

ASSESSMENT NOTES

Calculation Type: New Build (As Designed)



Property Reference	DE-18297 Plot 022 AS	Issued on Date	
Assessment Reference	DE-18297 Plot 022 AS	Prop Type Ref	T52 SH52 E MID
Property	3 bed, 2 bath		

SAP Rating	86 B	DER	14.20	TER	16.05
Environmental	89 B	% DER<TER	11.51		
CO ₂ Emissions (t/year)	1.10	DFEE	33.80	TFEE	42.11
General Requirements Compliance	Pass	% DFEE<TFEE	19.74		

Assessor Details	Mr. Michael Brogden, Michael Brogden, Tel: 0333 5777 577, michael@darren-evans.co.uk	Assessor ID	R034-0001
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Client	
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ASSESSMENT NOTES - Last time updated on: 22.01.2021

Eaved Front
No Side Windows

PREDICTED ENERGY ASSESSMENT



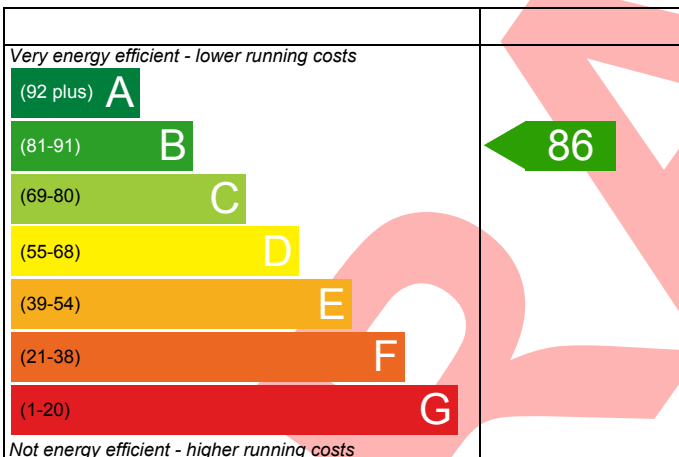
3 bed,
2 bath

Dwelling type: House, Mid-Terrace
Date of assessment: 22/01/2021
Produced by: Michael Brogden
Total floor area: 93 m²

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

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

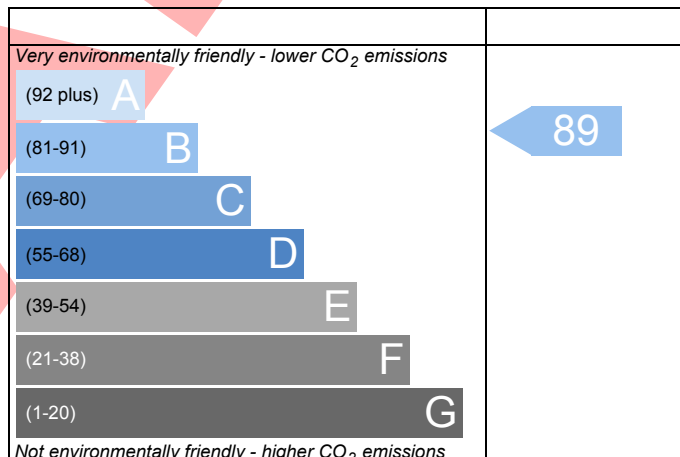
Energy Efficiency Rating



England EU Directive 2002/91/EC

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

Environmental Impact (CO₂) Rating



England EU Directive 2002/91/EC

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

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

SUMMARY FOR INPUT DATA

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

Orientation	South
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Urban
1.0 Property Type	House, Mid-Terrace
2.0 Number of Storeys	2
3.0 Date Built	2017
4.0 Sheltered Sides	3
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	9.20 m	46.50 m ²	2.31 m
1st Storey:	9.20 m	46.50 m ²	2.56 m

7.0 Living Area	19.29	m ²
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8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	219.87	kJ/m ² K

9.0 External Walls

Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
External Wall 1	Cavity Wall	Cavity wall : plasterboard on dabs, AAC block, filled cavity, any outside structure	0.26	60.00	44.80	31.28

9.1 Party Walls

Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	98.46

9.2 Internal Walls

Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
Internal Wall 1	Plasterboard on timber frame	9.00	133.42
Internal Wall 2	Other	62.70	15.31

10.0 External Roofs

Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
External Roof 1	External Plane Roof	Plasterboard, insulated at ceiling level	0.10	9.00	46.50	46.50

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10.2 Internal Ceilings

Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
Internal Ceiling 1	Plasterboard ceiling, carpeted chipboard floor	9.00	46.50

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)
Heat Loss Floor 1	Ground Floor - Solid	Suspended concrete floor, carpeted	0.12	75.00	46.50

11.2 Internal Floors

Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
floor	Plasterboard ceiling, carpeted chipboard floor	18.00	46.50

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m ² K)
French Door	Manufacturer	Window	Double glazed			0.71		0.70	1.41
Window	Manufacturer	Window	Double glazed			0.71		0.70	1.41
Solid door tall window	Manufacturer	Solid Door							1.00
half glazed	Manufacturer	Half Glazed Door	Double Low-E Soft 0.05			0.63		0.70	1.50

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m ²)	Curtain Closed
Front door	Solid Door	[1] External Wall 1	South							2.12	
front windows	Window	[1] External Wall 1	South	Dark-coloured curtain or roller blind	0.00					4.91	100
rear door	Window	[1] External Wall 1	North	Dark-coloured curtain or roller blind	0.00					2.12	100
rear windows	Window	[1] External Wall 1	North	Dark-coloured curtain or roller blind	0.00					4.37	100

14.0 Conservatory

15.0 Draught Proofing

%

16.0 Draught Lobby

17.0 Thermal Bridging

17.1 List of Bridges

SUMMARY FOR INPUT DATA

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Source Type	Bridge Type	Length	Psi	Imported	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	9.30	0.211	No	CATNIC
Independently assessed	E3 Sill	7.28	0.019	No	APA PF-WD-03
Independently assessed	E4 Jamb	23.40	0.020	No	APA PF-WD-04
Independently assessed	E5 Ground floor (normal)	19.31	0.082	No	Spantherm Bespoke
Independently assessed	E6 Intermediate floor within a dwelling	9.20	0.001	No	APA PF-IF-01
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	9.20	0.060	No	
Table K1 - Approved	E18 Party wall between dwellings	19.48	0.060	No	
Independently assessed	P1 Party wall - Ground floor	20.22	0.030	No	Spantherm Bespoke
Table K1 - Default	P2 Party wall - Intermediate floor within a dwelling	20.22	0.000	No	
Independently assessed	P4 Party wall - Roof (insulation at ceiling level)	20.22	0.036	No	Barratt Confidential Bespoke

Y-value W/m²K

18.0 Pressure Testing

Designed AP ₅₀	<input type="text" value="5.00"/>	m ³ /(h.m ²) @ 50 Pa
Property Tested ?	<input type="text"/>	
As Built AP ₅₀	<input type="text"/>	m ³ /(h.m ²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	<input type="text" value="Windows half open"/>
Cross ventilation possible	<input type="text" value="Yes"/>
Night Ventilation	<input type="text" value="No"/>
Air change rate	<input type="text" value="4.00"/>

Mechanical Ventilation

Mechanical Ventilation System Present	<input type="text" value="No"/>
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20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				3
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System

22.0 Lighting

Internal

Total number of light fittings	<input type="text" value="15"/>	
Total number of L.E.L. fittings	<input type="text" value="15"/>	
Percentage of L.E.L. fittings	<input type="text" value="100.00"/>	%

External

External lights fitted	<input type="text" value="No"/>
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23.0 Electricity Tariff

24.0 Main Heating 1

Percentage of Heat	<input type="text" value="100"/>	%
Database Ref. No.	<input type="text" value="17929"/>	
Fuel Type	<input type="text" value="Mains gas"/>	
Main Heating	<input type="text" value="BGW"/>	
SAP Code	<input type="text" value="104"/>	
In Winter	<input type="text" value="90.5"/>	

SUMMARY FOR INPUT DATA

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In Summer	87.3
Controls	CBI Time and temperature zone control
PCDF Controls	0
Delayed Start Stat	Yes
Sap Code	2110
Flue Type	Balanced
Fan Assisted Flue	Yes
Is MHS Pumped	Pump in heated space
Heat Emitter	Radiators
Flow Temperature	Normal (> 45°C)
Combi boiler type	Standard Combi
Combi keep hot type	None
25.0 Main Heating 2	None

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

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar water heating	£4,000 - £6,000	£29	B 87	
	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar photovoltaic panels, 2.5 kWp	£3,500 - £5,500	£345	A 97	

BASIC COMPLIANCE REPORT

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General Requirements Compliance	Pass	DFEE	33.80	
		TFEE	42.11	
		% DFEE<TFEE	19.74	
Assessor Details	Mr. Michael Brogden, Michael Brogden, Tel: 0333 5777 577, michael@darren-evans.co.uk		Assessor ID	R034-0001
Client				

SUMMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	16.05	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.20	kgCO ₂ /m ²	Pass
	-1.85 (-11.5%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	42.11	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	33.80	kWh/m ² /yr	
	-8.3 (-19.7%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.26 (max. 0.30)	0.26 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	Pass
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	Pass
Openings	1.35 (max. 2.00)	1.41 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

Limiting System Efficiencies

4 Heating efficiency

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Designed)



Main heating system

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

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Time and temperature zone control

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 (Severn Valley)

Not significant

Pass

Based on:

Overshading

Average

Windows facing North

6.49 m², No overhang

Windows facing South

4.91 m², No overhang

Air change rate

4.00 ach

Blinds/curtains

Dark-coloured curtain or roller blind, closed 100% of daylight hours

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

5.00 (design value)

Maximum

10.0

Pass

10 Key features

Party wall U-value

0.00

W/m²K

Roof U-value

0.10

W/m²K

Floor U-value

0.12

W/m²K

Door U-value

1.00

W/m²K

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FULL SAP CALCULATION PRINTOUT

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

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

DWELLING AS DESIGNED

Mid-Terrace House, total floor area 93 m²

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

1a TER and DER

Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 16.05 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 14.20 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 42.1 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 33.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.26 (max. 0.30)	0.26 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.35 (max. 2.00)	1.41 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

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

Data from database

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: Time and temperature zone control 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 (Severn Valley): Not significant OK

Based on:

Overshading:

Average

Windows facing North:

6.49 m², No overhang

Windows facing South:

4.91 m², No overhang

Air change rate:

4.00 ach

Blinds/curtains:

Dark-coloured curtain or roller blind, closed 100% of daylight hours

10 Key features

Party wall U-value 0.00 W/m²K

Roof U-value 0.10 W/m²K

Floor U-value 0.12 W/m²K

Door U-value 1.00 W/m²K

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	46.5000 (1b)	x 2.3100 (2b)	= 107.4150 (1b) - (3b)
First floor	46.5000 (1c)	x 2.5600 (2c)	= 119.0400 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 226.4550 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				3 * 10 =	30.0000 (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)				30.0000 / (5) =	0.1325 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3825 (18)
Number of sides sheltered					3 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.2964 (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	0.3779	0.3705	0.3631	0.3261	0.3187	0.2816	0.2816	0.2742	0.2964	0.3187	0.3335	0.3483 (22b)
	0.5714	0.5686	0.5659	0.5532	0.5508	0.5396	0.5396	0.5376	0.5439	0.5508	0.5556	0.5607 (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
French Door (Uw = 1.41)			2.1200	1.3347	2.8296		(27)
Window (Uw = 1.41)			9.2800	1.3347	12.3862		(27)
Solid door tall window			2.1200	1.0000	2.1200		(26)
Heat Loss Floor 1			46.5000	0.1200	5.5800	75.0000	3487.5000 (28a)
External Wall 1	44.8000	13.5200	31.2800	0.2600	8.1328	60.0000	1876.8000 (29a)
External Roof 1	46.5000		46.5000	0.1000	4.6500	9.0000	418.5000 (30)
Total net area of external elements Aum(A, m2)			137.8000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.6986		(33)
Party Wall 1			98.4600	0.0000	0.0000	110.0000	10830.6000 (32)
Internal Wall 1			133.4200			9.0000	1200.7800 (32c)
Internal Wall 2			15.3100			62.7000	959.9370 (32c)
floor			46.5000			18.0000	837.0000 (32d)
Internal Ceiling 1			46.5000			18.0000	837.0000 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 20448.1170 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							219.8722 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.2166 (36)
Total fabric heat loss							(33) + (36) = 42.9152 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	42.7021	42.4949	42.2917	41.3376	41.1591	40.3280	40.3280	40.1741	40.6481	41.1591	41.5202	41.8978 (38)
Average = Sum(39)m / 12 =	85.6173	85.4100	85.2069	84.2528	84.0743	83.2432	83.2432	83.0893	83.5633	84.0743	84.4354	84.8129 (39)
												84.2519 (39)
HLP	0.9206	0.9184	0.9162	0.9059	0.9040	0.8951	0.8951	0.8934	0.8985	0.9040	0.9079	0.9120 (40)
HLP (average)												0.9059 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.6646 (42)
Average daily hot water use (litres/day)												97.4842 (43)
Daily hot water use	107.2326	103.3332	99.4339	95.5345	91.6351	87.7358	87.7358	91.6351	95.5345	99.4339	103.3332	107.2326 (44)
Energy conte	159.0228	139.0824	143.5206	125.1247	120.0601	103.6028	96.0032	110.1651	111.4808	129.9201	141.8180	154.0051 (45)



FULL SAP CALCULATION PRINTOUT

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy content (annual)												Total = Sum (45)m =	1533.8058 (45)
Distribution loss (46)m = 0.15 x (45)m													
	23.8534	20.8624	21.5281	18.7687	18.0090	15.5404	14.4005	16.5248	16.7221	19.4880	21.2727	23.1008	(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	14.1382	12.7591	14.0991	13.5997	14.0206	13.5310	13.9587	13.9988	13.5684	14.0666	13.6532	14.1262	(61)
Total heat required for water heating calculated for each month													
	173.1611	151.8415	157.6196	138.7244	134.0807	117.1337	109.9619	124.1639	125.0492	143.9867	155.4711	168.1313	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum (63)m =												0.0000 (63)	
Output from w/h	173.1611	151.8415	157.6196	138.7244	134.0807	117.1337	109.9619	124.1639	125.0492	143.9867	155.4711	168.1313	(64)
Total per year (kWh/year) = Sum (64)m =												1699.3253 (64)	
Heat gains from water heating, kWh/month	56.4097	49.4347	51.2454	45.0039	43.4251	37.8307	35.4107	40.1296	40.4595	46.7151	50.5678	54.7383	(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	133.2299	133.2299	133.2299	133.2299	133.2299	133.2299	133.2299	133.2299	133.2299	133.2299	133.2299	133.2299	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.0795	21.3872	17.3932	13.1678	9.8431	8.3099	8.9792	11.6715	15.6654	19.8909	23.2156	24.7487	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	244.4900	247.0270	240.6338	227.0233	209.8424	193.6949	182.9074	180.3703	186.7636	200.3741	217.5549	233.7024	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3230	36.3230	36.3230	36.3230	36.3230	36.3230	36.3230	36.3230	36.3230	36.3230	36.3230	36.3230	(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)	-106.5839	-106.5839	-106.5839	-106.5839	-106.5839	-106.5839	-106.5839	-106.5839	-106.5839	-106.5839	-106.5839	-106.5839	(71)
Water heating gains (Table 5)	75.8194	73.5635	68.8782	62.5054	58.3671	52.5426	47.5951	53.9376	56.1937	62.7891	70.2330	73.5729	(72)
Total internal gains	410.3578	407.9466	392.8741	368.6654	344.0216	320.5164	305.4506	311.9484	324.5917	349.0230	376.9725	397.9930	(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		2.1200	10.6334	0.7100	0.7000	0.7700		7.7642	(74)				
North		4.3700	10.6334	0.7100	0.7000	0.7700		16.0045	(74)				
South		4.9100	46.7521	0.7100	0.7000	0.7700		79.0627	(78)				
Solar gains	102.8315	174.9077	242.1254	310.3975	361.2708	365.7389	349.5837	309.8208	265.1012	193.7316	123.0381	88.1323	(83)
Total gains	513.1893	582.8543	634.9995	679.0629	705.2924	686.2553	655.0343	621.7692	589.6929	542.7546	500.0106	486.1253	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	66.3421	66.5031	66.6616	67.4166	67.5597	68.2342	68.2342	68.3606	67.9728	67.5597	67.2708	66.9713	
alpha	5.4228	5.4335	5.4441	5.4944	5.5040	5.5489	5.5489	5.5574	5.5315	5.5040	5.4847	5.4648	
util living area	0.9975	0.9945	0.9868	0.9614	0.8863	0.7237	0.5491	0.5982	0.8372	0.9712	0.9947	0.9982	(86)
MIT	19.9259	20.0687	20.2868	20.5697	20.8159	20.9575	20.9923	20.9879	20.9026	20.5922	20.2064	19.8984	(87)
Th 2	20.1500	20.1519	20.1537	20.1625	20.1641	20.1717	20.1717	20.1731	20.1687	20.1641	20.1608	20.1573	(88)
util rest of house	0.9968	0.9930	0.9828	0.9490	0.8500	0.6489	0.4508	0.4986	0.7766	0.9595	0.9928	0.9976	(89)
MIT 2	18.7009	18.9106	19.2286	19.6389	19.9712	20.1398	20.1682	20.1671	20.0840	19.6768	19.1187	18.6662	(90)
Living area fraction												fLA = Living area / (4) = 0.2074 (91)	
MIT	18.9550	19.1508	19.4481	19.8320	20.1464	20.3094	20.3391	20.3373	20.2538	19.8667	19.3443	18.9218	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.8050	19.0008	19.2981	19.6820	19.9964	20.1594	20.1891	20.1873	20.1038	19.7167	19.1943	18.7718	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9951	0.9899	0.9773	0.9399	0.8415	0.6477	0.4529	0.5004	0.7711	0.9512	0.9897	0.9963	(94)
Ext temp.	510.6835	576.9696	620.5907	638.2383	593.5167	444.4637	296.6714	311.1134	454.7292	516.2434	494.8801	484.3212	(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	1241.8754	1204.3486	1090.4836	908.4124	697.5170	462.7804	298.7683	314.6855	501.6988	766.4761	1021.1872	1235.8736	(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	544.0068	421.5987	349.6003	194.5253	77.3762	0.0000	0.0000	0.0000	0.0000	186.1731	378.9412	559.1550	(98)
Space heating per m2												(98) / (4) = 29.1546 (99)	



FULL SAP CALCULATION PRINTOUT

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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													2995.9963 (211)
Space heating requirement	544.0068	421.5987	349.6003	194.5253	77.3762	0.0000	0.0000	0.0000	0.0000	186.1731	378.9412	559.1550	(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)	601.1125	465.8549	386.2987	214.9451	85.4986	0.0000	0.0000	0.0000	0.0000	205.7162	418.7195	617.8509	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	173.1611	151.8415	157.6196	138.7244	134.0807	117.1337	109.9619	124.1639	125.0492	143.9867	155.4711	168.1313	(64)
Efficiency of water heater (217)m	89.7061	89.6301	89.4808	89.1398	88.4443	87.3000	87.3000	87.3000	87.3000	89.0760	89.5451	89.7396	(217)
Fuel for water heating, kWh/month	193.0316	169.4091	176.1492	155.6256	151.5990	134.1738	125.9587	142.2267	143.2408	161.6447	173.6232	187.3547	(219)
Water heating fuel used													1914.0372 (219)
Annual totals kWh/year													
Space heating fuel - main system													2995.9963 (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)													425.2513 (232)
Total delivered energy for all uses													5410.2848 (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	2995.9963	0.2160	647.1352	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1914.0372	0.2160	413.4320	(264)
Space and water heating			1060.5672	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	425.2513	0.5190	220.7054	(268)
Total CO2, kg/year			1320.1976	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			14.2000	(273)

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

DER			14.2000	ZC1
Total Floor Area		TFA	93.0000	
Assumed number of occupants		N	2.6646	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			15.5785	ZC2
CO2 emissions from cooking, equation (L16)			1.9672	ZC3
Total CO2 emissions			31.7457	ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000	ZC5
Additional allowable electricity generation, kWh/m ² /year			0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000	ZC7
Net CO2 emissions			31.7457	ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	46.5000 (1b)	2.3100 (2b)	107.4150 (1b) - (3b)
First floor	46.5000 (1c)	2.5600 (2c)	119.0400 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.0000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 226.4550 (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				3 * 10 =	30.0000 (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) =				30.0000 / (5) =	0.1325 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.3825 (18)							
Number of sides sheltered					3 (19)							
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.7750 (20)							
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.2964 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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	0.3779	0.3705	0.3631	0.3261	0.3187	0.2816	0.2816	0.2742	0.2964	0.3187	0.3335	0.3483 (22b)
Effective ac	0.5714	0.5686	0.5659	0.5532	0.5508	0.5396	0.5396	0.5376	0.5439	0.5508	0.5556	0.5607 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K					
TER Opaque door			2.1200	1.0000	2.1200		(26)					
TER Opening Type (Uw = 1.40)			11.4000	1.3258	15.1136		(27)					
Heat Loss Floor 1			46.5000	0.1300	6.0450		(28a)					
External Wall 1	44.8000	13.5200	31.2800	0.1800	5.6304		(29a)					
External Roof 1	46.5000		46.5000	0.1300	6.0450		(30)					
Total net area of external elements Aum(A, m ²)			137.8000				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 34.9540		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.8534 (36)					
Total fabric heat loss							(33) + (36) = 45.8074 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 42.7021	Feb 42.4949	Mar 42.2917	Apr 41.3376	May 41.1591	Jun 40.3280	Jul 40.3280	Aug 40.1741	Sep 40.6481	Oct 41.1591	Nov 41.5202	Dec 41.8978 (38)
Heat transfer coeff	88.5095	88.3023	88.0992	87.1450	86.9665	86.1355	86.1355	85.9816	86.4556	86.9665	87.3276	87.7052 (39)
Average = Sum(39)m / 12 =												87.1442 (39)
HLP	Jan 0.9517	Feb 0.9495	Mar 0.9473	Apr 0.9370	May 0.9351	Jun 0.9262	Jul 0.9262	Aug 0.9245	Sep 0.9296	Oct 0.9351	Nov 0.9390	Dec 0.9431 (40)
HLP (average)												0.9370 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.6646 (42)
Average daily hot water use (litres/day)												97.4842 (43)
Daily hot water use	107.2326	103.3332	99.4339	95.5345	91.6351	87.7358	87.7358	91.6351	95.5345	99.4339	103.3332	107.2326 (44)
Energy conte	159.0228	139.0824	143.5206	125.1247	120.0601	103.6028	96.0032	110.1651	111.4808	129.9201	141.8180	154.0051 (45)
Energy content (annual)												Total = Sum(45)m = 1533.8058 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	23.8534	20.8624	21.5281	18.7687	18.0090	15.5404	14.4005	16.5248	16.7221	19.4880	21.2727	23.1008 (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												

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Total heat required for water heating calculated for each month	50.9589	46.0274	50.6704	47.1129	46.6963	43.2670	44.7092	46.6963	47.1129	50.6704	49.3151	50.9589	61									
Solar input	209.9818	185.1098	194.1910	172.2376	166.7564	146.8697	140.7124	156.8613	158.5937	180.5905	191.1330	204.9640	(62)									
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)									
Heat gains from water heating, kWh/month	209.9818	185.1098	194.1910	172.2376	166.7564	146.8697	140.7124	156.8613	158.5937	180.5905	191.1330	204.9640	(64)									
	65.6148	57.7517	60.3882	53.3822	51.5941	45.2647	43.0984	48.3040	48.8456	55.8660	59.4832	63.9464	(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	133.2299	133.2299	133.2299	133.2299	133.2299	133.2299	133.2299	133.2299	133.2299	133.2299	133.2299	133.2299	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.0795	21.3872	17.3932	13.1678	9.8431	8.3099	8.9792	11.6715	15.6654	19.8909	23.2156	24.7487	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	244.4900	247.0270	240.6338	227.0233	209.8424	193.6949	182.9074	180.3703	186.7636	200.3741	217.5549	233.7024	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3230	36.3230	36.3230	36.3230	36.3230	36.3230	36.3230	36.3230	36.3230	36.3230	36.3230	36.3230	(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)	-106.5839	-106.5839	-106.5839	-106.5839	-106.5839	-106.5839	-106.5839	-106.5839	-106.5839	-106.5839	-106.5839	-106.5839	(71)
Water heating gains (Table 5)	88.1920	85.9401	81.1669	74.1419	69.3469	62.8676	57.9279	64.9247	67.8411	75.0888	82.6156	85.9495	(72)
Total internal gains	422.7304	420.3233	405.1629	380.3019	355.0013	330.8414	315.7834	322.9354	336.2391	361.3227	389.3551	410.3696	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
	m2	Table 6a	Specific data	Specific data	factor	W
		W/m2	or Table 6b	or Table 6c	Table 6d	
North	6.4900	10.6334	0.6300	0.7000	0.7700	21.0906
South	4.9100	46.7521	0.6300	0.7000	0.7700	70.1543
Solar gains	91.2448	155.1998	214.8437	275.4231	320.5642	324.5289
Total gains	513.9752	575.5230	620.0065	655.7251	675.5655	655.3703

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	tau	72.9677	73.1389	73.3076	74.1102	74.2623	74.9788	75.1130	74.7012	74.2623	73.9552	73.6368	
	alpha	5.8645	5.8759	5.8872	5.9407	5.9508	5.9986	5.9986	6.0075	5.9801	5.9508	5.9303	
util living area	0.9987	0.9971	0.9927	0.9766	0.9209	0.7737	0.5933	0.6418	0.8745	0.9819	0.9970	0.9990	
MIT	19.9892	20.1114	20.3059	20.5650	20.8038	20.9535	20.9920	20.9875	20.8981	20.5997	20.2472	19.9660	
Th 2	20.1238	20.1256	20.1275	20.1361	20.1377	20.1453	20.1453	20.1467	20.1424	20.1377	20.1345	20.1310	
util rest of house	0.9982	0.9961	0.9900	0.9675	0.8890	0.6955	0.4844	0.5327	0.8156	0.9730	0.9958	0.9987	
MIT 2	18.7619	18.9418	19.2264	19.6056	19.9327	20.1117	20.1420	20.1410	20.0556	19.6596	19.1472	18.7334	
Living area fraction	MIT	19.0165	19.1844	19.4503	19.8046	20.1134	20.2863	20.3183	20.2304	19.8546	19.3754	18.9891	
Temperature adjustment	adjusted MIT	19.0165	19.1844	19.4503	19.8046	20.1134	20.2863	20.3183	20.2304	19.8546	19.3754	18.9891	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(94)
Useful gains	0.9974	0.9946	0.9872	0.9630	0.8879	0.7095	0.5071	0.5553	0.8226	0.9691	0.9943	0.9981	
Ext temp.	512.6407	572.3964	612.0775	631.4473	599.8682	464.9897	317.4449	331.9943	470.0647	516.7539	495.6698	487.6199	
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	
Month fracti	1302.5484	1261.3411	1140.9076	950.2818	731.6824	489.7906	320.2796	336.7570	530.0046	804.8372	1071.9779	1297.0803	
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	
Space heating per m2	587.6913	462.9708	393.4496	229.5609	98.0698	0.0000	0.0000	0.0000	0.0000	214.3339	414.9418	602.2385	
												3003.2566	
												32.2931	

8c. Space cooling requirement

Not applicable

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



FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3215.4782 (211)
Space heating requirement	587.6913	462.9708	393.4496	229.5609	98.0698	0.0000	0.0000	0.0000	0.0000	214.3339	414.9418	602.2385	(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)	629.2198	495.6861	421.2522	245.7825	104.9997	0.0000	0.0000	0.0000	0.0000	229.4796	444.2632	644.7950	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	209.9818	185.1098	194.1910	172.2376	166.7564	146.8697	140.7124	156.8613	158.5937	180.5905	191.1330	204.9640	(64)
Efficiency of water heater (217)m	87.5028	87.2649	86.7925	85.7753	83.7657	80.3000	80.3000	80.3000	80.3000	85.4834	86.9510	87.6022	(216)
Fuel for water heating, kWh/month	239.9716	212.1239	223.7416	200.8011	199.0748	182.9013	175.2334	195.3441	197.5015	211.2581	219.8169	233.9713	(219)
Water heating fuel used													2491.7395 (219)
Annual totals kWh/year													
Space heating fuel - main system													3215.4782 (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)													425.2513 (232)
Total delivered energy for all uses													6207.4690 (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	3215.4782	0.2160	694.5433 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2491.7395	0.2160	538.2157 (264)
Space and water heating			1232.7590 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	425.2513	0.5190	220.7054 (268)
Total CO2, kg/m2/year			1492.3894 (272)
Emissions per m2 for space and water heating			13.2555 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3732 (272b)
Emissions per m2 for pumps and fans			0.4185 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.2555 * 1.00) + 2.3732 + 0.4185, rounded to 2 d.p.			16.0500 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	46.5000 (1b)	x 2.3100 (2b)	= 107.4150 (1b) - (3b)
First floor	46.5000 (1c)	x 2.5600 (2c)	= 119.0400 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.0000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 226.4550 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour							
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)							
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)							
Number of intermittent fans				3 * 10 =	30.0000 (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) =				30.0000 / (5) =	0.1325 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.3825 (18)							
Number of sides sheltered					3 (19)							
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.7750 (20)							
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.2964 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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	0.3779	0.3705	0.3631	0.3261	0.3187	0.2816	0.2816	0.2742	0.2964	0.3187	0.3335	0.3483 (22b)
	0.5714	0.5686	0.5659	0.5532	0.5508	0.5396	0.5396	0.5376	0.5439	0.5508	0.5556	0.5607 (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
French Door (Uw = 1.41)			2.1200	1.3347	2.8296		(27)
Window (Uw = 1.41)			9.2800	1.3347	12.3862		(27)
Solid door tall window			2.1200	1.0000	2.1200		(26)
Heat Loss Floor 1			46.5000	0.1200	5.5800	75.0000	3487.5000 (28a)
External Wall 1	44.8000	13.5200	31.2800	0.2600	8.1328	60.0000	1876.8000 (29a)
External Roof 1	46.5000		46.5000	0.1000	4.6500	9.0000	418.5000 (30)
Total net area of external elements Aum(A, m2)			137.8000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.6986		(33)
Party Wall 1			98.4600	0.0000	0.0000	110.0000	10830.6000 (32)
Internal Wall 1			133.4200			9.0000	1200.7800 (32c)
Internal Wall 2			15.3100			62.7000	959.9370 (32c)
floor			46.5000			18.0000	837.0000 (32d)
Internal Ceiling 1			46.5000			9.0000	418.5000 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 20029.6170 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							215.3722 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.2166 (36)
Total fabric heat loss							(33) + (36) = 42.9152 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	42.7021	42.4949	42.2917	41.3376	41.1591	40.3280	40.3280	40.1741	40.6481	41.1591	41.5202	41.8978 (38)
Average = Sum(39)m / 12 =	85.6173	85.4100	85.2069	84.2528	84.0743	83.2432	83.2432	83.0893	83.5633	84.0743	84.4354	84.8129 (39)
												84.2519 (39)
HLP	0.9206	0.9184	0.9162	0.9059	0.9040	0.8951	0.8951	0.8934	0.8985	0.9040	0.9079	0.9120 (40)
HLP (average)												0.9059 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.6646 (42)
Average daily hot water use (litres/day)												97.4842 (43)
Daily hot water use	107.2326	103.3332	99.4339	95.5345	91.6351	87.7358	87.7358	91.6351	95.5345	99.4339	103.3332	107.2326 (44)
Energy conte	159.0228	139.0824	143.5206	125.1247	120.0601	103.6028	96.0032	110.1651	111.4808	129.9201	141.8180	154.0051 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



SAINT-GOBAIN INSULATION UK

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Energy content (annual)													Total = Sum(45)m =	1533.8058 (45)	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
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	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	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	0.0000	0.0000	(59)
Heat gains from water heating, kWh/month	33.7924	29.5550	30.4981	26.5890	25.5128	22.0156	20.4007	23.4101	23.6897	27.6080	30.1363	32.7261	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	133.2299	133.2299	133.2299	133.2299	133.2299	133.2299	133.2299	133.2299	133.2299	133.2299	133.2299	133.2299	133.2299
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.0795	21.3872	17.3932	13.1678	9.8431	8.3099	8.9792	11.6715	15.6654	19.8909	23.2156	24.7487	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	244.4900	247.0270	240.6338	227.0233	209.8424	193.6949	182.9074	180.3703	186.7636	200.3741	217.5549	233.7024	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3230	36.3230	36.3230	36.3230	36.3230	36.3230	36.3230	36.3230	36.3230	36.3230	36.3230	36.3230	(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)	-106.5839	-106.5839	-106.5839	-106.5839	-106.5839	-106.5839	-106.5839	-106.5839	-106.5839	-106.5839	-106.5839	-106.5839	(71)
Water heating gains (Table 5)	45.4198	43.9807	40.9921	36.9292	34.2914	30.5772	27.4203	31.4652	32.9023	37.1076	41.8560	43.9867	(72)
Total internal gains	376.9582	375.3638	361.9880	340.0892	316.9459	295.5510	282.2758	286.4759	298.3003	320.3415	345.5954	365.4068	(73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b		FF Specific data or Table 6c	Access factor Table 6d	Gains W						
North	2.1200	10.6334	0.7100		0.7000	0.7700	7.7642 (74)						
North	4.3700	10.6334	0.7100		0.7000	0.7700	16.0045 (74)						
South	4.9100	46.7521	0.7100		0.7000	0.7700	79.0627 (78)						
Solar gains	102.8315	174.9077	242.1254	310.3975	361.2708	365.7389	349.5837	309.8208	265.1012	193.7316	123.0381	88.1323	(83)
Total gains	479.7897	550.2715	604.1135	650.4867	678.2166	661.2899	631.8595	596.2967	563.4015	514.0730	468.6336	453.5391	(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	(86)
tau	64.9843	65.1420	65.2973	66.0368	66.1770	66.8377	66.8377	66.9615	66.5816	66.1770	65.8940	65.6006	
alpha	5.3323	5.3428	5.3532	5.4025	5.4118	5.4558	5.4558	5.4641	5.4388	5.4118	5.3929	5.3734	
util living area	0.9980	0.9955	0.9888	0.9661	0.8974	0.7416	0.5669	0.6195	0.8543	0.9759	0.9957	0.9985	(86)
MIT	19.8685	20.0152	20.2400	20.5333	20.7931	20.9494	20.9903	20.9847	20.8861	20.5550	20.1565	19.8413	(87)
Th 2	20.1500	20.1519	20.1537	20.1625	20.1641	20.1717	20.1717	20.1731	20.1687	20.1641	20.1608	20.1573	(88)
util rest of house	0.9975	0.9942	0.9854	0.9551	0.8636	0.6677	0.4664	0.5182	0.7970	0.9660	0.9943	0.9981	(89)
MIT 2	19.1048	19.2524	19.4771	19.7714	20.0137	20.1451	20.1686	20.1677	20.0993	19.7969	19.4010	19.0837	(90)
Living area fraction									fLA = Living area / (4) =				0.2074 (91)
MIT	19.2632	19.4106	19.6354	19.9294	20.1754	20.3119	20.3390	20.3372	20.2625	19.9542	19.5577	19.2408	(92)
Temperature adjustment												0.0000	(93)
adjusted MIT	19.2632	19.4106	19.6354	19.9294	20.1754	20.3119	20.3390	20.3372	20.2625	19.9542	19.5577	19.2408	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(94)
Useful gains	478.1912	546.2517	593.6600	618.8491	586.0515	450.4054	307.8964	321.4647	453.1738	494.9886	465.2948	452.4090	(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	1281.1076	1239.3541	1119.2235	929.2610	712.5614	475.4756	311.2478	327.1356	514.9604	786.4437	1051.8685	1275.6556	(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	597.3699	465.7648	391.0193	223.4965	94.1234	0.0000	0.0000	0.0000	0.0000	216.8426	422.3331	612.4955	(98)
Space heating													3023.4450 (98)
Space heating per m ²													(98) / (4) = 32.5102 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(100)
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	782.4863	615.9999	631.4789	0.0000	0.0000	0.0000	0.0000	(100)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8881	0.9428	0.9258	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	694.9542	580.7873	584.6269	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	874.8801	838.4128	798.9256	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												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	129.5466	191.6734	159.4382	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												480.6582 (104)
Cooled fraction									FC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)												
Intermittency factor	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												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	32.3867	47.9183	39.8596	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												120.1646 (107)
Space cooling per m2												1.2921 (108)
Energy for space heating												32.5102 (99)
Energy for space cooling												1.2921 (108)
Total												33.8023 (109)
Dwelling Fabric Energy Efficiency (DFEE)												33.8 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	46.5000 (1b)	2.3100 (2b)	107.4150 (1b) - (3b)
First floor	46.5000 (1c)	2.5600 (2c)	119.0400 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.0000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 226.4550 (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				3 * 10 =	30.0000 (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) =				30.0000 / (5) =	0.1325 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.3825 (18)							
Number of sides sheltered					3 (19)							
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.7750 (20)							
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.2964 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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	0.3779	0.3705	0.3631	0.3261	0.3187	0.2816	0.2816	0.2742	0.2964	0.3187	0.3335	0.3483 (22b)
Effective ac	0.5714	0.5686	0.5659	0.5532	0.5508	0.5396	0.5396	0.5376	0.5439	0.5508	0.5556	0.5607 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K					
TER Opaque door			2.1200	1.0000	2.1200		(26)					
TER Opening Type (Uw = 1.40)			11.4000	1.3258	15.1136		(27)					
Heat Loss Floor 1			46.5000	0.1300	6.0450		(28a)					
External Wall 1	44.8000	13.5200	31.2800	0.1800	5.6304		(29a)					
External Roof 1	46.5000		46.5000	0.1300	6.0450		(30)					
Total net area of external elements Aum(A, m ²)			137.8000				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 34.9540		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.8534 (36)					
Total fabric heat loss							(33) + (36) = 45.8074 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 42.7021	Feb 42.4949	Mar 42.2917	Apr 41.3376	May 41.1591	Jun 40.3280	Jul 40.3280	Aug 40.1741	Sep 40.6481	Oct 41.1591	Nov 41.5202	Dec 41.8978 (38)
Heat transfer coeff	88.5095	88.3023	88.0992	87.1450	86.9665	86.1355	86.1355	85.9816	86.4556	86.9665	87.3276	87.7052 (39)
Average = Sum(39)m / 12 =												87.1442 (39)
HLP	Jan 0.9517	Feb 0.9495	Mar 0.9473	Apr 0.9370	May 0.9351	Jun 0.9262	Jul 0.9262	Aug 0.9245	Sep 0.9296	Oct 0.9351	Nov 0.9390	Dec 0.9431 (40)
HLP (average)												0.9370 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.6646 (42)
Average daily hot water use (litres/day)												97.4842 (43)
Daily hot water use	107.2326	103.3332	99.4339	95.5345	91.6351	87.7358	87.7358	91.6351	95.5345	99.4339	103.3332	107.2326 (44)
Energy conte	159.0228	139.0824	143.5206	125.1247	120.0601	103.6028	96.0032	110.1651	111.4808	129.9201	141.8180	154.0051 (45)
Energy content (annual)												Total = Sum(45)m = 1533.8058 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
If cylinder contains dedicated solar storage												

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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	0.0000	0.0000	(57)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
	33.7924	29.5550	30.4981	26.5890	25.5128	22.0156	20.4007	23.4101	23.6897	27.6080	30.1363	32.7261	(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	133.2299	133.2299	133.2299	133.2299	133.2299	133.2299	133.2299	133.2299	133.2299	133.2299	133.2299	133.2299	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.0795	21.3872	17.3932	13.1678	9.8431	8.3099	8.9792	11.6715	15.6654	19.8909	23.2156	24.7487	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	244.4900	247.0270	240.6338	227.0233	209.8424	193.6949	182.9074	180.3703	186.7636	200.3741	217.5549	233.7024	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3230	36.3230	36.3230	36.3230	36.3230	36.3230	36.3230	36.3230	36.3230	36.3230	36.3230	36.3230	(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)	-106.5839	-106.5839	-106.5839	-106.5839	-106.5839	-106.5839	-106.5839	-106.5839	-106.5839	-106.5839	-106.5839	-106.5839	(71)
Water heating gains (Table 5)	45.4198	43.9807	40.9921	36.9292	34.2914	30.5772	27.4203	31.4652	32.9023	37.1076	41.8560	43.9867	(72)
Total internal gains	376.9582	375.3638	361.9880	340.0892	316.9459	295.5510	282.2758	286.4759	298.3003	320.3415	345.5954	365.4068	(73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W							
North	6.4900	10.6334	0.6300	0.7000	0.7700	21.0906 (74)							
South	4.9100	46.7521	0.6300	0.7000	0.7700	70.1543 (78)							
Solar gains	91.2448	155.1998	214.8437	275.4231	320.5642	324.5289	310.1940	274.9114	235.2306	171.9027	109.1747	78.2019	(83)
Total gains	468.2031	530.5636	576.8317	615.5123	637.5101	620.0799	592.4698	561.3873	533.5309	492.2441	454.7701	443.6087	(84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nll,m (see Table 9a)													
tau	72.9677	73.1389	73.3076	74.1102	74.2623	74.9788	74.9788	75.1130	74.7012	74.2623	73.9552	73.6368	
alpha	5.8645	5.8759	5.8872	5.9407	5.9508	5.9986	5.9986	6.0075	5.9801	5.9508	5.9303	5.9091	
util living area	0.9992	0.9981	0.9949	0.9826	0.9365	0.8022	0.6232	0.6768	0.8999	0.9876	0.9981	0.9994	(86)
MIT	19.9415	20.0649	20.2623	20.5276	20.7774	20.9433	20.9897	20.9836	20.8775	20.5604	20.2019	19.9190	(87)
Th 2	20.1238	20.1256	20.1275	20.1361	20.1377	20.1453	20.1453	20.1467	20.1424	20.1377	20.1345	20.1310	(88)
util rest of house	0.9989	0.9974	0.9930	0.9755	0.9089	0.7262	0.5107	0.5650	0.8475	0.9813	0.9974	0.9992	(89)
MIT 2	19.1464	19.2711	19.4692	19.7382	19.9755	20.1165	20.1423	20.1414	20.0685	19.7737	19.4154	19.1299	(90)
Living area fraction										fLA = Living area / (4) =		0.2074	(91)
MIT	19.3113	19.4358	19.6337	19.9019	20.1419	20.2880	20.3181	20.3161	20.2363	19.9368	19.5785	19.2936	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3113	19.4358	19.6337	19.9019	20.1419	20.2880	20.3181	20.3161	20.2363	19.9368	19.5785	19.2936	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9986	0.9967	0.9916	0.9730	0.9091	0.7402	0.5343	0.5883	0.8543	0.9793	0.9967	0.9990	(94)
Useful gains	467.5338	528.8271	571.9883	598.9080	579.5501	458.9531	316.5361	330.2857	455.7950	482.0698	453.2789	443.1471	(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	1328.6473	1283.5439	1157.0697	958.7638	734.1586	489.9401	320.2604	336.7145	530.5195	811.9916	1089.7219	1323.7884	(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	640.6684	507.1697	435.3006	259.0962	115.0287	0.0000	0.0000	0.0000	0.0000	245.4618	458.2389	655.1971	(98)
Space heating												3316.1615	(98)
Space heating per m ²										(98) / (4) =		35.6577	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.		4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W		0.0000	0.0000	0.0000	0.0000	0.0000	809.6735	637.4025	653.4600	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation		0.0000	0.0000	0.0000	0.0000	0.0000	0.8659	0.9322	0.9126	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss		0.0000	0.0000	0.0000	0.0000	0.0000	701.0820	594.1926	596.3370	0.0000	0.0000	0.0000	0.0000 (102)
Total gains		0.0000	0.0000	0.0000	0.0000	0.0000	826.7125	792.3728	758.1225	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	90.4540	147.4461	120.3684	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling													358.2684 (104)
Cooled fraction										fc = cooled area / (4) =			1.0000 (105)

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Intermittency factor (Table 10b)	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					22.6135	36.8615	30.0921	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling												89.5671 (107)
Space cooling per m2												0.9631 (108)
Energy for space heating												35.6577 (99)
Energy for space cooling												0.9631 (108)
Total												36.6207 (109)
Target Fabric Energy Efficiency (TFEE)												42.1 (109)

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

Overheating Calculation Input Data

Dwelling type	MidTerrace House
Number of storeys	2
Cross ventilation possible	Yes
SAP Region	Severn Valley
Front of dwelling faces	South
Overshading	Average or unknown
Thermal mass parameter	219.9 (calculated from construction elements)
Night ventilation	No
Ventilation rate during hot weather (ach)	4.00 (Windows half open)

Overheating Calculation

Summer ventilation heat loss coefficient	298.92 (P1)
Transmission heat loss coefficient	42.92 (37)
Summer heat loss coefficient	341.84 (P2)

Overhangs

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

Solar shading

Orientation	Z blinds	Solar access	Z overhangs	Z summer
North	0.850	0.90	1.000	0.765 (P8)
South	0.850	0.90	1.000	0.765 (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	2.1200	82.4373	0.7100	0.7000	0.7650	59.8026
North	4.3700	82.4373	0.7100	0.7000	0.7650	123.2724
South	4.9100	113.6726	0.7100	0.7000	0.7650	190.9843
total:						374.0593

	Jun	Jul	Aug	
Solar gains	406	374	336	(P3)
Internal gains	469	450	459	
Total summer gains	876	824	795	(P5)

	2.56	2.41	2.33	
Summer gain/loss ratio	2.56	2.41	2.33	(P6)
Summer external temperature	15.00	16.70	16.70	
Thermal mass temperature increment (TMP = 219.9)	0.46	0.46	0.46	
Threshold temperature	18.02	19.57	19.49	(P7)
Likelihood of high internal temperature	Not significant	Not significant	Not significant	

Assessment of likelihood of high internal temperature: Not significant