



SAP Report Submission for Building Regulations Compliance

Client: Metis Build Ltd

Project: Plot 8, Long Copse Lane
Emsworth, Hampshire, PO10 7UR

Contact: Scott Spearing
Scott Spearing
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Report Issue Date: 10/05/2022

EXCELLENCE
IN ENERGY
ASSESSMENT

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Designed)

Property Reference	SAP-1231 - Plot 8		Issued on Date	10/05/2022	
Assessment Reference	Rev A	Prop Type Ref			
Property	Plot 8, Long Copse Lane, Emsworth, Hampshire, PO10 7UR				
SAP Rating	88 B	DER	13.55	TER	16.83
Environmental	89 B	% DER<TER	19.49		
CO ₂ Emissions (t/year)	0.97	DFEE	46.23	TFEE	50.44
General Requirements Compliance	Pass	% DFEE<TFEE	8.35		
Assessor Details	Mr. Scott Spearing, Scott Spearing, Tel: 01489 565920, scott@beatsolutions.co.uk			Assessor ID	p775-0001
Client	Metis Build Ltd, METIS BUILD				

SUMMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	16.83	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	13.55	kgCO ₂ /m ²	Pass
	-3.28 (-19.5%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	50.44	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	46.23	kWh/m ² /yr	
	-4.2 (-8.3%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.19 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	Pass
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	Pass
Openings	1.45 (max. 2.00)	1.60 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Designed)

Main heating system

Boiler system with radiators or underfloor - Mains gas
Data from database
Vaillant ecoTEC sustain 28 VUW 286/7-2 (H-GB)
Combi boiler
Efficiency: 89.1% SEDBUK2009
Minimum: 88.0%

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Programmer, room thermostat and TRVs

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100 %

Minimum

75 %

Pass

8 Mechanical ventilation

Continuous extract system (decentralised)

Specific fan power

0.2000 0.1800

Maximum

0.7

Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Southern England)

Not significant

Pass

Based on:

Overshading

Average

Windows facing North

5.41 m², No overhang

Windows facing South

9.54 m², No overhang

Windows facing West

2.25 m², No overhang

Air change rate

8.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

5.00 (design value)

Maximum

10.0

Pass

10 Key features

Party wall U-value

0.00

W/m²K

Roof U-value

0.10

W/m²K

Floor U-value

0.12

W/m²K

Photovoltaic array

0.76

kW

BASIC COMPLIANCE REPORT

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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 Designed)

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

Orientation	North
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	House, Semi-Detached
2.0 Number of Storeys	2
3.0 Date Built	2021
4.0 Sheltered Sides	1
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements		Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	Ground Floor:	20.56 m	51.83 m ²	2.48 m
	1st Storey:	20.56 m	51.83 m ²	2.65 m

7.0 Living Area	21.86	m ²
8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	207.62	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 Walls	Cavity Wall	Cavity wall : plasterboard on dabs, AAC block, filled cavity, any outside structure	0.19	60.00	105.47	86.17

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	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	53.40

9.2 Internal Walls				
Description	Construction		Kappa (kJ/m ² K)	Area (m ²)
Internal Wall - Masonry	Dense block, plasterboard on dabs		75.00	46.67
Internal Wall - Timber	Plasterboard on timber frame		9.00	84.25

10.0 External Roofs						
Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Pitched Cold Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.10	9.00	51.83	51.83

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

10.2 Internal Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Ceiling	Plasterboard ceiling, carpeted chipboard floor	9.00	51.83

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)
Ground Floor	Ground Floor - Solid	Suspended concrete floor, carpeted	0.12	75.00	51.83

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor	Plasterboard ceiling, carpeted chipboard floor	18.00	51.83

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Front Door	Manufacturer	Solid Door							1.60
Windows	Manufacturer	Window	Double Low-E Soft 0.05			0.63		0.70	1.40
French Doors	Manufacturer	Window	Double Low-E Soft 0.05			0.63		0.70	1.50

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
Front Door	Solid Door	[1] External Walls	North							2.10	
Front Elevation	Window	[1] External Walls	North	None	0.00					5.41	
Side Elevation	Window	[1] External Walls	West	None	0.00					2.25	
Rear French Doors	Window	[1] External Walls	South	None	0.00					6.30	
Rear Elevation	Window	[1] External Walls	South	None	0.00					3.24	

14.0 Conservatory

None

15.0 Draught Proofing

100

%

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	12.34	0.050	Yes	Hi-Therms
Table K1 - Approved	E3 Sill	11.34	0.040	Yes	
Table K1 - Approved	E4 Jamb	26.10	0.050	Yes	
Table K1 - Approved	E5 Ground floor (normal)	20.56	0.160	Yes	
Table K1 - Approved	E6 Intermediate floor within a dwelling	20.56	0.070	Yes	
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	14.76	0.060	No	
Table K1 - Approved	E12 Gable (insulation at ceiling level)	5.80	0.240	No	
Table K1 - Approved	E16 Corner (normal)	15.39	0.090	No	
Table K1 - Approved	E17 Corner (inverted – internal area greater than external area)	5.13	-0.090	No	
Table K1 - Approved	E18 Party wall between dwellings	10.26	0.060	Yes	
Table K1 - Default	P1 Party wall - Ground floor	10.41	0.160	No	
Table K1 - Default	P2 Party wall - Intermediate floor within a dwelling	10.41	0.000	No	
Table K1 - Default	P4 Party wall - Roof (insulation at ceiling level)	10.41	0.240	No	

Y-value 0.072 W/m²K

18.0 Pressure Testing

Yes

Designed AP₅₀ 5.00 m³/(h.m²) @ 50 Pa

SUMMARY FOR INPUT DATA

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Property Tested ?
As Built AP₅₀ m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

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

Mechanical Ventilation

Mechanical Ventilation System Present
Approved Installation
Mechanical Ventilation data Type
Type
MV Reference Number
Duct Type

19.1 Mechanical extract ventilation - Decentralised

SFP	Fan/Room Type	Count
0.20	In Room Fan Kitchen	1
0.18	In Room Fan Other Wet Room	3

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				0
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System

22.0 Lighting

Internal

Total number of light fittings
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

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

In Summer	87.0
Controls	CBE Programmer, room thermostat and TRVs
PCDF Controls	0
Delayed Start Stat	No
Sap Code	2106
Flue Type	Balanced
Fan Assisted Flue	Yes
Is MHS Pumped	Pump in heated space
Heat Emitter	Radiators
Flow Temperature	Normal (> 45°C)
Combi boiler type	Standard Combi
Combi keep hot type	None
25.0 Main Heating 2	None

Community Heating	None
28.0 Water Heating	HWP From main heating 1
Water Heating	Main Heating 1
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
SAP Code	901
29.0 Hot Water Cylinder	None

32.0 Photovoltaic Unit		One Dwelling		
PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
0.76	South	45°	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar water heating	£4,000 - £6,000	£28	B 89	

U-VALUE CALCULATOR REPORT

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Building Elements

Roof Pitched Cold Roof

Roof Type: Pitched Roof, insulated flat ceiling

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

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

Unheated space: None

Total thickness: 416 mm

U-value: 0.10 W/m² K

Kappa: n/a

U-VALUE CALCULATOR REPORT

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Building Elements

Wall External Walls

Wall Type: Standard Wall

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)
Ext surface				0.0400	
Layer 1	Brick, outer leaf				
	Main construction	102.5	0.7700	0.1331	82.81
	Main construction	102.5	0.9407	0.1090	17.19
Layer 2	Earthwool Dritherm 37 Standard				
	Main construction	150	0.0370	4.0541	100.00
	Corrections - Air Gap: Level 0, Fasteners: None or plastic				
Layer 3	Supabloc				
	Main construction	100	0.1100	0.9091	94.04
	Main construction	100	0.8803	0.1136	5.96
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
Layer 4	airspace/plaster dabs				
	Main construction	15	0.0882	0.1700	80.00
	Main construction	15	0.0882	0.1700	20.00
	Corrections - Cavity Unventilated, Emissivity: Normal				
Layer 5	Plasterboard, standard				
	Main construction	12.5	0.2100	0.0595	100.00
Layer 6	Plaster, standard				
	Main construction	3	0.4000	0.0075	100.00
Int surface				0.1300	

Total resistance:	Upper limit = 5.444 m ² K/W	Lower limit = 5.231 m ² K/W	Average = 5.337 m ² K/W
	Total correction = 0.0001 m ² K/W	U-value (unrounded) = 0.19 W/m ² K	

Unheated space: None

Total thickness: 383 mm

U-value: 0.19 W/m² K

Kappa: n/a

U-VALUE CALCULATOR REPORT

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Building Elements

Floor Ground Floor

Floor Type: Suspended Floor

Area = 51.83 m², Perimeter = 20.56 m, Wall thickness = 320.00 mm, Soil: Unknown

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

Floor height above ground: h = 0.200 m

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

Ventilation openings per perimeter length: e = 0.0015 %

Mean wind speed: v = 5.000 m/s

Resistance on solum: R_g = 0.000 m²K/W

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

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

Total correction = 0.0088 m² K/W

U-value (unrounded) = 0.12 W/m² K

Unheated space: None

Total thickness: 325 mm

U-value: 0.12 W/m² K

Kappa: n/a

FULL SAP CALCULATION PRINTOUT

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FULL SAP CALCULATION PRINTOUT

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

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

DWELLING AS DESIGNED

Semi-Detached House, total floor area 104 m²

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

1a TER and DER

Fuel for main heating:Mains gas

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 16.83 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 13.55 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 50.4 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE) 46.2 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.19 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.45 (max. 2.00)	1.60 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	5.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas

Data from database

Vaillant ecoTEC sustain 28 VUW 286/7-2 (H-GB)

Combi boiler

Efficiency: 89.1% SEDBUK2009

Minimum: 88.0% OK

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls:

No cylinder

Boiler interlock

Yes

OK

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)

Specific fan power:	0.2000 0.1800	
Maximum	0.7	OK

9 Summertime temperature

Overheating risk (Southern England): Not significant OK

Based on:

Overshading:	Average
Windows facing North:	5.41 m ² , No overhang
Windows facing South:	9.54 m ² , No overhang
Windows facing West:	2.25 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
Roof U-value	0.10 W/m ² K
Floor U-value	0.12 W/m ² K
Photovoltaic array	0.76 kW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	51.8300 (1b)	x 2.4800 (2b)	= 128.5384 (1b) - (3b)
First floor	51.8300 (1c)	x 2.6500 (2c)	= 137.3495 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	103.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 265.8879 (5)

2. Ventilation rate

					main heating	+	secondary heating	+	other	=	total	m3 per hour	
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)	
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)	
Number of intermittent fans											0 * 10 =	0.0000 (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) =												0.0000 / (5) =	0.0000 (8)
Pressure test											Yes		
Measured/design AP50											5.0000		
Infiltration rate											0.2500	(18)	
Number of sides sheltered											1	(19)	
Shelter factor									(20) = 1 - [0.075 x (19)] =		0.9250	(20)	
Infiltration rate adjusted to include shelter factor									(21) = (18) x (20) =		0.2313	(21)	
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	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)	
Adj infilt rate	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)	
	0.2948	0.2891	0.2833	0.2544	0.2486	0.2197	0.2197	0.2139	0.2313	0.2486	0.2602	0.2717 (22b)	
Mechanical extract ventilation - decentralised													
If mechanical ventilation:												0.5000 (23a)	
Effective ac	0.5448	0.5391	0.5333	0.5044	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5102	0.5217 (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					
Front Door			2.1000	1.6000	3.3600		(26)					
Windows (Uw = 1.40)			10.9000	1.3258	14.4508		(27)					
French Doors (Uw = 1.50)			6.3000	1.4151	8.9151		(27)					
Ground Floor			51.8300	0.1200	6.2196	75.0000	3887.2500 (28a)					
External Walls	105.4700	19.3000	86.1700	0.1900	16.3723	60.0000	5170.2000 (29a)					
Pitched Cold Roof	51.8300		51.8300	0.1000	5.1830	9.0000	466.4700 (30)					
Total net area of external elements Aum(A, m2)			209.1300				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	54.5008		(33)					
Party Wall			53.4000	0.0000	0.0000	110.0000	5874.0000 (32)					
Internal Wall - Masonry			46.6700			75.0000	3500.2500 (32c)					
Internal Wall - Timber			84.2500			9.0000	758.2500 (32c)					
Internal Floor			51.8300			18.0000	932.9400 (32d)					
Internal Ceiling			51.8300			18.0000	932.9400 (32e)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		21522.3000 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							207.6240 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.0850 (36)					
Total fabric heat loss						(33) + (36) =	69.5858 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 47.8062	Feb 47.2990	Mar 46.7917	Apr 44.2554	May 43.8715	Jun 43.8715	Jul 43.8715	Aug 43.8715	Sep 43.8715	Oct 43.8715	Nov 44.7626	Dec 45.7772 (38)
Heat transfer coeff	117.3920	116.8847	116.3775	113.8411	113.4573	113.4573	113.4573	113.4573	113.4573	113.4573	114.3484	115.3629 (39)
Average = Sum(39)m / 12 =												114.5792 (39)
HLP	Jan 1.1325	Feb 1.1276	Mar 1.1227	Apr 1.0982	May 1.0945	Jun 1.0945	Jul 1.0945	Aug 1.0945	Sep 1.0945	Oct 1.0945	Nov 1.1031	Dec 1.1129 (40)
HLP (average)												1.1053 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7709 (42)
Average daily hot water use (litres/day)												100.0094 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Daily hot water use	110.0103	106.0100	102.0096	98.0092	94.0088	90.0085	90.0085	94.0088	98.0092	102.0096	106.0100	110.0103 (44)
Energy conte	163.1422	142.6852	147.2383	128.3659	123.1702	106.2865	98.4901	113.0188	114.3686	133.2856	145.4916	157.9945 (45)
Energy content (annual)										Total = Sum (45)m =		1573.5374 (45)
Distribution loss (46)m = 0.15 x (45)m												
	24.4713	21.4028	22.0857	19.2549	18.4755	15.9430	14.7735	16.9528	17.1553	19.9928	21.8237	23.6992 (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	18.8357	16.9657	18.6751	17.9042	18.3574	17.5997	18.0833	18.2611	17.7656	18.5341	18.1030	18.7837 (61)
Total heat required for water heating calculated for each month												
	181.9779	159.6509	165.9134	146.2701	141.5276	123.8862	116.5734	131.2798	132.1342	151.8197	163.5946	176.7782 (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)
								Solar input (sum of months) = Sum (63)m =				0.0000 (63)
Output from w/h												
	181.9779	159.6509	165.9134	146.2701	141.5276	123.8862	116.5734	131.2798	132.1342	151.8197	163.5946	176.7782 (64)
Heat gains from water heating, kWh/month								Total per year (kWh/year) = Sum (64)m =				1791.4060 (64)
	58.9537	51.6843	53.6255	47.1577	45.5434	39.7402	37.2688	42.1440	42.4690	48.9510	52.9017	57.2291 (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	138.5461	138.5461	138.5461	138.5461	138.5461	138.5461	138.5461	138.5461	138.5461	138.5461	138.5461	138.5461 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	24.2085	21.5018	17.4864	13.2383	9.8958	8.3545	9.0273	11.7340	15.7494	19.9974	23.3400	24.8813 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	262.1125	264.8324	257.9783	243.3868	224.9676	207.6562	196.0911	193.3712	200.2253	214.8168	233.2360	250.5474 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	36.8546	36.8546	36.8546	36.8546	36.8546	36.8546	36.8546	36.8546	36.8546	36.8546	36.8546	36.8546 (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)												
	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369 (71)
Water heating gains (Table 5)												
	79.2388	76.9111	72.0773	65.4968	61.2143	55.1947	50.0924	56.6452	58.9847	65.7943	73.4746	76.9208 (72)
Total internal gains												
	433.1236	430.8091	415.1059	389.6858	363.6416	338.7692	322.7747	329.3142	342.5231	368.1724	397.6144	419.9134 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W
North	5.4100	10.6334	0.6300	0.7000	0.7700	17.5809 (74)
South	3.2400	46.7521	0.6300	0.7000	0.7700	46.2932 (78)
West	2.2500	19.6403	0.6300	0.7000	0.7700	13.5052 (80)
South	6.3000	46.7521	0.6300	0.7000	0.7700	90.0146 (78)

Solar gains	167.3940	283.2543	384.9642	476.5513	536.2105	534.1597	514.1710	468.8828	416.2966	312.1247	200.0991	143.5449 (83)
Total gains	600.5177	714.0634	800.0701	866.2371	899.8520	872.9289	836.9456	798.1970	758.8198	680.2971	597.7134	563.4583 (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	50.9270	51.1480	51.3709	52.5154	52.6931	52.6931	52.6931	52.6931	52.6931	52.6931	52.2825	51.8227
alpha	4.3951	4.4099	4.4247	4.5010	4.5129	4.5129	4.5129	4.5129	4.5129	4.5129	4.4855	4.4548
util living area												
	0.9962	0.9913	0.9803	0.9501	0.8772	0.7363	0.5717	0.6170	0.8311	0.9629	0.9922	0.9971 (86)
MIT	19.5696	19.7660	20.0497	20.4135	20.7186	20.9117	20.9780	20.9689	20.8389	20.4444	19.9472	19.5488 (87)
Th 2	19.9744	19.9784	19.9824	20.0023	20.0053	20.0053	20.0053	20.0053	20.0053	20.0053	19.9983	19.9903 (88)
util rest of house												
	0.9951	0.9888	0.9744	0.9343	0.8369	0.6530	0.4539	0.4999	0.7643	0.9481	0.9896	0.9963 (89)
MIT 2	18.6697	18.8680	19.1517	19.5215	19.8051	19.9595	19.9985	19.9947	19.9100	19.5585	19.0649	18.6615 (90)
Living area fraction									fLA = Living area / (4) =			0.2109 (91)
MIT	18.8595	19.0574	19.3411	19.7096	19.9977	20.1603	20.2051	20.2002	20.1059	19.7453	19.2509	18.8486 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8595	19.0574	19.3411	19.7096	19.9977	20.1603	20.2051	20.2002	20.1059	19.7453	19.2509	18.8486 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9934	0.9859	0.9697	0.9287	0.8366	0.6671	0.4786	0.5242	0.7720	0.9432	0.9869	0.9950 (94)
Useful gains	596.5772	703.9832	775.8308	804.4691	752.8118	582.3672	400.5946	418.4212	585.8129	641.6663	589.8926	560.6345 (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												
	1709.1662	1654.7810	1494.4104	1230.5800	941.4373	630.8587	409.0200	431.1552	681.4112	1037.6045	1389.4403	1689.9065 (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												
	827.7662	638.9361	534.6232	306.7999	140.3373	0.0000	0.0000	0.0000	0.0000	294.5781	575.6743	840.1784 (98)
Space heating												4158.8935 (98)
Space heating per m2										(98) / (4) =		40.1205 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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 %)																		90.0000 (206)
Efficiency of secondary/supplementary heating system, %																		0.0000 (208)
Space heating requirement																		4620.9928 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec						
Space heating requirement	827.7662	638.9361	534.6232	306.7999	140.3373	0.0000	0.0000	0.0000	0.0000	294.5781	575.6743	840.1784	(98)					
Space heating efficiency (main heating system 1)	90.0000	90.0000	90.0000	90.0000	90.0000	0.0000	0.0000	0.0000	0.0000	90.0000	90.0000	90.0000	(210)					
Space heating fuel (main heating system)	919.7403	709.9290	594.0258	340.8888	155.9304	0.0000	0.0000	0.0000	0.0000	327.3089	639.6381	933.5315	(211)					
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)					
Water heating requirement	181.9779	159.6509	165.9134	146.2701	141.5276	123.8862	116.5734	131.2798	132.1342	151.8197	163.5946	176.7782	(64)					
Efficiency of water heater (217)m	89.4441	89.3838	89.2709	89.0091	88.4682	87.0000	87.0000	87.0000	87.0000	88.9568	89.3184	89.4637	(216)					
Fuel for water heating, kWh/month	203.4542	178.6128	185.8537	164.3316	159.9756	142.3980	133.9924	150.8964	151.8784	170.6669	183.1588	197.5976	(219)					
Water heating fuel used												2022.8163	(219)					
Annual totals kWh/year																		
Space heating fuel - main system												4620.9928	(211)					
Space heating fuel - secondary												0.0000	(215)					
Electricity for pumps and fans:																		
(MEV)Decentralised, Database: total watage = 10.0340, total flow = 37.0000, SFP = 0.2712)																		
mechanical ventilation fans (SFP = 0.2712)													87.9692	(230a)				
central heating pump													30.0000	(230c)				
main heating flue fan													45.0000	(230e)				
Total electricity for the above, kWh/year													162.9692	(231)				
Electricity for lighting (calculated in Appendix L)													427.5295	(232)				
Energy saving/generation technologies (Appendices M ,N and Q)																		
PV Unit 0 (0.80 * 0.76 * 1068 * 1.00) =													-649.3869				-649.3869	(233)
Total delivered energy for all uses													6584.9210	(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	4620.9928	0.2160	998.1344 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2022.8163	0.2160	436.9283 (264)
Space and water heating			1435.0628 (265)
Pumps and fans	162.9692	0.5190	84.5810 (267)
Energy for lighting	427.5295	0.5190	221.8878 (268)
Energy saving/generation technologies			
PV Unit	-649.3869	0.5190	-337.0318 (269)
Total CO2, kg/year			1404.4998 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			13.5500 (273)

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

DER			13.5500 ZC1
Total Floor Area		TFA	103.6600
Assumed number of occupants		N	2.7709
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			14.9838 ZC2
CO2 emissions from cooking, equation (L16)			1.7895 ZC3
Total CO2 emissions			30.3234 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			30.3234 ZC8

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Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	51.8300 (1b)	x 2.4800 (2b)	= 128.5384 (1b) - (3b)
First floor	51.8300 (1c)	x 2.6500 (2c)	= 137.3495 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	103.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 265.8879 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) = 0.1504 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4004 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3704 (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	0.4723	0.4630	0.4537	0.4074	0.3982	0.3519	0.3519	0.3426	0.3704	0.3982	0.4167	0.4352 (22b)
Effective ac	0.6115	0.6072	0.6029	0.5830	0.5793	0.5619	0.5619	0.5587	0.5686	0.5793	0.5868	0.5947 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1000	1.0000	2.1000		(26)
TER Opening Type (Uw = 1.40)			17.2000	1.3258	22.8030		(27)
Ground Floor			51.8300	0.1300	6.7379		(28a)
External Walls	105.4700	19.3000	86.1700	0.1800	15.5106		(29a)
Pitched Cold Roof	51.8300		51.8300	0.1300	6.7379		(30)
Total net area of external elements Aum(A, m ²)			209.1300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		53.8894		(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)							10.6332 (36)
Total fabric heat loss						(33) + (36) =	64.5226 (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	53.6565	53.2765	52.9041	51.1547	50.8275	49.3038	49.3038	49.0217	49.8907	50.8275	51.4896	52.1818 (38)
Heat transfer coeff	118.1791	117.7991	117.4267	115.6774	115.3501	113.8265	113.8265	113.5443	114.4133	115.3501	116.0122	116.7044 (39)
Average = Sum(39)m / 12 =												115.6758 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1401	1.1364	1.1328	1.1159	1.1128	1.0981	1.0981	1.0954	1.1037	1.1128	1.1192	1.1258 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7709 (42)
Average daily hot water use (litres/day)												100.0094 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	110.0103	106.0100	102.0096	98.0092	94.0088	90.0085	90.0085	94.0088	98.0092	102.0096	106.0100	110.0103 (44)
Energy conte	163.1422	142.6852	147.2383	128.3659	123.1702	106.2865	98.4901	113.0188	114.3686	133.2856	145.4916	157.9945 (45)
Energy content (annual)										Total = Sum(45)m =		1573.5374 (45)
Distribution loss (46)m = 0.15 x (45)m	24.4713	21.4028	22.0857	19.2549	18.4755	15.9430	14.7735	16.9528	17.1553	19.9928	21.8237	23.6992 (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												

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Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Total heat required for water heating calculated for each month	50.9589	46.0274	50.9589	48.3333	47.9059	44.3877	45.8673	47.9059	48.3333	50.9589	49.3151	50.9589 (61)
Solar input	214.1011	188.7126	198.1972	176.6993	171.0761	150.6742	144.3574	160.9247	162.7019	184.2445	194.8067	208.9534 (62)
Output from w/h	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)
Heat gains from water heating, kWh/month	214.1011	188.7126	198.1972	176.6993	171.0761	150.6742	144.3574	160.9247	162.7019	184.2445	194.8067	208.9534 (64)
	66.9845	58.9497	61.6965	54.7650	52.9306	46.4372	44.2148	49.5552	50.1109	57.0572	60.7047	65.2729 (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	138.5461	138.5461	138.5461	138.5461	138.5461	138.5461	138.5461	138.5461	138.5461	138.5461	138.5461	138.5461	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.2085	21.5018	17.4864	13.2383	9.8958	8.3545	9.0273	11.7340	15.7494	19.9974	23.3400	24.8813	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	262.1125	264.8324	257.9783	243.3868	224.9676	207.6562	196.0911	193.3712	200.2253	214.8168	233.2360	250.5474	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.8546	36.8546	36.8546	36.8546	36.8546	36.8546	36.8546	36.8546	36.8546	36.8546	36.8546	36.8546	(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)	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	(71)
Water heating gains (Table 5)	90.0329	87.7227	82.9254	76.0625	71.1432	64.4961	59.4285	66.6065	69.5985	76.6898	84.3121	87.7324	(72)
Total internal gains	443.9177	441.6207	425.9539	400.2515	373.5705	348.0706	332.1107	339.2755	353.1369	379.0678	408.4519	430.7249	(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				5.4100	10.6334		0.6300		0.7000		0.7700		17.5809 (74)
South				9.5400	46.7521		0.6300		0.7000		0.7700		136.3079 (78)
West				2.2500	19.6403		0.6300		0.7000		0.7700		13.5052 (80)
Solar gains	167.3940	283.2543	384.9642	476.5513	536.2105	534.1597	514.1710	468.8828	416.2966	312.1247	200.0991	143.5449	(83)
Total gains	611.3117	724.8750	810.9182	876.8028	909.7809	882.2303	846.2816	808.1583	769.4336	691.1926	608.5509	574.2698	(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	60.9127	61.1092	61.3030	62.2301	62.4066	63.2420	63.2420	63.3991	62.9176	62.4066	62.0505	61.6824	
alpha	5.0608	5.0739	5.0869	5.1487	5.1604	5.2161	5.2161	5.2266	5.1945	5.1604	5.1367	5.1122	
util living area	0.9982	0.9953	0.9878	0.9644	0.8982	0.7496	0.5755	0.6213	0.8491	0.9745	0.9958	0.9987	(86)
MIT	19.7625	19.9327	20.1806	20.4948	20.7669	20.9385	20.9874	20.9815	20.8756	20.5201	20.0829	19.7377	(87)
Th 2	19.9682	19.9712	19.9741	19.9878	19.9904	20.0024	20.0024	20.0046	19.9978	19.9904	19.9852	19.9798	(88)
util rest of house	0.9975	0.9937	0.9835	0.9506	0.8578	0.6611	0.4534	0.4992	0.7790	0.9620	0.9941	0.9982	(89)
MIT 2	18.3174	18.5677	18.9296	19.3881	19.7554	19.9599	19.9976	19.9968	19.8968	19.4316	18.7977	18.2893	(90)
Living area fraction	18.6221	18.8555	19.1934	19.6215	19.9687	20.1663	20.2063	20.2044	20.1033	19.6612	19.0687	18.5948	(92)
MIT	18.6221	18.8555	19.1934	19.6215	19.9687	20.1663	20.2063	20.2044	20.1033	19.6612	19.0687	18.5948	(93)
Temperature adjustment												0.0000	
adjusted MIT	18.6221	18.8555	19.1934	19.6215	19.9687	20.1663	20.2063	20.2044	20.1033	19.6612	19.0687	18.5948	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9963	0.9912	0.9789	0.9442	0.8568	0.6769	0.4793	0.5249	0.7875	0.9565	0.9918	0.9973	(94)
Useful gains	609.0512	718.4730	793.7819	827.9114	779.4981	597.1823	405.5867	424.2037	605.9222	661.1330	603.5812	572.7034	(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	1692.5752	1643.9513	1490.5402	1240.2379	953.7988	633.5911	410.4957	431.9732	686.8528	1045.2045	1388.5190	1679.9316	(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	806.1419	621.9214	518.3882	296.8751	129.6797	0.0000	0.0000	0.0000	0.0000	285.7492	565.1552	823.7778	(98)
Space heating												4047.6885	(98)
Space heating per m2												39.0477	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 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 %)												93.4000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												4333.7136 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	806.1419	621.9214	518.3882	296.8751	129.6797	0.0000	0.0000	0.0000	0.0000	285.7492	565.1552	823.7778 (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)	863.1069	665.8688	555.0195	317.8534	138.8434	0.0000	0.0000	0.0000	0.0000	305.9413	605.0912	881.9891 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	214.1011	188.7126	198.1972	176.6993	171.0761	150.6742	144.3574	160.9247	162.7019	184.2445	194.8067	208.9534 (64)
Efficiency of water heater (217)m	88.0753	87.8283	87.3608	86.3477	84.3641	80.3000	80.3000	80.3000	80.3000	86.1521	87.5764	80.3000 (216)
Fuel for water heating, kWh/month	243.0888	214.8653	226.8719	204.6369	202.7829	187.6391	179.7726	200.4043	202.6176	213.8595	222.4420	237.0254 (219)
Water heating fuel used												2536.0064 (219)
Annual totals kWh/year												
Space heating fuel - main system												4333.7136 (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)												427.5295 (232)
Total delivered energy for all uses												7372.2495 (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	4333.7136	0.2160	936.0821 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2536.0064	0.2160	547.7774 (264)
Space and water heating			1483.8595 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	427.5295	0.5190	221.8878 (268)
Total CO2, kg/m2/year			1744.6723 (272)
Emissions per m2 for space and water heating			14.3147 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.1405 (272b)
Emissions per m2 for pumps and fans			0.3755 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.3147 * 1.00) + 2.1405 + 0.3755, rounded to 2 d.p.			16.8300 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	51.8300 (1b)	x 2.4800 (2b)	= 128.5384 (1b) - (3b)
First floor	51.8300 (1c)	x 2.6500 (2c)	= 137.3495 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	103.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 265.8879 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) = 0.1504 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4004 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3704 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4723	0.4630	0.4537	0.4074	0.3982	0.3519	0.3519	0.3426	0.3704	0.3982	0.4167	0.4352 (22b)
	0.6115	0.6072	0.6029	0.5830	0.5793	0.5619	0.5619	0.5587	0.5686	0.5793	0.5868	0.5947 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1000	1.6000	3.3600		(26)
Windows (Uw = 1.40)			10.9000	1.3258	14.4508		(27)
French Doors (Uw = 1.50)			6.3000	1.4151	8.9151		(27)
Ground Floor			51.8300	0.1200	6.2196	75.0000	3887.2500 (28a)
External Walls	105.4700	19.3000	86.1700	0.1900	16.3723	60.0000	5170.2000 (29a)
Pitched Cold Roof	51.8300		51.8300	0.1000	5.1830	9.0000	466.4700 (30)
Total net area of external elements Aum(A, m ²)			209.1300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	54.5008		(33)
Party Wall			53.4000	0.0000	0.0000	110.0000	5874.0000 (32)
Internal Wall - Masonry			46.6700			75.0000	3500.2500 (32c)
Internal Wall - Timber			84.2500			9.0000	758.2500 (32c)
Internal Floor			51.8300			18.0000	932.9400 (32d)
Internal Ceiling			51.8300			9.0000	466.4700 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 21055.8300 (34)
203.1240 (35)
15.0850 (36)
(33) + (36) = 69.5858 (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	53.6565	53.2765	52.9041	51.1547	50.8275	49.3038	49.3038	49.0217	49.8907	50.8275	51.4896	52.1818 (38)
Heat transfer coeff	123.2422	122.8623	122.4898	120.7405	120.4132	118.8896	118.8896	118.6074	119.4765	120.4132	121.0753	121.7675 (39)
Average = Sum(39)m / 12 =												120.7389 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1889	1.1852	1.1816	1.1648	1.1616	1.1469	1.1469	1.1442	1.1526	1.1616	1.1680	1.1747 (40)
HLP (average)												1.1648 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy
Average daily hot water use (litres/day)
2.7709 (42)
100.0094 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	110.0103	106.0100	102.0096	98.0092	94.0088	90.0085	90.0085	94.0088	98.0092	102.0096	106.0100	110.0103 (44)
Energy conte	163.1422	142.6852	147.2383	128.3659	123.1702	106.2865	98.4901	113.0188	114.3686	133.2856	145.4916	157.9945 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Energy content (annual)	Total = Sum(45)m = 1573.5374 (45)											
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	34.6677	30.3206	31.2881	27.2778	26.1737	22.5859	20.9291	24.0165	24.3033	28.3232	30.9170	33.5738 (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	138.5461	138.5461	138.5461	138.5461	138.5461	138.5461	138.5461	138.5461	138.5461	138.5461	138.5461	138.5461	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.2085	21.5018	17.4864	13.2383	9.8958	8.3545	9.0273	11.7340	15.7494	19.9974	23.3400	24.8813	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	262.1125	264.8324	257.9783	243.3868	224.9676	207.6562	196.0911	193.3712	200.2253	214.8168	233.2360	250.5474	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.8546	36.8546	36.8546	36.8546	36.8546	36.8546	36.8546	36.8546	36.8546	36.8546	36.8546	36.8546	(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)	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	(71)
Water heating gains (Table 5)	46.5964	45.1199	42.0540	37.8858	35.1797	31.3693	28.1306	32.2802	33.7546	38.0688	42.9402	45.1261	(72)
Total internal gains	397.4812	396.0179	382.0825	359.0748	334.6069	311.9438	297.8128	301.9493	314.2931	337.4469	364.0800	385.1187	(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				5.4100	10.6334		0.6300		0.7000		0.7700		17.5809 (74)
South				3.2400	46.7521		0.6300		0.7000		0.7700		46.2932 (78)
West				2.2500	19.6403		0.6300		0.7000		0.7700		13.5052 (80)
South				6.3000	46.7521		0.6300		0.7000		0.7700		90.0146 (78)
Solar gains	167.3940	283.2543	384.9642	476.5513	536.2105	534.1597	514.1710	468.8828	416.2966	312.1247	200.0991		143.5449 (83)
Total gains	564.8752	679.2722	767.0468	835.6260	870.8174	846.1035	811.9837	770.8321	730.5897	649.5716	564.1791		528.6636 (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	47.4581	47.6049	47.7496	48.4414	48.5731	49.1956	49.1956	49.3126	48.9539	48.5731	48.3075	48.0329
alpha	4.1639	4.1737	4.1833	4.2294	4.2382	4.2797	4.2797	4.2875	4.2636	4.2382	4.2205	4.2022
util living area	0.9967	0.9924	0.9828	0.9574	0.8954	0.7653	0.6055	0.6518	0.8555	0.9692	0.9934	0.9975 (86)
MIT	19.4228	19.6234	19.9200	20.2992	20.6391	20.8793	20.9665	20.9540	20.7881	20.3393	19.8106	19.3934 (87)
Th 2	19.9289	19.9318	19.9347	19.9483	19.9508	19.9627	19.9627	19.9649	19.9581	19.9508	19.9457	19.9403 (88)
util rest of house	0.9957	0.9902	0.9777	0.9434	0.8583	0.6822	0.4800	0.5288	0.7922	0.9564	0.9911	0.9968 (89)
MIT 2	18.4903	18.6922	18.9884	19.3698	19.6898	19.8985	19.9520	19.9487	19.8294	19.4153	18.8902	18.4699 (90)
Living area fraction	18.6870	18.8886	19.1848	19.5658	19.8900	20.1053	20.1660	20.1607	20.0315	19.6102	19.0843	18.6646 (92)
Temperature adjustment	18.6870	18.8886	19.1848	19.5658	19.8900	20.1053	20.1660	20.1607	20.0315	19.6102	19.0843	18.6646 (93)
adjusted MIT	18.6870	18.8886	19.1848	19.5658	19.8900	20.1053	20.1660	20.1607	20.0315	19.6102	19.0843	18.6646 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9942	0.9873	0.9729	0.9371	0.8558	0.6949	0.5061	0.5539	0.7975	0.9510	0.9886	0.9955 (94)
Useful gains	561.5789	670.6700	746.2430	783.0471	745.2511	587.9706	410.9832	426.9887	582.6339	617.7654	557.7334	526.3047 (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	1773.0835	1718.6663	1553.7646	1287.7889	986.1805	654.5230	423.9574	446.0513	708.6806	1084.9453	1451.0033	1761.3244 (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	901.3595	704.2536	600.7961	363.4140	179.2515	0.0000	0.0000	0.0000	0.0000	347.5819	643.1543	918.8546 (98)
Space heating												4658.6654 (99)
Space heating per m2	(98) / (4) =											44.9418 (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												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	1117.5622	879.7830	901.4166	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.8027	0.8760	0.8533	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	897.1201	770.6549	769.1464	0.0000	0.0000	0.0000	0.0000 (102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1096.3475	1054.1660	1008.0887	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	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	0.0000	0.0000	0.0000	0.0000	0.0000	143.4437	210.9323	177.7731	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fC = cooled area / (4) =			532.1491 (104)
Intermittency factor (Table 10b)												1.0000 (105)
Space cooling kWh	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	0.0000	0.0000	0.0000	0.0000	0.0000	35.8609	52.7331	44.4433	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling per m2												133.0373 (107)
Energy for space heating												1.2834 (108)
Energy for space cooling												44.9418 (99)
Total												1.2834 (108)
Dwelling Fabric Energy Efficiency (DFEE)												46.2252 (109)
												46.2 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	51.8300 (1b)	x 2.4800 (2b)	= 128.5384 (1b) - (3b)
First floor	51.8300 (1c)	x 2.6500 (2c)	= 137.3495 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	103.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 265.8879 (5)

2. Ventilation rate

										main	secondary	other	total	m3 per hour			
										heating	heating						
Number of chimneys										0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues										0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans																4 * 10 =	40.0000 (7a)
Number of passive vents																0 * 10 =	0.0000 (7b)
Number of flueless gas fires																0 * 40 =	0.0000 (7c)
										Air changes per hour							
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =				40.0000	/ (5) =	0.1504 (8)	
Pressure test										Yes							
Measured/design AP50										5.0000							
Infiltration rate										0.4004 (18)							
Number of sides sheltered										1 (19)							
Shelter factor										(20) = 1 - [0.075 x (19)] =				0.9250 (20)			
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =				0.3704 (21)			
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
Wind factor	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)				
Adj infilt rate	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)				
	0.4723	0.4630	0.4537	0.4074	0.3982	0.3519	0.3519	0.3426	0.3704	0.3982	0.4167	0.4352	(22b)				
Effective ac	0.6115	0.6072	0.6029	0.5830	0.5793	0.5619	0.5619	0.5587	0.5686	0.5793	0.5868	0.5947	(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 Opaque door			2.1000	1.0000	2.1000		(26)					
TER Opening Type (Uw = 1.40)			17.2000	1.3258	22.8030		(27)					
Ground Floor			51.8300	0.1300	6.7379		(28a)					
External Walls	105.4700	19.3000	86.1700	0.1800	15.5106		(29a)					
Pitched Cold Roof	51.8300		51.8300	0.1300	6.7379		(30)					
Total net area of external elements Aum(A, m2)			209.1300				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		53.8894		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.6332 (36)					
Total fabric heat loss						(33) + (36) =	64.5226 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 53.6565	Feb 53.2765	Mar 52.9041	Apr 51.1547	May 50.8275	Jun 49.3038	Jul 49.3038	Aug 49.0217	Sep 49.8907	Oct 50.8275	Nov 51.4896	Dec 52.1818 (38)
Heat transfer coeff	118.1791	117.7991	117.4267	115.6774	115.3501	113.8265	113.8265	113.5443	114.4133	115.3501	116.0122	116.7044 (39)
Average = Sum(39)m / 12 =												115.6758 (39)
HLP	Jan 1.1401	Feb 1.1364	Mar 1.1328	Apr 1.1159	May 1.1128	Jun 1.0981	Jul 1.0981	Aug 1.0954	Sep 1.1037	Oct 1.1128	Nov 1.1192	Dec 1.1258 (40)
HLP (average)												1.1159 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7709 (42)
Average daily hot water use (litres/day)												100.0094 (43)
Daily hot water use	Jan 110.0103	Feb 106.0100	Mar 102.0096	Apr 98.0092	May 94.0088	Jun 90.0085	Jul 90.0085	Aug 94.0088	Sep 98.0092	Oct 102.0096	Nov 106.0100	Dec 110.0103 (44)
Energy conte	163.1422	142.6852	147.2383	128.3659	123.1702	106.2865	98.4901	113.0188	114.3686	133.2856	145.4916	157.9945 (45)
Energy content (annual)										Total = Sum(45)m =		1573.5374 (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	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 (46)
If cylinder contains dedicated solar storage												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Heat gains from water heating, kWh/month	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)
	34.6677	30.3206	31.2881	27.2778	26.1737	22.5859	20.9291	24.0165	24.3033	28.3232	30.9170	33.5738 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	138.5461	138.5461	138.5461	138.5461	138.5461	138.5461	138.5461	138.5461	138.5461	138.5461	138.5461	138.5461 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	24.2085	21.5018	17.4864	13.2383	9.8958	8.3545	9.0273	11.7340	15.7494	19.9974	23.3400	24.8813 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	262.1125	264.8324	257.9783	243.3868	224.9676	207.6562	196.0911	193.3712	200.2253	214.8168	233.2360	250.5474 (68)
Pumps, fans	36.8546	36.8546	36.8546	36.8546	36.8546	36.8546	36.8546	36.8546	36.8546	36.8546	36.8546	36.8546 (69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369 (71)
Total internal gains	46.5964	45.1199	42.0540	37.8858	35.1797	31.3693	28.1306	32.2802	33.7546	38.0688	42.9402	45.1261 (72)
	397.4812	396.0179	382.0825	359.0748	334.6069	311.9438	297.8128	301.9493	314.2931	337.4469	364.0800	385.1187 (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				5.4100	10.6334		0.6300	0.7000		0.7700		17.5809 (74)
South				9.5400	46.7521		0.6300	0.7000		0.7700		136.3079 (78)
West				2.2500	19.6403		0.6300	0.7000		0.7700		13.5052 (80)

Solar gains	167.3940	283.2543	384.9642	476.5513	536.2105	534.1597	514.1710	468.8828	416.2966	312.1247	200.0991	143.5449 (83)
Total gains	564.8752	679.2722	767.0468	835.6260	870.8174	846.1035	811.9837	770.8321	730.5897	649.5716	564.1791	528.6636 (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)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	60.9127	61.1092	61.3030	62.2301	62.4066	63.2420	63.2420	63.3991	62.9176	62.4066	62.0505	61.6824
util living area	5.0608	5.0739	5.0869	5.1487	5.1604	5.2161	5.2161	5.2266	5.1945	5.1604	5.1367	5.1122
	0.9987	0.9965	0.9904	0.9705	0.9113	0.7705	0.5968	0.6462	0.8692	0.9802	0.9970	0.9991 (86)
MIT	19.7207	19.8922	20.1430	20.4633	20.7453	20.9299	20.9851	20.9779	20.8589	20.4865	20.0433	19.6965 (87)
Th 2	19.9682	19.9712	19.9741	19.9878	19.9904	20.0024	20.0024	20.0046	19.9978	19.9904	19.9852	19.9798 (88)
util rest of house	0.9983	0.9953	0.9869	0.9587	0.8742	0.6832	0.4717	0.5217	0.8035	0.9701	0.9958	0.9988 (89)
MIT 2	18.7994	18.9728	19.2241	19.5488	19.8125	19.9687	19.9985	19.9981	19.9176	19.5772	19.1351	18.7845 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.9937	19.1667	19.4179	19.7417	20.0092	20.1714	20.2065	20.2047	20.1161	19.7689	19.3266	18.9768 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.9937	19.1667	19.4179	19.7417	20.0092	20.1714	20.2065	20.2047	20.1161	19.7689	19.3266	18.9768 (93)

8. Space heating requirement												

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9977	0.9940	0.9844	0.9550	0.8750	0.6995	0.4983	0.5482	0.8126	0.9672	0.9947	0.9984 (94)
Ext temp.	563.5772	675.1727	755.0426	798.0573	761.9966	591.8103	404.6497	422.5375	593.6630	628.2601	561.1867	527.7936 (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	1736.4904	1680.6005	1516.9048	1254.1369	958.4711	634.1720	410.5198	432.0025	688.3230	1057.6374	1418.4386	1724.5154 (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	872.6474	675.6475	566.8255	328.3773	146.1770	0.0000	0.0000	0.0000	0.0000	319.4567	617.2214	890.3610 (98)
Space heating												4416.7138 (98)
Space heating per m2												(98) / (4) = 42.6077 (99)

8c. Space cooling requirement												

Calculated for June, July and August. See Table 10b												
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	1069.9688	842.3159	862.9368	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.8492	0.9171	0.8970	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	908.5845	772.4749	774.0397	0.0000	0.0000	0.0000	0.0000 (102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1096.3475	1054.1660	1008.0887	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	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)
	0.0000	0.0000	0.0000	0.0000	0.0000	135.1893	209.5782	174.1325	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												518.9000 (104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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	33.7973	52.3945	43.5331	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												129.7250 (107)
Space cooling per m2												1.2514 (108)
Energy for space heating												42.6077 (99)
Energy for space cooling												1.2514 (108)
Total												43.8591 (109)
Target Fabric Energy Efficiency (TFEE)												50.4 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	51.8300 (1b)	x 2.4800 (2b)	= 128.5384 (1b) - (3b)
First floor	51.8300 (1c)	x 2.6500 (2c)	= 137.3495 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	103.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 265.8879 (5)

2. Ventilation rate

					main heating	+	secondary heating	+	other	=	total	m3 per hour
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											0 * 10 =	0.0000 (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) =										0.0000 / (5) =	0.0000 (8)
Pressure test											Yes	
Measured/design AP50											5.0000	
Infiltration rate											0.2500	(18)
Number of sides sheltered											1	(19)
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.2313 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	4.6000	4.2000	4.1000	4.0000	4.2000	3.7000	3.9000	3.7000	3.7000	4.0000	3.9000	4.1000 (22)
Adj infilt rate	1.1500	1.0500	1.0250	1.0000	1.0500	0.9250	0.9750	0.9250	0.9250	1.0000	0.9750	1.0250 (22a)
	0.2659	0.2428	0.2370	0.2313	0.2428	0.2139	0.2255	0.2139	0.2139	0.2313	0.2255	0.2370 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation:	0.5000 (23a)											
Effective ac	0.5159	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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					
Front Door			2.1000	1.6000	3.3600		(26)					
Windows (Uw = 1.40)			10.9000	1.3258	14.4508		(27)					
French Doors (Uw = 1.50)			6.3000	1.4151	8.9151		(27)					
Ground Floor			51.8300	0.1200	6.2196	75.0000	3887.2500 (28a)					
External Walls	105.4700	19.3000	86.1700	0.1900	16.3723	60.0000	5170.2000 (29a)					
Pitched Cold Roof	51.8300		51.8300	0.1000	5.1830	9.0000	466.4700 (30)					
Total net area of external elements Aum(A, m2)			209.1300				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	54.5008		(33)					
Party Wall			53.4000	0.0000	0.0000	110.0000	5874.0000 (32)					
Internal Wall - Masonry			46.6700			75.0000	3500.2500 (32c)					
Internal Wall - Timber			84.2500			9.0000	758.2500 (32c)					
Internal Floor			51.8300			18.0000	932.9400 (32d)					
Internal Ceiling			51.8300			18.0000	932.9400 (32e)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		21522.3000 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							207.6240 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.0850 (36)					
Total fabric heat loss						(33) + (36) =	69.5858 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 45.2699	Feb 43.8715	Mar 43.8715	Apr 43.8715	May 43.8715	Jun 43.8715	Jul 43.8715	Aug 43.8715	Sep 43.8715	Oct 43.8715	Nov 43.8715	Dec 43.8715 (38)
Heat transfer coeff	114.8557	113.4573	113.4573	113.4573	113.4573	113.4573	113.4573	113.4573	113.4573	113.4573	113.4573	113.4573 (39)
Average = Sum(39)m / 12 =												113.5738 (39)
HLP	Jan 1.1080	Feb 1.0945	Mar 1.0945	Apr 1.0945	May 1.0945	Jun 1.0945	Jul 1.0945	Aug 1.0945	Sep 1.0945	Oct 1.0945	Nov 1.0945	Dec 1.0945 (40)
HLP (average)												1.0956 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7709 (42)
Average daily hot water use (litres/day)												100.0094 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Daily hot water use	110.0103	106.0100	102.0096	98.0092	94.0088	90.0085	90.0085	94.0088	98.0092	102.0096	106.0100	110.0103 (44)
Energy conte	163.1422	142.6852	147.2383	128.3659	123.1702	106.2865	98.4901	113.0188	114.3686	133.2856	145.4916	157.9945 (45)
Energy content (annual)										Total = Sum	Sum(45)m =	1573.5374 (45)
Distribution loss (46)m = 0.15 x (45)m	24.4713	21.4028	22.0857	19.2549	18.4755	15.9430	14.7735	16.9528	17.1553	19.9928	21.8237	23.6992 (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	18.8357	16.9657	18.6751	17.9042	18.3574	17.5997	18.0833	18.2611	17.7656	18.5341	18.1030	18.7837 (61)
Total heat required for water heating calculated for each month	181.9779	159.6509	165.9134	146.2701	141.5276	123.8862	116.5734	131.2798	132.1342	151.8197	163.5946	176.7782 (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	181.9779	159.6509	165.9134	146.2701	141.5276	123.8862	116.5734	131.2798	132.1342	151.8197	163.5946	176.7782 (64)
RHI water heating demand										Total per year (kWh/year) = Sum(64)m =		1791 (64)
Heat gains from water heating, kWh/month	58.9537	51.6843	53.6255	47.1577	45.5434	39.7402	37.2688	42.1440	42.4690	48.9510	52.9017	57.2291 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	166.2553	166.2553	166.2553	166.2553	166.2553	166.2553	166.2553	166.2553	166.2553	166.2553	166.2553	166.2553 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	60.5212	53.7544	43.7160	33.0958	24.7395	20.8862	22.5682	29.3350	39.3734	49.9936	58.3499	62.2033 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	391.2127	395.2722	385.0423	363.2639	335.7726	309.9346	292.6733	288.6137	298.8437	320.6221	348.1134	373.9513 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.3965	54.3965	54.3965	54.3965	54.3965	54.3965	54.3965	54.3965	54.3965	54.3965	54.3965	54.3965 (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)	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369 (71)
Water heating gains (Table 5)	79.2388	76.9111	72.0773	65.4968	61.2143	55.1947	50.0924	56.6452	58.9847	65.7943	73.4746	76.9208 (72)
Total internal gains	643.7876	638.7526	613.6505	574.6715	534.5413	498.8304	478.1488	487.4088	510.0167	549.2249	592.7528	625.8904 (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				5.4100	14.6401	0.6300	0.7000	0.7700	24.2054 (74)			
South				3.2400	61.3950	0.6300	0.7000	0.7700	60.7924 (78)			
West				2.2500	27.3735	0.6300	0.7000	0.7700	18.8228 (80)			
South				6.3000	61.3950	0.6300	0.7000	0.7700	118.2075 (78)			
Solar gains	222.0282	308.5588	419.2056	535.2055	585.8375	626.5252	601.9422	483.5319	362.9336	254.3673	184.7722 (83)	
Total gains	865.8158	947.3115	1032.8561	1109.8770	1120.3788	1125.3556	1080.0911	1033.9843	993.5486	912.1585	847.1201	810.6625 (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	52.0516	52.6931	52.6931	52.6931	52.6931	52.6931	52.6931	52.6931	52.6931	52.6931	52.6931	52.6931
Feb	4.4701	4.5129	4.5129	4.5129	4.5129	4.5129	4.5129	4.5129	4.5129	4.5129	4.5129	4.5129
util living area	0.9801	0.9694	0.9393	0.8662	0.7235	0.5103	0.3447	0.3491	0.6148	0.8615	0.9593	0.9834 (86)
MIT	19.9923	20.1345	20.3936	20.6846	20.8973	20.9834	20.9978	20.9978	20.9620	20.7510	20.3470	19.9823 (87)
Th 2	19.9943	20.0053	20.0053	20.0053	20.0053	20.0053	20.0053	20.0053	20.0053	20.0053	20.0053	20.0053 (88)
util rest of house	0.9747	0.9614	0.9233	0.8316	0.6579	0.4188	0.2419	0.2417	0.5217	0.8168	0.9466	0.9788 (89)
MIT 2	19.1036	19.2513	19.5009	19.7687	19.9442	19.9992	20.0050	20.0050	19.9889	19.8326	19.4603	19.1032 (90)
Living area fraction									fLA = Living area / (4) =			0.2109 (91)
MIT	19.2911	19.4375	19.6892	19.9619	20.1452	20.2068	20.2143	20.2143	20.1941	20.0263	19.6473	19.2886 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2911	19.4375	19.6892	19.9619	20.1452	20.2068	20.2143	20.2143	20.1941	20.0263	19.6473	19.2886 (93)

8. Space heating requirement

Utilisation	0.9699	0.9557	0.9172	0.8299	0.6677	0.4379	0.2636	0.2644	0.5403	0.8179	0.9409	0.9745 (94)
Useful gains	839.7691	905.3403	947.3868	921.1369	748.1311	492.7556	284.7540	273.4229	536.7965	746.0756	797.0688	790.0097 (95)
Ext temp.	5.3000	5.7000	7.4000	9.1000	13.0000	15.8000	17.7000	17.8000	15.3000	12.0000	8.4000	5.5000 (96)
Heat loss rate W	1606.9515	1558.6238	1394.2934	1141.5925	810.6720	499.9788	285.2704	273.9251	555.2758	910.6385	1276.0885	1564.4128 (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	570.7837	439.0065	332.4985	158.7281	46.5305	0.0000	0.0000	0.0000	0.0000	122.4348	344.8942	576.1559 (98)
Space heating												2591.0321 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

RHI space heating demand

2591 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	51.8300 (1b)	x 2.4800 (2b)	= 128.5384 (1b) - (3b)
First floor	51.8300 (1c)	x 2.6500 (2c)	= 137.3495 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	103.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 265.8879 (5)

2. Ventilation rate

						main heating	secondary heating	other		total	m3 per hour			
Number of chimneys						0	+	0	+	0	=	0 * 40 =	0.0000 (6a)	
Number of open flues						0	+	0	+	0	=	0 * 20 =	0.0000 (6b)	
Number of intermittent fans												0 * 10 =	0.0000 (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) =		0.0000 / (5) =	0.0000 (8)
Pressure test													Yes	
Measured/design AP50													5.0000	
Infiltration rate													0.2500 (18)	
Number of sides sheltered													1 (19)	
Shelter factor											(20) = 1 - [0.075 x (19)] =		0.9250 (20)	
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =		0.2313 (21)	
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Wind factor	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)		
Adj infilt rate	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)		
	0.2948	0.2891	0.2833	0.2544	0.2486	0.2197	0.2197	0.2139	0.2313	0.2486	0.2602	0.2717 (22b)		
Mechanical extract ventilation - decentralised														
If mechanical ventilation:													0.5000 (23a)	
Effective ac	0.5448	0.5391	0.5333	0.5044	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5102	0.5217 (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					
Front Door			2.1000	1.6000	3.3600		(26)					
Windows (Uw = 1.40)			10.9000	1.3258	14.4508		(27)					
French Doors (Uw = 1.50)			6.3000	1.4151	8.9151		(27)					
Ground Floor			51.8300	0.1200	6.2196	75.0000	3887.2500 (28a)					
External Walls	105.4700	19.3000	86.1700	0.1900	16.3723	60.0000	5170.2000 (29a)					
Pitched Cold Roof	51.8300		51.8300	0.1000	5.1830	9.0000	466.4700 (30)					
Total net area of external elements Aum(A, m2)			209.1300				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	54.5008		(33)					
Party Wall			53.4000	0.0000	0.0000	110.0000	5874.0000 (32)					
Internal Wall - Masonry			46.6700			75.0000	3500.2500 (32c)					
Internal Wall - Timber			84.2500			9.0000	758.2500 (32c)					
Internal Floor			51.8300			18.0000	932.9400 (32d)					
Internal Ceiling			51.8300			18.0000	932.9400 (32e)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		21522.3000 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							207.6240 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.0850 (36)					
Total fabric heat loss						(33) + (36) =	69.5858 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 47.8062	Feb 47.2990	Mar 46.7917	Apr 44.2554	May 43.8715	Jun 43.8715	Jul 43.8715	Aug 43.8715	Sep 43.8715	Oct 43.8715	Nov 44.7626	Dec 45.7772 (38)
Heat transfer coeff	117.3920	116.8847	116.3775	113.8411	113.4573	113.4573	113.4573	113.4573	113.4573	113.4573	114.3484	115.3629 (39)
Average = Sum(39)m / 12 =												114.5792 (39)
HLP	Jan 1.1325	Feb 1.1276	Mar 1.1227	Apr 1.0982	May 1.0945	Jun 1.0945	Jul 1.0945	Aug 1.0945	Sep 1.0945	Oct 1.0945	Nov 1.1031	Dec 1.1129 (40)
HLP (average)												1.1053 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7709 (42)
Average daily hot water use (litres/day)												100.0094 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Daily hot water use	110.0103	106.0100	102.0096	98.0092	94.0088	90.0085	90.0085	94.0088	98.0092	102.0096	106.0100	110.0103 (44)
Energy conte	163.1422	142.6852	147.2383	128.3659	123.1702	106.2865	98.4901	113.0188	114.3686	133.2856	145.4916	157.9945 (45)
Energy content (annual)										Total = Sum	(45)m =	1573.5374 (45)
Distribution loss (46)m = 0.15 x (45)m	24.4713	21.4028	22.0857	19.2549	18.4755	15.9430	14.7735	16.9528	17.1553	19.9928	21.8237	23.6992 (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	18.8357	16.9657	18.6751	17.9042	18.3574	17.5997	18.0833	18.2611	17.7656	18.5341	18.1030	18.7837 (61)
Total heat required for water heating calculated for each month	181.9779	159.6509	165.9134	146.2701	141.5276	123.8862	116.5734	131.2798	132.1342	151.8197	163.5946	176.7782 (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	181.9779	159.6509	165.9134	146.2701	141.5276	123.8862	116.5734	131.2798	132.1342	151.8197	163.5946	176.7782 (64)
Heat gains from water heating, kWh/month	58.9537	51.6843	53.6255	47.1577	45.5434	39.7402	37.2688	42.1440	42.4690	48.9510	52.9017	57.2291 (65)
										Total per year (kWh/year) = Sum	(64)m =	1791.4060 (64)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	166.2553	166.2553	166.2553	166.2553	166.2553	166.2553	166.2553	166.2553	166.2553	166.2553	166.2553	166.2553 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	60.5212	53.7544	43.7160	33.0958	24.7395	20.8862	22.5682	29.3350	39.3734	49.9936	58.3499	62.2033 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	391.2127	395.2722	385.0423	363.2639	335.7726	309.9346	292.6733	288.6137	298.8437	320.6221	348.1134	373.9513 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.3965	54.3965	54.3965	54.3965	54.3965	54.3965	54.3965	54.3965	54.3965	54.3965	54.3965	54.3965 (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)	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369 (71)
Water heating gains (Table 5)	79.2388	76.9111	72.0773	65.4968	61.2143	55.1947	50.0924	56.6452	58.9847	65.7943	73.4746	76.9208 (72)
Total internal gains	643.7876	638.7526	613.6505	574.6715	534.5413	498.8304	478.1488	487.4088	510.0167	549.2249	592.7528	625.8904 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W
North	5.4100	10.6334	0.6300	0.7000	0.7700	17.5809 (74)
South	3.2400	46.7521	0.6300	0.7000	0.7700	46.2932 (78)
West	2.2500	19.6403	0.6300	0.7000	0.7700	13.5052 (80)
South	6.3000	46.7521	0.6300	0.7000	0.7700	90.0146 (78)

Solar gains	167.3940	283.2543	384.9642	476.5513	536.2105	534.1597	514.1710	468.8828	416.2966	312.1247	200.0991	143.5449 (83)
Total gains	811.1816	922.0069	998.6147	1051.2228	1070.7518	1032.9901	992.3198	956.2917	926.3133	861.3497	792.8518	769.4353 (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	50.9270	51.1480	51.3709	52.5154	52.6931	52.6931	52.6931	52.6931	52.6931	52.6931	52.2825	51.8227
alpha	4.3951	4.4099	4.4247	4.5010	4.5129	4.5129	4.5129	4.5129	4.5129	4.5129	4.4855	4.4548
util living area	0.9878	0.9776	0.9575	0.9093	0.8125	0.6533	0.4916	0.5290	0.7438	0.9208	0.9774	0.9901 (86)
MIT	19.7828	19.9694	20.2305	20.5541	20.8040	20.9457	20.9879	20.9831	20.9006	20.5905	20.1394	19.7597 (87)
Th 2	19.9744	19.9784	19.9824	20.0023	20.0053	20.0053	20.0053	20.0053	20.0053	20.0053	19.9983	19.9903 (88)
util rest of house	0.9845	0.9718	0.9461	0.8847	0.7628	0.5694	0.3860	0.4224	0.6676	0.8942	0.9704	0.9875 (89)
MIT 2	18.8809	19.0676	19.3255	19.6492	19.8724	19.9787	20.0018	19.9999	19.9507	19.6910	19.2529	18.8707 (90)
Living area fraction	19.0711	19.2578	19.5164	19.8400	20.0689	20.1827	20.2097	20.2072	20.1510	19.8807	19.4398	0.2109 (91)
MIT	19.0711	19.2578	19.5164	19.8400	20.0689	20.1827	20.2097	20.2072	20.1510	19.8807	19.4398	19.0582 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0711	19.2578	19.5164	19.8400	20.0689	20.1827	20.2097	20.2072	20.1510	19.8807	19.4398	19.0582 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9808	0.9666	0.9398	0.8801	0.7663	0.5852	0.4082	0.4448	0.6797	0.8902	0.9655	0.9843 (94)
Ext temp.	795.6091	891.1877	938.4976	925.1976	820.4734	604.4931	405.0823	425.3162	629.6355	766.7855	765.5225	757.3214 (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	1734.0035	1678.2031	1514.8097	1245.4248	949.5072	633.3922	409.5487	431.9584	686.5297	1052.9643	1411.0387	1714.0829 (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	698.1654	528.8743	428.7762	230.5636	96.0011	0.0000	0.0000	0.0000	0.0000	212.9170	464.7717	711.8305 (98)
Space heating per m2												3371.9000 (98)
										(98) / (4) =		32.5285 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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 %)													90.0000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3746.5555 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	698.1654	528.8743	428.7762	230.5636	96.0011	0.0000	0.0000	0.0000	0.0000	212.9170	464.7717	711.8305	(98)
Space heating efficiency (main heating system 1)	90.0000	90.0000	90.0000	90.0000	90.0000	0.0000	0.0000	0.0000	0.0000	90.0000	90.0000	90.0000	(210)
Space heating fuel (main heating system)	775.7394	587.6381	476.4180	256.1818	106.6679	0.0000	0.0000	0.0000	0.0000	236.5745	516.4130	790.9228	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	181.9779	159.6509	165.9134	146.2701	141.5276	123.8862	116.5734	131.2798	132.1342	151.8197	163.5946	176.7782	(64)
Efficiency of water heater (217)m	89.3629	89.2861	89.1424	88.8113	88.1881	87.0000	87.0000	87.0000	87.0000	88.7265	89.1992	89.3868	(216)
Fuel for water heating, kWh/month	203.6392	178.8082	186.1217	164.6977	160.4838	142.3980	133.9924	150.8964	151.8784	171.1098	183.4036	197.7676	(217)
Water heating fuel used												2025.1968	(219)
Annual totals kWh/year													
Space heating fuel - main system												3746.5555	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 10.0340, total flow = 37.0000, SFP = 0.2712)													
mechanical ventilation fans (SFP = 0.2712)												87.9692	(230a)
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												162.9692	(231)
Electricity for lighting (calculated in Appendix L)												427.5295	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.76 * 1068 * 1.00) =										-649.3869		-649.3869	(233)
Total delivered energy for all uses												5712.8642	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3746.5555	3.4800	130.3801	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	2025.1968	3.4800	70.4768	(247)
Mechanical ventilation fans	87.9692	13.1900	11.6031	(249)
Pumps and fans for heating	75.0000	13.1900	9.8925	(249)
Energy for lighting	427.5295	13.1900	56.3911	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	-649.3869	13.1900	-85.6541	(252)
Total energy cost			313.0896	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.4200	(256)
Energy cost factor (ECF)	0.8846	(257)
SAP value	87.6605	
SAP rating (Section 12)	88	(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	3746.5555	0.2160	809.2560	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2025.1968	0.2160	437.4425	(264)
Space and water heating			1246.6985	(265)
Pumps and fans	162.9692	0.5190	84.5810	(267)
Energy for lighting	427.5295	0.5190	221.8878	(268)
Energy saving/generation technologies				
PV Unit	-649.3869	0.5190	-337.0318	(269)
Total kg/year			1216.1356	(272)
CO2 emissions per m2			11.7300	(273)
EI value			89.0379	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

EI rating

89 (274)

EI band

B

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9000 = 3.867$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9000 = 0.2400$, stars = 4
Water heating energy efficiency	$3.48 / 0.8834 = 3.939$, stars = 4
Water heating environmental impact	$0.216 / 0.8834 = 0.2445$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	51.8300 (1b)	x 2.4800 (2b)	= 128.5384 (1b) - (3b)
First floor	51.8300 (1c)	x 2.6500 (2c)	= 137.3495 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	103.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 265.8879 (5)

2. Ventilation rate

					main heating	+	secondary heating	+	other	=	total	m3 per hour
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											0 * 10 =	0.0000 (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) =										0.0000 / (5) =	0.0000 (8)
Pressure test											Yes	
Measured/design AP50											5.0000	
Infiltration rate											0.2500 (18)	
Number of sides sheltered											1 (19)	
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.2313 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	4.6000	4.2000	4.1000	4.0000	4.2000	3.7000	3.9000	3.7000	3.7000	4.0000	3.9000	4.1000 (22)
Adj infilt rate	1.1500	1.0500	1.0250	1.0000	1.0500	0.9250	0.9750	0.9250	0.9250	1.0000	0.9750	1.0250 (22a)
	0.2659	0.2428	0.2370	0.2313	0.2428	0.2139	0.2255	0.2139	0.2139	0.2313	0.2255	0.2370 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation:	0.5000 (23a)											
Effective ac	0.5159	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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					
Front Door			2.1000	1.6000	3.3600		(26)					
Windows (Uw = 1.40)			10.9000	1.3258	14.4508		(27)					
French Doors (Uw = 1.50)			6.3000	1.4151	8.9151		(27)					
Ground Floor			51.8300	0.1200	6.2196	75.0000	3887.2500 (28a)					
External Walls	105.4700	19.3000	86.1700	0.1900	16.3723	60.0000	5170.2000 (29a)					
Pitched Cold Roof	51.8300		51.8300	0.1000	5.1830	9.0000	466.4700 (30)					
Total net area of external elements Aum(A, m2)			209.1300				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	54.5008		(33)					
Party Wall			53.4000	0.0000	0.0000	110.0000	5874.0000 (32)					
Internal Wall - Masonry			46.6700			75.0000	3500.2500 (32c)					
Internal Wall - Timber			84.2500			9.0000	758.2500 (32c)					
Internal Floor			51.8300			18.0000	932.9400 (32d)					
Internal Ceiling			51.8300			18.0000	932.9400 (32e)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		21522.3000 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							207.6240 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.0850 (36)					
Total fabric heat loss						(33) + (36) =	69.5858 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 45.2699	Feb 43.8715	Mar 43.8715	Apr 43.8715	May 43.8715	Jun 43.8715	Jul 43.8715	Aug 43.8715	Sep 43.8715	Oct 43.8715	Nov 43.8715	Dec 43.8715 (38)
Heat transfer coeff	114.8557	113.4573	113.4573	113.4573	113.4573	113.4573	113.4573	113.4573	113.4573	113.4573	113.4573	113.4573 (39)
Average = Sum(39)m / 12 =												113.5738 (39)
HLP	Jan 1.1080	Feb 1.0945	Mar 1.0945	Apr 1.0945	May 1.0945	Jun 1.0945	Jul 1.0945	Aug 1.0945	Sep 1.0945	Oct 1.0945	Nov 1.0945	Dec 1.0945 (40)
HLP (average)												1.0956 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7709 (42)
Average daily hot water use (litres/day)												100.0094 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Daily hot water use	110.0103	106.0100	102.0096	98.0092	94.0088	90.0085	90.0085	94.0088	98.0092	102.0096	106.0100	110.0103 (44)
Energy conte	163.1422	142.6852	147.2383	128.3659	123.1702	106.2865	98.4901	113.0188	114.3686	133.2856	145.4916	157.9945 (45)
Energy content (annual)										Total = Sum (45)m =		1573.5374 (45)
Distribution loss (46)m = 0.15 x (45)m												
	24.4713	21.4028	22.0857	19.2549	18.4755	15.9430	14.7735	16.9528	17.1553	19.9928	21.8237	23.6992 (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	18.8357	16.9657	18.6751	17.9042	18.3574	17.5997	18.0833	18.2611	17.7656	18.5341	18.1030	18.7837 (61)
Total heat required for water heating calculated for each month												
Solar input	181.9779	159.6509	165.9134	146.2701	141.5276	123.8862	116.5734	131.2798	132.1342	151.8197	163.5946	176.7782 (62)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum (63)m =												0.0000 (63)
Output from w/h	181.9779	159.6509	165.9134	146.2701	141.5276	123.8862	116.5734	131.2798	132.1342	151.8197	163.5946	176.7782 (64)
Heat gains from water heating, kWh/month												
	58.9537	51.6843	53.6255	47.1577	45.5434	39.7402	37.2688	42.1440	42.4690	48.9510	52.9017	57.2291 (65)
Total per year (kWh/year) = Sum (64)m =												1791.4060 (64)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	166.2553	166.2553	166.2553	166.2553	166.2553	166.2553	166.2553	166.2553	166.2553	166.2553	166.2553	166.2553 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	60.5212	53.7544	43.7160	33.0958	24.7395	20.8862	22.5682	29.3350	39.3734	49.9936	58.3499	62.2033 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	391.2127	395.2722	385.0423	363.2639	335.7726	309.9346	292.6733	288.6137	298.8437	320.6221	348.1134	373.9513 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	54.3965	54.3965	54.3965	54.3965	54.3965	54.3965	54.3965	54.3965	54.3965	54.3965	54.3965	54.3965 (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)												
	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369 (71)
Water heating gains (Table 5)												
	79.2388	76.9111	72.0773	65.4968	61.2143	55.1947	50.0924	56.6452	58.9847	65.7943	73.4746	76.9208 (72)
Total internal gains	643.7876	638.7526	613.6505	574.6715	534.5413	498.8304	478.1488	487.4088	510.0167	549.2249	592.7528	625.8904 (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					5.4100	14.6401	0.6300	0.7000	0.7700	24.2054 (74)		
South					3.2400	61.3950	0.6300	0.7000	0.7700	60.7924 (78)		
West					2.2500	27.3735	0.6300	0.7000	0.7700	18.8228 (80)		
South					6.3000	61.3950	0.6300	0.7000	0.7700	118.2075 (78)		
Solar gains	222.0282	308.5588	419.2056	535.2055	585.8375	626.5252	601.9422	546.5755	483.5319	362.9336	254.3673	184.7722 (83)
Total gains	865.8158	947.3115	1032.8561	1109.8770	1120.3788	1125.3556	1080.0911	1033.9843	993.5486	912.1585	847.1201	810.6625 (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	52.0516	52.6931	52.6931	52.6931	52.6931	52.6931	52.6931	52.6931	52.6931	52.6931	52.6931	52.6931
alpha	4.4701	4.5129	4.5129	4.5129	4.5129	4.5129	4.5129	4.5129	4.5129	4.5129	4.5129	4.5129
util living area	0.9801	0.9694	0.9393	0.8662	0.7235	0.5103	0.3447	0.3491	0.6148	0.8615	0.9593	0.9834 (86)
MIT	19.9923	20.1345	20.3936	20.6846	20.8973	20.9834	20.9978	20.9978	20.9620	20.7510	20.3470	19.9823 (87)
Th 2	19.9943	20.0053	20.0053	20.0053	20.0053	20.0053	20.0053	20.0053	20.0053	20.0053	20.0053	20.0053 (88)
util rest of house	0.9747	0.9614	0.9233	0.8316	0.6579	0.4188	0.2419	0.2417	0.5217	0.8168	0.9466	0.9788 (89)
MIT 2	19.1036	19.2513	19.5009	19.7687	19.9442	19.9992	20.0050	20.0050	19.9889	19.8326	19.4603	19.1032 (90)
Living area fraction									fLA = Living area / (4) =			0.2109 (91)
MIT	19.2911	19.4375	19.6892	19.9619	20.1452	20.2068	20.2143	20.2143	20.1941	20.0263	19.6473	19.2886 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2911	19.4375	19.6892	19.9619	20.1452	20.2068	20.2143	20.2143	20.1941	20.0263	19.6473	19.2886 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	839.7691	905.3403	947.3868	921.1369	748.1311	492.7556	284.7540	273.4229	536.7965	746.0756	797.0688	790.0097 (95)
Ext temp.	5.3000	5.7000	7.4000	9.9000	13.0000	15.8000	17.7000	17.8000	15.3000	12.0000	8.4000	5.5000 (96)
Heat loss rate W	1606.9515	1558.6238	1394.2934	1141.5925	810.6720	499.9788	285.2704	273.9251	555.2758	910.6385	1276.0885	1564.4128 (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	570.7837	439.0065	332.4985	158.7281	46.5305	0.0000	0.0000	0.0000	0.0000	122.4348	344.8942	576.1559 (98)
Space heating												2591.0321 (98)
Space heating per m2												24.9955 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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 %)													90.0000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2878.9246 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	570.7837	439.0065	332.4985	158.7281	46.5305	0.0000	0.0000	0.0000	0.0000	122.4348	344.8942	576.1559	(98)
Space heating efficiency (main heating system 1)	90.0000	90.0000	90.0000	90.0000	90.0000	0.0000	0.0000	0.0000	0.0000	90.0000	90.0000	90.0000	(210)
Space heating fuel (main heating system)	634.2041	487.7850	369.4428	176.3645	51.7005	0.0000	0.0000	0.0000	0.0000	136.0387	383.2158	640.1732	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	181.9779	159.6509	165.9134	146.2701	141.5276	123.8862	116.5734	131.2798	132.1342	151.8197	163.5946	176.7782	(64)
Efficiency of water heater (217)m	89.2560	89.1799	88.9786	88.5359	87.7235	87.0000	87.0000	87.0000	87.0000	88.3142	89.0125	89.2772	(216)
Fuel for water heating, kWh/month	203.8832	179.0212	186.4643	165.2100	161.3337	142.3980	133.9924	150.8964	151.8784	171.9086	183.7883	198.0104	(219)
Water heating fuel used												2028.7848	(219)
Annual totals kWh/year													
Space heating fuel - main system												2878.9246	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 10.0340, total flow = 37.0000, SFP = 0.2712)													
mechanical ventilation fans (SFP = 0.2712)												87.9692	(230a)
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												162.9692	(231)
Electricity for lighting (calculated in Appendix L)												427.5295	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.76 * 1246 * 1.00) =										-757.5778		-757.5778	(233)
Total delivered energy for all uses												4740.6304	(238)

10a. Fuel costs - using BEDF prices (495)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2878.9246	3.6300	104.5050	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	2028.7848	3.6300	73.6449	(247)
Mechanical ventilation fans	87.9692	19.4400	17.1012	(249)
Pumps and fans for heating	75.0000	19.4400	14.5800	(249)
Energy for lighting	427.5295	19.4400	83.1117	(250)
Additional standing charges			95.0000	(251)
Energy saving/generation technologies				
PV Unit	-757.5778	19.4400	-147.2731	(252)
Total energy cost			240.6697	(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	2878.9246	0.2160	621.8477	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2028.7848	0.2160	438.2175	(264)
Space and water heating			1060.0652	(265)
Pumps and fans	162.9692	0.5190	84.5810	(267)
Energy for lighting	427.5295	0.5190	221.8878	(268)
Energy saving/generation technologies				
PV Unit	-757.5778	0.5190	-393.1829	(269)
Total kg/year			973.3512	(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	2878.9246	1.2200	3512.2880	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2028.7848	1.2200	2475.1175	(264)
Space and water heating			5987.4055	(265)
Pumps and fans	162.9692	3.0700	500.3155	(267)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Energy for lighting	427.5295	3.0700	1312.5157 (268)
Energy saving/generation technologies			
PV Unit	-757.5778	3.0700	-2325.7638 (269)
Primary energy kWh/year			5474.4729 (272)
Primary energy kWh/m ² /year			52.8118 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 88
Current environmental impact rating: B 89

(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	Recommended
O	Not considered
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U Solar photovoltaic panels	Already installed
A2	Not considered
A3	Not considered
T2	Not considered
W	Not considered
X	Not considered
Y	Not considered
J2	Not considered
Q2	Not considered
Z1	Not considered
Z2	Not considered
Z3	Not considered
Z4	Not considered
Z5	Not considered
V2 Wind turbine	Not applicable
L2	Not considered
Q3	Not considered
O3	Not considered

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.1	-£ 28	-200 kg (20.5%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£28 1.93 kg/m ²	B 89	B 91
Total Savings	£28 1.93 kg/m ²		

Potential energy efficiency rating: B 89
Potential environmental impact rating: B 91

Fuel prices for cost data on this page from database revision number 495 TEST (29 Apr 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	£115	£125	-£10
Mains gas	£273	£235	£38
Space heating	£231	£231	£0
Water heating	£74	£45	£28
Lighting	£83	£83	£0
Generated (PV)	-£147	-£147	£0
Total cost of fuels	£241	£213	£28
Total cost of uses	£241	£212	£28
Delivered energy	46 kWh/m ²	36 kWh/m ²	10 kWh/m ²
Carbon dioxide emissions	1.0 tonnes	0.8 tonnes	0.2 tonnes
CO2 emissions per m ²	9 kg/m ²	7 kg/m ²	2 kg/m ²
Primary energy	53 kWh/m ²	42 kWh/m ²	11 kWh/m ²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	51.8300 (1b)	x 2.4800 (2b)	= 128.5384 (1b) - (3b)
First floor	51.8300 (1c)	x 2.6500 (2c)	= 137.3495 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	103.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 265.8879 (5)

2. Ventilation rate

					main heating	secondary heating	other		total	m3 per hour		
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											0 * 10 =	0.0000 (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) =											0.0000 / (5) =	0.0000 (8)
Pressure test											Yes	
Measured/design AP50											5.0000	
Infiltration rate											0.2500 (18)	
Number of sides sheltered											1 (19)	
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.2313 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	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												
	0.2948	0.2891	0.2833	0.2544	0.2486	0.2197	0.2197	0.2139	0.2313	0.2486	0.2602	0.2717 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5448	0.5391	0.5333	0.5044	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5102	0.5217 (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					
Front Door			2.1000	1.6000	3.3600		(26)					
Windows (Uw = 1.40)			10.9000	1.3258	14.4508		(27)					
French Doors (Uw = 1.50)			6.3000	1.4151	8.9151		(27)					
Ground Floor			51.8300	0.1200	6.2196	75.0000	3887.2500 (28a)					
External Walls	105.4700	19.3000	86.1700	0.1900	16.3723	60.0000	5170.2000 (29a)					
Pitched Cold Roof	51.8300		51.8300	0.1000	5.1830	9.0000	466.4700 (30)					
Total net area of external elements Aum(A, m2)			209.1300				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	54.5008		(33)					
Party Wall			53.4000	0.0000	0.0000	110.0000	5874.0000 (32)					
Internal Wall - Masonry			46.6700			75.0000	3500.2500 (32c)					
Internal Wall - Timber			84.2500			9.0000	758.2500 (32c)					
Internal Floor			51.8300			18.0000	932.9400 (32d)					
Internal Ceiling			51.8300			18.0000	932.9400 (32e)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		21522.3000 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							207.6240 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.0850 (36)					
Total fabric heat loss						(33) + (36) =	69.5858 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 47.8062	Feb 47.2990	Mar 46.7917	Apr 44.2554	May 43.8715	Jun 43.8715	Jul 43.8715	Aug 43.8715	Sep 43.8715	Oct 43.8715	Nov 44.7626	Dec 45.7772 (38)
Heat transfer coeff	117.3920	116.8847	116.3775	113.8411	113.4573	113.4573	113.4573	113.4573	113.4573	113.4573	114.3484	115.3629 (39)
Average = Sum(39)m / 12 =												114.5792 (39)
HLP	Jan 1.1325	Feb 1.1276	Mar 1.1227	Apr 1.0982	May 1.0945	Jun 1.0945	Jul 1.0945	Aug 1.0945	Sep 1.0945	Oct 1.0945	Nov 1.1031	Dec 1.1129 (40)
HLP (average)												1.1053 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7709 (42)
Average daily hot water use (litres/day)												100.0094 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Daily hot water use	110.0103	106.0100	102.0096	98.0092	94.0088	90.0085	90.0085	94.0088	98.0092	102.0096	106.0100	110.0103 (44)
Energy conte	163.1422	142.6852	147.2383	128.3659	123.1702	106.2865	98.4901	113.0188	114.3686	133.2856	145.4916	157.9945 (45)
Energy content (annual)										Total = Sum (45)m =		1573.5374 (45)
Distribution loss (46)m = 0.15 x (45)m	24.4713	21.4028	22.0857	19.2549	18.4755	15.9430	14.7735	16.9528	17.1553	19.9928	21.8237	23.6992 (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	18.8357	16.9657	18.6751	17.9042	18.3574	17.5997	18.0833	18.2611	17.7656	18.5341	18.1030	18.7837 (61)
Total heat required for water heating calculated for each month	181.9779	159.6509	165.9134	146.2701	141.5276	123.8862	116.5734	131.2798	132.1342	151.8197	163.5946	176.7782 (62)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.7000 (H2)
Collector heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0050 (H3a)
Collector effective heat loss coefficient												1.8063 (H3b)
Collector performance ratio												2.5804 (H4)
Annual solar radiation per m2												1079.5246 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												1813.6014 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.1526 (H8)
Utilisation factor												0.5801 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												100.0094 (H14)
Volume ratio Veff/V												0.7499 (H15)
Solar storage volume factor												0.9424 (H16)
Solar input												-871.7675 (H17)
Solar input	-25.2795	-42.1843	-71.8446	-96.2859	-118.9532	-116.9499	-115.4044	-100.8294	-78.9696	-53.9270	-29.9852	-21.1546 (63)
Solar input (sum of months) = Sum (63)m =												-871.7675 (63)
Output from w/h	156.6983	117.4666	94.0688	49.9842	22.5744	6.9363	1.1690	30.4505	53.1646	97.8927	133.6094	155.6235 (64)
Total per year (kWh/year) = Sum (64)m =												919.6384 (64)
Heat gains from water heating, kWh/month	58.9537	51.6843	53.6255	47.1577	45.5434	39.7402	37.2688	42.1440	42.4690	48.9510	52.9017	57.2291 (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	166.2553	166.2553	166.2553	166.2553	166.2553	166.2553	166.2553	166.2553	166.2553	166.2553	166.2553	166.2553 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	60.5212	53.7544	43.7160	33.0958	24.7395	20.8862	22.5682	29.3350	39.3734	49.9936	58.3499	62.2033 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	391.2127	395.2722	385.0423	363.2639	335.7726	309.9346	292.6733	288.6137	298.8437	320.6221	348.1134	373.9513 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.3965	54.3965	54.3965	54.3965	54.3965	54.3965	54.3965	54.3965	54.3965	54.3965	54.3965	54.3965 (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)	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369 (71)
Water heating gains (Table 5)	79.2388	76.9111	72.0773	65.4968	61.2143	55.1947	50.0924	56.6452	58.9847	65.7943	73.4746	76.9208 (72)
Total internal gains	643.7876	638.7526	613.6505	574.6715	534.5413	498.8304	478.1488	487.4088	510.0167	549.2249	592.7528	625.8904 (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				5.4100	10.6334	0.6300	0.7000		0.7700		17.5809 (74)	
South				3.2400	46.7521	0.6300	0.7000		0.7700		46.2932 (78)	
West				2.2500	19.6403	0.6300	0.7000		0.7700		13.5052 (80)	
South				6.3000	46.7521	0.6300	0.7000		0.7700		90.0146 (78)	

Solar gains	167.3940	283.2543	384.9642	476.5513	536.2105	534.1597	514.1710	468.8828	416.2966	312.1247	200.0991	143.5449 (83)
Total gains	811.1816	922.0069	998.6147	1051.2228	1070.7518	1032.9901	992.3198	956.2917	926.3133	861.3497	792.8518	769.4353 (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	50.9270	51.1480	51.3709	52.5154	52.6931	52.6931	52.6931	52.6931	52.6931	52.6931	52.2825	51.8227
alpha	4.3951	4.4099	4.4247	4.5010	4.5129	4.5129	4.5129	4.5129	4.5129	4.5129	4.4855	4.4548
util living area	0.9878	0.9776	0.9575	0.9093	0.8125	0.6533	0.4916	0.5290	0.7438	0.9208	0.9774	0.9901 (86)
MIT	19.7828	19.9694	20.2305	20.5541	20.8040	20.9457	20.9879	20.9831	20.9006	20.5905	20.1394	19.7597 (87)
Th 2	19.9744	19.9784	19.9824	20.0023	20.0053	20.0053	20.0053	20.0053	20.0053	20.0053	19.9983	19.9903 (88)
util rest of house	0.9845	0.9718	0.9461	0.8847	0.7628	0.5694	0.3860	0.4224	0.6676	0.8942	0.9704	0.9875 (89)
MIT 2	18.8809	19.0676	19.3255	19.6492	19.8724	19.9787	20.0018	19.9999	19.9507	19.6910	19.2529	18.8707 (90)
Living area fraction									fLA = Living area / (4) =			0.2109 (91)
MIT	19.0711	19.2578	19.5164	19.8400	20.0689	20.1827	20.2097	20.2072	20.1510	19.8807	19.4398	19.0582 (92)
Temperature adjustment												0.0000

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

adjusted MIT 19.0711 19.2578 19.5164 19.8400 20.0689 20.1827 20.2097 20.2072 20.1510 19.8807 19.4398 19.0582 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9808	0.9666	0.9398	0.8801	0.7663	0.5852	0.4082	0.4448	0.6797	0.8902	0.9655	0.9843	(94)
Useful gains	795.6091	891.1877	938.4976	925.1976	820.4734	604.4931	405.0823	425.3162	629.6355	766.7855	765.5225	757.3214	(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	1734.0035	1678.2031	1514.8097	1245.4248	949.5072	633.3922	409.5487	431.9584	686.5297	1052.9643	1411.0387	1714.0829	(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	698.1654	528.8743	428.7762	230.5636	96.0011	0.0000	0.0000	0.0000	0.0000	212.9170	464.7717	711.8305	(98)
Space heating													
Space heating per m2													(98) / (4) = 32.5285 (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 %)													90.0000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3746.5555 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	698.1654	528.8743	428.7762	230.5636	96.0011	0.0000	0.0000	0.0000	0.0000	212.9170	464.7717	711.8305	(98)
Space heating efficiency (main heating system 1)	90.0000	90.0000	90.0000	90.0000	90.0000	0.0000	0.0000	0.0000	0.0000	90.0000	90.0000	90.0000	(210)
Space heating fuel (main heating system)	775.7394	587.6381	476.4180	256.1818	106.6679	0.0000	0.0000	0.0000	0.0000	236.5745	516.4130	790.9228	(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	156.6983	117.4666	94.0688	49.9842	22.5744	6.9363	1.1690	30.4505	53.1646	97.8927	133.6094	155.6235	(64)
Efficiency of water heater (217)m	89.4347	89.4395	89.4451	89.4504	89.4130	87.0000	87.0000	87.0000	87.0000	89.0330	89.3123	89.4467	(216)
Fuel for water heating, kWh/month	175.2098	131.3364	105.1693	55.8792	25.2474	7.9728	1.3437	35.0005	61.1087	109.9510	149.5979	173.9847	(219)
Water heating fuel used													1031.8015 (219)
Annual totals kWh/year													
Space heating fuel - main system													3746.5555 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 10.0340, total flow = 37.0000, SFP = 0.2712)													
mechanical ventilation fans (SFP = 0.2712)													87.9692 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
pump for solar water heating													50.0000 (230g)
Total electricity for the above, kWh/year													212.9692 (231)
Electricity for lighting (calculated in Appendix L)													427.5295 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.76 * 1068 * 1.00) =										-649.3869			-649.3869 (233)
Total delivered energy for all uses													4769.4689 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3746.5555	3.4800	130.3801	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1031.8015	3.4800	35.9067	(247)
Mechanical ventilation fans	87.9692	13.1900	11.6031	(249)
Pumps and fans for heating	75.0000	13.1900	9.8925	(249)
Pump for solar water heating	50.0000	13.1900	6.5950	(249)
Energy for lighting	427.5295	13.1900	56.3911	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	-649.3869	13.1900	-85.6541	(252)
Total energy cost			285.1145	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):			0.4200 (256)
Energy cost factor (ECF)		[(255) x (256)] / [(4) + 45.0] =	0.8055 (257)
SAP value			88.7630
SAP rating (Section 12)			89 (258)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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	3746.5555	0.2160	809.2560	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1031.8015	0.2160	222.8691	(264)
Space and water heating			1032.1251	(265)
Pumps and fans	212.9692	0.5190	110.5310	(267)
Energy for lighting	427.5295	0.5190	221.8878	(268)
Energy saving/generation technologies				
PV Unit	-649.3869	0.5190	-337.0318	(269)
Total kg/year			1027.5122	(272)
CO2 emissions per m2			9.9100	(273)
EI value			90.7382	
EI rating			91	(274)
EI band			B	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	51.8300 (1b)	x 2.4800 (2b)	= 128.5384 (1b) - (3b)
First floor	51.8300 (1c)	x 2.6500 (2c)	= 137.3495 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	103.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 265.8879 (5)

2. Ventilation rate

					main heating	+	secondary heating	+	other	=	total	m3 per hour
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											0 * 10 =	0.0000 (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) =										0.0000 / (5) =	0.0000 (8)
Pressure test											Yes	
Measured/design AP50											5.0000	
Infiltration rate											0.2500	(18)
Number of sides sheltered											1	(19)
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.2313 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	4.6000	4.2000	4.1000	4.0000	4.2000	3.7000	3.9000	3.7000	3.7000	4.0000	3.9000	4.1000 (22)
Adj infilt rate	1.1500	1.0500	1.0250	1.0000	1.0500	0.9250	0.9750	0.9250	0.9250	1.0000	0.9750	1.0250 (22a)
	0.2659	0.2428	0.2370	0.2313	0.2428	0.2139	0.2255	0.2139	0.2139	0.2313	0.2255	0.2370 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation:	0.5000 (23a)											
Effective ac	0.5159	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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					
Front Door			2.1000	1.6000	3.3600		(26)					
Windows (Uw = 1.40)			10.9000	1.3258	14.4508		(27)					
French Doors (Uw = 1.50)			6.3000	1.4151	8.9151		(27)					
Ground Floor			51.8300	0.1200	6.2196	75.0000	3887.2500 (28a)					
External Walls	105.4700	19.3000	86.1700	0.1900	16.3723	60.0000	5170.2000 (29a)					
Pitched Cold Roof	51.8300		51.8300	0.1000	5.1830	9.0000	466.4700 (30)					
Total net area of external elements Aum(A, m2)			209.1300				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	54.5008		(33)					
Party Wall			53.4000	0.0000	0.0000	110.0000	5874.0000 (32)					
Internal Wall - Masonry			46.6700			75.0000	3500.2500 (32c)					
Internal Wall - Timber			84.2500			9.0000	758.2500 (32c)					
Internal Floor			51.8300			18.0000	932.9400 (32d)					
Internal Ceiling			51.8300			18.0000	932.9400 (32e)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		21522.3000 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							207.6240 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.0850 (36)					
Total fabric heat loss						(33) + (36) =	69.5858 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 45.2699	Feb 43.8715	Mar 43.8715	Apr 43.8715	May 43.8715	Jun 43.8715	Jul 43.8715	Aug 43.8715	Sep 43.8715	Oct 43.8715	Nov 43.8715	Dec 43.8715 (38)
Heat transfer coeff	114.8557	113.4573	113.4573	113.4573	113.4573	113.4573	113.4573	113.4573	113.4573	113.4573	113.4573	113.4573 (39)
Average = Sum(39)m / 12 =												113.5738 (39)
HLP	Jan 1.1080	Feb 1.0945	Mar 1.0945	Apr 1.0945	May 1.0945	Jun 1.0945	Jul 1.0945	Aug 1.0945	Sep 1.0945	Oct 1.0945	Nov 1.0945	Dec 1.0945 (40)
HLP (average)												1.0956 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7709 (42)
Average daily hot water use (litres/day)												100.0094 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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Daily hot water use	110.0103	106.0100	102.0096	98.0092	94.0088	90.0085	90.0085	94.0088	98.0092	102.0096	106.0100	110.0103 (44)
Energy conte	163.1422	142.6852	147.2383	128.3659	123.1702	106.2865	98.4901	113.0188	114.3686	133.2856	145.4916	157.9945 (45)
Energy content (annual)												
Distribution loss (46)m = 0.15 x (45)m												1573.5374 (45)
	24.4713	21.4028	22.0857	19.2549	18.4755	15.9430	14.7735	16.9528	17.1553	19.9928	21.8237	23.6992 (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	18.8357	16.9657	18.6751	17.9042	18.3574	17.5997	18.0833	18.2611	17.7656	18.5341	18.1030	18.7837 (61)
Total heat required for water heating calculated for each month	181.9779	159.6509	165.9134	146.2701	141.5276	123.8862	116.5734	131.2798	132.1342	151.8197	163.5946	176.7782 (62)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.7000 (H2)
Collector heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0050 (H3a)
Collector effective heat loss coefficient												1.8063 (H3b)
Collector performance ratio												2.5804 (H4)
Annual solar radiation per m2												1269.6808 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												2133.0637 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.3556 (H8)
Utilisation factor												0.5218 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												100.0094 (H14)
Volume ratio Veff/V												0.7499 (H15)
Solar storage volume factor												0.9424 (H16)
Solar input												-922.3224 (H17)
Solar input	-31.0631	-42.6284	-72.4238	-99.3345	-118.4377	-124.5632	-122.8728	-107.6011	-84.6963	-58.1594	-35.3330	-25.2092 (63)
Solar input (sum of months) = Sum (63)m =												-922.3224 (63)
Output from w/h	150.9148	117.0225	93.4895	46.9356	23.0899	0.0000	0.0000	23.6787	47.4379	93.6603	128.2616	151.5690 (64)
Total per year (kWh/year) = Sum (64)m =												876.0599 (64)
Heat gains from water heating, kWh/month	58.9537	51.6843	53.6255	47.1577	45.5434	39.7402	37.2688	42.1440	42.4690	48.9510	52.9017	57.2291 (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	166.2553	166.2553	166.2553	166.2553	166.2553	166.2553	166.2553	166.2553	166.2553	166.2553	166.2553	166.2553 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	60.5212	53.7544	43.7160	33.0958	24.7395	20.8862	22.5682	29.3350	39.3734	49.9936	58.3499	62.2033 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	391.2127	395.2722	385.0423	363.2639	335.7726	309.9346	292.6733	288.6137	298.8437	320.6221	348.1134	373.9513 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.3965	54.3965	54.3965	54.3965	54.3965	54.3965	54.3965	54.3965	54.3965	54.3965	54.3965	54.3965 (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)	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369	-110.8369 (71)
Water heating gains (Table 5)	79.2388	76.9111	72.0773	65.4968	61.2143	55.1947	50.0924	56.6452	58.9847	65.7943	73.4746	76.9208 (72)
Total internal gains	643.7876	638.7526	613.6505	574.6715	534.5413	498.8304	478.1488	487.4088	510.0167	549.2249	592.7528	625.8904 (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					5.4100	14.6401		0.6300	0.7000	0.7700	24.2054 (74)	
South					3.2400	61.3950		0.6300	0.7000	0.7700	60.7924 (78)	
West					2.2500	27.3735		0.6300	0.7000	0.7700	18.8228 (80)	
South					6.3000	61.3950		0.6300	0.7000	0.7700	118.2075 (78)	

Solar gains	222.0282	308.5588	419.2056	535.2055	585.8375	626.5252	601.9422	546.5755	483.5319	362.9336	254.3673	184.7722 (83)
Total gains	865.8158	947.3115	1032.8561	1109.8770	1120.3788	1125.3556	1080.0911	1033.9843	993.5486	912.1585	847.1201	810.6625 (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)												
tau	52.0516	52.6931	52.6931	52.6931	52.6931	52.6931	52.6931	52.6931	52.6931	52.6931	52.6931	52.6931
alpha	4.4701	4.5129	4.5129	4.5129	4.5129	4.5129	4.5129	4.5129	4.5129	4.5129	4.5129	4.5129
util living area	0.9801	0.9694	0.9393	0.8662	0.7235	0.5103	0.3447	0.3491	0.6148	0.8615	0.9593	0.9834 (86)
MIT	19.9923	20.1345	20.3936	20.6846	20.8973	20.9834	20.9978	20.9978	20.9620	20.7510	20.3470	19.9823 (87)
Th 2	19.9943	20.0053	20.0053	20.0053	20.0053	20.0053	20.0053	20.0053	20.0053	20.0053	20.0053	20.0053 (88)
util rest of house	0.9747	0.9614	0.9233	0.8316	0.6579	0.4188	0.2419	0.2417	0.5217	0.8168	0.9466	0.9788 (89)
MIT 2	19.1036	19.2513	19.5009	19.7687	19.9442	19.9992	20.0050	20.0050	19.9889	19.8326	19.4603	19.1032 (90)
Living area fraction									fLA = Living area / (4) =			0.2109 (91)
MIT	19.2911	19.4375	19.6892	19.9619	20.1452	20.2068	20.2143	20.2143	20.1941	20.0263	19.6473	19.2886 (92)
Temperature adjustment												0.0000

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adjusted MIT 19.2911 19.4375 19.6892 19.9619 20.1452 20.2068 20.2143 20.2143 20.1941 20.0263 19.6473 19.2886 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9699	0.9557	0.9172	0.8299	0.6677	0.4379	0.2636	0.2644	0.5403	0.8179	0.9409	0.9745	(94)
Useful gains	839.7691	905.3403	947.3868	921.1369	748.1311	492.7556	284.7540	273.4229	536.7965	746.0756	797.0688	790.0097	(95)
Ext temp.	5.3000	5.7000	7.4000	9.9000	13.0000	15.8000	17.7000	17.8000	15.3000	12.0000	8.4000	5.5000	(96)
Heat loss rate W	1606.9515	1558.6238	1394.2934	1141.5925	810.6720	499.9788	285.2704	273.9251	555.2758	910.6385	1276.0885	1564.4128	(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	570.7837	439.0065	332.4985	158.7281	46.5305	0.0000	0.0000	0.0000	0.0000	122.4348	344.8942	576.1559	(98)
Space heating													(98)
Space heating per m2													(98) / (4) = 24.9955 (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 %)													90.0000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2878.9246 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	570.7837	439.0065	332.4985	158.7281	46.5305	0.0000	0.0000	0.0000	0.0000	122.4348	344.8942	576.1559	(98)
Space heating efficiency (main heating system 1)	90.0000	90.0000	90.0000	90.0000	90.0000	0.0000	0.0000	0.0000	0.0000	90.0000	90.0000	90.0000	(210)
Space heating fuel (main heating system)	634.2041	487.7850	369.4428	176.3645	51.7005	0.0000	0.0000	0.0000	0.0000	136.0387	383.2158	640.1732	(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	150.9148	117.0225	93.4895	46.9356	23.0899	0.0000	0.0000	23.6787	47.4379	93.6603	128.2616	151.5690	(64)
Efficiency of water heater (217)m	89.3557	89.3516	89.3240	89.2973	88.9824	87.0000	87.0000	87.0000	87.0000	88.6747	89.1665	89.3582	(216)
Fuel for water heating, kWh/month	168.8922	130.9687	104.6634	52.5611	25.9489	0.0000	0.0000	27.2169	54.5263	105.6223	143.8450	169.6195	(219)
Water heating fuel used													(219)
Annual totals kWh/year													
Space heating fuel - main system													2878.9246 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 10.0340, total flow = 37.0000, SFP = 0.2712)													
mechanical ventilation fans (SFP = 0.2712)													87.9692 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
pump for solar water heating													50.0000 (230g)
Total electricity for the above, kWh/year													212.9692 (231)
Electricity for lighting (calculated in Appendix L)													427.5295 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.76 * 1246 * 1.00) =										-757.5778			-757.5778 (233)
Total delivered energy for all uses													3745.7098 (238)

10a. Fuel costs - using BEDF prices (495)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2878.9246	3.6300	104.5050	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	983.8643	3.6300	35.7143	(247)
Mechanical ventilation fans	87.9692	19.4400	17.1012	(249)
Pumps and fans for heating	75.0000	19.4400	14.5800	(249)
Pump for solar water heating	50.0000	19.4400	9.7200	(249)
Energy for lighting	427.5295	19.4400	83.1117	(250)
Additional standing charges			95.0000	(251)
Energy saving/generation technologies				
PV Unit	-757.5778	19.4400	-147.2731	(252)
Total energy cost			212.4591	(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	2878.9246	0.2160	621.8477	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)

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Water heating (other fuel)	983.8643	0.2160	212.5147 (264)
Space and water heating			834.3624 (265)
Pumps and fans	212.9692	0.5190	110.5310 (267)
Energy for lighting	427.5295	0.5190	221.8878 (268)
Energy saving/generation technologies			
PV Unit	-757.5778	0.5190	-393.1829 (269)
Total kg/year			773.5984 (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	2878.9246	1.2200	3512.2880 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	983.8643	1.2200	1200.3144 (264)
Space and water heating			4712.6024 (265)
Pumps and fans	212.9692	3.0700	653.8155 (267)
Energy for lighting	427.5295	3.0700	1312.5157 (268)
Energy saving/generation technologies			
PV Unit	-757.5778	3.0700	-2325.7638 (269)
Primary energy kWh/year			4353.1698 (272)
Primary energy kWh/m2/year			41.9947 (273)

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

Overheating Calculation Input Data

Dwelling type	SemiDetached House
Number of storeys	2
Cross ventilation possible	Yes
SAP Region	Southern England
Front of dwelling faces	North
Overshading	Average or unknown
Thermal mass parameter	207.6 (calculated from construction elements)
Night ventilation	Yes
Ventilation rate during hot weather (ach)	8.00 (Windows fully open)

Overheating Calculation

Summer ventilation heat loss coefficient	701.94 (P1)
Transmission heat loss coefficient	69.59 (P7)
Summer heat loss coefficient	771.53 (P2)

Overhangs	Ratio	Z_overhangs	Overhang type
Orientation			
North	0.000	1.000	None
South	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)
South	1.000	0.90	1.000	0.900 (P8)
West	1.000	0.90	1.000	0.900 (P8)

[Jul]	Area m2	Solar flux Table 6a W/m2	Specific data g or Table 6b	FF Specific data or Table 6c	Shading	Gains W
North	5.4100	87.1704	0.6300	0.7000	0.9000	168.4574
South	3.2400	118.5567	0.6300	0.7000	0.9000	137.2128
West	2.2500	125.2818	0.6300	0.7000	0.9000	100.6918
South	6.3000	118.5567	0.6300	0.7000	0.9000	266.8027
total:						673.1647

Solar gains	Jun 718	Jul 673	Aug 623	(P3)
Internal gains	496	475	484	
Total summer gains	1213	1148	1107	(P5)
Summer gain/loss ratio	1.57	1.49	1.44	(P6)
Summer external temperature	15.40	17.30	17.30	
Thermal mass temperature increment (TMP = 207.6)	0.55	0.55	0.55	
Threshold temperature	17.52	19.33	19.28	(P7)
Likelihood of high internal temperature	Not significant	Not significant	Not significant	
Assessment of likelihood of high internal temperature:	Not significant			

PREDICTED ENERGY ASSESSMENT

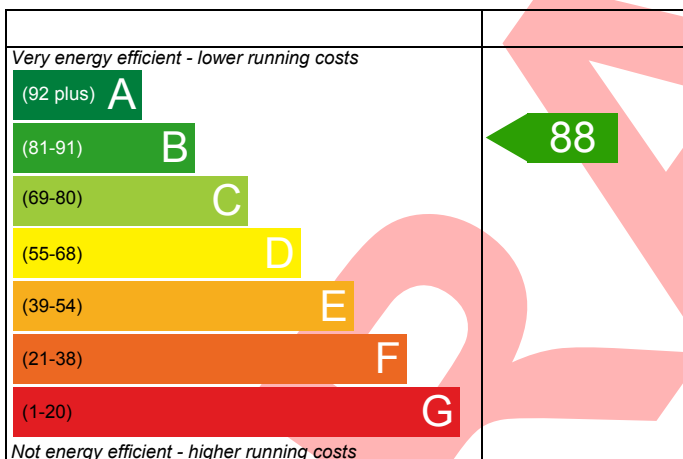
Plot 8, Long Copse Lane,
Emsworth,
Hampshire,
PO10 7UR

Dwelling type: House, Semi-Detached
Date of assessment: 10/05/2022
Produced by: Scott Spearing
Total floor area: 103.66 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP2012 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.

Energy Efficiency Rating

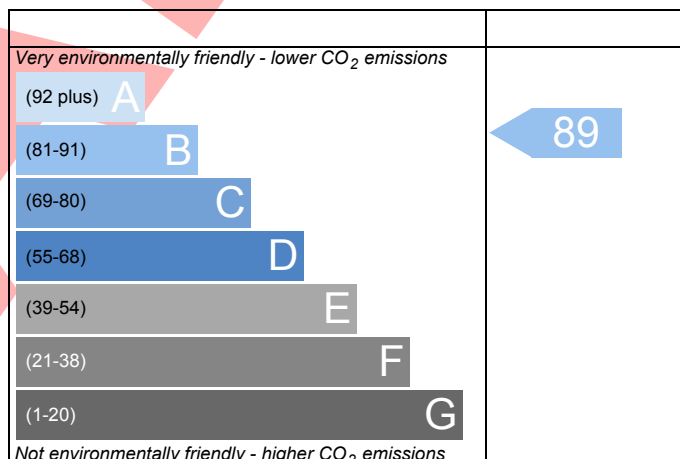


England

EU Directive
2002/91/EC

The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

Environmental Impact (CO₂) Rating



England

EU Directive
2002/91/EC

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions. The higher the rating the less impact it has on the environment.

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