20.0299	20.0252	20.0203	(88)
util rest of house	0.9981	0.9956	0.9861	0.9461	0.8281	0.6126	0.4179	0.4757	0.7850	0.9714	0.9958	0.9986	(89)
MIT 2	18.9158	19.0628	19.3200	19.6609	19.9083	20.0228	20.0389	20.0391	19.9717	19.6380	19.2234	18.9031	(90)
Living area fraction									fLA = Living area / (4) =			0.3756	(91)
MIT	19.2493	19.3956	19.6527	19.9934	20.2503	20.3750	20.3971	20.3952	20.3144	19.9674	19.5524	19.2334	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2493	19.3956	19.6527	19.9934	20.2503	20.3750	20.3971	20.3952	20.3144	19.9674	19.5524	19.2334	(93)

8. Space heating requirement

Utilisation	0.9976	0.9946	0.9844	0.9455	0.8394	0.6444	0.4597	0.5190	0.8069	0.9706	0.9950	0.9982	(94)
Useful gains	326.2409	374.2481	426.7383	468.8583	449.5856	339.9319	231.2404	241.1516	335.8356	346.1600	316.3401	308.9073	(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	950.9973	919.3582	831.7176	691.7104	531.7313	354.7004	233.2203	244.8213	383.5266	582.5464	778.5522	945.1693	(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	464.8188	366.3140	301.3046	160.4535	61.1164	0.0000	0.0000	0.0000	0.0000	175.8715	332.7927	473.3789	(98)
Space heating												2336.0503	(98)
Space heating per m ²										(98) / (4) =		39.9872	(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	577.3517	454.5109	465.7139	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9082	0.9542	0.9355	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	524.3504	433.6776	435.6850	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	689.4450	659.3942	615.7515	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	118.8681	167.9331	133.9695	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												420.7707	(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	29.7170	41.9833	33.4924	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												105.1927 (107)
Space cooling per m2												1.8006 (108)
Energy for space heating												39.9872 (99)
Energy for space cooling												1.8006 (108)
Total												41.7878 (109)
Target Fabric Energy Efficiency (TFEE)												48.1 (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	58.4200 (1b)	x 2.3500 (2b)	= 137.2870 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	58.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 137.2870 (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) = 0.1457 (8)
Pressure test					Yes
Measured/design AP50					2.1300
Infiltration rate					0.2522 (18)
Number of sides sheltered					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.2333 (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	0.2566	0.2391	0.2391	0.2274	0.2274	0.2158	0.2158	0.2041	0.2041	0.2216	0.2158	0.2274 (22b)
Effective ac	0.5329	0.5286	0.5286	0.5259	0.5259	0.5233	0.5233	0.5208	0.5208	0.5246	0.5233	0.5259 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.40)			8.7900	1.3258	11.6534		(27)
Heat Loss Floor			58.4200	0.1600	9.3472	75.0000	4381.5000 (28a)
External Wall	56.6400	8.7900	47.8500	0.2000	9.5700	9.0000	430.6500 (29a)
Total net area of external elements Aum(A, m ²)			115.0600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	30.5706			(33)
Party Wall			17.0800	0.0000	0.0000	20.0000	341.6000 (32)
Party Ceilings			58.4200			30.0000	1752.6000 (32b)
Internal Walls			88.9200			9.0000	800.2800 (32c)
Heat capacity Cm = Sum (A x k)					(28)...(30) + (32) + (32a)...(32e) =		7706.6300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							131.9177 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.3132 (36)
Total fabric heat loss					(33) + (36) =		40.8838 (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	24.1438	23.9473	23.9473	23.8241	23.8241	23.7070	23.7070	23.5961	23.5961	23.7648	23.7070	23.8241 (38)
Heat transfer coeff	65.0276	64.8312	64.8312	64.7079	64.7079	64.5908	64.5908	64.4799	64.4799	64.6486	64.5908	64.7079 (39)
Average = Sum(39)m / 12 =												64.6829 (39)
HLP	1.1131	1.1097	1.1097	1.1076	1.1076	1.1056	1.1056	1.1037	1.1037	1.1066	1.1056	1.1076 (40)
HLP (average)												1.1072 (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												1.9366 (42)
Average daily hot water use (litres/day)												80.1949 (43)
Daily hot water use	88.2144	85.0066	81.7988	78.5910	75.3832	72.1754	72.1754	75.3832	78.5910	81.7988	85.0066	88.2144 (44)
Energy conte	130.8194	114.4155	118.0665	102.9332	98.7669	85.2283	78.9766	90.6268	91.7091	106.8782	116.6659	126.6916 (45)
Energy content (annual)										Total = Sum(45)m =		1261.7778 (45)
Distribution loss (46)m = 0.15 x (45)m	19.6229	17.1623	17.7100	15.4400	14.8150	12.7842	11.8465	13.5940	13.7564	16.0317	17.4999	19.0037 (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	14.0335	12.6587	13.9883	13.5070	13.9352	13.4604	13.8934	13.9205	13.4858	13.9664	13.5508	(61)
Total heat required for water heating calculated for each month	144.8529	127.0742	132.0548	116.4402	112.7021	98.6888	92.8699	104.5473	105.1949	120.8445	130.2167	(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	(63)
Output from w/h	144.8529	127.0742	132.0548	116.4402	112.7021	98.6888	92.8699	104.5473	105.1949	120.8445	130.2167	(64)
RHI water heating demand	47.0058	41.2078	42.7542	37.6020	36.3238	31.7035	29.7330	33.6135	33.8647	39.0286	42.1791	(65)
Heat gains from water heating, kWh/month												

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	116.1976	116.1976	116.1976	116.1976	116.1976	116.1976	116.1976	116.1976	116.1976	116.1976	116.1976	116.1976	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	39.7783	35.3307	28.7329	21.7526	16.2603	13.7277	14.8332	19.2808	25.8786	32.8589	38.3512	40.8838	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	252.1571	254.7737	248.1800	234.1427	216.4231	199.7691	188.6433	186.0267	192.6205	206.6578	224.3774	241.0313	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	48.5564	48.5564	48.5564	48.5564	48.5564	48.5564	48.5564	48.5564	48.5564	48.5564	48.5564	48.5564	(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)	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651	(71)
Water heating gains (Table 5)	63.1799	61.3212	57.4653	52.2251	48.8223	44.0327	39.9638	45.1795	47.0344	52.4578	58.5821	61.3322	(72)
Total internal gains	445.4042	441.7145	424.6671	398.4093	371.7946	347.8184	333.7292	340.7759	355.8224	382.2633	411.5995	433.5362	(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
East					3.2400	25.1925	0.6300	0.7000			0.7700			24.9453
West					5.5500	25.1925	0.6300	0.7000			0.7700			42.7304 (76)

Solar gains	67.6757	112.6120	186.4465	272.4246	314.7560	352.8685	324.2623	291.3426	226.9541	142.2322	84.1064	52.6785 (83)		
Total gains	513.0799	554.3265	611.1136	670.8339	686.5507	700.6869	657.9915	632.1185	582.7764	524.4955	495.7059	486.2147 (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	32.9203	33.0201	33.0201	33.0830	33.0830	33.1430	33.1430	33.2000	33.2000	33.1133	33.1430	33.0830		
alpha	3.1947	3.2013	3.2013	3.2055	3.2055	3.2095	3.2095	3.2133	3.2133	3.2076	3.2095	3.2055		
util living area	0.9406	0.9227	0.8754	0.7843	0.6406	0.4471	0.3180	0.3298	0.5688	0.8003	0.9091	0.9469	(86)	
MIT	19.6208	19.7864	20.1336	20.5177	20.8146	20.9580	20.9899	20.9888	20.9063	20.5788	20.0560	19.5906	(87)	
Th 2	19.9901	19.9929	19.9929	19.9946	19.9946	19.9962	19.9962	19.9978	19.9978	19.9954	19.9962	19.9946	(88)	
util rest of house	0.9303	0.9095	0.8541	0.7481	0.5815	0.3671	0.2239	0.2327	0.4872	0.7567	0.8909	0.9374	(89)	
MIT 2	18.7675	18.9298	19.2621	19.6183	19.8728	19.9771	19.9937	19.9950	19.9485	19.6837	19.1973	18.7423	(90)	
Living area fraction	19.0879	19.2515	19.5894	19.9561	20.2265	20.3455	20.3678	20.3682	20.3082	20.0198	19.5198	19.0609	(92)	
Temperature adjustment	19.0879	19.2515	19.5894	19.9561	20.2265	20.3455	20.3678	20.3682	20.3082	20.0198	19.5198	19.0609	(93)	
adjusted MIT	19.0879	19.2515	19.5894	19.9561	20.2265	20.3455	20.3678	20.3682	20.3082	20.0198	19.5198	19.0609	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	471.5714	497.7711	515.9980	500.8293	409.1061	277.2328	170.5861	170.1258	299.3700	397.5206	436.5758	450.5710	(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	890.0935	865.5951	777.2865	644.2358	461.1414	287.1388	172.3175	172.0465	322.9271	518.4712	718.2370	877.4953	(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	311.3804	247.1777	194.3987	103.2527	38.7143	0.0000	0.0000	0.0000	0.0000	89.9872	202.7961	317.6316	(98)
Space heating													
RHI space heating demand													

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1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	58.4200 (1b)	x 2.3500 (2b)	= 137.2870 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	58.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 137.2870 (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) = 0.1457 (8)
Measured/design AP50					Yes
Infiltration rate					2.1300
Number of sides sheltered					0.2522 (18)
					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.2333 (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	0.2974	0.2916	0.2858	0.2566	0.2508	0.2216	0.2216	0.2158	0.2333	0.2508	0.2624	0.2741 (22b)
	0.5442	0.5425	0.5408	0.5329	0.5314	0.5246	0.5246	0.5233	0.5272	0.5314	0.5344	0.5376 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.40)			8.7900	1.3258	11.6534		(27)
Heat Loss Floor			58.4200	0.1600	9.3472	75.0000	4381.5000 (28a)
External Wall	56.6400	8.7900	47.8500	0.2000	9.5700	9.0000	430.6500 (29a)
Total net area of external elements Aum(A, m ²)			115.0600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.5706		(33)
Party Wall			17.0800	0.0000	0.0000	20.0000	341.6000 (32)
Party Ceilings			58.4200			30.0000	1752.6000 (32b)
Internal Walls			88.9200			9.0000	800.2800 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		7706.6300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							131.9177 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.3132 (36)
Total fabric heat loss					(33) + (36) =		40.8838 (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	24.6561	24.5783	24.5020	24.1438	24.0768	23.7648	23.7648	23.7070	23.8849	24.0768	24.2124	24.3541 (38)
Heat transfer coeff	65.5399	65.4621	65.3858	65.0276	64.9606	64.6486	64.6486	64.5908	64.7688	64.9606	65.0962	65.2379 (39)
Average = Sum(39)m / 12 =												65.0273 (39)
HLP	1.1219	1.1205	1.1192	1.1131	1.1120	1.1066	1.1066	1.1056	1.1087	1.1120	1.1143	1.1167 (40)
HLP (average)												1.1131 (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												1.9366 (42)
Average daily hot water use (litres/day)												80.1949 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	88.2144	85.0066	81.7988	78.5910	75.3832	72.1754	72.1754	75.3832	78.5910	81.7988	85.0066	88.2144 (44)
Energy content (annual)	130.8194	114.4155	118.0665	102.9332	98.7669	85.2283	78.9766	90.6268	91.7091	106.8782	116.6659	126.6916 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1261.7778 (45)
Water storage loss:	19.6229	17.1623	17.7100	15.4400	14.8150	12.7842	11.8465	13.5940	13.7564	16.0317	17.4999	19.0037 (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	14.0335	12.6587	13.9883	13.5070	13.9352	13.4604	13.8934	13.9205	13.4858	13.9664	13.5508	14.0248 (61)
Total heat required for water heating calculated for each month	144.8529	127.0742	132.0548	116.4402	112.7021	98.6888	92.8699	104.5473	105.1949	120.8445	130.2167	140.7164 (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	144.8529	127.0742	132.0548	116.4402	112.7021	98.6888	92.8699	104.5473	105.1949	120.8445	130.2167	140.7164 (64)
Heat gains from water heating, kWh/month	47.0058	41.2078	42.7542	37.6020	36.3238	31.7035	29.7330	33.6135	33.8647	39.0286	42.1791	45.6311 (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	116.1976	116.1976	116.1976	116.1976	116.1976	116.1976	116.1976	116.1976	116.1976	116.1976	116.1976	116.1976 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	39.7783	35.3307	28.7329	21.7526	16.2603	13.7277	14.8332	19.2808	25.8786	32.8589	38.3512	40.8838 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	252.1571	254.7737	248.1800	234.1427	216.4231	199.7691	188.6433	186.0267	192.6205	206.6578	224.3774	241.0313 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	48.5564	48.5564	48.5564	48.5564	48.5564	48.5564	48.5564	48.5564	48.5564	48.5564	48.5564	48.5564 (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)	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651 (71)
Water heating gains (Table 5)	63.1799	61.3212	57.4653	52.2251	48.8223	44.0327	39.9638	45.1795	47.0344	52.4578	58.5821	61.3322 (72)
Total internal gains	445.4042	441.7145	424.6671	398.4093	371.7946	347.8184	333.7292	340.7759	355.8224	382.2633	411.5995	433.5362 (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
East													3.2400	19.6403	0.6300	0.7000	0.7700	19.4475 (76)
West													5.5500	19.6403	0.6300	0.7000	0.7700	33.3129 (80)

Solar gains	52.7604	103.2105	169.9730	247.8955	303.8053	310.9988	296.0835	254.3313	197.6857	122.4680	65.7860	43.3876 (83)						
Total gains	498.1646	544.9250	594.6401	646.3048	675.5999	658.8172	629.8127	595.1072	553.5080	504.7313	477.3855	476.9238 (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	32.6630	32.7018	32.7400	32.9203	32.9543	33.1133	33.1133	33.1430	33.0519	32.9543	32.8857	32.8142
alpha	3.1775	3.1801	3.1827	3.1947	3.1970	3.2076	3.2076	3.2095	3.2035	3.1970	3.1924	3.1876
util living area	0.9536	0.9367	0.9015	0.8305	0.7176	0.5668	0.4316	0.4708	0.6753	0.8589	0.9341	0.9589 (86)
MIT	19.3976	19.5936	19.9334	20.3514	20.6904	20.8953	20.9672	20.9560	20.8101	20.3720	19.8103	19.3455 (87)
Th 2	19.9830	19.9841	19.9852	19.9901	19.9911	19.9954	19.9954	19.9962	19.9938	19.9911	19.9892	19.9872 (88)
util rest of house	0.9458	0.9262	0.8849	0.8015	0.6696	0.4946	0.3407	0.3785	0.6073	0.8283	0.9214	0.9519 (89)
MIT 2	18.5430	18.7349	19.0648	19.4634	19.7674	19.9359	19.9826	19.9779	19.8754	19.4930	18.9543	18.4952 (90)
Living area fraction	18.8639	19.0574	19.3910	19.7969	20.1140	20.2962	20.3524	20.3453	20.2264	19.8231	19.2758	18.8145 (92)
MIT	18.8639	19.0574	19.3910	19.7969	20.1140	20.2962	20.3524	20.3453	20.2264	19.8231	19.2758	18.8145 (93)
Temperature adjustment												0.0000
adjusted MIT	18.8639	19.0574	19.3910	19.7969	20.1140	20.2962	20.3524	20.3453	20.2264	19.8231	19.2758	18.8145 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9352	0.9146	0.8736	0.7954	0.6758	0.5172	0.3739	0.4116	0.6241	0.8225	0.9105	0.9419 (94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	954.5184	926.7712	842.8892	708.5972	546.5789	368.2496	242.5868	254.8272	396.7999	599.1410	792.5974	953.4209 (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	363.5593	287.8693	240.6203	140.0638	66.9520	0.0000	0.0000	0.0000	0.0000	136.9004	257.7171	375.1396 (98)
Space heating												1868.8219 (98)
Space heating per m2												31.9894 (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													2064.9966 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	363.5593	287.8693	240.6203	140.0638	66.9520	0.0000	0.0000	0.0000	0.0000	136.9004	257.7171	375.1396	(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)	401.7230	318.0876	265.8788	154.7667	73.9801	0.0000	0.0000	0.0000	0.0000	151.2711	284.7703	414.5189	(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	144.8529	127.0742	132.0548	116.4402	112.7021	98.6888	92.8699	104.5473	105.1949	120.8445	130.2167	140.7164	(64)
Efficiency of water heater (217)m	89.5646	89.4954	89.3396	89.0188	88.4657	87.3000	87.3000	87.3000	87.3000	88.9710	89.4000	87.3000	(216)
Fuel for water heating, kWh/month	161.7300	141.9896	147.8122	130.8041	127.3964	113.0455	106.3802	119.7563	120.4982	135.8247	145.6562	157.0424	(219)
Water heating fuel used													1607.9359 (219)
Annual totals kWh/year													
Space heating fuel - main system													2064.9966 (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)													280.9987 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses													4028.9311 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2064.9966	3.4800	71.8619 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1607.9359	3.4800	55.9562 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	280.9987	13.1900	37.0637 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	0.0000	13.1900	0.0000 (252)
Total energy cost			294.7743 (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] =	1.1971 (257)
SAP value		83.3003
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	2064.9966	0.2160	446.0393 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1607.9359	0.2160	347.3142 (264)
Space and water heating			793.3534 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	280.9987	0.5190	145.8383 (268)
Energy saving/generation technologies			
PV Unit	-371.3800	0.5190	-192.7462 (269)
Total kg/year			785.3705 (272)
CO2 emissions per m2			13.4400 (273)
EI value			89.8241
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	$3.48 / 0.8859 = 3.928$, stars = 4
Water heating environmental impact	$0.216 / 0.8859 = 0.2438$, 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	58.4200 (1b)	x 2.3500 (2b)	= 137.2870 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	58.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 137.2870 (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) = 0.1457 (8)
Measured/design AP50					Yes
Infiltration rate					2.1300
Number of sides sheltered					0.2522 (18)
					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.2333 (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												
	0.2566	0.2391	0.2391	0.2274	0.2274	0.2158	0.2158	0.2041	0.2041	0.2216	0.2158	0.2274 (22b)
Effective ac	0.5329	0.5286	0.5286	0.5259	0.5259	0.5233	0.5233	0.5208	0.5208	0.5246	0.5233	0.5259 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.40)			8.7900	1.3258	11.6534		(27)
Heat Loss Floor			58.4200	0.1600	9.3472	75.0000	4381.5000 (28a)
External Wall	56.6400	8.7900	47.8500	0.2000	9.5700	9.0000	430.6500 (29a)
Total net area of external elements Aum(A, m ²)			115.0600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.5706		(33)
Party Wall			17.0800	0.0000	0.0000	20.0000	341.6000 (32)
Party Ceilings			58.4200			30.0000	1752.6000 (32b)
Internal Walls			88.9200			9.0000	800.2800 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 7706.6300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							131.9177 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.3132 (36)
Total fabric heat loss							(33) + (36) = 40.8838 (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	24.1438	23.9473	23.9473	23.8241	23.8241	23.7070	23.7070	23.5961	23.5961	23.7648	23.7070	23.8241 (38)
Heat transfer coeff	65.0276	64.8312	64.8312	64.7079	64.7079	64.5908	64.5908	64.4799	64.4799	64.6486	64.5908	64.7079 (39)
Average = Sum(39)m / 12 =												64.6829 (39)
HLP	1.1131	1.1097	1.1097	1.1076	1.1076	1.1056	1.1056	1.1037	1.1037	1.1066	1.1056	1.1076 (40)
HLP (average)												1.1072 (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												1.9366 (42)
Average daily hot water use (litres/day)												80.1949 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	88.2144	85.0066	81.7988	78.5910	75.3832	72.1754	72.1754	75.3832	78.5910	81.7988	85.0066	88.2144 (44)
Energy conte	130.8194	114.4155	118.0665	102.9332	98.7669	85.2283	78.9766	90.6268	91.7091	106.8782	116.6659	126.6916 (45)
Energy content (annual)										Total = Sum(45)m =		1261.7778 (45)
Distribution loss (46)m = 0.15 x (45)m	19.6229	17.1623	17.7100	15.4400	14.8150	12.7842	11.8465	13.5940	13.7564	16.0317	17.4999	19.0037 (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	14.0335	12.6587	13.9883	13.5070	13.9352	13.4604	13.8934	13.9205	13.4858	13.9664	13.5508	14.0248 (61)
Total heat required for water heating calculated for each month	144.8529	127.0742	132.0548	116.4402	112.7021	98.6888	92.8699	104.5473	105.1949	120.8445	130.2167	140.7164 (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	144.8529	127.0742	132.0548	116.4402	112.7021	98.6888	92.8699	104.5473	105.1949	120.8445	130.2167	140.7164 (64)
Heat gains from water heating, kWh/month	47.0058	41.2078	42.7542	37.6020	36.3238	31.7035	29.7330	33.6135	33.8647	39.0286	42.1791	45.6311 (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	116.1976	116.1976	116.1976	116.1976	116.1976	116.1976	116.1976	116.1976	116.1976	116.1976	116.1976	116.1976 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	39.7783	35.3307	28.7329	21.7526	16.2603	13.7277	14.8332	19.2808	25.8786	32.8589	38.3512	40.8838 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	252.1571	254.7737	248.1800	234.1427	216.4231	199.7691	188.6433	186.0267	192.6205	206.6578	224.3774	241.0313 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	48.5564	48.5564	48.5564	48.5564	48.5564	48.5564	48.5564	48.5564	48.5564	48.5564	48.5564	48.5564 (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)	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651	-77.4651 (71)
Water heating gains (Table 5)	63.1799	61.3212	57.4653	52.2251	48.8223	44.0327	39.9638	45.1795	47.0344	52.4578	58.5821	61.3322 (72)
Total internal gains	445.4042	441.7145	424.6671	398.4093	371.7946	347.8184	333.7292	340.7759	355.8224	382.2633	411.5995	433.5362 (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		
East					3.2400	25.1925	0.6300	0.7000	0.7700	24.9453 (76)		
West					5.5500	25.1925	0.6300	0.7000	0.7700	42.7304 (80)		

Solar gains	67.6757	112.6120	186.4465	272.4246	314.7560	352.8685	324.2623	291.3426	226.9541	142.2322	84.1064	52.6785 (83)
Total gains	513.0799	554.3265	611.1136	670.8339	686.5507	700.6869	657.9915	632.1185	582.7764	524.4955	495.7059	486.2147 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor for gains for living area, nil,m (see Table 9a)	32.9203	33.0201	33.0201	33.0830	33.0830	33.1430	33.1430	33.2000	33.2000	33.1133	33.1430	33.0830
tau	3.1947	3.2013	3.2013	3.2055	3.2055	3.2095	3.2095	3.2133	3.2133	3.2076	3.2095	3.2055
util living area	0.9406	0.9227	0.8754	0.7843	0.6406	0.4471	0.3180	0.3298	0.5688	0.8003	0.9091	0.9469 (86)
MIT	19.6208	19.7864	20.1336	20.5177	20.8146	20.9580	20.9899	20.9888	20.9063	20.5788	20.0560	19.5906 (87)
Th 2	19.9901	19.9929	19.9929	19.9946	19.9946	19.9962	19.9962	19.9978	19.9978	19.9954	19.9962	19.9946 (88)
util rest of house	0.9303	0.9095	0.8541	0.7481	0.5815	0.3671	0.2239	0.2327	0.4872	0.7567	0.8909	0.9374 (89)
MIT 2	18.7675	18.9298	19.2621	19.6183	19.8728	19.9771	19.9937	19.9950	19.9485	19.6837	19.1973	18.7423 (90)
Living area fraction	19.0879	19.2515	19.5894	19.9561	20.2265	20.3455	20.3678	20.3682	20.3082	20.0198	19.5198	19.0609 (92)
MIT	19.0879	19.2515	19.5894	19.9561	20.2265	20.3455	20.3678	20.3682	20.3082	20.0198	19.5198	19.0609 (93)
Temperature adjustment	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
adjusted MIT	19.0879	19.2515	19.5894	19.9561	20.2265	20.3455	20.3678	20.3682	20.3082	20.0198	19.5198	19.0609 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9191	0.8980	0.8444	0.7466	0.5959	0.3957	0.2593	0.2691	0.5137	0.7579	0.8807	0.9267 (94)
Ext temp.	471.5714	497.7711	515.9980	500.8293	409.1061	277.2328	170.5861	170.1258	299.3700	397.5206	436.5758	450.5710 (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	890.0935	865.5951	777.2865	644.2358	461.1414	287.1388	172.3175	172.0465	322.9271	518.4712	718.2370	877.4953 (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	311.3804	247.1777	194.3987	103.2527	38.7143	0.0000	0.0000	0.0000	0.0000	89.9872	202.7961	317.6316 (98)
Space heating per m2												1505.3388 (98)
												(98) / (4) = 25.7675 (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													1663.3578 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	311.3804	247.1777	194.3987	103.2527	38.7143	0.0000	0.0000	0.0000	0.0000	89.9872	202.7961	317.6316	(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)	344.0667	273.1246	214.8052	114.0914	42.7782	0.0000	0.0000	0.0000	0.0000	99.4334	224.0841	350.9742	(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	144.8529	127.0742	132.0548	116.4402	112.7021	98.6888	92.8699	104.5473	105.1949	120.8445	130.2167	140.7164	(64)
Efficiency of water heater (217)m	89.4589	89.3875	89.1777	88.7753	88.0964	87.3000	87.3000	87.3000	87.3000	88.6377	89.2212	87.3000	(216)
Fuel for water heating, kWh/month	161.9212	142.1610	148.0805	131.1628	127.9304	113.0455	106.3802	119.7563	120.4982	136.3353	145.9482	157.2375	(219)
Water heating fuel used												1610.4572	(219)
Annual totals kWh/year													
Space heating fuel - main system												1663.3578	(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)												280.9987	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses												3629.8137	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1663.3578	4.2600	70.8590 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1610.4572	4.2600	68.6055 (247)
Pumps and fans for heating	75.0000	22.5500	16.9125 (249)
Energy for lighting	280.9987	22.5500	63.3652 (250)
Additional standing charges			96.0000 (251)
Energy saving/generation technologies			
PV Unit	0.0000	22.5500	0.0000 (252)
Total energy cost			315.7422 (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	1663.3578	0.2160	359.2853 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1610.4572	0.2160	347.8588 (264)
Space and water heating			707.1440 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	280.9987	0.5190	145.8383 (268)
Energy saving/generation technologies			
PV Unit	-371.3800	0.5190	-192.7462 (269)
Total kg/year			699.1611 (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	1663.3578	1.2200	2029.2965 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1610.4572	1.2200	1964.7578 (264)
Space and water heating			3994.0543 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	280.9987	3.0700	862.6659 (268)
Energy saving/generation technologies			
PV Unit	-371.3800	3.0700	-1140.1366 (269)
Primary energy kWh/year			3946.8336 (272)
Primary energy kWh/m2/year			67.5596 (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 510 TEST (21 Dec 2022)
Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£80	£80	£0
Mains gas	£235	£235	£0
Space heating	£184	£184	£0
Water heating	£69	£69	£0
Lighting	£63	£63	£0
Total cost of fuels	£315	£315	£0
Total cost of uses	£316	£316	£0
Delivered energy	62 kWh/m²	62 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.7 tonnes	0.7 tonnes	0.0 tonnes
CO2 emissions per m²	12 kg/m²	12 kg/m²	0 kg/m²
Primary energy	68 kWh/m²	68 kWh/m²	0 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

No improvements selected / applicable

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

Overheating Calculation Input Data

Dwelling type	EndTerrace Flat
Number of storeys	1
Cross ventilation possible	Yes
SAP Region	Southern England
Front of dwelling faces	North
Overshading	Average or unknown
Thermal mass parameter	131.9 (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	271.83 (P1)
Transmission heat loss coefficient	40.88 (37)
Summer heat loss coefficient	312.71 (P2)

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

Solar shading	Z blinds	Solar access	Z overhangs	Z summer
Orientation				
East	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
East	3.2400	125.2818	0.6300	0.7000	0.9000	144.9962
West	5.5500	125.2818	0.6300	0.7000	0.9000	248.3731
total:						393.3693

	Jun	Jul	Aug	
Solar gains	423	393	346	(P3)
Internal gains	345	331	338	
Total summer gains	768	724	684	(P5)
Summer gain/loss ratio	2.46	2.32	2.19	(P6)
Summer external temperature	15.40	17.30	17.30	
Thermal mass temperature increment (TMP = 131.9)	1.08	1.08	1.08	
Threshold temperature	18.93	20.69	20.56	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	
Assessment of likelihood of high internal temperature:	Slight			