



SAP Report Submission for Building Regulations Compliance

Client: Highwood Construction Ltd

Project: 99 Highwood Avenue
EASTLEIGH, SO50 9QY

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

Report Issue Date: 31/01/2023

EXCELLENCE
IN ENERGY
ASSESSMENT

BLOCK COMPLIANCE

Calculation Type: New Build (As Built)

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

Block Compliance Report - DER

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

Block Compliance Report - DFEE

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

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Built)

Property Reference	SAP-0796 (3B4A) - Plot 200				Issued on Date	31/01/2023
Assessment Reference	AB	Prop Type Ref	2B4P Ground Floor			
Property	99 Highwood Avenue, EASTLEIGH, SO50 9QY					
SAP Rating	84 B	DER	14.62	TER	18.48	
Environmental	90 B	% DER<TER	20.88			
CO ₂ Emissions (t/year)	0.75	DFEE	40.90	TFEE	45.37	
General Requirements Compliance	Pass	% DFEE<TFEE	9.87			
Assessor Details	Mr. Scott Spearing, Scott Spearing, Tel: 01489 565920, scott@beatsolutions.co.uk				Assessor ID	p775-0001
Client	Highwood Construction Ltd, HIGHWOOD					

SUMMARY FOR INPUT DATA FOR New Build (As Built)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	18.48	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.62	kgCO ₂ /m ²	Pass
	-3.86 (-20.9%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	45.37	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	40.90	kWh/m ² /yr	
	-4.5 (-9.9%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.20 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.16 (max. 0.25)	0.16 (max. 0.70)	Pass
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	2.75 (measured in this dwelling)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Boiler system with radiators or underfloor - Mains gas Data from database Ideal LOGIC COMBI ESP1 35 Combi boiler Efficiency: 89.6% SEDBUK2009 Minimum: 88.0%	Pass
---------------------	---	------

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Built)

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Programmer, room thermostat and TRVs

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100

%

Minimum

75

%

Pass

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Southern England)

Not significant

Pass

Based on:

Overshading

Average

Windows facing North

4.01 m², No overhang

Windows facing South

2.75 m², No overhang

Air change rate

8.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

2.75 (measured in this dwelling)

Maximum

10.0

Pass

10 Key features

Party wall U-value

0.00

W/m²K

Air permeability

2.8

m³/m²h

Photovoltaic array

421.47

kWh/Year

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

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Property Reference	SAP-0796 (3B4A) - Plot 200			Issued on Date	31/01/2023
Assessment Reference	AB	Prop Type Ref	2B4P Ground Floor		
Property	99 Highwood Avenue, EASTLEIGH, SO50 9QY				
SAP Rating	84 B	DER	14.62	TER	18.48
Environmental	90 B	% DER<TER	20.88		
CO ₂ Emissions (t/year)	0.75	DFEE	40.90	TFEE	45.37
General Requirements Compliance	Pass	% DFEE<TFEE	9.87		
Assessor Details	Mr. Scott Spearing, Scott Spearing, Tel: 01489 565920, scott@beatsolutions.co.uk			Assessor ID	p775-0001
Client	Highwood Construction Ltd, HIGHWOOD				

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

Orientation	South					
Property Tenure	Unknown					
Transaction Type	New dwelling					
Terrain Type	Urban					
1.0 Property Type	Flat, End-Terrace					
2.0 Number of Storeys	1					
3.0 Date Built	2023					
4.0 Sheltered Sides	1					
5.0 Sunlight/Shade	Average or unknown					
6.0 Measurements						
Ground Floor:		Heat Loss Perimeter		Internal Floor Area		Average Storey Height
		25.38 m		66.30 m²		2.35 m
7.0 Living Area	26.69			m²		
8.0 Thermal Mass Parameter	Precise calculation					
Thermal Mass	131.08			kJ/m²K		
9.0 External Walls						
Description	Type	Construction		U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area (m²)
				Nett Area (m²)		
External Wall	Timber Frame	Timber framed wall (one layer of plasterboard)		0.20	9.00	59.64
				52.88		
9.1 Party Walls						
Description	Type	Construction		U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)
Party Wall	Filled Cavity with Edge Sealing	Double plasterboard on both sides, twin timber f rame with/without sheathing board		0.00	20.00	22.60
9.2 Internal Walls						
Description	Construction		Kappa (kJ/m²K)		Area (m²)	
Internal Walls	Plasterboard on timber frame		9.00		88.99	
10.1 Party Ceilings						
Description	Construction		Kappa (kJ/m²K)		Area (m²)	
Party Ceilings	Timber I-joists, carpeted		20.00		66.30	
11.0 Heat Loss Floors						

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)
Heat Loss Floor	Ground Floor - Solid	Suspended concrete floor, carpeted	0.16	75.00	66.30

12.0 Opening Types

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

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
North	Window	[1] External Wall	North	None	0.00					4.01	
South	Window	[1] External Wall	South	None	0.00					2.75	

14.0 Conservatory

None

15.0 Draught Proofing

100 %

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported
Table K1 - Approved	E2 Other lintels (including other steel lintels)	5.22	0.300	Yes
Table K1 - Approved	E3 Sill	5.22	0.040	Yes
Table K1 - Approved	E4 Jamb	10.28	0.050	Yes
Table K1 - Approved	E5 Ground floor (normal)	25.38	0.160	Yes
Table K1 - Approved	E7 Party floor between dwellings (in blocks of flats)	25.38	0.070	No
Table K1 - Approved	E16 Corner (normal)	9.40	0.090	No
Table K1 - Approved	E17 Corner (inverted – internal area greater than external area)	4.70	-0.090	No
Table K1 - Default	E25 Staggered party wall between dwellings	4.70	0.120	No
Table K1 - Default	P1 Party wall - Ground floor	9.62	0.160	No
Table K1 - Default	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	9.62	0.000	No

Y-value	0.085	W/m²K
---------	-------	-------

18.0 Pressure Testing

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

19.0 Mechanical Ventilation

Summer Overheating

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

Mechanical Ventilation

Mechanical Ventilation System Present	No
---------------------------------------	----

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				2
Number of passive vents				0
Number of flueless gas fires				0

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

21.0 Fixed Cooling System

No

22.0 Lighting

Internal

Total number of light fittings

9

Total number of L.E.L. fittings

9

Percentage of L.E.L. fittings

100.00

%

External

External lights fitted

No

23.0 Electricity Tariff

Standard

24.0 Main Heating 1

Database

Description

Gas Boiler

Percentage of Heat

100

%

Database Ref. No.

17929

Fuel Type

Mains gas

Main Heating

BGW

SAP Code

104

In Winter

90.5

In Summer

87.3

Controls

CBE Programmer, room thermostat and TRVs

PCDF Controls

0

Delayed Start Stat

No

Sap Code

2106

Flue Type

Balanced

Fan Assisted Flue

Yes

Is MHS Pumped

Pump in heated space

Heat Emitter

Radiators

Flow Temperature

Normal (> 45°C)

Combi boiler type

Standard Combi

Combi keep hot type

None

25.0 Main Heating 2

None

Community Heating

None

28.0 Water Heating

HWP From main heating 1

Water Heating

Main Heating 1

Flue Gas Heat Recovery System

No

Waste Water Heat Recovery

No

Instantaneous System 1

Waste Water Heat Recovery

No

Instantaneous System 2

Waste Water Heat Recovery

No

Storage System

Solar Panel

No

Water use <= 125 litres/person/day

Yes

SAP Code

901

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)



29.0 Hot Water Cylinder	None	
32.0 Photovoltaic Unit	More Dwellings, One Block	
Apportioned	421.47	kWh/Year

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

U-VALUE CALCULATOR REPORT

Property Reference	SAP-0796 (3B4A) - Plot 200		Issued on Date	31/01/2023
Assessment Reference	AB	Prop Type Ref	2B4P Ground Floor	
Project	99 Highwood Avenue, EASTLEIGH, SO50 9QY			
Calculation Type	New Build (As Built)			

SAP Rating	84 B	DER	14.62	TER	18.48
Environmental	90 B	% DER<TER	20.88		
CO ₂ Emissions (t/year)	0.75	DFEE	40.90	TFEE	45.37
General Requirements Compliance	Pass	% DFEE<TFEE	9.87		

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

Building Elements

Wall External Walls - Stoneham - TF

Wall Type: Timber framed Wall with I-beams

U-VALUE CALCULATOR REPORT

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

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

Unheated space: None

Total thickness: 342 mm

U-value: 0.20 W/m² K

Kappa: n/a

U-VALUE CALCULATOR REPORT

Property Reference	SAP-0796 (3B4A) - Plot 200	Issued on Date	31/01/2023
Assessment Reference	AB	Prop Type Ref	2B4P Ground Floor
Project	99 Highwood Avenue, EASTLEIGH, SO50 9QY		
Calculation Type	New Build (As Built)		

SAP Rating	84 B	DER	14.62	TER	18.48
Environmental	90 B	% DER<TER	20.88		
CO ₂ Emissions (t/year)	0.75	DFEE	40.90	TFEE	45.37
General Requirements Compliance	Pass	% DFEE<TFEE	9.87		

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

Building Elements

Floor Ground Floor - Stoneham - Ground Floor

Floor Type: Suspended Floor

Area = 66.30 m², Perimeter = 25.38 m, Wall thickness = 275.00 mm, Soil: Unknown

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

Floor height above ground: h = 0.200 m

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

Ventilation openings per perimeter length: e = 0.0015 %

Mean wind speed: v = 5.000 m/s

Resistance on solum: R_g = 0.000 m²K/W

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

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

Total correction = 0.0083 m² K/W

U-value (unrounded) = 0.16 W/m² K

Unheated space: None

Total thickness: 325 mm

U-value: 0.16 W/m² K

Kappa: n/a

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	SAP-0796 (3B4A) - Plot 200				Issued on Date	31/01/2023
Assessment Reference	AB	Prop Type Ref	2B4P Ground Floor			
Property	99 Highwood Avenue, EASTLEIGH, SO50 9QY					
SAP Rating	84 B	DER	14.62	TER	18.48	
Environmental	90 B	% DER<TER	20.88			
CO ₂ Emissions (t/year)	0.75	DFEE	40.90	TFEE	45.37	
General Requirements Compliance	Pass	% DFEE<TFEE	9.87			
Assessor Details	Mr. Scott Spearing, Scott Spearing, Tel: 01489 565920, scott@beatsolutions.co.uk				Assessor ID	p775-0001
Client	Highwood Construction Ltd, HIGHWOOD					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

DWELLING AS BUILT

Ground-floor flat, total floor area 66 m²

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

1a TER and DER

Fuel for main heating: Mains gas
Fuel factor: 1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 18.48 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 14.62 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 45.4 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 40.9 kWh/m²/yr OK

2 Fabric U-values

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 2.75 (measured in this dwelling)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from database
Ideal LOGIC COMBI ESP1 35
Combi boiler
Efficiency: 89.6% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls:

No cylinder

Boiler interlock

Yes

OK

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Southern England): Not significant OK

Based on:

Overshading: Average
Windows facing North: 4.01 m², No overhang
Windows facing South: 2.75 m², No overhang
Air change rate: 8.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Air permeability 2.8 m³/m²h
Photovoltaic array 421.47 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

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

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) = 0.1284 (8)
Pressure test					Yes
Measured/design AP50					2.7500
Infiltration rate					0.2659 (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) =				0.2459 (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	0.3136	0.3074	0.3013	0.2705	0.2644	0.2336	0.2336	0.2275	0.2459	0.2644	0.2767	0.2890 (22b)
Effective ac	0.5492	0.5472	0.5454	0.5366	0.5349	0.5273	0.5273	0.5259	0.5302	0.5349	0.5383	0.5417 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.40)			6.7600	1.3258	8.9621		(27)
Heat Loss Floor			66.3000	0.1600	10.6080	75.0000	4972.5000 (28a)
External Wall	59.6400	6.7600	52.8800	0.2000	10.5760	9.0000	475.9200 (29a)
Total net area of external elements Aum(A, m ²)			125.9400				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.1461		(33)
Party Wall			22.6000	0.0000	0.0000	20.0000	452.0000 (32)
Party Ceilings			66.3000			30.0000	1989.0000 (32b)
Internal Walls			88.9900			9.0000	800.9100 (32c)
Heat capacity Cm = Sum (A x k)					(28)...(30) + (32) + (32a)...(32e) =		8690.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							131.0759 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.6524 (36)
Total fabric heat loss					(33) + (36) =		40.7985 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	28.2353	28.1372	28.0410	27.5891	27.5046	27.1110	27.1110	27.0381	27.2626	27.5046	27.6756	27.8544 (38)
Heat transfer coeff	69.0339	68.9357	68.8395	68.3876	68.3031	67.9095	67.9095	67.8367	68.0611	68.3031	68.4741	68.6529 (39)
Average = Sum(39)m / 12 =												68.3872 (39)
HLP	1.0412	1.0398	1.0383	1.0315	1.0302	1.0243	1.0243	1.0232	1.0266	1.0302	1.0328	1.0355 (40)
HLP (average)												1.0315 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1531 (42)
Average daily hot water use (litres/day)												85.3352 (43)
Daily hot water use	93.8687	90.4553	87.0419	83.6285	80.2151	76.8017	76.8017	80.2151	83.6285	87.0419	90.4553	93.8687 (44)
Energy conte	139.2046	121.7493	125.6343	109.5311	105.0977	90.6913	84.0388	96.4358	97.5875	113.7288	124.1439	134.8123 (45)
Energy content (annual)										Total = Sum(45)m =		1342.6553 (45)
Distribution loss (46)m = 0.15 x (45)m	20.8807	18.2624	18.8451	16.4297	15.7646	13.6037	12.6058	14.4654	14.6381	17.0593	18.6216	20.2218 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	14.0702	12.6896	14.0190	13.5326	13.9589	13.4800	13.9115	13.9422	13.5087	13.9941	13.5823	14.0603	(61)
Total heat required for water heating calculated for each month	153.2748	134.4388	139.6533	123.0637	119.0565	104.1712	97.9503	110.3780	111.0962	127.7230	137.7262	148.8725	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Output from w/h	153.2748	134.4388	139.6533	123.0637	119.0565	104.1712	97.9503	110.3780	111.0962	127.7230	137.7262	148.8725	(64)
Heat gains from water heating, kWh/month	49.8031	43.6540	45.2782	39.8022	38.4347	33.5248	31.4208	35.5504	35.8250	41.3134	44.6734	48.3401	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.3269	17.1660	13.9603	10.5689	7.9003	6.6698	7.2070	9.3679	12.5735	15.9650	18.6335	19.8641	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	188.5123	190.4685	185.5390	175.0447	161.7976	149.3472	141.0295	139.0733	144.0028	154.4971	167.7442	180.1947	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	(71)
Water heating gains (Table 5)	66.9396	64.9613	60.8578	55.2809	51.6595	46.5623	42.2322	47.7829	49.7570	55.5287	62.0464	64.9733	(72)
Total internal gains	333.0748	330.8918	318.6530	299.1904	279.6534	260.8752	248.7646	254.5200	264.6292	284.2867	306.7201	323.3280	(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					4.0100	10.6334	0.6300	0.7000	0.7700		13.0313 (74)	
South					2.7500	46.7521	0.6300	0.7000	0.7700		39.2921 (78)	
Solar gains	52.3234	89.2538	124.2881	160.6171	188.1065	190.9311	182.2938	160.7640	136.5072	99.0522	62.6503	44.8155 (83)
Total gains	385.3982	420.1456	442.9411	459.8075	467.7599	451.8062	431.0584	415.2840	401.1365	383.3390	369.3704	368.1435 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
tau	34.9681	35.0179	35.0668	35.2985	35.3422	35.5470	35.5470	35.5852	35.4678	35.3422	35.2539	35.1621		
alpha	3.3312	3.3345	3.3378	3.3532	3.3561	3.3698	3.3698	3.3723	3.3645	3.3561	3.3503	3.3441		
util living area	0.9825	0.9753	0.9619	0.9329	0.8718	0.7560	0.6157	0.6515	0.8275	0.9377	0.9739	0.9849	(86)	
MIT	19.1847	19.3577	19.6574	20.0627	20.4650	20.7807	20.9213	20.9022	20.6757	20.1745	19.6082	19.1426	(87)	
Th 2	20.0491	20.0503	20.0515	20.0572	20.0582	20.0632	20.0632	20.0641	20.0613	20.0582	20.0561	20.0539	(88)	
util rest of house	0.9794	0.9707	0.9545	0.9183	0.8405	0.6902	0.5110	0.5509	0.7752	0.9214	0.9683	0.9822	(89)	
MIT 2	18.3849	18.5571	18.8544	19.2558	19.6400	19.9237	20.0280	20.0175	19.8381	19.3693	18.8114	18.3467	(90)	
Living area fraction	18.7069	18.8794	19.1777	19.5806	19.9721	20.2687	20.3876	20.3736	20.1753	19.6935	19.1322	18.6671	(92)	
MIT	18.7069	18.8794	19.1777	19.5806	19.9721	20.2687	20.3876	20.3736	20.1753	19.6935	19.1322	18.6671	(93)	
Temperature adjustment														
adjusted MIT	18.7069	18.8794	19.1777	19.5806	19.9721	20.2687	20.3876	20.3736	20.1753	19.6935	19.1322	18.6671		

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9735	0.9636	0.9459	0.9094	0.8372	0.7060	0.5495	0.5866	0.7824	0.9137	0.9613	0.9769	(94)
Ext temp.	375.1960	404.8510	418.9980	418.1667	391.6008	318.9759	236.8748	243.6139	313.8612	350.2435	355.0703	359.6446	(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	994.5619	963.6809	872.7255	730.4227	565.0123	384.9580	257.2131	269.5578	413.4920	621.1111	823.8932	993.2103	(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	460.8082	375.5337	337.5732	224.8243	129.0182	0.0000	0.0000	0.0000	0.0000	201.5255	337.5525	471.3729	(98)
Space heating per m2												2538.2084	(98)
												38.2837	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												90.5000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												2804.6502 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	460.8082	375.5337	337.5732	224.8243	129.0182	0.0000	0.0000	0.0000	0.0000	201.5255	337.5525	471.3729 (98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000 (210)
Space heating fuel (main heating system)	509.1803	414.9544	373.0091	248.4247	142.5615	0.0000	0.0000	0.0000	0.0000	222.6801	372.9861	520.8540 (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	153.2748	134.4388	139.6533	123.0637	119.0565	104.1712	97.9503	110.3780	111.0962	127.7230	137.7262	148.8725 (64)
Efficiency of water heater (217)m	89.6795	89.6339	89.5395	89.3415	88.9355	87.3000	87.3000	87.3000	87.3000	89.2312	89.5488	87.3000 (216)
Fuel for water heating, kWh/month	170.9140	149.9867	155.9683	137.7452	133.8684	119.3256	112.1996	126.4352	127.2579	143.1371	153.8002	165.9473 (219)
Water heating fuel used												1696.5856 (219)
Annual totals kWh/year												
Space heating fuel - main system												2804.6502 (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)												341.3193 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
Total delivered energy for all uses												4917.5551 (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	2804.6502	0.2160	605.8044 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1696.5856	0.2160	366.4625 (264)
Space and water heating			972.2669 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	341.3193	0.5190	177.1447 (268)
Energy saving/generation technologies			
PV Unit	-421.4700	0.5190	-218.7429 (269)
Total CO2, kg/year			969.5937 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			14.6200 (273)

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

DER	14.6200	ZC1
Total Floor Area	66.3000	TFA
Assumed number of occupants	2.1531	N
CO2 emission factor in Table 12 for electricity displaced from grid	0.5190	EF
CO2 emissions from appliances, equation (L14)	16.8489	ZC2
CO2 emissions from cooking, equation (L16)	2.5743	ZC3
Total CO2 emissions	34.0432	ZC4
Residual CO2 emissions offset from biofuel CHP	0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year	0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation	0.0000	ZC7
Net CO2 emissions	34.0432	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

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

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) = 0.1284 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3784 (18)
Number of sides sheltered					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3500 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4462	0.4375	0.4287	0.3850	0.3762	0.3325	0.3325	0.3237	0.3500	0.3762	0.3937	0.4112 (22b)
Effective ac	0.5996	0.5957	0.5919	0.5741	0.5708	0.5553	0.5553	0.5524	0.5612	0.5708	0.5775	0.5846 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opening Type (Uw = 1.40)			6.7600	1.3258	8.9621		(27)					
Heat Loss Floor			66.3000	0.1300	8.6190		(28a)					
External Wall	59.6400	6.7600	52.8800	0.1800	9.5184		(29a)					
Total net area of external elements Aum(A, m2)			125.9400				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =			27.0995	(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.3480 (36)					
Total fabric heat loss						(33) + (36) =	35.4475 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 30.8269	Feb 30.6281	Mar 30.4333	Apr 29.5181	May 29.3469	Jun 28.5498	Jul 28.5498	Aug 28.4022	Sep 28.8568	Oct 29.3469	Nov 29.6933	Dec 30.0554 (38)
Heat transfer coeff	66.2744	66.0757	65.8808	64.9656	64.7944	63.9973	63.9973	63.8497	64.3043	64.7944	65.1408	65.5029 (39)
Average = Sum(39)m / 12 =												64.9648 (39)
HLP	Jan 0.9996	Feb 0.9966	Mar 0.9937	Apr 0.9799	May 0.9773	Jun 0.9653	Jul 0.9653	Aug 0.9630	Sep 0.9699	Oct 0.9773	Nov 0.9825	Dec 0.9880 (40)
HLP (average)												0.9799 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1531 (42)
Average daily hot water use (litres/day)												85.3352 (43)
Daily hot water use	Jan 93.8687	Feb 90.4553	Mar 87.0419	Apr 83.6285	May 80.2151	Jun 76.8017	Jul 76.8017	Aug 80.2151	Sep 83.6285	Oct 87.0419	Nov 90.4553	Dec 93.8687 (44)
Energy conte	139.2046	121.7493	125.6343	109.5311	105.0977	90.6913	84.0388	96.4358	97.5875	113.7288	124.1439	134.8123 (45)
Energy content (annual)										Total = Sum(45)m =		1342.6553 (45)
Distribution loss (46)m = 0.15 x (45)m	20.8807	18.2624	18.8451	16.4297	15.7646	13.6037	12.6058	14.4654	14.6381	17.0593	18.6216	20.2218 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	47.8345	41.6342	44.3556	41.2415	40.8767	37.8748	39.1373	40.8767	41.2415	44.3556	44.6081	47.8345 (61)
Total heat required for water heating calculated for each month												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Solar input	187.0391	163.3835	169.9899	150.7725	145.9744	128.5661	123.1761	137.3125	138.8290	158.0844	168.7520	182.6467 (62)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	187.0391	163.3835	169.9899	150.7725	145.9744	128.5661	123.1761	137.3125	138.8290	158.0844	168.7520	182.6467 (64)
Heat gains from water heating, kWh/month	58.2442	50.8902	52.8623	46.7294	45.1642	39.6236	37.7272	42.2841	42.7582	48.9037	52.4299	56.7837 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.3269	17.1660	13.9603	10.5689	7.9003	6.6698	7.2070	9.3679	12.5735	15.9650	18.6335	19.8641 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	188.5123	190.4685	185.5390	175.0447	161.7976	149.3472	141.0295	139.0733	144.0028	154.4971	167.7442	180.1947 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225 (71)
Water heating gains (Table 5)	78.2852	75.7294	71.0515	64.9020	60.7045	55.0327	50.7086	56.8334	59.3864	65.7308	72.8193	76.3222 (72)
Total internal gains	344.4203	341.6599	328.8468	308.8115	288.6984	269.3456	257.2410	263.5706	274.2587	294.4889	317.4930	334.6768 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W
North	4.0100	10.6334	0.6300		0.7000	0.7700	13.0313 (74)
South	2.7500	46.7521	0.6300		0.7000	0.7700	39.2921 (78)

Solar gains	52.3234	89.2538	124.2881	160.6171	188.1065	190.9311	182.2938	160.7640	136.5072	99.0522	62.6503	44.8155 (83)
Total gains	396.7438	430.9137	453.1348	469.4286	476.8049	460.2767	439.5349	424.3346	410.7659	393.5411	380.1433	379.4924 (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	69.4712	69.6802	69.8863	70.8708	71.0581	71.9431	71.9431	72.1094	71.5996	71.0581	70.6802	70.2895
alpha	5.6314	5.6453	5.6591	5.7247	5.7372	5.7962	5.7962	5.8073	5.7733	5.7372	5.7120	5.6860
util living area	0.9980	0.9964	0.9922	0.9783	0.9313	0.7988	0.6223	0.6648	0.8831	0.9805	0.9959	0.9985 (86)
MIT	19.9647	20.0754	20.2627	20.5222	20.7682	20.9386	20.9882	20.9830	20.8815	20.5788	20.2302	19.9468 (87)
Th 2	20.0837	20.0862	20.0886	20.1001	20.1023	20.1124	20.1124	20.1142	20.1085	20.1023	20.0979	20.0934 (88)
util rest of house	0.9974	0.9952	0.9894	0.9695	0.9018	0.7206	0.5062	0.5503	0.8251	0.9709	0.9943	0.9980 (89)
MIT 2	18.6963	18.8597	19.1343	19.5167	19.8571	20.0671	20.1075	20.1064	20.0067	19.6019	19.0949	18.6774 (90)
Living area fraction												0.4026 (91)
MIT	19.2070	19.3491	19.5885	19.9215	20.2239	20.4179	20.4620	20.4593	20.3588	19.9951	19.5519	19.1884 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2070	19.3491	19.5885	19.9215	20.2239	20.4179	20.4620	20.4593	20.3588	19.9951	19.5519	19.1884 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9965	0.9938	0.9874	0.9674	0.9064	0.7497	0.5534	0.5967	0.8435	0.9694	0.9930	0.9972 (94)
Useful gains	395.3466	428.2501	447.4173	454.1129	432.1842	345.0643	243.2353	253.2162	346.4920	381.5154	377.4644	378.4440 (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	987.9498	954.7357	862.2835	716.0172	552.2992	372.3317	247.1596	259.1846	402.4697	608.7531	811.1269	981.7858 (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	440.8967	353.7983	308.6604	188.5711	89.3656	0.0000	0.0000	0.0000	0.0000	169.0648	312.2370	448.8862 (98)
Space heating												2311.4803 (98)
Space heating per m2												34.8640 (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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Efficiency of main space heating system 1 (in %)												93.4000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												2474.8183 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	440.8967	353.7983	308.6604	188.5711	89.3656	0.0000	0.0000	0.0000	0.0000	169.0648	312.2370	448.8862 (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)	472.0522	378.7990	330.4716	201.8963	95.6805	0.0000	0.0000	0.0000	0.0000	181.0116	334.3009	480.6063 (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	187.0391	163.3835	169.9899	150.7725	145.9744	128.5661	123.1761	137.3125	138.8290	158.0844	168.7520	182.6467 (64)
Efficiency of water heater	87.1355	86.9452	86.5345	85.6155	83.8577	80.3000	80.3000	80.3000	80.3000	85.2204	86.5794	80.3000 (216)
Fuel for water heating, kWh/month	214.6532	187.9154	196.4417	176.1043	174.0739	160.1072	153.3949	170.9994	172.8879	185.5006	194.9102	209.3925 (219)
Water heating fuel used												2196.3811 (219)
Annual totals kWh/year												
Space heating fuel - main system												2474.8183 (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)												341.3193 (232)
Total delivered energy for all uses												5087.5187 (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	2474.8183	0.2160	534.5607 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2196.3811	0.2160	474.4183 (264)
Space and water heating			1008.9791 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	341.3193	0.5190	177.1447 (268)
Total CO2, kg/m2/year			1225.0488 (272)
Emissions per m2 for space and water heating			15.2184 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.6719 (272b)
Emissions per m2 for pumps and fans			0.5871 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.2184 * 1.00) + 2.6719 + 0.5871, rounded to 2 d.p.			18.4800 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

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

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				2 * 10 =	20.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					20.0000 / (5) =
Measured/design AP50					Yes
Infiltration rate					2.7500
Number of sides sheltered					0.2659 (18)
					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.2459 (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	0.3136	0.3074	0.3013	0.2705	0.2644	0.2336	0.2336	0.2275	0.2459	0.2644	0.2767	0.2890 (22b)
Effective ac	0.5492	0.5472	0.5454	0.5366	0.5349	0.5273	0.5273	0.5259	0.5302	0.5349	0.5383	0.5417 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.40)			6.7600	1.3258	8.9621		(27)
Heat Loss Floor			66.3000	0.1600	10.6080	75.0000	4972.5000 (28a)
External Wall	59.6400	6.7600	52.8800	0.2000	10.5760	9.0000	475.9200 (29a)
Total net area of external elements Aum(A, m ²)			125.9400				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.1461		(33)
Party Wall			22.6000	0.0000	0.0000	20.0000	452.0000 (32)
Party Ceilings			66.3000			20.0000	1326.0000 (32b)
Internal Walls			88.9900			9.0000	800.9100 (32c)
Heat capacity Cm = Sum (A x k)							(28)...(30) + (32) + (32a)...(32e) =
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							8027.3300 (34)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							121.0759 (35)
Total fabric heat loss							(33) + (36) =
							10.6524 (36)
							40.7985 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	28.2353	28.1372	28.0410	27.5891	27.5046	27.1110	27.1110	27.0381	27.2626	27.5046	27.6756	27.8544 (38)
Heat transfer coeff	69.0339	68.9357	68.8395	68.3876	68.3031	67.9095	67.9095	67.8367	68.0611	68.3031	68.4741	68.6529 (39)
Average = Sum(39)m / 12 =												68.3872 (39)
HLP	1.0412	1.0398	1.0383	1.0315	1.0302	1.0243	1.0243	1.0232	1.0266	1.0302	1.0328	1.0355 (40)
HLP (average)												1.0315 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1531 (42)
Average daily hot water use (litres/day)												85.3352 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	93.8687	90.4553	87.0419	83.6285	80.2151	76.8017	76.8017	80.2151	83.6285	87.0419	90.4553	93.8687 (44)
Energy content (annual)	139.2046	121.7493	125.6343	109.5311	105.0977	90.6913	84.0388	96.4358	97.5875	113.7288	124.1439	134.8123 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(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	1342.6553 (45)
Water storage loss:												0.0000 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

If cylinder contains dedicated solar storage											
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	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	29.5810	25.8717	26.6973	23.2753	22.3333	19.2719	17.8582	20.4926	20.7373	24.1674	26.3806
											(65)

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

Metabolic gains (Table 5), Watts											
(66)m	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.3269	17.1660	13.9603	10.5689	7.9003	6.6698	7.2070	9.3679	12.5735	15.9650	18.6335
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	188.5123	190.4685	185.5390	175.0447	161.7976	149.3472	141.0295	139.0733	144.0028	154.4971	167.7442
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Losses e.g. evaporation (negative values) (Table 5)	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225
Water heating gains (Table 5)	39.7594	38.4996	35.8835	32.3269	30.0178	26.7665	24.0030	27.5438	28.8019	32.4830	36.6397
Total internal gains	302.8946	301.4300	290.6787	273.2364	255.0117	238.0794	227.5354	231.2809	240.6741	258.2411	278.3134
											293.8595
											(73)

6. Solar gains											

[Jan]											
			Area		Solar flux		g		FF		Access
			m2		Table 6a		Specific data		Specific data		factor
					W/m2		or Table 6b		or Table 6c		Table 6d
											Gains
											W
North			4.0100		10.6334		0.6300		0.7000		0.7700
South			2.7500		46.7521		0.6300		0.7000		0.7700

Solar gains	52.3234	89.2538	124.2881	160.6171	188.1065	190.9311	182.2938	160.7640	136.5072	99.0522	62.6503
Total gains	355.2180	390.6838	414.9668	433.8535	443.1182	429.0105	409.8292	392.0449	377.1814	357.2933	340.9637
											44.8155
											(83)
											338.6750
											(84)

7. Mean internal temperature (heating season)											

Temperature during heating periods in the living area from Table 9, Th1 (C)											21.0000
Utilisation factor for gains for living area, nil,m (see Table 9a)											(85)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
tau	32.3003	32.3463	32.3915	32.6055	32.6459	32.8351	32.8351	32.8703	32.7619	32.6459	32.5643
alpha	3.1534	3.1564	3.1594	3.1737	3.1764	3.1890	3.1890	3.1914	3.1841	3.1764	3.1710
util living area	0.9830	0.9757	0.9625	0.9343	0.8761	0.7662	0.6308	0.6686	0.8369	0.9406	0.9749
											0.9853
											(86)
MIT	19.0115	19.1962	19.5172	19.9522	20.3867	20.7365	20.8998	20.8758	20.6172	20.0707	19.4634
Th 2	20.0491	20.0503	20.0515	20.0572	20.0582	20.0632	20.0632	20.0641	20.0613	20.0582	20.0561
util rest of house	0.9800	0.9714	0.9555	0.9206	0.8467	0.7034	0.5277	0.5704	0.7880	0.9256	0.9698
MIT 2	18.2204	18.4045	18.7232	19.1547	19.5723	19.8909	20.0161	20.0020	19.7915	19.2753	18.6755
Living area fraction											
MIT	18.5389	18.7232	19.0428	19.4758	19.9002	20.2313	20.3719	20.3538	20.1239	19.5955	18.9926
Temperature adjustment											
adjusted MIT	18.5389	18.7232	19.0428	19.4758	19.9002	20.2313	20.3719	20.3538	20.1239	19.5955	18.9926
											18.4979
											(92)
											0.0000
											(93)

8. Space heating requirement											

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Useful gains	0.9738	0.9637	0.9461	0.9103	0.8410	0.7158	0.5642	0.6033	0.7917	0.9165	0.9622
Ext temp.	345.9239	376.5181	392.6184	394.9554	372.6594	307.1070	231.2061	236.5300	298.6231	327.4733	328.0860
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
Month fracti	982.9633	952.9128	863.4409	723.2514	560.0973	382.4205	256.1464	268.2095	409.9945	614.4217	814.3384
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
Space heating per m2	473.9574	387.3373	350.2919	236.3732	139.4538	0.0000	0.0000	0.0000	0.0000	213.4896	350.1017
											484.0834
											(98)
											2635.0881
											(98)
											39.7449
											(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
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	638.3498	502.5307	515.5587	0.0000	0.0000	0.0000
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7254	0.7999	0.7784	0.0000	0.0000	0.0000
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	463.0897	401.9992	401.3364	0.0000	0.0000	0.0000
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	582.6461	558.7156	539.5743	0.0000	0.0000	0.0000
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	86.0806	116.5970	102.8490	0.0000	0.0000	0.0000
Space cooling											0.0000
											305.5266
											(104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF 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	21.5201	29.1492	25.7122	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												76.3816 (107)
Space cooling per m2												1.1521 (108)
Energy for space heating												39.7449 (99)
Energy for space cooling												1.1521 (108)
Total												40.8970 (109)
Dwelling Fabric Energy Efficiency (DFEE)												40.9 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

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

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 20.0000 / (5) = 0.1284 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3784 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3500 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4462	0.4375	0.4287	0.3850	0.3762	0.3325	0.3325	0.3237	0.3500	0.3762	0.3937	0.4112 (22b)
Effective ac	0.5996	0.5957	0.5919	0.5741	0.5708	0.5553	0.5553	0.5524	0.5612	0.5708	0.5775	0.5846 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opening Type (Uw = 1.40)			6.7600	1.3258	8.9621		(27)
Heat Loss Floor			66.3000	0.1300	8.6190		(28a)
External Wall	59.6400	6.7600	52.8800	0.1800	9.5184		(29a)
Total net area of external elements Aum(A, m ²)			125.9400				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.0995		(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)							8.3480 (36)
Total fabric heat loss						(33) + (36) =	35.4475 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	30.8269	30.6281	30.4333	29.5181	29.3469	28.5498	28.5498
Heat transfer coeff	66.2744	66.0757	65.8808	64.9656	64.7944	63.9973	63.9973
Average = Sum(39)m / 12 =							
HLP	0.9996	0.9966	0.9937	0.9799	0.9773	0.9653	0.9653
HLP (average)							
Days in month	31	28	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1531 (42)
Average daily hot water use (litres/day)												85.3352 (43)
Daily hot water use	93.8687	90.4553	87.0419	83.6285	80.2151	76.8017	76.8017	80.2151	83.6285	87.0419	90.4553	93.8687 (44)
Energy conte	139.2046	121.7493	125.6343	109.5311	105.0977	90.6913	84.0388	96.4358	97.5875	113.7288	124.1439	134.8123 (45)
Energy content (annual)												1342.6553 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

29.5810 25.8717 26.6973 23.2753 22.3333 19.2719 17.8582 20.4926 20.7373 24.1674 26.3806 28.6476 (65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531	107.6531	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.3269	17.1660	13.9603	10.5689	7.9003	6.6698	7.2070	9.3679	12.5735	15.9650	18.6335	19.8641	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	188.5123	190.4685	185.5390	175.0447	161.7976	149.3472	141.0295	139.0733	144.0028	154.4971	167.7442	180.1947	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653	33.7653	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	(71)
Water heating gains (Table 5)	39.7594	38.4996	35.8835	32.3269	30.0178	26.7665	24.0030	27.5438	28.8019	32.4830	36.6397	38.5048	(72)
Total internal gains	302.8946	301.4300	290.6787	273.2364	255.0117	238.0794	227.5354	231.2809	240.6741	258.2411	278.3134	293.8595	(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				4.0100	10.6334	0.6300		0.7000		0.7700	13.0313 (74)		
South				2.7500	46.7521	0.6300		0.7000		0.7700	39.2921 (78)		
Solar gains	52.3234	89.2538	124.2881	160.6171	188.1065	190.9311	182.2938	160.7640	136.5072	99.0522	62.6503	44.8155	(83)
Total gains	355.2180	390.6838	414.9668	433.8535	443.1182	429.0105	409.8292	392.0449	377.1814	357.2933	340.9637	338.6750	(84)

7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, nil,m (see Table 9a)													21.0000 (85)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.4712	69.6802	69.8863	70.8708	71.0581	71.9431	71.9431	72.1094	71.5996	71.0581	70.6802	70.2895	
alpha	5.6314	5.6453	5.6591	5.7247	5.7372	5.7962	5.7962	5.8073	5.7733	5.7372	5.7120	5.6860	
util living area	0.9989	0.9978	0.9949	0.9848	0.9481	0.8324	0.6606	0.7083	0.9120	0.9875	0.9976	0.9991	(86)
MIT	19.9048	20.0178	20.2091	20.4755	20.7331	20.9231	20.9841	20.9765	20.8540	20.5305	20.1740	19.8877	(87)
Th 2	20.0837	20.0862	20.0886	20.1001	20.1023	20.1124	20.1124	20.1142	20.1085	20.1023	20.0979	20.0934	(88)
util rest of house	0.9985	0.9970	0.9930	0.9784	0.9239	0.7584	0.5407	0.5916	0.8624	0.9810	0.9967	0.9989	(89)
MIT 2	19.0767	19.1915	19.3842	19.6570	19.9048	20.0722	20.1077	20.1066	20.0190	19.7145	19.3574	19.0676	(90)
Living area fraction									fLA = Living area / (4) =			0.4026	(91)
MIT	19.4101	19.5242	19.7163	19.9865	20.2383	20.4147	20.4605	20.4568	20.3552	20.0430	19.6861	19.3977	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4101	19.5242	19.7163	19.9865	20.2383	20.4147	20.4605	20.4568	20.3552	20.0430	19.6861	19.3977	(93)

8. Space heating requirement

Utilisation	0.9981	0.9964	0.9920	0.9774	0.9282	0.7860	0.5897	0.6392	0.8783	0.9805	0.9961	0.9986	(94)
Useful gains	354.5483	389.2789	411.6662	424.0536	411.2979	337.2146	241.6681	250.6049	331.2850	350.3178	339.6335	338.1886	(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	1001.4124	966.3012	870.6982	720.2407	553.2314	372.1262	247.0626	259.0245	402.2334	611.8508	819.8699	995.4961	(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	481.2669	387.7590	341.5198	213.2547	105.5985	0.0000	0.0000	0.0000	0.0000	194.5805	345.7702	489.0368	(98)
Space heating												2558.7864	(98)
Space heating per m ²												38.5941	(99)

8c. Space cooling requirement

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

Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	601.5748	473.5801	485.2578	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8389	0.9134	0.8943	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	504.6517	432.5656	433.9709	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	582.6461	558.7156	539.5743	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	56.1559	93.8556	78.5689	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												228.5804	(104)
Cooled fraction												1.0000	(105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling kWh													

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

	0.0000	0.0000	0.0000	0.0000	0.0000	14.0390	23.4639	19.6422	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												57.1451 (107)
Space cooling per m2												0.8619 (108)
Energy for space heating												38.5941 (99)
Energy for space cooling												0.8619 (108)
Total												39.4560 (109)
Target Fabric Energy Efficiency (TFEE)												45.4 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

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

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					20.0000 / (5) = 0.1284 (8)
Measured/design AP50					Yes
Infiltration rate					2.7500
Number of sides sheltered					0.2659 (18)
					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.2459 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.4000	4.1000	4.1000	3.9000	3.9000	3.7000	3.7000	3.5000	3.5000	3.8000	3.7000	3.9000 (22)
Wind factor	1.1000	1.0250	1.0250	0.9750	0.9750	0.9250	0.9250	0.8750	0.8750	0.9500	0.9250	0.9750 (22a)
Adj infilt rate												
	0.2705	0.2521	0.2521	0.2398	0.2398	0.2275	0.2275	0.2152	0.2152	0.2336	0.2275	0.2398 (22b)
Effective ac	0.5366	0.5318	0.5318	0.5287	0.5287	0.5259	0.5259	0.5232	0.5232	0.5273	0.5259	0.5287 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.40)			6.7600	1.3258	8.9621		(27)
Heat Loss Floor			66.3000	0.1600	10.6080	75.0000	4972.5000 (28a)
External Wall	59.6400	6.7600	52.8800	0.2000	10.5760	9.0000	475.9200 (29a)
Total net area of external elements Aum(A, m ²)			125.9400				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.1461		(33)
Party Wall			22.6000	0.0000	0.0000	20.0000	452.0000 (32)
Party Ceilings			66.3000			30.0000	1989.0000 (32b)
Internal Walls			88.9900			9.0000	800.9100 (32c)
Heat capacity Cm = Sum (A x k)							(28)...(30) + (32) + (32a)...(32e) = 8690.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							131.0759 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.6524 (36)
Total fabric heat loss							(33) + (36) = 40.7985 (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	27.5891	27.3413	27.3413	27.1859	27.1859	27.0381	27.0381	26.8982	26.8982	27.1110	27.0381	27.1859 (38)
Heat transfer coeff	68.3876	68.1399	68.1399	67.9844	67.9844	67.8367	67.8367	67.6967	67.6967	67.9095	67.8367	67.9844 (39)
Average = Sum(39)m / 12 =												67.9528 (39)
HLP	1.0315	1.0278	1.0278	1.0254	1.0254	1.0232	1.0232	1.0211	1.0211	1.0243	1.0232	1.0254 (40)
HLP (average)												1.0249 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1531 (42)
Average daily hot water use (litres/day)												85.3352 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	93.8687	90.4553	87.0419	83.6285	80.2151	76.8017	76.8017	80.2151	83.6285	87.0419	90.4553	93.8687 (44)
Energy conte	139.2046	121.7493	125.6343	109.5311	105.0977	90.6913	84.0388	96.4358	97.5875	113.7288	124.1439	134.8123 (45)
Energy content (annual)										Total = Sum(45)m =		1342.6553 (45)
Distribution loss (46)m = 0.15 x (45)m												
	20.8807	18.2624	18.8451	16.4297	15.7646	13.6037	12.6058	14.4654	14.6381	17.0593	18.6216	20.2218 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	14.0702	12.6896	14.0190	13.5326	13.9589	13.4800	13.9115	13.9422	13.5087	13.9941	13.5823	(61)
Total heat required for water heating calculated for each month	153.2748	134.4388	139.6533	123.0637	119.0565	104.1712	97.9503	110.3780	111.0962	127.7230	137.7262	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Output from w/h	153.2748	134.4388	139.6533	123.0637	119.0565	104.1712	97.9503	110.3780	111.0962	127.7230	137.7262	(64)
RHI water heating demand												(64)
Heat gains from water heating, kWh/month	49.8031	43.6540	45.2782	39.8022	38.4347	33.5248	31.4208	35.5504	35.8250	41.3134	44.6734	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	129.1837	129.1837	129.1837	129.1837	129.1837	129.1837	129.1837	129.1837	129.1837	129.1837	129.1837	129.1837	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	48.3173	42.9150	34.9008	26.4222	19.7509	16.6745	18.0174	23.4197	31.4339	39.9125	46.5838	49.6602	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	281.3617	284.2814	276.9239	261.2608	241.4890	222.9062	210.4918	207.5721	214.9296	230.5927	250.3645	268.9473	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.0714	50.0714	50.0714	50.0714	50.0714	50.0714	50.0714	50.0714	50.0714	50.0714	50.0714	50.0714	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	(71)
Water heating gains (Table 5)	66.9396	64.9613	60.8578	55.2809	51.6595	46.5623	42.2322	47.7829	49.7570	55.5287	62.0464	64.9733	(72)
Total internal gains	492.7513	488.2903	468.8151	439.0965	409.0320	382.2757	366.8741	374.9073	392.2531	422.1666	455.1274	479.7134	(73)

6. Solar gains

[Jan]													Gains
	Area m2				Solar flux Table 6a W/m2		Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		W
North	4.0100				13.4839		0.6300		0.7000		0.7700		16.5246
South	2.7500				56.7559		0.6300		0.7000		0.7700		47.6997 (78)

Solar gains	64.2243	93.4444	132.0712	173.5747	193.7545	216.2331	198.9481	182.0163	152.6963	110.6916	76.6823	52.0579	(83)
Total gains	556.9755	581.7348	600.8863	612.6712	602.7866	598.5087	565.8222	556.9237	544.9494	532.8582	531.8098	531.7713	(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	35.2985	35.4269	35.4269	35.5079	35.5079	35.5852	35.5852	35.6587	35.6587	35.5470	35.5852	35.5079		
alpha	3.3532	3.3618	3.3618	3.3672	3.3672	3.3723	3.3723	3.3772	3.3772	3.3698	3.3723	3.3672		
util living area	0.9426	0.9303	0.9001	0.8411	0.7247	0.5358	0.3850	0.3899	0.6254	0.8209	0.9128	0.9478	(86)	
MIT	19.7257	19.8517	20.1238	20.4522	20.7638	20.9404	20.9858	20.9853	20.8937	20.5905	20.1293	19.7049	(87)	
Th 2	20.0572	20.0603	20.0603	20.0622	20.0622	20.0641	20.0641	20.0658	20.0658	20.0632	20.0641	20.0622	(88)	
util rest of house	0.9329	0.9186	0.8826	0.8115	0.6707	0.4514	0.2805	0.2845	0.5463	0.7815	0.8958	0.9389	(89)	
MIT 2	18.9218	19.0467	19.3099	19.6220	19.8995	20.0350	20.0602	20.0618	20.0070	19.7541	19.3218	18.9060	(90)	
Living area fraction									fLA = Living area / (4) =			0.4026	(91)	
MIT	19.2454	19.3708	19.6375	19.9562	20.2474	20.3995	20.4328	20.4336	20.3640	20.0908	19.6469	19.2276	(92)	
Temperature adjustment												0.0000		
adjusted MIT	19.2454	19.3708	19.6375	19.9562	20.2474	20.3995	20.4328	20.4336	20.3640	20.0908	19.6469	19.2276	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9229	0.9084	0.8735	0.8078	0.6821	0.4828	0.3225	0.3269	0.5729	0.7828	0.8870	0.9292	(94)
Ext temp.	514.0079	528.4629	524.8765	494.9305	411.1507	288.9330	182.4681	182.0377	312.2133	417.1371	471.6998	494.1188	(95)
Heat loss rate W	5.4000	5.9000	7.6000	10.0000	13.1000	15.9000	17.7000	17.7000	15.3000	12.0000	8.4000	5.5000	(96)
Month fracti	946.8570	917.8977	820.2365	676.8650	485.9146	305.2298	185.3837	185.0534	342.8143	549.4447	762.9493	933.2630	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating RHI space heating demand	322.0397	261.7002	219.7479	130.9929	55.6243	0.0000	0.0000	0.0000	0.0000	98.4369	209.6997	326.7233	(98)
												1624.9648	(98)
												1625	(98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

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

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					20.0000 / (5) = 0.1284 (8)
Measured/design AP50					Yes
Infiltration rate					2.7500
Number of sides sheltered					0.2659 (18)
					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.2459 (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	0.3136	0.3074	0.3013	0.2705	0.2644	0.2336	0.2336	0.2275	0.2459	0.2644	0.2767	0.2890 (22b)
	0.5492	0.5472	0.5454	0.5366	0.5349	0.5273	0.5273	0.5259	0.5302	0.5349	0.5383	0.5417 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.40)			6.7600	1.3258	8.9621		(27)
Heat Loss Floor			66.3000	0.1600	10.6080	75.0000	4972.5000 (28a)
External Wall	59.6400	6.7600	52.8800	0.2000	10.5760	9.0000	475.9200 (29a)
Total net area of external elements Aum(A, m ²)			125.9400				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.1461		(33)
Party Wall			22.6000	0.0000	0.0000	20.0000	452.0000 (32)
Party Ceilings			66.3000			30.0000	1989.0000 (32b)
Internal Walls			88.9900			9.0000	800.9100 (32c)
Heat capacity Cm = Sum (A x k)							(28)...(30) + (32) + (32a)...(32e) = 8690.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							131.0759 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.6524 (36)
Total fabric heat loss							(33) + (36) = 40.7985 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	28.2353	28.1372	28.0410	27.5891	27.5046	27.1110	27.1110	27.0381	27.2626	27.5046	27.6756	27.8544 (38)
Heat transfer coeff	69.0339	68.9357	68.8395	68.3876	68.3031	67.9095	67.9095	67.8367	68.0611	68.3031	68.4741	68.6529 (39)
Average = Sum(39)m / 12 =												68.3872 (39)
HLP	1.0412	1.0398	1.0383	1.0315	1.0302	1.0243	1.0243	1.0232	1.0266	1.0302	1.0328	1.0355 (40)
HLP (average)												1.0315 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1531 (42)
Average daily hot water use (litres/day)												85.3352 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	93.8687	90.4553	87.0419	83.6285	80.2151	76.8017	76.8017	80.2151	83.6285	87.0419	90.4553	93.8687 (44)
Energy content (annual)	139.2046	121.7493	125.6343	109.5311	105.0977	90.6913	84.0388	96.4358	97.5875	113.7288	124.1439	134.8123 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	20.8807	18.2624	18.8451	16.4297	15.7646	13.6037	12.6058	14.4654	14.6381	17.0593	18.6216	20.2218 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	14.0702	12.6896	14.0190	13.5326	13.9589	13.4800	13.9115	13.9422	13.5087	13.9941	13.5823	14.0603	(61)
Total heat required for water heating calculated for each month	153.2748	134.4388	139.6533	123.0637	119.0565	104.1712	97.9503	110.3780	111.0962	127.7230	137.7262	148.8725	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Output from w/h	153.2748	134.4388	139.6533	123.0637	119.0565	104.1712	97.9503	110.3780	111.0962	127.7230	137.7262	148.8725	(64)
Heat gains from water heating, kWh/month	49.8031	43.6540	45.2782	39.8022	38.4347	33.5248	31.4208	35.5504	35.8250	41.3134	44.6734	48.3401	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	129.1837	129.1837	129.1837	129.1837	129.1837	129.1837	129.1837	129.1837	129.1837	129.1837	129.1837	129.1837	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	48.3173	42.9150	34.9008	26.4222	19.7509	16.6745	18.0174	23.4197	31.4339	39.9125	46.5838	49.6602	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	281.3617	284.2814	276.9239	261.2608	241.4890	222.9062	210.4918	207.5721	214.9296	230.5927	250.3645	268.9473	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.0714	50.0714	50.0714	50.0714	50.0714	50.0714	50.0714	50.0714	50.0714	50.0714	50.0714	50.0714	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	(71)
Water heating gains (Table 5)	66.9396	64.9613	60.8578	55.2809	51.6595	46.5623	42.2322	47.7829	49.7570	55.5287	62.0464	64.9733	(72)
Total internal gains	492.7513	488.2903	468.8151	439.0965	409.0320	382.2757	366.8741	374.9073	392.2531	422.1666	455.1274	479.7134	(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					4.0100	10.6334	0.6300		0.7000		0.7700		13.0313 (74)
South					2.7500	46.7521	0.6300		0.7000		0.7700		39.2921 (78)
Solar gains	52.3234	89.2538	124.2881	160.6171	188.1065	190.9311	182.2938	160.7640	136.5072	99.0522	62.6503		44.8155 (83)
Total gains	545.0747	577.5442	593.1032	599.7136	597.1385	573.2067	549.1679	535.6713	528.7603	521.2188	517.7778		524.5290 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
tau	34.9681	35.0179	35.0668	35.2985	35.3422	35.5470	35.5470	35.5852	35.4678	35.3422	35.2539	35.1621		
alpha	3.3312	3.3345	3.3378	3.3532	3.3561	3.3698	3.3698	3.3723	3.3645	3.3561	3.3503	3.3441		
util living area	0.9548	0.9423	0.9203	0.8759	0.7937	0.6554	0.5098	0.5391	0.7232	0.8728	0.9362	0.9596	(86)	
MIT	19.5171	19.6731	19.9384	20.2894	20.6205	20.8611	20.9556	20.9452	20.7946	20.3990	19.9021	19.4732	(87)	
Th 2	20.0491	20.0503	20.0515	20.0572	20.0582	20.0632	20.0632	20.0641	20.0613	20.0582	20.0561	20.0539	(88)	
util rest of house	0.9474	0.9328	0.9066	0.8530	0.7528	0.5853	0.4138	0.4447	0.6604	0.8453	0.9242	0.9529	(89)	
MIT 2	18.7106	18.8642	19.1241	19.4659	19.7728	19.9794	20.0445	20.0396	19.9282	19.5749	19.0955	18.6714	(90)	
Living area fraction	19.0353	19.1898	19.4519	19.7974	20.1140	20.3344	20.4113	20.4042	20.2770	19.9067	19.4202	18.9942	(92)	
MIT	19.0353	19.1898	19.4519	19.7974	20.1140	20.3344	20.4113	20.4042	20.2770	19.9067	19.4202	18.9942	(93)	
Temperature adjustment														
adjusted MIT	19.0353	19.1898	19.4519	19.7974	20.1140	20.3344	20.4113	20.4042	20.2770	19.9067	19.4202	18.9942		

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9377	0.9226	0.8965	0.8459	0.7555	0.6068	0.4508	0.4804	0.6760	0.8402	0.9145	0.9438	(94)
Ext temp.	511.1414	532.8510	531.6953	507.3040	451.1218	347.7983	247.5549	257.3390	357.4334	437.9452	473.5124	495.0269	(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	1017.2336	985.0805	891.6030	745.2479	574.7049	389.4184	258.8222	271.6303	420.4108	635.6741	843.6142	1015.6632	(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	376.5326	303.8982	267.7713	171.3196	91.9458	0.0000	0.0000	0.0000	0.0000	147.1103	266.4733	387.3534	(98)
Space heating per m2												2012.4046	(98)
												30.3530	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2223.6515 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	376.5326	303.8982	267.7713	171.3196	91.9458	0.0000	0.0000	0.0000	0.0000	147.1103	266.4733	387.3534	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	416.0581	335.7991	295.8799	189.3035	101.5976	0.0000	0.0000	0.0000	0.0000	162.5528	294.4456	428.0148	(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	153.2748	134.4388	139.6533	123.0637	119.0565	104.1712	97.9503	110.3780	111.0962	127.7230	137.7262	148.8725	(64)
Efficiency of water heater (217)m	89.5504	89.4939	89.3770	89.1342	88.6662	87.3000	87.3000	87.3000	87.3000	88.9842	89.3836	87.3000	(216)
Fuel for water heating, kWh/month	171.1604	150.2213	156.2519	138.0657	134.2751	119.3256	112.1996	126.4352	127.2579	143.5345	154.0844	166.1741	(219)
Water heating fuel used												1698.9857	(219)
Annual totals kWh/year													
Space heating fuel - main system												2223.6515	(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)												341.3193	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses												4338.9564	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2223.6515	3.4800	77.3831 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1698.9857	3.4800	59.1247 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	341.3193	13.1900	45.0200 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	0.0000	13.1900	0.0000 (252)
Total energy cost			311.4203 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.1752 (257)
SAP value		83.6064
SAP rating (Section 12)		84 (258)
SAP band		B

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2223.6515	0.2160	480.3087 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1698.9857	0.2160	366.9809 (264)
Space and water heating			847.2896 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	341.3193	0.5190	177.1447 (268)
Energy saving/generation technologies			
PV Unit	-421.4700	0.5190	-218.7429 (269)
Total kg/year			844.6164 (272)
CO2 emissions per m2			12.7400 (273)
EI value			89.8312
EI rating			90 (274)
EI band			B

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9050 = 3.845$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9050 = 0.2387$, stars = 4
Water heating energy efficiency	$3.48 / 0.8861 = 3.927$, stars = 4
Water heating environmental impact	$0.216 / 0.8861 = 0.2438$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

1. Overall dwelling dimensions

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

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 20.0000 / (5) = 0.1284 (8)
Pressure test					Yes
Measured/design AP50					2.7500
Infiltration rate					0.2659 (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) =		0.2459 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.4000	4.1000	4.1000	3.9000	3.9000	3.7000	3.7000	3.5000	3.5000	3.8000	3.7000	3.9000 (22)
Wind factor	1.1000	1.0250	1.0250	0.9750	0.9750	0.9250	0.9250	0.8750	0.8750	0.9500	0.9250	0.9750 (22a)
Adj infilt rate												
	0.2705	0.2521	0.2521	0.2398	0.2398	0.2275	0.2275	0.2152	0.2152	0.2336	0.2275	0.2398 (22b)
Effective ac	0.5366	0.5318	0.5318	0.5287	0.5287	0.5259	0.5259	0.5232	0.5232	0.5273	0.5259	0.5287 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.40)			6.7600	1.3258	8.9621		(27)
Heat Loss Floor			66.3000	0.1600	10.6080	75.0000	4972.5000 (28a)
External Wall	59.6400	6.7600	52.8800	0.2000	10.5760	9.0000	475.9200 (29a)
Total net area of external elements Aum(A, m ²)			125.9400				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.1461		(33)
Party Wall			22.6000	0.0000	0.0000	20.0000	452.0000 (32)
Party Ceilings			66.3000			30.0000	1989.0000 (32b)
Internal Walls			88.9900			9.0000	800.9100 (32c)
Heat capacity Cm = Sum (A x k)							(28)...(30) + (32) + (32a)...(32e) = 8690.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							131.0759 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.6524 (36)
Total fabric heat loss							(33) + (36) = 40.7985 (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	27.5891	27.3413	27.3413	27.1859	27.1859	27.0381	27.0381	26.8982	26.8982	27.1110	27.0381	27.1859 (38)
Heat transfer coeff	68.3876	68.1399	68.1399	67.9844	67.9844	67.8367	67.8367	67.6967	67.6967	67.9095	67.8367	67.9844 (39)
Average = Sum(39)m / 12 =												67.9528 (39)
HLP	1.0315	1.0278	1.0278	1.0254	1.0254	1.0232	1.0232	1.0211	1.0211	1.0243	1.0232	1.0254 (40)
HLP (average)												1.0249 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1531 (42)
Average daily hot water use (litres/day)												85.3352 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	93.8687	90.4553	87.0419	83.6285	80.2151	76.8017	76.8017	80.2151	83.6285	87.0419	90.4553	93.8687 (44)
Energy conte	139.2046	121.7493	125.6343	109.5311	105.0977	90.6913	84.0388	96.4358	97.5875	113.7288	124.1439	134.8123 (45)
Energy content (annual)										Total = Sum(45)m =		1342.6553 (45)
Distribution loss (46)m = 0.15 x (45)m												
	20.8807	18.2624	18.8451	16.4297	15.7646	13.6037	12.6058	14.4654	14.6381	17.0593	18.6216	20.2218 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	14.0702	12.6896	14.0190	13.5326	13.9589	13.4800	13.9115	13.9422	13.5087	13.9941	13.5823	14.0603 (61)
Total heat required for water heating calculated for each month	153.2748	134.4388	139.6533	123.0637	119.0565	104.1712	97.9503	110.3780	111.0962	127.7230	137.7262	148.8725 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	153.2748	134.4388	139.6533	123.0637	119.0565	104.1712	97.9503	110.3780	111.0962	127.7230	137.7262	148.8725 (64)
Heat gains from water heating, kWh/month	49.8031	43.6540	45.2782	39.8022	38.4347	33.5248	31.4208	35.5504	35.8250	41.3134	44.6734	48.3401 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	129.1837	129.1837	129.1837	129.1837	129.1837	129.1837	129.1837	129.1837	129.1837	129.1837	129.1837	129.1837 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	48.3173	42.9150	34.9008	26.4222	19.7509	16.6745	18.0174	23.4197	31.4339	39.9125	46.5838	49.6602 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	281.3617	284.2814	276.9239	261.2608	241.4890	222.9062	210.4918	207.5721	214.9296	230.5927	250.3645	268.9473 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.0714	50.0714	50.0714	50.0714	50.0714	50.0714	50.0714	50.0714	50.0714	50.0714	50.0714	50.0714 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225	-86.1225 (71)
Water heating gains (Table 5)	66.9396	64.9613	60.8578	55.2809	51.6595	46.5623	42.2322	47.7829	49.7570	55.5287	62.0464	64.9733 (72)
Total internal gains	492.7513	488.2903	468.8151	439.0965	409.0320	382.2757	366.8741	374.9073	392.2531	422.1666	455.1274	479.7134 (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					4.0100	13.4839		0.6300	0.7000	0.7700		16.5246
South					2.7500	56.7559		0.6300	0.7000	0.7700		47.6997 (78)

Solar gains	64.2243	93.4444	132.0712	173.5747	193.7545	216.2331	198.9481	182.0163	152.6963	110.6916	76.6823	52.0579 (83)
Total gains	556.9755	581.7348	600.8863	612.6712	602.7866	598.5087	565.8222	556.9237	544.9494	532.8582	531.8098	531.7713 (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	35.2985	35.4269	35.4269	35.5079	35.5079	35.5852	35.5852	35.6587	35.6587	35.5470	35.5852	35.5079
alpha	3.3532	3.3618	3.3618	3.3672	3.3672	3.3723	3.3723	3.3772	3.3772	3.3698	3.3723	3.3672
util living area	0.9426	0.9303	0.9001	0.8411	0.7247	0.5358	0.3850	0.3899	0.6254	0.8209	0.9128	0.9478 (86)
MIT	19.7257	19.8517	20.1238	20.4522	20.7638	20.9404	20.9858	20.9853	20.8937	20.5905	20.1293	19.7049 (87)
Th 2	20.0572	20.0603	20.0603	20.0622	20.0622	20.0641	20.0641	20.0658	20.0658	20.0632	20.0641	20.0622 (88)
util rest of house	0.9329	0.9186	0.8826	0.8115	0.6707	0.4514	0.2805	0.2845	0.5463	0.7815	0.8958	0.9389 (89)
MIT 2	18.9218	19.0467	19.3099	19.6220	19.8995	20.0350	20.0602	20.0618	20.0070	19.7541	19.3218	18.9060 (90)
Living area fraction	19.2454	19.3708	19.6375	19.9562	20.2474	20.3995	20.4328	20.4336	20.3640	20.0908	19.6469	19.2276 (92)
MIT	19.2454	19.3708	19.6375	19.9562	20.2474	20.3995	20.4328	20.4336	20.3640	20.0908	19.6469	19.2276 (93)
Temperature adjustment												0.0000
adjusted MIT	19.2454	19.3708	19.6375	19.9562	20.2474	20.3995	20.4328	20.4336	20.3640	20.0908	19.6469	19.2276 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9229	0.9084	0.8735	0.8078	0.6821	0.4828	0.3225	0.3269	0.5729	0.7828	0.8870	0.9292 (94)
Ext temp.	514.0079	528.4629	524.8765	494.9305	411.1507	288.9330	182.4681	182.0377	312.2133	417.1371	471.6998	494.1188 (95)
Heat loss rate W	5.4000	5.9000	7.6000	10.0000	13.1000	15.9000	17.7000	17.7000	15.3000	12.0000	8.4000	5.5000 (96)
Month fracti	946.8570	917.8977	820.2365	676.8650	485.9146	305.2298	185.3837	185.0534	342.8143	549.4447	762.9493	933.2630 (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	322.0397	261.7002	219.7479	130.9929	55.6243	0.0000	0.0000	0.0000	0.0000	98.4369	209.6997	326.7233 (98)
Space heating per m2												1624.9648 (98)
										(98) / (4) =		24.5093 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1795.5413 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	322.0397	261.7002	219.7479	130.9929	55.6243	0.0000	0.0000	0.0000	0.0000	98.4369	209.6997	326.7233	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	355.8450	289.1715	242.8154	144.7435	61.4634	0.0000	0.0000	0.0000	0.0000	108.7700	231.7123	361.0202	(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	153.2748	134.4388	139.6533	123.0637	119.0565	104.1712	97.9503	110.3780	111.0962	127.7230	137.7262	148.8725	(64)
Efficiency of water heater (217)m	89.4428	89.3880	89.2291	88.9212	88.2942	87.3000	87.3000	87.3000	87.3000	88.6646	89.2038	87.3000	(216)
Fuel for water heating, kWh/month	171.3663	150.3992	156.5110	138.3964	134.8408	119.3256	112.1996	126.4352	127.2579	144.0519	154.3950	166.3875	(219)
Water heating fuel used												1701.5665	(219)
Annual totals kWh/year													
Space heating fuel - main system												1795.5413	(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)												341.3193	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses												3913.4270	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1795.5413	4.2600	76.4901 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1701.5665	4.2600	72.4867 (247)
Pumps and fans for heating	75.0000	22.5500	16.9125 (249)
Energy for lighting	341.3193	22.5500	76.9675 (250)
Additional standing charges			96.0000 (251)
Energy saving/generation technologies			
PV Unit	0.0000	22.5500	0.0000 (252)
Total energy cost			338.8568 (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	1795.5413	0.2160	387.8369 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1701.5665	0.2160	367.5384 (264)
Space and water heating			755.3753 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	341.3193	0.5190	177.1447 (268)
Energy saving/generation technologies			
PV Unit	-421.4700	0.5190	-218.7429 (269)
Total kg/year			752.7020 (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	1795.5413	1.2200	2190.5603 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1701.5665	1.2200	2075.9111 (264)
Space and water heating			4266.4715 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	341.3193	3.0700	1047.8501 (268)
Energy saving/generation technologies			
PV Unit	-421.4700	3.0700	-1293.9129 (269)
Primary energy kWh/year			4250.6587 (272)
Primary energy kWh/m2/year			64.1125 (273)

SAP 2012 EPC IMPROVEMENTS

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Current energy efficiency rating: B 84
Current environmental impact rating: B 90

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

Recommended measures: SAP change Cost change CO2 change
(none)

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

Potential energy efficiency rating: B 84
Potential environmental impact rating: B 90

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

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

	Current	Potential	Saving
Electricity	£94	£94	£0
Mains gas	£245	£245	£0
Space heating	£189	£189	£0
Water heating	£72	£72	£0
Lighting	£77	£77	£0
Total cost of fuels	£339	£339	£0
Total cost of uses	£338	£338	£0
Delivered energy	59 kWh/m²	59 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.8 tonnes	0.8 tonnes	0.0 tonnes
CO2 emissions per m²	11 kg/m²	11 kg/m²	0 kg/m²
Primary energy	64 kWh/m²	64 kWh/m²	0 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

No improvements selected / applicable

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

Overheating Calculation Input Data

Dwelling type	EndTerrace Flat
Number of storeys	1
Cross ventilation possible	Yes
SAP Region	Southern England
Front of dwelling faces	South
Overshading	Average or unknown
Thermal mass parameter	131.1 (calculated from construction elements)
Night ventilation	Yes
Ventilation rate during hot weather (ach)	6.00 (Windows fully open)

Overheating Calculation

Summer ventilation heat loss coefficient	308.49 (P1)
Transmission heat loss coefficient	40.80 (37)
Summer heat loss coefficient	349.29 (P2)

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

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

[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Shading	Gains W
North	4.0100	87.1704	0.6300	0.7000	0.9000	124.8640
South	2.7500	118.5567	0.6300	0.7000	0.9000	116.4615
total:						241.3255

	Jun	Jul	Aug	
Solar gains	259	241	216	(P3)
Internal gains	379	364	372	
Total summer gains	639	605	588	(P5)

Summer gain/loss ratio	1.83	1.73	1.68	(P6)
Summer external temperature	15.40	17.30	17.30	
Thermal mass temperature increment (TMP = 131.1)	1.08	1.08	1.08	
Threshold temperature	18.31	20.12	20.07	(P7)
Likelihood of high internal temperature	Not significant	Not significant	Not significant	

Assessment of likelihood of high internal temperature: Not significant