



SAP Report Submission for Building Regulations Compliance

Client: Highwood Construction Ltd

Project: 95 Highwood Avenue
EASTLEIGH, SO50 9QY

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

EXCELLENCE
IN ENERGY
ASSESSMENT

BLOCK COMPLIANCE

Calculation Type: New Build (As Built)

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

Block Compliance Report - DER

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

Block Compliance Report - DFEE

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

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Built)

Property Reference	SAP-0796 (3B4A) - Plot 204	Issued on Date	31/01/2023
Assessment Reference	AB	Prop Type Ref	1B2P Mid Floor
Property	95 Highwood Avenue, EASTLEIGH, SO50 9QY		
SAP Rating	84 B	DER	13.19
Environmental	92 A	TER	17.56
CO₂ Emissions (t/year)	0.51	% DER<TER	24.88
General Requirements Compliance	Pass	DFEE	31.27
		TFEE	34.56
		% DFEE<TFEE	9.51
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)	17.56	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	13.19	kgCO ₂ /m ²	Pass
	-4.37 (-24.9%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	34.56	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	31.27	kWh/m ² /yr	
	-3.3 (-9.5%)	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
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	3.01 (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
Secondary heating system	None	

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Built)

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 North

3.09 m², No overhang

Windows facing West

4.29 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

3.01 (measured in this dwelling)

Maximum

10.0

Pass

10 Key features

Party wall U-value

0.00

W/m²K

Air permeability

3.0

m³/m²h

Photovoltaic array

303.48

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 204				Issued on Date	31/01/2023
Assessment Reference	AB		Prop Type Ref	1B2P Mid Floor		
Property	95 Highwood Avenue, EASTLEIGH, SO50 9QY					
SAP Rating		84 B	DER	13.19	TER	17.56
Environmental		92 A	% DER<TER	24.88		
CO ₂ Emissions (t/year)		0.51	DFEE	31.27	TFEE	34.56
General Requirements Compliance		Pass	% DFEE<TFEE	9.51		
Assessor Details	Mr. Scott Spearing, Scott Spearing, Tel: 01489 565920, scott@beatsolutions.co.uk				Assessor ID	p775-0001
Client	Highwood Construction Ltd, HIGHWOOD					

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

Orientation	East
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Urban
1.0 Property Type	Flat, Mid-Terrace
2.0 Number of Storeys	1
3.0 Date Built	2023
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

		Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	Ground Floor:	15.61 m	47.74 m ²	2.35 m
7.0 Living Area	25.22	m ²		
8.0 Thermal Mass Parameter	Precise calculation			
Thermal Mass	91.67	kJ/m ² K		

9.0 External Walls

Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
External Wall	Timber Frame	Timber framed wall (one layer of plasterboard)	0.20	9.00	36.68	29.30

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	31.02

9.2 Internal Walls

Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
Internal Walls	Plasterboard on timber frame	9.00	69.74

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
Party Ceilings	Timber I-joists, carpeted	20.00	47.74

11.1 Party Floors

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor	Timber I-joists, carpeted	30.00	47.74

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
West	Window	[1] External Wall	West	None	0.00					4.29	
North	Window	[1] External Wall	North	None	0.00					3.09	

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)	5.68	0.300	Yes
Table K1 - Approved	E3 Sill	5.68	0.040	Yes
Table K1 - Approved	E4 Jamb	13.00	0.050	Yes
Table K1 - Approved	E7 Party floor between dwellings (in blocks of flats)	31.22	0.070	No
Table K1 - Approved	E16 Corner (normal)	7.05	0.090	No
Table K1 - Approved	E17 Corner (inverted – internal area greater than external area)	2.35	-0.090	No
Table K1 - Approved	E18 Party wall between dwellings	2.35	0.060	No
Table K1 - Default	E25 Staggered party wall between dwellings	2.35	0.120	No
Table K1 - Default	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	26.40	0.000	No

Y-value	0.153	W/m²K
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18.0 Pressure Testing

Yes

Designed AP₅₀

6.00

m³/(h.m²) @ 50 Pa

Property Tested ?

Yes

As Built AP₅₀

3.01

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

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

22.0 Lighting

Internal

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

External

External lights fitted

23.0 Electricity Tariff

24.0 Main Heating 1

Description
 Percentage of Heat %
 Database Ref. No.
 Fuel Type
 Main Heating
 SAP Code
 In Winter
 In Summer
 Controls
 PCDF Controls
 Delayed Start Stat
 Sap Code
 Flue Type
 Fan Assisted Flue
 Is MHS Pumped
 Heat Emitter
 Flow Temperature
 Combi boiler type
 Combi keep hot type

25.0 Main Heating 2

Community Heating

28.0 Water Heating

Water Heating
 Flue Gas Heat Recovery System
 Waste Water Heat Recovery
 Instantaneous System 1
 Waste Water Heat Recovery
 Instantaneous System 2
 Waste Water Heat Recovery
 Storage System
 Solar Panel
 Water use <= 125 litres/person/day
 SAP Code

29.0 Hot Water Cylinder

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)



32.0 Photovoltaic Unit	More Dwellings, One Block	
Apportioned	303.48	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 204		Issued on Date	31/01/2023
Assessment Reference	AB	Prop Type Ref	1B2P Mid Floor	
Project	95 Highwood Avenue, EASTLEIGH, SO50 9QY			
Calculation Type	New Build (As Built)			

SAP Rating	84 B	DER	13.19	TER	17.56
Environmental	92 A	% DER<TER	24.88		
CO ₂ Emissions (t/year)	0.51	DFEE	31.27	TFEE	34.56
General Requirements Compliance	Pass	% DFEE<TFEE	9.51		

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

DWELLING AS BUILT

Mid-floor flat, total floor area 48 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) 17.56 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 13.19 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)34.6 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)31.3 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.20 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(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:	3.01 (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
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6 Controls

Space heating controls:	Programmer, room thermostat and TRVs	OK
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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
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Based on:

Overshading:	Average
Windows facing North:	3.09 m ² , No overhang
Windows facing West:	4.29 m ² , No overhang
Air change rate:	8.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	303.48 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	47.7400 (1b)	x 2.3500 (2b)	= 112.1890 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	47.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 112.1890 (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) = 0.1783 (8)
Pressure test					Yes
Measured/design AP50					3.0100
Infiltration rate					0.3288 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.2795 (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	0.3563	0.3493	0.3423	0.3074	0.3004	0.2655	0.2655	0.2585	0.2795	0.3004	0.3144	0.3284 (22b)
Effective ac	0.5635	0.5610	0.5586	0.5472	0.5451	0.5352	0.5352	0.5334	0.5390	0.5451	0.5494	0.5539 (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)			7.3800	1.3258	9.7841		(27)
External Wall	36.6800	7.3800	29.3000	0.2000	5.8600	9.0000	263.7000 (29a)
Total net area of external elements Aum(A, m ²)			36.6800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	15.6441		(33)
Party Wall			31.0200	0.0000	0.0000	20.0000	620.4000 (32)
Party Floor			47.7400			30.0000	1432.2000 (32d)
Party Ceilings			47.7400			30.0000	1432.2000 (32b)
Internal Walls			69.7400			9.0000	627.6600 (32c)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			4376.1600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							91.6665 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.6126 (36)
Total fabric heat loss						(33) + (36) =	21.2567 (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	20.8612	20.7700	20.6805	20.2604	20.1818	19.8159	19.8159	19.7481	19.9568	20.1818	20.3408	20.5071 (38)
Heat transfer coeff	42.1179	42.0267	41.9372	41.5171	41.4385	41.0726	41.0726	41.0048	41.2135	41.4385	41.5975	41.7638 (39)
Average = Sum(39)m / 12 =												41.5167 (39)
HLP	0.8822	0.8803	0.8785	0.8697	0.8680	0.8603	0.8603	0.8589	0.8633	0.8680	0.8713	0.8748 (40)
HLP (average)												0.8696 (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												1.6238 (42)
Average daily hot water use (litres/day)												72.7658 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	80.0424	77.1317	74.2211	71.3105	68.3998	65.4892	65.4892	68.3998	71.3105	74.2211	77.1317	80.0424 (44)
Energy content (annual)	118.7005	103.8162	107.1290	93.3977	89.6173	77.3329	71.6603	82.2313	83.2134	96.9772	105.8582	114.9551 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1144.8892 (45)
Water storage loss:	17.8051	15.5724	16.0694	14.0097	13.4426	11.5999	10.7490	12.3347	12.4820	14.5466	15.8787	17.2433 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

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If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	13.9846	12.6175	13.9474	13.4726	13.9037	13.4343	13.8692	13.8916	13.4552	13.9293	13.5088	13.9774 (61)
Total heat required for water heating calculated for each month	132.6851	116.4337	121.0764	106.8703	103.5210	90.7673	85.5295	96.1228	96.6686	110.9065	119.3669	128.9325 (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	132.6851	116.4337	121.0764	106.8703	103.5210	90.7673	85.5295	96.1228	96.6686	110.9065	119.3669	128.9325 (64)
Heat gains from water heating, kWh/month	42.9641	37.6733	39.1073	34.4229	33.2737	29.0718	27.2944	30.8148	31.0323	35.7272	38.5750	41.7169 (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	81.1911	81.1911	81.1911	81.1911	81.1911	81.1911	81.1911	81.1911	81.1911	81.1911	81.1911	81.1911 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.2397	11.7594	9.5634	7.2401	5.4121	4.5691	4.9371	6.4174	8.6134	10.9367	12.7647	13.6077 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	141.3672	142.8341	139.1374	131.2677	121.3335	111.9968	105.7593	104.2924	107.9890	115.8588	125.7930	135.1297 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.1191	31.1191	31.1191	31.1191	31.1191	31.1191	31.1191	31.1191	31.1191	31.1191	31.1191	31.1191 (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)	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529 (71)
Water heating gains (Table 5)	57.7474	56.0614	52.5635	47.8096	44.7227	40.3775	36.6860	41.4177	43.1003	48.0205	53.5764	56.0711 (72)
Total internal gains	262.7116	261.0122	251.6217	236.6747	221.8256	207.3007	197.7397	202.4848	210.0601	225.1733	242.4914	255.1658 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b			FF Specific data or Table 6c			Access factor Table 6d	Gains W	
North				3.0900	10.6334	0.6300			0.7000			0.7700	10.0416 (74)	
West				4.2900	19.6403	0.6300			0.7000			0.7700	25.7500 (80)	

Solar gains	35.7915	69.5623	115.5646	173.3641	218.8309	227.3181	215.0253	180.0765	135.6873	82.6142	44.4947	29.5467 (83)		
Total gains	298.5031	330.5746	367.1863	410.0388	440.6565	434.6188	412.7650	382.5613	345.7475	307.7875	286.9862	284.7125 (84)		

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	28.8618	28.9245	28.9862	29.2795	29.3350	29.5964	29.5964	29.6453	29.4952	29.3350	29.2229	29.1066
alpha	2.9241	2.9283	2.9324	2.9520	2.9557	2.9731	2.9731	2.9764	2.9663	2.9557	2.9482	2.9404
util living area	0.9514	0.9332	0.8954	0.8171	0.6952	0.5428	0.4159	0.4606	0.6709	0.8564	0.9319	0.9569 (86)
MIT	19.1689	19.3914	19.7785	20.2658	20.6529	20.8813	20.9601	20.9453	20.7694	20.2650	19.6371	19.1204 (87)
Th 2	20.1826	20.1843	20.1859	20.1934	20.1948	20.2013	20.2013	20.2026	20.1988	20.1948	20.1919	20.1890 (88)
util rest of house	0.9454	0.9251	0.8825	0.7946	0.6583	0.4885	0.3473	0.3904	0.6196	0.8336	0.9222	0.9515 (89)
MIT 2	18.4940	18.7137	19.0930	19.5657	19.9228	20.1231	20.1812	20.1736	20.0354	19.5754	18.9643	18.4510 (90)
Living area fraction	18.8505	19.0717	19.4552	19.9355	20.3085	20.5236	20.5927	20.5813	20.4231	19.9397	19.3197	18.8046 (91)
MIT	18.8505	19.0717	19.4552	19.9355	20.3085	20.5236	20.5927	20.5813	20.4231	19.9397	19.3197	18.8046 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8505	19.0717	19.4552	19.9355	20.3085	20.5236	20.5927	20.5813	20.4231	19.9397	19.3197	18.8046 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9334	0.9119	0.8692	0.7868	0.6638	0.5110	0.3815	0.4245	0.6347	0.8254	0.9098	0.9403 (94)
Ext temp.	278.6364	301.4564	319.1707	322.6158	292.4940	222.1006	157.4692	162.4006	219.4468	254.0598	261.1140	267.7106 (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	612.8376	595.5906	543.3032	458.1621	356.7225	243.2990	163.9897	171.4529	260.5989	387.0233	508.3095	609.9438 (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	248.6457	197.6582	166.7546	97.5933	47.7860	0.0000	0.0000	0.0000	0.0000	98.9248	177.9807	254.6215 (98)
Space heating per m2												1289.9648 (98)
										(98) / (4) =		27.0206 (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												1425.3755 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	248.6457	197.6582	166.7546	97.5933	47.7860	0.0000	0.0000	0.0000	0.0000	98.9248	177.9807	254.6215 (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)	274.7466	218.4068	184.2592	107.8380	52.8022	0.0000	0.0000	0.0000	0.0000	109.3092	196.6638	281.3497 (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	132.6851	116.4337	121.0764	106.8703	103.5210	90.7673	85.5295	96.1228	96.6686	110.9065	119.3669	128.9325 (64)
Efficiency of water heater	89.3603	89.2868	89.1258	88.7987	88.2859	87.3000	87.3000	87.3000	87.3000	88.7800	89.1876	87.3000 (216)
(217)m	89.3603	89.2868	89.1258	88.7987	88.2859	87.3000	87.3000	87.3000	87.3000	88.7800	89.1876	89.3985 (217)
Fuel for water heating, kWh/month	148.4833	130.4042	135.8490	120.3513	117.2565	103.9717	97.9720	110.1063	110.7315	124.9229	133.8380	144.2223 (219)
Water heating fuel used	148.4833	130.4042	135.8490	120.3513	117.2565	103.9717	97.9720	110.1063	110.7315	124.9229	133.8380	1478.1089 (219)
Annual totals kWh/year												
Space heating fuel - main system												1425.3755 (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)												233.8175 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
Total delivered energy for all uses												3212.3019 (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	1425.3755	0.2160	307.8811 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1478.1089	0.2160	319.2715 (264)
Space and water heating			627.1526 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	233.8175	0.5190	121.3513 (268)
Energy saving/generation technologies			
PV Unit	-303.4800	0.5190	-157.5061 (269)
Total CO2, kg/year			629.9228 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			13.1900 (273)

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

DER	13.1900	ZC1
Total Floor Area	47.7400	TFA
Assumed number of occupants	1.6238	N
CO2 emission factor in Table 12 for electricity displaced from grid	0.5190	EF
CO2 emissions from appliances, equation (L14)	17.5474	ZC2
CO2 emissions from cooking, equation (L16)	3.3090	ZC3
Total CO2 emissions	34.0464	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	34.0464	ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	47.7400 (1b)	x 2.3500 (2b)	= 112.1890 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	47.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 112.1890 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 20.0000 / (5) = 0.1783 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4283 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3640 (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	0.4641	0.4550	0.4459	0.4004	0.3913	0.3458	0.3458	0.3367	0.3640	0.3913	0.4095	0.4277 (22b)
Effective ac	0.6077	0.6035	0.5994	0.5802	0.5766	0.5598	0.5598	0.5567	0.5663	0.5766	0.5839	0.5915 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opening Type (Uw = 1.40)			7.3800	1.3258	9.7841		(27)						
External Wall	36.6800	7.3800	29.3000	0.1800	5.2740		(29a)						
Total net area of external elements Aum(A, m2)			36.6800				(31)						
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.0581		(33)						
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.1084 (36)						
Total fabric heat loss						(33) + (36) =	19.1665 (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	22.4989	22.3441	22.1923	21.4794	21.3460	20.7251	20.7251	20.6101	20.9642	21.3460	21.6158	21.8979	(38)
Heat transfer coeff	41.6654	41.5106	41.3588	40.6459	40.5125	39.8916	39.8916	39.7766	40.1307	40.5125	40.7823	41.0644	(39)
Average = Sum(39)m / 12 =												40.6452	(39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8728	0.8695	0.8663	0.8514	0.8486	0.8356	0.8356	0.8332	0.8406	0.8486	0.8543	0.8602	(40)
HLP (average)												0.8514	(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												1.6238 (42)
Average daily hot water use (litres/day)												72.7658 (43)
Daily hot water use	80.0424	77.1317	74.2211	71.3105	68.3998	65.4892	65.4892	68.3998	71.3105	74.2211	77.1317	80.0424 (44)
Energy conte	118.7005	103.8162	107.1290	93.3977	89.6173	77.3329	71.6603	82.2313	83.2134	96.9772	105.8582	114.9551 (45)
Energy content (annual)										Total = Sum(45)m =		1144.8892 (45)
Distribution loss (46)m = 0.15 x (45)m	17.8051	15.5724	16.0694	14.0097	13.4426	11.5999	10.7490	12.3347	12.4820	14.5466	15.8787	17.2433 (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	40.7887	35.5017	37.8223	35.1668	34.8558	32.2960	33.3726	34.8558	35.1668	37.8223	38.0376	40.7887 (61)
Total heat required for water heating calculated for each month	159.4892	139.3180	144.9513	128.5645	124.4731	109.6290	105.0329	117.0871	118.3802	134.7994	143.8957	155.7438 (62)

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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	0.0000 (63)
Output from w/h	159.4892	139.3180	144.9513	128.5645	124.4731	109.6290	105.0329	117.0871	118.3802	134.7994	143.8957	155.7438	1581.3643 (64)
Heat gains from water heating, kWh/month	49.6651	43.3943	45.0760	39.8464	38.5117	33.7872	32.1702	36.0559	36.4601	41.7005	44.7072	48.4198	48.4198 (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	81.1911	81.1911	81.1911	81.1911	81.1911	81.1911	81.1911	81.1911	81.1911	81.1911	81.1911	81.1911	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.2397	11.7594	9.5634	7.2401	5.4121	4.5691	4.9371	6.4174	8.6134	10.9367	12.7647	13.6077	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	141.3672	142.8341	139.1374	131.2677	121.3335	111.9968	105.7593	104.2924	107.9890	115.8588	125.7930	135.1297	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.1191	31.1191	31.1191	31.1191	31.1191	31.1191	31.1191	31.1191	31.1191	31.1191	31.1191	31.1191	(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)	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529	(71)
Water heating gains (Table 5)	66.7542	64.5749	60.5860	55.3423	51.7631	46.9267	43.2395	48.4622	50.6391	56.0490	62.0934	65.0803	(72)
Total internal gains	271.7184	269.5257	259.6442	244.2074	228.8660	213.8499	204.2932	209.5293	217.5989	233.2018	251.0084	264.1750	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
North					3.0900	10.6334		0.6300	0.7000	0.7700		10.0416	
West					4.2900	19.6403		0.6300	0.7000	0.7700		25.7500 (80)	
Solar gains	35.7915	69.5623	115.5646	173.3641	218.8309	227.3181	215.0253	180.0765	135.6873	82.6142	44.4947	29.5467 (83)	
Total gains	307.5099	339.0881	375.2087	417.5715	447.6969	441.1680	419.3186	389.6058	353.2862	315.8161	295.5031	293.7217 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.5690	79.8658	80.1589	81.5649	81.8335	83.1072	83.1072	83.3475	82.6119	81.8335	81.2920	80.7336	
alpha	6.3046	6.3244	6.3439	6.4377	6.4556	6.5405	6.5405	6.5565	6.5075	6.4556	6.4195	6.3822	
util living area	0.9967	0.9932	0.9803	0.9252	0.7811	0.5718	0.4178	0.4679	0.7424	0.9559	0.9926	0.9975	(86)
MIT	20.1934	20.3127	20.5189	20.7806	20.9436	20.9936	20.9993	20.9986	20.9695	20.7514	20.4312	20.1757	(87)
Th 2	20.1907	20.1935	20.1962	20.2090	20.2114	20.2226	20.2226	20.2247	20.2183	20.2114	20.2066	20.2015	(88)
util rest of house	0.9957	0.9911	0.9740	0.9033	0.7319	0.5054	0.3444	0.3900	0.6737	0.9381	0.9899	0.9967	(89)
MIT 2	19.1107	19.2863	19.5855	19.9578	20.1592	20.2185	20.2223	20.2241	20.1954	19.9275	19.4696	19.0933	(90)
Living area fraction	19.6827	19.8285	20.0786	20.3924	20.5736	20.6280	20.6328	20.6332	20.6043	20.3628	19.9776	19.6651	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6827	19.8285	20.0786	20.3924	20.5736	20.6280	20.6328	20.6332	20.6043	20.3628	19.9776	19.6651	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	305.9423	335.6574	365.0418	379.5300	338.1559	238.3779	160.6849	167.9915	250.4207	297.5082	292.2352	292.5669	(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	640.9265	619.6908	561.5950	467.1201	359.4907	240.4660	160.8735	168.3829	261.0240	395.5140	525.1789	635.0653	(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	249.2282	190.8705	146.2356	63.0649	15.8731	0.0000	0.0000	0.0000	0.0000	72.9163	167.7195	254.8188	(98)
Space heating												1160.7268	(98)
Space heating per m2												24.3135	(99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	93.4000 (206)

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Efficiency of secondary/supplementary heating system, %	0.0000 (208)											
Space heating requirement	1242.7482 (211)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	249.2282	190.8705	146.2356	63.0649	15.8731	0.0000	0.0000	0.0000	0.0000	72.9163	167.7195	254.8188 (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)	266.8397	204.3581	156.5692	67.5213	16.9947	0.0000	0.0000	0.0000	0.0000	78.0688	179.5712	272.8252 (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	159.4892	139.3180	144.9513	128.5645	124.4731	109.6290	105.0329	117.0871	118.3802	134.7994	143.8957	155.7438 (64)
Efficiency of water heater	86.1707	85.8442	85.0734	83.3652	81.3277	80.3000	80.3000	80.3000	80.3000	83.5779	85.4377	80.3000 (216)
Fuel for water heating, kWh/month	185.0853	162.2916	170.3838	154.2184	153.0514	136.5243	130.8006	145.8121	147.4224	161.2859	168.4219	180.5031 (219)
Water heating fuel used												1895.8008 (219)
Annual totals kWh/year												
Space heating fuel - main system												1242.7482 (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)												233.8175 (232)
Total delivered energy for all uses												3447.3665 (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	1242.7482	0.2160	268.4336 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1895.8008	0.2160	409.4930 (264)
Space and water heating			677.9266 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	233.8175	0.5190	121.3513 (268)
Total CO2, kg/m2/year			838.2028 (272)
Emissions per m2 for space and water heating			14.2004 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.5419 (272b)
Emissions per m2 for pumps and fans			0.8154 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.2004 * 1.00) + 2.5419 + 0.8154, rounded to 2 d.p.			17.5600 (273)

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Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	47.7400 (1b)	x 2.3500 (2b)	= 112.1890 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	47.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 112.1890 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				2 * 10 =	20.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					20.0000 / (5) =
Measured/design AP50					Yes
Infiltration rate					3.0100
Number of sides sheltered					0.3288 (18)
					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.2795 (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	0.3563	0.3493	0.3423	0.3074	0.3004	0.2655	0.2655	0.2585	0.2795	0.3004	0.3144	0.3284 (22b)
Effective ac	0.5635	0.5610	0.5586	0.5472	0.5451	0.5352	0.5352	0.5334	0.5390	0.5451	0.5494	0.5539 (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)			7.3800	1.3258	9.7841		(27)
External Wall	36.6800	7.3800	29.3000	0.2000	5.8600	9.0000	263.7000 (29a)
Total net area of external elements Aum(A, m ²)			36.6800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	15.6441		(33)
Party Wall			31.0200	0.0000	0.0000	20.0000	620.4000 (32)
Party Floor			47.7400			30.0000	1432.2000 (32d)
Party Ceilings			47.7400			20.0000	954.8000 (32b)
Internal Walls			69.7400			9.0000	627.6600 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		3898.7600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							81.6665 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.6126 (36)
Total fabric heat loss					(33) + (36) =		21.2567 (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	20.8612	20.7700	20.6805	20.2604	20.1818	19.8159	19.8159	19.7481	19.9568	20.1818	20.3408	20.5071 (38)
Heat transfer coeff	42.1179	42.0267	41.9372	41.5171	41.4385	41.0726	41.0726	41.0048	41.2135	41.4385	41.5975	41.7638 (39)
Average = Sum(39)m / 12 =												41.5167 (39)
HLP	0.8822	0.8803	0.8785	0.8697	0.8680	0.8603	0.8603	0.8589	0.8633	0.8680	0.8713	0.8748 (40)
HLP (average)												0.8696 (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	1.6238 (42)											
Average daily hot water use (litres/day)	72.7658 (43)											
Daily hot water use	80.0424	77.1317	74.2211	71.3105	68.3998	65.4892	65.4892	68.3998	71.3105	74.2211	77.1317	80.0424 (44)
Energy conte	118.7005	103.8162	107.1290	93.3977	89.6173	77.3329	71.6603	82.2313	83.2134	96.9772	105.8582	114.9551 (45)
Energy content (annual)	Total = Sum(45)m = 1144.8892 (45)											
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

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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	25.2239	22.0609	22.7649	19.8470	19.0437	16.4332	15.2278	17.4741	17.6828	20.6076	22.4949	24.4280 (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	81.1911	81.1911	81.1911	81.1911	81.1911	81.1911	81.1911	81.1911	81.1911	81.1911	81.1911	81.1911 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.2397	11.7594	9.5634	7.2401	5.4121	4.5691	4.9371	6.4174	8.6134	10.9367	12.7647	13.6077 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	141.3672	142.8341	139.1374	131.2677	121.3335	111.9968	105.7593	104.2924	107.9890	115.8588	125.7930	135.1297 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.1191	31.1191	31.1191	31.1191	31.1191	31.1191	31.1191	31.1191	31.1191	31.1191	31.1191	31.1191 (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)	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529 (71)
Water heating gains (Table 5)	33.9030	32.8288	30.5980	27.5653	25.5963	22.8240	20.4675	23.4868	24.5595	27.6985	31.2429	32.8333 (72)
Total internal gains	235.8672	234.7796	226.6562	213.4304	199.6993	186.7472	178.5212	181.5538	188.5193	201.8513	217.1579	228.9280 (73)

6. Solar gains												

[Jan]				Area	Solar flux		g		FF		Access	Gains
				m2	Table 6a		Specific data		Specific data		factor	W
					W/m2		or Table 6b		or Table 6c		Table 6d	
North				3.0900	10.6334		0.6300		0.7000		0.7700	10.0416 (74)
West				4.2900	19.6403		0.6300		0.7000		0.7700	25.7500 (80)

Solar gains	35.7915	69.5623	115.5646	173.3641	218.8309	227.3181	215.0253	180.0765	135.6873	82.6142	44.4947	29.5467 (83)
Total gains	271.6588	304.3420	342.2208	386.7945	418.5302	414.0653	393.5465	361.6304	324.2066	284.4655	261.6526	258.4746 (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	25.7132	25.7691	25.8240	26.0854	26.1349	26.3677	26.3677	26.4113	26.2775	26.1349	26.0349	25.9313
alpha	2.7142	2.7179	2.7216	2.7390	2.7423	2.7578	2.7578	2.7608	2.7518	2.7423	2.7357	2.7288
util living area	0.9522	0.9339	0.8963	0.8198	0.7019	0.5540	0.4285	0.4763	0.6837	0.8620	0.9340	0.9576 (86)
MIT	18.9118	19.1558	19.5826	20.1252	20.5671	20.8412	20.9428	20.9223	20.7031	20.1224	19.4250	18.8606 (87)
Th 2	20.1826	20.1843	20.1859	20.1934	20.1948	20.2013	20.2013	20.2026	20.1988	20.1948	20.1919	20.1890 (88)
util rest of house	0.9467	0.9263	0.8843	0.7986	0.6666	0.5008	0.3597	0.4061	0.6347	0.8410	0.9252	0.9526 (89)
MIT 2	18.2490	18.4903	18.9096	19.4380	19.8499	20.0937	20.1711	20.1595	19.9830	19.4465	18.7647	18.2031 (90)
Living area fraction									fLA = Living area / (4) =			0.5283 (91)
MIT	18.5991	18.8419	19.2651	19.8010	20.2287	20.4886	20.5788	20.5625	20.3634	19.8036	19.1135	18.5505 (92)
Temperature adjustment												0.0000
adjusted MIT	18.5991	18.8419	19.2651	19.8010	20.2287	20.4886	20.5788	20.5625	20.3634	19.8036	19.1135	18.5505 (93)

8. Space heating requirement												

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9333	0.9112	0.8684	0.7872	0.6682	0.5205	0.3929	0.4386	0.6454	0.8293	0.9109	0.9401 (94)
Useful gains	253.5341	277.3201	297.1704	304.4706	279.6708	215.5358	154.6299	158.6251	209.2476	235.9050	238.3438	242.9884 (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	602.2498	585.9308	535.3349	452.5782	353.4184	241.8595	163.4179	170.6811	258.1383	381.3813	499.7315	599.3295 (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	259.4445	207.3864	177.1943	106.6375	54.8682	0.0000	0.0000	0.0000	0.0000	108.2343	188.1992	265.1178 (98)
Space heating												1367.0822 (98)
Space heating per m2										(98) / (4) =		28.6360 (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	386.0821	303.9369	311.6364	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8453	0.8914	0.8697	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	326.3550	270.9167	271.0307	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	545.9458	520.8314	484.5127	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	158.1054	185.9365	158.8306	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												502.8725 (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	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	39.5264	46.4841	39.7076	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												125.7181 (107)
Space cooling per m2												2.6334 (108)
Energy for space heating												28.6360 (99)
Energy for space cooling												2.6334 (108)
Total												31.2694 (109)
Dwelling Fabric Energy Efficiency (DFEE)												31.3 (109)

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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	47.7400 (1b)	x 2.3500 (2b)	= 112.1890 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	47.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 112.1890 (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) = 0.1783 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4283 (18)
					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3640 (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	0.4641	0.4550	0.4459	0.4004	0.3913	0.3458	0.3458	0.3367	0.3640	0.3913	0.4095	0.4277 (22b)
Effective ac	0.6077	0.6035	0.5994	0.5802	0.5766	0.5598	0.5598	0.5567	0.5663	0.5766	0.5839	0.5915 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opening Type (Uw = 1.40)			7.3800	1.3258	9.7841		(27)
External Wall	36.6800	7.3800	29.3000	0.1800	5.2740		(29a)
Total net area of external elements Aum(A, m ²)			36.6800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	15.0581		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.1084 (36)
Total fabric heat loss						(33) + (36) =	19.1665 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	22.4989	22.3441	22.1923	21.4794	21.3460	20.7251	20.7251
Heat transfer coeff	41.6654	41.5106	41.3588	40.6459	40.5125	39.8916	39.8916
Average = Sum(39)m / 12 =							
HLP	0.8728	0.8695	0.8663	0.8514	0.8486	0.8356	0.8356
HLP (average)							0.8332
Days in month	31	28	31	30	31	30	31
							0.8406
							0.8486
							0.8543
							0.8602 (40)
							0.8514 (40)
							31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6238 (42)
Average daily hot water use (litres/day)													72.7658 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	80.0424	77.1317	74.2211	71.3105	68.3998	65.4892	65.4892	68.3998	71.3105	74.2211	77.1317	80.0424	(44)
Energy conte	118.7005	103.8162	107.1290	93.3977	89.6173	77.3329	71.6603	82.2313	83.2134	96.9772	105.8582	114.9551	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1144.8892	(45)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Heat gains from water heating, kWh/month													
	25.2239	22.0609	22.7649	19.8470	19.0437	16.4332	15.2278	17.4741	17.6828	20.6076	22.4949	24.4280	(65)

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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	81.1911	81.1911	81.1911	81.1911	81.1911	81.1911	81.1911	81.1911	81.1911	81.1911	81.1911	81.1911	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.2397	11.7594	9.5634	7.2401	5.4121	4.5691	4.9371	6.4174	8.6134	10.9367	12.7647	13.6077	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	141.3672	142.8341	139.1374	131.2677	121.3335	111.9968	105.7593	104.2924	107.9890	115.8588	125.7930	135.1297	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.1191	31.1191	31.1191	31.1191	31.1191	31.1191	31.1191	31.1191	31.1191	31.1191	31.1191	31.1191	(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)	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529	(71)
Water heating gains (Table 5)	33.9030	32.8288	30.5980	27.5653	25.5963	22.8240	20.4675	23.4868	24.5595	27.6985	31.2429	32.8333	(72)
Total internal gains	235.8672	234.7796	226.6562	213.4304	199.6993	186.7472	178.5212	181.5538	188.5193	201.8513	217.1579	228.9280	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W		
North					3.0900	10.6334	0.6300	0.7000	0.7700	10.0416		
West					4.2900	19.6403	0.6300	0.7000	0.7700	25.7500 (80)		

Solar gains	35.7915	69.5623	115.5646	173.3641	218.8309	227.3181	215.0253	180.0765	135.6873	82.6142	44.4947	29.5467 (83)
Total gains	271.6588	304.3420	342.2208	386.7945	418.5302	414.0653	393.5465	361.6304	324.2066	284.4655	261.6526	258.4746 (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	79.5690	79.8658	80.1589	81.5649	81.8335	83.1072	83.1072	83.3475	82.6119	81.8335	81.2920	80.7336		
alpha	6.3046	6.3244	6.3439	6.4377	6.4556	6.5405	6.5405	6.5565	6.5075	6.4556	6.4195	6.3822		
util living area	0.9984	0.9962	0.9876	0.9454	0.8163	0.6063	0.4447	0.5031	0.7897	0.9728	0.9962	0.9988	(86)	
MIT	20.1203	20.2430	20.4571	20.7375	20.9269	20.9911	20.9990	20.9978	20.9565	20.6990	20.3633	20.1034	(87)	
Th 2	20.1907	20.1935	20.1962	20.2090	20.2114	20.2226	20.2226	20.2247	20.2183	20.2114	20.2066	20.2015	(88)	
util rest of house	0.9979	0.9950	0.9834	0.9278	0.7695	0.5371	0.3669	0.4198	0.7229	0.9607	0.9948	0.9984	(89)	
MIT 2	19.3806	19.5052	19.7193	19.9993	20.1640	20.2187	20.2223	20.2240	20.1950	19.9698	19.6364	19.3728	(90)	
Living area fraction														
MIT	19.7714	19.8950	20.1090	20.3893	20.5671	20.6267	20.6326	20.6328	20.5973	20.3550	20.0204	19.7587	(92)	
Temperature adjustment												0.0000		
adjusted MIT	19.7714	19.8950	20.1090	20.3893	20.5671	20.6267	20.6326	20.6328	20.5973	20.3550	20.0204	19.7587	(93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9975	0.9944	0.9829	0.9323	0.7916	0.5736	0.4081	0.4639	0.7569	0.9633	0.9943	0.9982	(94)
Useful gains	270.9809	302.6481	336.3578	360.5938	331.3085	237.4878	160.5929	167.7658	245.3826	274.0215	260.1721	257.9966	(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	644.6209	622.4497	562.8529	466.9933	359.2266	240.4159	160.8668	168.3665	260.7418	395.1999	526.9238	638.9106	(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	277.9882	214.9067	168.5124	76.6076	20.7711	0.0000	0.0000	0.0000	0.0000	90.1567	192.0613	283.4000	(98)
Space heating												1324.4039	(98)
Space heating per m2												27.7420	(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	374.9807	295.1976	302.3020	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9715	0.9893	0.9824	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	364.2878	292.0347	296.9933	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	545.9458	520.8314	484.5127	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	130.7938	170.2247	139.5145	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												440.5330	(104)
Cooled fraction												1.0000	(105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	32.6984	42.5562	34.8786	0.0000	0.0000	0.0000	0.0000	(107)

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Space cooling	110.1332 (107)
Space cooling per m2	2.3069 (108)
Energy for space heating	27.7420 (99)
Energy for space cooling	2.3069 (108)
Total	30.0490 (109)
Target Fabric Energy Efficiency (TFEE)	34.6 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	47.7400 (1b)	x 2.3500 (2b)	= 112.1890 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	47.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 112.1890 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				2 * 10 =	20.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					20.0000 / (5) =
Measured/design AP50					Yes
Infiltration rate					3.0100
Number of sides sheltered					0.3288 (18)
					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.2795 (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	0.3074	0.2864	0.2864	0.2725	0.2725	0.2585	0.2585	0.2445	0.2445	0.2655	0.2585	0.2725 (22b)
Effective ac	0.5472	0.5410	0.5410	0.5371	0.5371	0.5334	0.5334	0.5299	0.5299	0.5352	0.5334	0.5371 (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)			7.3800	1.3258	9.7841		(27)
External Wall	36.6800	7.3800	29.3000	0.2000	5.8600	9.0000	263.7000 (29a)
Total net area of external elements Aum(A, m ²)			36.6800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	15.6441		(33)
Party Wall			31.0200	0.0000	0.0000	20.0000	620.4000 (32)
Party Floor			47.7400			30.0000	1432.2000 (32d)
Party Ceilings			47.7400			30.0000	1432.2000 (32b)
Internal Walls			69.7400			9.0000	627.6600 (32c)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			4376.1600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							91.6665 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.6126 (36)
Total fabric heat loss						(33) + (36) =	21.2567 (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	20.2604	20.0300	20.0300	19.8854	19.8854	19.7481	19.7481	19.6180	19.6180	19.8159	19.7481	19.8854 (38)
Heat transfer coeff	41.5171	41.2867	41.2867	41.1421	41.1421	41.0048	41.0048	40.8747	40.8747	41.0726	41.0048	41.1421 (39)
Average = Sum(39)m / 12 =												41.1128 (39)
HLP	0.8697	0.8648	0.8648	0.8618	0.8618	0.8589	0.8589	0.8562	0.8562	0.8603	0.8589	0.8618 (40)
HLP (average)												0.8612 (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												1.6238 (42)
Average daily hot water use (litres/day)												72.7658 (43)
Daily hot water use	80.0424	77.1317	74.2211	71.3105	68.3998	65.4892	65.4892	68.3998	71.3105	74.2211	77.1317	80.0424 (44)
Energy conte	118.7005	103.8162	107.1290	93.3977	89.6173	77.3329	71.6603	82.2313	83.2134	96.9772	105.8582	114.9551 (45)
Energy content (annual)										Total = Sum(45)m =		1144.8892 (45)
Distribution loss (46)m = 0.15 x (45)m	17.8051	15.5724	16.0694	14.0097	13.4426	11.5999	10.7490	12.3347	12.4820	14.5466	15.8787	17.2433 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

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If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	13.9846	12.6175	13.9474	13.4726	13.9037	13.4343	13.8692	13.8916	13.4552	13.9293	13.5088	13.9774 (61)
Total heat required for water heating calculated for each month	132.6851	116.4337	121.0764	106.8703	103.5210	90.7673	85.5295	96.1228	96.6686	110.9065	119.3669	128.9325 (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	132.6851	116.4337	121.0764	106.8703	103.5210	90.7673	85.5295	96.1228	96.6686	110.9065	119.3669	128.9325 (64)
RHI water heating demand												1308.8807 (64)
Heat gains from water heating, kWh/month	42.9641	37.6733	39.1073	34.4229	33.2737	29.0718	27.2944	30.8148	31.0323	35.7272	38.5750	41.7169 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	97.4294	97.4294	97.4294	97.4294	97.4294	97.4294	97.4294	97.4294	97.4294	97.4294	97.4294	97.4294	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	33.0993	29.3985	23.9085	18.1002	13.5301	11.4227	12.3426	16.0434	21.5335	27.3417	31.9118	34.0192	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	210.9958	213.1852	207.6678	195.9219	181.0948	167.1594	157.8497	155.6603	161.1777	172.9236	187.7507	201.6861	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.3668	46.3668	46.3668	46.3668	46.3668	46.3668	46.3668	46.3668	46.3668	46.3668	46.3668	46.3668	(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)	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529	(71)
Water heating gains (Table 5)	57.7474	56.0614	52.5635	47.8096	44.7227	40.3775	36.6860	41.4177	43.1003	48.0205	53.5764	56.0711	(72)
Total internal gains	383.6857	380.4883	365.9830	343.6749	321.1909	300.8028	288.7216	294.9646	307.6547	330.1290	355.0821	373.6196	(73)

6. Solar gains

[Jan]													Gains
	Area				Solar flux		g		FF		Access		W
	m2				Table 6a		or Table 6b		or Table 6c		factor		
					W/m2						Table 6d		
North	3.0900				13.4839		0.6300		0.7000		0.7700		12.7334
West	4.2900				25.1925		0.6300		0.7000		0.7700		33.0294 (80)

Solar gains	45.7629	75.9132	127.3579	192.0130	228.6638	260.0782	237.4916	208.0071	156.7462	96.1340	56.7588	35.7254	(83)
Total gains	429.4485	456.4016	493.3409	535.6879	549.8547	560.8811	526.2132	502.9717	464.4009	426.2630	411.8409	409.3451	(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	29.2795	29.4429	29.4429	29.5464	29.5464	29.6453	29.6453	29.7397	29.7397	29.5964	29.6453	29.5464	
alpha	2.9520	2.9629	2.9629	2.9698	2.9698	2.9764	2.9764	2.9826	2.9826	2.9731	2.9764	2.9698	
util living area	0.8752	0.8501	0.7888	0.6820	0.5332	0.3602	0.2538	0.2643	0.4676	0.6928	0.8261	0.8841	(86)
MIT	19.8072	19.9647	20.2784	20.6160	20.8598	20.9687	20.9922	20.9914	20.9300	20.6725	20.2223	19.7857	(87)
Th 2	20.1934	20.1975	20.1975	20.2001	20.2001	20.2026	20.2026	20.2049	20.2049	20.2013	20.2026	20.2001	(88)
util rest of house	0.8618	0.8344	0.7671	0.6510	0.4898	0.3076	0.1938	0.2022	0.4109	0.6547	0.8053	0.8713	(89)
MIT 2	19.1222	19.2764	19.5745	19.8878	20.0998	20.1853	20.1997	20.2018	20.1624	19.9469	19.5313	19.1076	(90)
Living area fraction									fLA = Living area / (4) =			0.5283	(91)
MIT	19.4840	19.6400	19.9463	20.2725	20.5013	20.5992	20.6184	20.6189	20.5679	20.3302	19.8963	19.4658	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4840	19.6400	19.9463	20.2725	20.5013	20.5992	20.6184	20.6189	20.5679	20.3302	19.8963	19.4658	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.8485	0.8223	0.7597	0.6539	0.5065	0.3340	0.2253	0.2347	0.4373	0.6612	0.7966	0.8580	(94)
Ext temp.	364.3789	375.3216	374.8139	350.2816	278.5253	187.3525	118.5382	118.0594	203.0847	281.8434	328.0759	351.2113	(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	584.7281	567.2802	509.7385	422.6315	304.5059	192.6887	119.6674	119.3088	215.3240	342.1433	471.4052	574.5835	(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	163.9399	128.9961	100.3839	52.0920	19.3296	0.0000	0.0000	0.0000	0.0000	44.8631	103.1971	166.1889	(98)
RHI space heating demand												779	(98)

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	47.7400 (1b)	x 2.3500 (2b)	= 112.1890 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	47.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 112.1890 (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) = 0.1783 (8)
Measured/design AP50					Yes
Infiltration rate					3.0100
Number of sides sheltered					0.3288 (18)
					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.2795 (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	0.3563	0.3493	0.3423	0.3074	0.3004	0.2655	0.2655	0.2585	0.2795	0.3004	0.3144	0.3284 (22b)
Effective ac	0.5635	0.5610	0.5586	0.5472	0.5451	0.5352	0.5352	0.5334	0.5390	0.5451	0.5494	0.5539 (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)			7.3800	1.3258	9.7841		(27)
External Wall	36.6800	7.3800	29.3000	0.2000	5.8600	9.0000	263.7000 (29a)
Total net area of external elements Aum(A, m ²)			36.6800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	15.6441		(33)
Party Wall			31.0200	0.0000	0.0000	20.0000	620.4000 (32)
Party Floor			47.7400			30.0000	1432.2000 (32d)
Party Ceilings			47.7400			30.0000	1432.2000 (32b)
Internal Walls			69.7400			9.0000	627.6600 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		4376.1600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							91.6665 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.6126 (36)
Total fabric heat loss					(33) + (36) =		21.2567 (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	20.8612	20.7700	20.6805	20.2604	20.1818	19.8159	19.8159	19.7481	19.9568	20.1818	20.3408	20.5071 (38)
Heat transfer coeff	42.1179	42.0267	41.9372	41.5171	41.4385	41.0726	41.0726	41.0048	41.2135	41.4385	41.5975	41.7638 (39)
Average = Sum(39)m / 12 =												41.5167 (39)
HLP	0.8822	0.8803	0.8785	0.8697	0.8680	0.8603	0.8603	0.8589	0.8633	0.8680	0.8713	0.8748 (40)
HLP (average)												0.8696 (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												1.6238 (42)
Average daily hot water use (litres/day)												72.7658 (43)
Daily hot water use	80.0424	77.1317	74.2211	71.3105	68.3998	65.4892	65.4892	68.3998	71.3105	74.2211	77.1317	80.0424 (44)
Energy conte	118.7005	103.8162	107.1290	93.3977	89.6173	77.3329	71.6603	82.2313	83.2134	96.9772	105.8582	114.9551 (45)
Energy content (annual)										Total = Sum(45)m =		1144.8892 (45)
Distribution loss (46)m = 0.15 x (45)m	17.8051	15.5724	16.0694	14.0097	13.4426	11.5999	10.7490	12.3347	12.4820	14.5466	15.8787	17.2433 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

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If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	13.9846	12.6175	13.9474	13.4726	13.9037	13.4343	13.8692	13.8916	13.4552	13.9293	13.5088	13.9774 (61)
Total heat required for water heating calculated for each month	132.6851	116.4337	121.0764	106.8703	103.5210	90.7673	85.5295	96.1228	96.6686	110.9065	119.3669	128.9325 (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	132.6851	116.4337	121.0764	106.8703	103.5210	90.7673	85.5295	96.1228	96.6686	110.9065	119.3669	128.9325 (64)
Heat gains from water heating, kWh/month	42.9641	37.6733	39.1073	34.4229	33.2737	29.0718	27.2944	30.8148	31.0323	35.7272	38.5750	41.7169 (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	97.4294	97.4294	97.4294	97.4294	97.4294	97.4294	97.4294	97.4294	97.4294	97.4294	97.4294	97.4294 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	33.0993	29.3985	23.9085	18.1002	13.5301	11.4227	12.3426	16.0434	21.5335	27.3417	31.9118	34.0192 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	210.9958	213.1852	207.6678	195.9219	181.0948	167.1594	157.8497	155.6603	161.1777	172.9236	187.7507	201.6861 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.3668	46.3668	46.3668	46.3668	46.3668	46.3668	46.3668	46.3668	46.3668	46.3668	46.3668	46.3668 (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)	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529 (71)
Water heating gains (Table 5)	57.7474	56.0614	52.5635	47.8096	44.7227	40.3775	36.6860	41.4177	43.1003	48.0205	53.5764	56.0711 (72)
Total internal gains	383.6857	380.4883	365.9830	343.6749	321.1909	300.8028	288.7216	294.9646	307.6547	330.1290	355.0821	373.6196 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g		FF		Access factor		Gains W
						Specific data or Table 6b		Specific data or Table 6c		Table 6d		
North				3.0900	10.6334	0.6300		0.7000		0.7700		10.0416 (74)
West				4.2900	19.6403	0.6300		0.7000		0.7700		25.7500 (80)

Solar gains	35.7915	69.5623	115.5646	173.3641	218.8309	227.3181	215.0253	180.0765	135.6873	82.6142	44.4947	29.5467 (83)
Total gains	419.4772	450.0507	481.5476	517.0390	540.0218	528.1210	503.7469	475.0412	443.3420	412.7432	399.5769	403.1663 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	28.8618	28.9245	28.9862	29.2795	29.3350	29.5964	29.5964	29.6453	29.4952	29.3350	29.2229	29.1066
alpha	2.9241	2.9283	2.9324	2.9520	2.9557	2.9731	2.9731	2.9764	2.9663	2.9557	2.9482	2.9404
util living area	0.8975	0.8729	0.8252	0.7361	0.6113	0.4642	0.3476	0.3813	0.5670	0.7631	0.8646	0.9060 (86)
MIT	19.5727	19.7600	20.0785	20.4656	20.7573	20.9220	20.9753	20.9671	20.8549	20.4906	19.9793	19.5269 (87)
Th 2	20.1826	20.1843	20.1859	20.1934	20.1948	20.2013	20.2013	20.2026	20.1988	20.1948	20.1919	20.1890 (88)
util rest of house	0.8866	0.8597	0.8070	0.7094	0.5733	0.4140	0.2882	0.3201	0.5160	0.7331	0.8485	0.8959 (89)
MIT 2	18.8856	19.0681	19.3754	19.7453	20.0086	20.1511	20.1892	20.1856	20.0994	19.7775	19.2905	18.8464 (90)
Living area fraction	19.2486	19.4336	19.7468	20.1258	20.4041	20.5584	20.6045	20.5984	20.4985	20.1542	19.6544	0.5283 (91)
MIT	19.2486	19.4336	19.7468	20.1258	20.4041	20.5584	20.6045	20.5984	20.4985	20.1542	19.6544	19.2059 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2486	19.4336	19.7468	20.1258	20.4041	20.5584	20.6045	20.5984	20.4985	20.1542	19.6544	19.2059 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.8722	0.8460	0.7963	0.7070	0.5835	0.4369	0.3185	0.3509	0.5357	0.7314	0.8365	0.8817 (94)
Ext temp.	365.8871	380.7398	383.4546	365.5440	315.1208	230.7271	160.4548	166.7086	237.4816	301.8966	334.2509	355.4754 (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	629.6028	610.8000	555.5348	466.0642	360.6861	244.7265	164.4754	172.1562	263.7044	395.9116	522.2309	626.7020 (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	196.2045	154.6004	128.0277	72.3745	33.9006	0.0000	0.0000	0.0000	0.0000	69.9471	135.3456	201.7926 (98)
Space heating per m2										(98) / (4) =		20.7833 (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													1096.3459 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	196.2045	154.6004	128.0277	72.3745	33.9006	0.0000	0.0000	0.0000	0.0000	69.9471	135.3456	201.7926	(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)	216.8006	170.8292	141.4670	79.9718	37.4592	0.0000	0.0000	0.0000	0.0000	77.2897	149.5531	222.9752	(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	132.6851	116.4337	121.0764	106.8703	103.5210	90.7673	85.5295	96.1228	96.6686	110.9065	119.3669	128.9325	(64)
Efficiency of water heater	89.1812	89.0970	88.9159	88.5644	88.0682	87.3000	87.3000	87.3000	87.3000	88.5104	88.9717	87.3000	(216)
(217)m													89.2250 (217)
Fuel for water heating, kWh/month	148.7815	130.6819	136.1697	120.6696	117.5464	103.9717	97.9720	110.1063	110.7315	125.3033	134.1629	144.5027	(219)
Water heating fuel used													1480.5994 (219)
Annual totals kWh/year													
Space heating fuel - main system													1096.3459 (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)													233.8175 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses													2885.7627 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1096.3459	3.4800	38.1528 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1480.5994	3.4800	51.5249 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	233.8175	13.1900	30.8405 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	0.0000	13.1900	0.0000 (252)
Total energy cost			250.4107 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)		1.1341 (257)
SAP value	$[(255) \times (256)] / [(4) + 45.0] =$	84.1799
SAP rating (Section 12)		84 (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	1096.3459	0.2160	236.8107 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1480.5994	0.2160	319.8095 (264)
Space and water heating			556.6202 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	233.8175	0.5190	121.3513 (268)
Energy saving/generation technologies			
PV Unit	-303.4800	0.5190	-157.5061 (269)
Total kg/year			559.3903 (272)
CO2 emissions per m2			11.7200 (273)
EI value			91.9174
EI rating			92 (274)
EI band			A

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9050 = 3.845$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9050 = 0.2387$, stars = 4
Water heating energy efficiency	$3.48 / 0.8831 = 3.941$, stars = 4
Water heating environmental impact	$0.216 / 0.8831 = 0.2446$, stars = 4

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	47.7400 (1b)	x 2.3500 (2b)	= 112.1890 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	47.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 112.1890 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				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) =	0.1783 (8)
Pressure test					Yes
Measured/design AP50					3.0100
Infiltration rate					0.3288 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.2795 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.4000	4.1000	4.1000	3.9000	3.9000	3.7000	3.7000	3.5000	3.5000	3.8000	3.7000	3.9000 (22)
Wind factor	1.1000	1.0250	1.0250	0.9750	0.9750	0.9250	0.9250	0.8750	0.8750	0.9500	0.9250	0.9750 (22a)
Adj infilt rate												
Effective ac	0.3074	0.2864	0.2864	0.2725	0.2725	0.2585	0.2585	0.2445	0.2445	0.2655	0.2585	0.2725 (22b)
	0.5472	0.5410	0.5410	0.5371	0.5371	0.5334	0.5334	0.5299	0.5299	0.5352	0.5334	0.5371 (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)			7.3800	1.3258	9.7841		(27)
External Wall	36.6800	7.3800	29.3000	0.2000	5.8600	9.0000	263.7000 (29a)
Total net area of external elements Aum(A, m ²)			36.6800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	15.6441		(33)
Party Wall			31.0200	0.0000	0.0000	20.0000	620.4000 (32)
Party Floor			47.7400			30.0000	1432.2000 (32d)
Party Ceilings			47.7400			30.0000	1432.2000 (32b)
Internal Walls			69.7400			9.0000	627.6600 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		4376.1600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							91.6665 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.6126 (36)
Total fabric heat loss						(33) + (36) =	21.2567 (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	20.2604	20.0300	20.0300	19.8854	19.8854	19.7481	19.7481	19.6180	19.6180	19.8159	19.7481	19.8854 (38)
Heat transfer coeff	41.5171	41.2867	41.2867	41.1421	41.1421	41.0048	41.0048	40.8747	40.8747	41.0726	41.0048	41.1421 (39)
Average = Sum(39)m / 12 =												41.1128 (39)
HLP	0.8697	0.8648	0.8648	0.8618	0.8618	0.8589	0.8589	0.8562	0.8562	0.8603	0.8589	0.8618 (40)
HLP (average)												0.8612 (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												1.6238 (42)
Average daily hot water use (litres/day)												72.7658 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	80.0424	77.1317	74.2211	71.3105	68.3998	65.4892	65.4892	68.3998	71.3105	74.2211	77.1317	80.0424 (44)
Energy content (annual)	118.7005	103.8162	107.1290	93.3977	89.6173	77.3329	71.6603	82.2313	83.2134	96.9772	105.8582	114.9551 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1144.8892 (45)
Water storage loss:	17.8051	15.5724	16.0694	14.0097	13.4426	11.5999	10.7490	12.3347	12.4820	14.5466	15.8787	17.2433 (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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	13.9846	12.6175	13.9474	13.4726	13.9037	13.4343	13.8692	13.8916	13.4552	13.9293	13.5088	13.9774 (61)
Total heat required for water heating calculated for each month	132.6851	116.4337	121.0764	106.8703	103.5210	90.7673	85.5295	96.1228	96.6686	110.9065	119.3669	128.9325 (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	132.6851	116.4337	121.0764	106.8703	103.5210	90.7673	85.5295	96.1228	96.6686	110.9065	119.3669	128.9325 (64)
Heat gains from water heating, kWh/month	42.9641	37.6733	39.1073	34.4229	33.2737	29.0718	27.2944	30.8148	31.0323	35.7272	38.5750	41.7169 (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	97.4294	97.4294	97.4294	97.4294	97.4294	97.4294	97.4294	97.4294	97.4294	97.4294	97.4294	97.4294 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	33.0993	29.3985	23.9085	18.1002	13.5301	11.4227	12.3426	16.0434	21.5335	27.3417	31.9118	34.0192 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	210.9958	213.1852	207.6678	195.9219	181.0948	167.1594	157.8497	155.6603	161.1777	172.9236	187.7507	201.6861 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.3668	46.3668	46.3668	46.3668	46.3668	46.3668	46.3668	46.3668	46.3668	46.3668	46.3668	46.3668 (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)	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529	-64.9529 (71)
Water heating gains (Table 5)	57.7474	56.0614	52.5635	47.8096	44.7227	40.3775	36.6860	41.4177	43.1003	48.0205	53.5764	56.0711 (72)
Total internal gains	383.6857	380.4883	365.9830	343.6749	321.1909	300.8028	288.7216	294.9646	307.6547	330.1290	355.0821	373.6196 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North				3.0900	13.4839	0.6300		0.7000		0.7700		12.7334 (74)
West				4.2900	25.1925	0.6300		0.7000		0.7700		33.0294 (80)

Solar gains	45.7629	75.9132	127.3579	192.0130	228.6638	260.0782	237.4916	208.0071	156.7462	96.1340	56.7588	35.7254 (83)
Total gains	429.4485	456.4016	493.3409	535.6879	549.8547	560.8811	526.2132	502.9717	464.4009	426.2630	411.8409	409.3451 (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	29.2795	29.4429	29.4429	29.5464	29.5464	29.6453	29.6453	29.7397	29.7397	29.5964	29.6453	29.5464
alpha	2.9520	2.9629	2.9629	2.9698	2.9698	2.9764	2.9764	2.9826	2.9826	2.9731	2.9764	2.9698
util living area	0.8752	0.8501	0.7888	0.6820	0.5332	0.3602	0.2538	0.2643	0.4676	0.6928	0.8261	0.8841 (86)
MIT	19.8072	19.9647	20.2784	20.6160	20.8598	20.9687	20.9922	20.9914	20.9300	20.6725	20.2223	19.7857 (87)
Th 2	20.1934	20.1975	20.1975	20.2001	20.2001	20.2026	20.2026	20.2049	20.2049	20.2013	20.2026	20.2001 (88)
util rest of house	0.8618	0.8344	0.7671	0.6510	0.4898	0.3076	0.1938	0.2022	0.4109	0.6547	0.8053	0.8713 (89)
MIT 2	19.1222	19.2764	19.5745	19.8878	20.0998	20.1853	20.1997	20.2018	20.1624	19.9469	19.5313	19.1076 (90)
Living area fraction	19.4840	19.6400	19.9463	20.2725	20.5013	20.5992	20.6184	20.6189	20.5679	20.3302	19.8963	19.4658 (92)
MIT	19.4840	19.6400	19.9463	20.2725	20.5013	20.5992	20.6184	20.6189	20.5679	20.3302	19.8963	19.4658 (93)
Temperature adjustment												0.0000
adjusted MIT	19.4840	19.6400	19.9463	20.2725	20.5013	20.5992	20.6184	20.6189	20.5679	20.3302	19.8963	19.4658 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	364.3789	375.3216	374.8139	350.2816	278.5253	187.3525	118.5382	118.0594	203.0847	281.8434	328.0759	351.2113 (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	584.7281	567.2802	509.7385	422.6315	304.5059	192.6887	119.6674	119.3088	215.3240	342.1433	471.4052	574.5835 (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	163.9399	128.9961	100.3839	52.0920	19.3296	0.0000	0.0000	0.0000	0.0000	44.8631	103.1971	166.1889 (98)
Space heating												778.9906 (98)
Space heating per m2												16.3174 (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													860.7631 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	163.9399	128.9961	100.3839	52.0920	19.3296	0.0000	0.0000	0.0000	0.0000	44.8631	103.1971	166.1889	(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)	181.1490	142.5372	110.9214	57.5602	21.3587	0.0000	0.0000	0.0000	0.0000	49.5725	114.0299	183.6342	(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	132.6851	116.4337	121.0764	106.8703	103.5210	90.7673	85.5295	96.1228	96.6686	110.9065	119.3669	128.9325	(64)
Efficiency of water heater	89.0401	88.9531	88.7220	88.3234	87.7884	87.3000	87.3000	87.3000	87.3000	88.1982	88.7551	87.3000	(216)
Fuel for water heating, kWh/month	149.0173	130.8933	136.4672	120.9989	117.9210	103.9717	97.9720	110.1063	110.7315	125.7469	134.4901	144.7483	(219)
Water heating fuel used												1483.0645	(219)
Annual totals kWh/year													
Space heating fuel - main system												860.7631	(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)													233.8175 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses													2652.6450 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	860.7631	4.2600	36.6685 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1483.0645	4.2600	63.1785 (247)
Pumps and fans for heating	75.0000	22.5500	16.9125 (249)
Energy for lighting	233.8175	22.5500	52.7258 (250)
Additional standing charges			96.0000 (251)
Energy saving/generation technologies			
PV Unit	0.0000	22.5500	0.0000 (252)
Total energy cost			265.4854 (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	860.7631	0.2160	185.9248 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1483.0645	0.2160	320.3419 (264)
Space and water heating			506.2667 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	233.8175	0.5190	121.3513 (268)
Energy saving/generation technologies			
PV Unit	-303.4800	0.5190	-157.5061 (269)
Total kg/year			509.0369 (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	860.7631	1.2200	1050.1309 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1483.0645	1.2200	1809.3387 (264)
Space and water heating			2859.4696 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	233.8175	3.0700	717.8196 (268)
Energy saving/generation technologies			
PV Unit	-303.4800	3.0700	-931.6836 (269)
Primary energy kWh/year			2875.8556 (272)
Primary energy kWh/m2/year			60.2400 (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 84
Current environmental impact rating: A 92

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

Recommended measures: 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 84
Potential environmental impact rating: A 92

Fuel prices for cost data on this page from database revision number 510 TEST (21 Dec 2022)
Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£70	£70	£0
Mains gas	£196	£196	£0
Space heating	£150	£150	£0
Water heating	£63	£63	£0
Lighting	£53	£53	£0
Total cost of fuels	£266	£266	£0
Total cost of uses	£266	£266	£0
Delivered energy	56 kWh/m²	56 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.5 tonnes	0.5 tonnes	0.0 tonnes
CO2 emissions per m²	11 kg/m²	11 kg/m²	0 kg/m²
Primary energy	60 kWh/m²	60 kWh/m²	0 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

No improvements selected / applicable

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

Overheating Calculation Input Data

Dwelling type	MidTerrace Flat
Number of storeys	1
Cross ventilation possible	Yes
SAP Region	Southern England
Front of dwelling faces	East
Overshading	Average or unknown
Thermal mass parameter	91.7 (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	222.13 (P1)
Transmission heat loss coefficient	21.26 (37)
Summer heat loss coefficient	243.39 (P2)

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

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

[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Shading	Gains W
North	3.0900	87.1704	0.6300	0.7000	0.9000	96.2169
West	4.2900	125.2818	0.6300	0.7000	0.9000	191.9857
total:						288.2026

Solar gains	Jun 312	Jul 288	Aug 247	(P3)
Internal gains	298	286	292	
Total summer gains	610	574	539	(P5)

Summer gain/loss ratio	2.51	2.36	2.21	(P6)
Summer external temperature	15.40	17.30	17.30	
Thermal mass temperature increment (TMP = 91.7)	1.36	1.36	1.36	
Threshold temperature	19.26	21.02	20.87	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	

Assessment of likelihood of high internal temperature: Slight