



Doherty Energy



SAP Report Submission for Building Regulations Compliance

Client:

Project: 15a, Parliament Hill
London, NW3 2SY

Contact: Jason Doherty
Doherty Energy Limited
jason@doherty-energy.co.uk

Report Issue Date: 19/02/2019

EXCELLENCE
IN ENERGY
ASSESSMENT

PREDICTED ENERGY ASSESSMENT



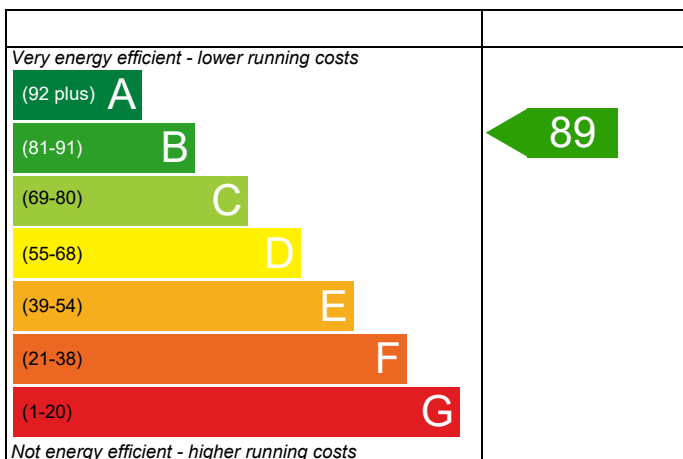
15a, Parliament Hill,
London,
NW3 2SY

Dwelling type: House, Mid-Terrace
Date of assessment: 19/02/2019
Produced by: Doherty Energy Limited
Total floor area: 343.4 m²
RRN: 3571-9202-9714

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

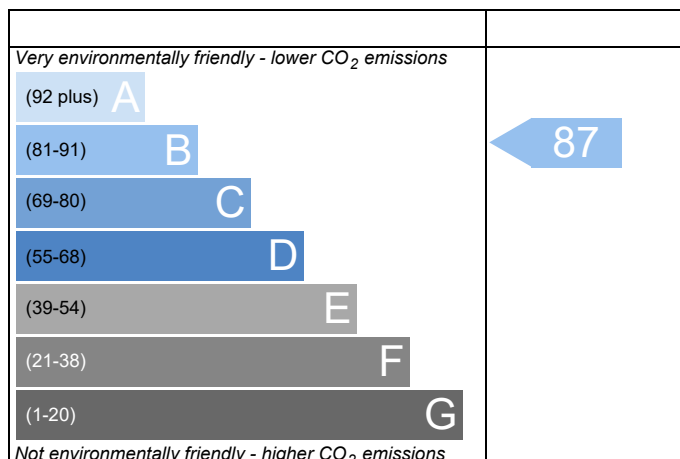


England

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 been produced by an accredited Elmhurst member whose work is subject to quality assurance audits. The data used to produce the report has been verified by the Elmhurst members' portal.



BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Designed)



Property Reference	E845-01	Issued on Date	19/02/2019
Assessment Reference	E845-01	Prop Type Ref	
Property	15a, Parliament Hill, London, NW3 2SY		
SAP Rating	89 B	DER	11.69
Environmental	87 B	TER	12.12
CO ₂ Emissions (t/year)	3.26	% DER<TER	3.51
General Requirements Compliance	Pass	DfEE	38.98
		TfEE	49.98
		% DfEE<TfEE	22.01
Assessor Details	Mr. Jason Doherty, Doherty Energy Limited, Tel: 01354 688413, jason@doherty-energy.co.uk		Assessor ID
			L143-0001
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)	12.12	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	11.69	kgCO ₂ /m ²	Pass
	-0.43 (-3.5%)	kgCO ₂ /m ²	

1b TfEE and DfEE

Target Fabric Energy Efficiency (TfEE)	49.98	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DfEE)	38.98	kWh/m ² /yr	
	-11.0 (-22.0%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.14 (max. 0.30)	0.22 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.10 (max. 0.25)	0.12 (max. 0.70)	Pass
Roof	0.11 (max. 0.20)	0.25 (max. 0.35)	Pass
Openings	1.11 (max. 2.00)	1.20 (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)	m ³ /(h.m ²) @ 50 Pa	
Maximum	10.0	m ³ /(h.m ²) @ 50 Pa	Pass

Limiting System Efficiencies

4 Heating efficiency

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BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Designed)



Main heating system

Boiler system with radiators or underfloor - Mains gas
Data from database
ATAG Q60S

Efficiency: 89.5% SEDBUK2009
Minimum: 88.0%

Pass

Secondary heating system

Room heaters - mains gas
Data from manufacturer, tested to BS EN 1266
Maestro 75 Eco
Efficiency: 89%
Minimum: 45%

Pass

5 Cylinder insulation

Hot water storage

Measured cylinder loss: 2.45 kWh/day
Permitted by DBSCG 3.41

Pass

Primary pipework insulated

Yes

Pass

6 Controls

Space heating controls

Time and temperature zone control

Pass

Hot water controls

Cylinderstat

Pass

Independent timer for DHW

Pass

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 (Thames Valley)

Not significant

Pass

Based on:

Overshading

Average

Windows facing North East

3.36 m², No overhang

Windows facing South East

38.05 m², No overhang

Windows facing South West

10.70 m², No overhang

Windows facing North West

17.70 m², No overhang

Air change rate

4.00 ach

Blinds/curtains

Light-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

Solid Wall

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

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BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Designed)



Air permeability at 50 pascals

5.00 (design value)

m³/(h.m²) @ 50 Pa

Maximum

10.0

m³/(h.m²) @ 50 Pa

Pass

10 Key features

External wall U-value	0.13	W/m ² K
External wall U-value	0.11	W/m ² K
External wall U-value	0.13	W/m ² K
External wall U-value	0.13	W/m ² K
External wall U-value	0.11	W/m ² K
External wall U-value	0.13	W/m ² K
External wall U-value	0.14	W/m ² K
External wall U-value	0.14	W/m ² K
External wall U-value	0.08	W/m ² K
External wall U-value	0.13	W/m ² K
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External wall U-value	0.12	W/m ² K
External wall U-value	0.14	W/m ² K
External wall U-value	0.12	W/m ² K
External wall U-value	0.11	W/m ² K
External wall U-value	0.14	W/m ² K
Party wall U-value	0.00	W/m ² K
Roof U-value	0.07	W/m ² K
Roof U-value	0.10	W/m ² K
Roof U-value	0.11	W/m ² K
Roof U-value	0.10	W/m ² K
Roof U-value	0.11	W/m ² K
Roof U-value	0.11	W/m ² K
Roof U-value	0.10	W/m ² K
Floor U-value	0.12	W/m ² K
Floor U-value	0.09	W/m ² K
Door U-value	0.14	W/m ² K
Window U-value	1.10	W/m ² K
Window U-value	1.15	W/m ² K
Roof window U-value	1.10	W/m ² K
Secondary heating (mains gas)	N/A	

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RECOMMENDATIONS

	Typical cost	Typical savings per year	Energy efficiency	Environmental impact	Result
Low energy lights			0	0	Already installed
Solar water heating			B 89	B 88	SAP increase too small
Photovoltaic	£5,000 - £8,000	£303	A 92	B 90	Recommended
Wind turbine			0	0	Not applicable
Totals	£5,000 - £8,000	£303	A 92	B 90	

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FULL SAP CALCULATION PRINTOUT

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Environmental	87 B	TER	12.12
CO ₂ Emissions (t/year)	3.26	% DER<TER	3.51
General Requirements Compliance	Pass	DFEE	38.98
		TFEE	49.98
		% DFEE<TFEE	22.01
Assessor Details	Mr. Jason Doherty, Doherty Energy Limited, Tel: 01354 688413, jason@doherty-energy.co.uk		Assessor ID
			L143-0001
Client			

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 343 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) 12.12 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 11.69 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)50.0 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)39.0 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.14 (max. 0.30)	0.22 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	0.11 (max. 0.20)	0.25 (max. 0.35)	OK
Openings	1.11 (max. 2.00)	1.20 (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
ATAG Q60S

Efficiency: 89.5% SEDBUK2009

Minimum: 88.0% OK

Secondary heating system: Room heaters - mains gas

Data from manufacturer, tested to BS EN 1266

Maestro 75 Eco

Efficiency: 89%

Minimum: 45% OK

5 Cylinder insulation

Hot water storage Measured cylinder loss: 2.45 kWh/day

Permitted by DBSCG 3.41 OK

Primary pipework insulated: Yes OK

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls:

Cylinderstat OK

Independent timer for DHW OK

Boiler interlock Yes OK

7 Low energy lights

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

Minimum 75%

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames Valley): Not significant OK

Based on:

Overshading: Average

Windows facing North East: 3.36 m², No overhang

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

Windows facing South East: 38.05 m², No overhang
Windows facing South West: 10.70 m², No overhang
Windows facing North West: 17.70 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: Light-coloured curtain or roller blind, closed 100% of daylight hours

10 Key features
External wall U-value 0.13 W/m²K
External wall U-value 0.11 W/m²K
External wall U-value 0.13 W/m²K
External wall U-value 0.13 W/m²K
External wall U-value 0.11 W/m²K
External wall U-value 0.13 W/m²K
External wall U-value 0.14 W/m²K
External wall U-value 0.14 W/m²K
External wall U-value 0.08 W/m²K
External wall U-value 0.13 W/m²K
External wall U-value 0.13 W/m²K
External wall U-value 0.13 W/m²K
External wall U-value 0.12 W/m²K
External wall U-value 0.14 W/m²K
External wall U-value 0.12 W/m²K
External wall U-value 0.11 W/m²K
External wall U-value 0.14 W/m²K
Party wall U-value 0.00 W/m²K
Roof U-value 0.07 W/m²K
Roof U-value 0.10 W/m²K
Roof U-value 0.11 W/m²K
Roof U-value 0.10 W/m²K
Roof U-value 0.11 W/m²K
Roof U-value 0.11 W/m²K
Roof U-value 0.10 W/m²K
Floor U-value 0.12 W/m²K
Floor U-value 0.09 W/m²K
Door U-value 0.14 W/m²K
Window U-value 1.10 W/m²K
Window U-value 1.15 W/m²K
Roof window U-value 1.10 W/m²K
Secondary heating (mains gas)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Basement floor	70.4000 (1a)	x 2.8000 (2a)	= 197.1200 (1a) - (3a)
Ground floor	110.6000 (1b)	x 2.7500 (2b)	= 304.1500 (1b) - (3b)
First floor	77.0000 (1c)	x 2.4000 (2c)	= 184.8000 (1c) - (3c)
Second floor	44.0000 (1d)	x 2.5900 (2d)	= 113.9600 (1d) - (3d)
Third floor	41.4000 (1e)	x 2.4000 (2e)	= 99.3600 (1e) - (3e)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e) ... (1n)	343.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e) ... (3n)	= 899.3900 (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					7 * 10 = 70.0000 (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 70.0000 / (5) = 0.0778 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3278 (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) =				0.2541 (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 infiltr rate	0.3239	0.3176	0.3112	0.2795	0.2731	0.2414	0.2414	0.2350	0.2541	0.2731	0.2858	0.2985 (22b)
Effective ac	0.5525	0.5504	0.5484	0.5391	0.5373	0.5291	0.5291	0.5276	0.5323	0.5373	0.5408	0.5446 (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
W1 (Uw = 1.20)			26.0000	1.1450	29.7710		(27)
W2 (Uw = 1.10)			40.8100	1.0536	42.9990		(27)
W3 (Uw = 1.15)			3.0000	1.0994	3.2983		(27)
D1			2.1600	0.1400	0.3024		(26)
R1 (Uw = 1.10)			3.1700	1.0536	3.3400		(27a)
Basement Floor			30.2000	0.1200	3.6240	110.0000	3322.0000 (28a)
Ground Floor			40.2000	0.0900	3.6180	110.0000	4422.0000 (28a)
B-1a	1.5000		1.5000	0.1300	0.1950	60.0000	90.0000 (29a)
B-1b	4.7000		4.7000	0.1100	0.5170	9.0000	42.3000 (29a)
B-2	17.2100	10.6100	6.6000	0.1300	0.8580	60.0000	396.0000 (29a)
B-3a	1.7000		1.7000	0.1300	0.2210	60.0000	102.0000 (29a)
B-3b+4	4.6000		4.6000	0.1100	0.5060	60.0000	276.0000 (29a)
B-5b	5.4000		5.4000	0.1800	0.9720	9.0000	48.6000 (29a)
B-6a+6b	0.2000		0.2000	0.1300	0.0260	9.0000	1.8000 (29a)
B-7b	2.3000		2.3000	0.1400	0.3220	9.0000	20.7000 (29a)
B-8b	9.4000		9.4000	0.1400	1.3160	110.0000	1034.0000 (29a)
B-9b	12.0000		12.0000	0.1600	1.9200	9.0000	108.0000 (29a)
GB-2b	8.4600	3.3600	5.1000	0.0800	0.4080	60.0000	306.0000 (29a)
GB-3+GF5+6+F-6	34.8600	12.3600	22.5000	0.1300	2.9250	110.0000	2475.0000 (29a)
GB-4	19.0000	5.5000	13.5000	0.1300	1.7550	110.0000	1485.0000 (29a)
GF-1+2+3	24.7200	11.7200	13.0000	0.2200	2.8600	9.0000	117.0000 (29a)
GF-4	1.9000		1.9000	0.1300	0.2470	60.0000	114.0000 (29a)
GF-8a	7.8000		7.8000	0.1200	0.9360	60.0000	468.0000 (29a)
GF-9a	8.9000		8.9000	0.1500	1.3350	60.0000	534.0000 (29a)
F-1+2+3+4+9+S-1+6+7	60.5300	14.2300	46.3000	0.1400	6.4820	110.0000	5093.0000 (29a)
F-7	6.8000		6.8000	0.1500	1.0200	60.0000	408.0000 (29a)
F-8	3.0000		3.0000	0.1200	0.3600	9.0000	27.0000 (29a)
S-2+3+T-1+3+4	45.8900	12.9900	32.9000	0.1100	3.6190	60.0000	1974.0000 (29a)
S-5	3.4000	1.2000	2.2000	0.1900	0.4180	110.0000	242.0000 (29a)
T-2	10.8000		10.8000	0.1400	1.5120	60.0000	648.0000 (29a)
GB-R1+2	3.1200	0.7200	2.4000	0.0700	0.1680	9.0000	21.6000 (30)
GB-R3	5.9000		5.9000	0.1000	0.5900	9.0000	53.1000 (30)
GB-R4	15.7000		15.7000	0.1100	1.7270	9.0000	141.3000 (30)
F-R1	16.3000	0.9000	15.4000	0.1000	1.5400	9.0000	138.6000 (30)
F-R2+3+S-R1	21.0500	1.5500	19.5000	0.1100	2.1450	9.0000	175.5000 (30)
T-R1+3+4+5+6+7+9+10	52.7000		52.7000	0.1100	5.7970	9.0000	474.3000 (30)
T-R2	9.2000		9.2000	0.1000	0.9200	9.0000	82.8000 (30)
T-R8	1.7000		1.7000	0.2500	0.4250	9.0000	15.3000 (30)
Total net area of external elements Aum(A, m ²)			491.1400				(31)
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		130.9948		(33)
Party Wall S			159.3000	0.0000	0.0000	20.0000	3186.0000 (32)
GB-R5			14.2000			30.0000	426.0000 (32b)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

B-S	180.4400	75.0000	13533.0000 (32c)
G-S	78.7000	75.0000	5902.5000 (32c)
F-S	149.3000	75.0000	11197.5000 (32c)
S-S	73.6000	75.0000	5520.0000 (32c)
G-F	70.4000	40.0000	2816.0000 (32d)
F-F	77.0000	18.0000	1386.0000 (32d)
S-F	44.0000	18.0000	792.0000 (32d)
T-F	41.4000	18.0000	745.2000 (32d)
B-C	70.4000	40.0000	2816.0000 (32e)
G-C	78.7000	18.0000	1416.6000 (32e)
F-C	44.0000	18.0000	792.0000 (32e)
S-C	41.4000	18.0000	745.2000 (32e)

Heat capacity $C_m = \text{Sum}(A \times k)$ (28)...(30) + (32) + (32a)...(32e) = 76130.9000 (34)
Thermal mass parameter (TMP = C_m / TFA) in $\text{kJ/m}^2\text{K}$ = 221.6974 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) = 42.0472 (36)
Total fabric heat loss (33) + (36) = 173.0420 (37)

Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)\text{m} \times (5)$	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	163.9717	163.3670	162.7743	159.9903	159.4694	157.0447	157.0447	156.5956	157.9787	159.4694	160.5232	161.6248	(38)
Heat transfer coeff	337.0137	336.4090	335.8163	333.0323	332.5114	330.0866	330.0866	329.6376	331.0206	332.5114	333.5651	334.6667	(39)
Average = Sum(39)m / 12 =												333.0298	(39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.9814	0.9796	0.9779	0.9698	0.9683	0.9612	0.9612	0.9599	0.9640	0.9683	0.9714	0.9746	(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 = 3.1884 (42)
Average daily hot water use (litres/day) = 109.9233 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	120.9156	116.5187	112.1218	107.7248	103.3279	98.9310	98.9310	103.3279	107.7248	112.1218	116.5187	120.9156	(44)
Energy content	179.3144	156.8295	161.8340	141.0908	135.3800	116.8226	108.2534	124.2223	125.7059	146.4981	159.9142	173.6564	(45)
Energy content (annual)													(45)
Distribution loss (46)m = $0.15 \times (45)\text{m}$													(46)
	26.8972	23.5244	24.2751	21.1636	20.3070	17.5234	16.2380	18.6333	18.8559	21.9747	23.9871	26.0485	(46)
Water storage loss:													(47)
Store volume													400.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													2.4500 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													1.3230 (55)
Total storage loss													(56)
	41.0130	37.0440	41.0130	39.6900	41.0130	39.6900	41.0130	41.0130	39.6900	41.0130	39.6900	41.0130	(56)
If cylinder contains dedicated solar storage													(57)
	41.0130	37.0440	41.0130	39.6900	41.0130	39.6900	41.0130	41.0130	39.6900	41.0130	39.6900	41.0130	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													(62)
	243.5898	214.8847	226.1094	203.2928	199.6554	179.0246	172.5288	188.4977	187.9079	210.7735	222.1162	237.9318	(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 =													(63)
	243.5898	214.8847	226.1094	203.2928	199.6554	179.0246	172.5288	188.4977	187.9079	210.7735	222.1162	237.9318	(64)
Total per year (kWh/year) = Sum(64)m =													(64)
	111.0424	98.5900	105.2301	96.6743	96.4342	88.6051	87.4146	92.7242	91.5588	100.1309	102.9331	109.1611	(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	159.4175	159.4175	159.4175	159.4175	159.4175	159.4175	159.4175	159.4175	159.4175	159.4175	159.4175	159.4175	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													(67)
	43.9731	39.0565	31.7629	24.0465	17.9751	15.1753	16.3975	21.3140	28.6077	36.3240	42.3955	45.1952	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													(68)
	492.5301	497.6410	484.7616	457.3430	422.7319	390.2024	368.4706	363.3597	376.2391	403.6577	438.2688	470.7983	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													(69)
	38.9418	38.9418	38.9418	38.9418	38.9418	38.9418	38.9418	38.9418	38.9418	38.9418	38.9418	38.9418	(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)													(71)
	-127.5340	-127.5340	-127.5340	-127.5340	-127.5340	-127.5340	-127.5340	-127.5340	-127.5340	-127.5340	-127.5340	-127.5340	(71)
Water heating gains (Table 5)													(72)
	149.2505	146.7113	141.4383	134.2699	129.6158	123.0627	117.4927	124.6294	127.1650	134.5846	142.9626	146.7219	(72)
Total internal gains													(73)
	759.5789	757.2340	731.7881	689.4846	644.1481	602.2656	576.1860	583.1284	605.8370	648.3915	697.4521	736.5407	(73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	3.3600	11.2829	0.6300	0.7000	0.7700	11.5860 (75)
Southeast	9.6700	36.7938	0.6300	0.7000	0.7700	108.7360 (77)
Southwest	6.7000	36.7938	0.6300	0.7000	0.7700	75.3393 (79)
Northwest	6.2700	11.2829	0.6300	0.7000	0.7700	21.6203 (81)

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Southeast			28.3800		36.7938		0.6300		0.7000		0.7700		319.1238 (77)
Southwest			4.0000		36.7938		0.6300		0.7000		0.7700		44.9787 (79)
Northwest			8.4300		11.2829		0.6300		0.7000		0.7700		29.0684 (81)
Northwest			3.0000		11.2829		0.6300		0.7000		0.7700		10.3446 (81)
Southwest			0.9000		38.2331		0.6300		0.7000		1.0000		13.6572 (82)
Horizontal			2.2700		26.0000		0.6300		0.7000		1.0000		23.4250 (82)

Solar gains	657.8795	1155.8502	1670.6086	2212.0409	2602.0597	2636.5450	2519.8329	2221.6470	1857.4672	1301.9230	794.5136	558.7265	(83)
Total gains	1417.4583	1913.0842	2402.3967	2901.5255	3246.2077	3238.8106	3096.0190	2804.7754	2463.3042	1950.3146	1491.9657	1295.2671	(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	62.7496	62.8624	62.9733	63.4998	63.5992	64.0664	64.0664	64.1537	63.8857	63.5992	63.3983	63.1896	
alpha	5.1833	5.1908	5.1982	5.2333	5.2399	5.2711	5.2711	5.2769	5.2590	5.2399	5.2266	5.2126	
util living area	0.9994	0.9971	0.9870	0.9424	0.8187	0.6267	0.4645	0.5307	0.8069	0.9777	0.9982	0.9996	(86)
MIT	19.9657	20.1294	20.3649	20.6454	20.8465	20.9291	20.9451	20.9420	20.8790	20.5855	20.2128	19.9375	(87)
Th 2	20.0989	20.1003	20.1018	20.1086	20.1098	20.1158	20.1158	20.1169	20.1135	20.1098	20.1073	20.1046	(88)
util rest of house	0.9992	0.9962	0.9829	0.9248	0.7712	0.5500	0.3735	0.4337	0.7394	0.9680	0.9975	0.9995	(89)
MIT 2	18.6877	18.9280	19.2713	19.6733	19.9337	20.0268	20.0389	20.0385	19.9799	19.5976	19.0558	18.6509	(90)
Living area fraction													
MIT	18.8812	19.1099	19.4369	19.8205	20.0719	20.1634	20.1761	20.1753	20.1160	19.7472	19.2310	18.8457	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8812	19.1099	19.4369	19.8205	20.0719	20.1634	20.1761	20.1753	20.1160	19.7472	19.2310	18.8457	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9989	0.9948	0.9789	0.9179	0.7690	0.5543	0.3798	0.4403	0.7397	0.9627	0.9966	0.9993	(94)
Useful gains	1415.8540	1903.1593	2351.7308	2663.3885	2496.3562	1795.2898	1175.8876	1234.9170	1821.9844	1877.5891	1486.8359	1294.3414	(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	4914.0607	4780.3388	4344.4226	3636.8822	2783.7607	1836.4177	1180.4293	1244.4819	1991.4323	3041.5547	4046.4724	4901.4301	(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	2602.6658	1933.4646	1482.5627	700.9155	213.8289	0.0000	0.0000	0.0000	0.0000	865.9904	1842.9383	2683.6740	(98)
Space heating												12326.0402	(98)
Space heating per m2												35.8941	(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)													0.1000 (201)
Fraction of space heat from main system(s)													0.9000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													89.0000 (208)
Space heating requirement													12257.9405 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	2602.6658	1933.4646	1482.5627	700.9155	213.8289	0.0000	0.0000	0.0000	0.0000	865.9904	1842.9383	2683.6740	(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)	2588.2864	1922.7825	1474.3718	697.0430	212.6476	0.0000	0.0000	0.0000	0.0000	861.2059	1832.7563	2668.8471	(211)
Water heating requirement	292.4344	217.2432	166.5801	78.7545	24.0257	0.0000	0.0000	0.0000	0.0000	97.3023	207.0717	301.5364	(215)
Water heating requirement	243.5898	214.8847	226.1094	203.2928	199.6554	179.0246	172.5288	188.4977	187.9079	210.7735	222.1162	237.9318	(64)
Efficiency of water heater (217)m	89.3712	89.1856	88.7752	87.6361	84.7160	79.8000	79.8000	79.8000	79.8000	87.9886	89.0892	79.8000	(216)
Fuel for water heating, kWh/month	272.5596	240.9411	254.6990	231.9739	235.6762	224.3417	216.2015	236.2127	235.4736	239.5464	249.3187	266.0694	(219)
Water heating fuel used												2903.0136	(219)
Annual totals kWh/year													
Space heating fuel - main system												12257.9405	(211)
Space heating fuel - secondary												1384.9483	(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)												776.5783	(232)
Total delivered energy for all uses												17397.4807	(238)

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



FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	12257.9405	0.2160	2647.7151 (261)
Space heating - secondary	1384.9483	0.2160	299.1488 (263)
Water heating (other fuel)	2903.0136	0.2160	627.0509 (264)
Space and water heating			3573.9149 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	776.5783	0.5190	403.0441 (268)
Total CO2, kg/year			4015.8840 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			11.6900 (273)

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

DER	11.6900	ZC1
Total Floor Area	TFA 343.4000	
Assumed number of occupants	N 3.1884	
CO2 emission factor in Table 12 for electricity displaced from grid	EF 0.5190	
CO2 emissions from appliances, equation (L14)	8.4992	ZC2
CO2 emissions from cooking, equation (L16)	0.5694	ZC3
Total CO2 emissions	20.7586	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	20.7586	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Basement floor	70.4000 (1a)	x 2.8000 (2a)	= 197.1200 (1a) - (3a)
Ground floor	110.6000 (1b)	x 2.7500 (2b)	= 304.1500 (1b) - (3b)
First floor	77.0000 (1c)	x 2.4000 (2c)	= 184.8000 (1c) - (3c)
Second floor	44.0000 (1d)	x 2.5900 (2d)	= 113.9600 (1d) - (3d)
Third floor	41.4000 (1e)	x 2.4000 (2e)	= 99.3600 (1e) - (3e)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e) ... (1n)	343.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e) ... (3n)	= 899.3900 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				40.0000 / (5) = 0.0445 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.2945 (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) =				0.2282 (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 infiltr rate	0.2910	0.2853	0.2796	0.2510	0.2453	0.2168	0.2168	0.2111	0.2282	0.2453	0.2567	0.2682 (22b)
Effective ac	0.5423	0.5407	0.5391	0.5315	0.5301	0.5235	0.5235	0.5223	0.5260	0.5301	0.5330	0.5360 (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			2.1600	1.0000	2.1600		(26)
TER Opening Type (Uw = 1.40)			69.8100	1.3258	92.5511		(27)
TER Room Window (Uw = 1.70)			3.1700	1.5918	5.0459		(27a)
Basement Floor			30.2000	0.1300	3.9260		(28a)
Ground Floor			40.2000	0.1300	5.2260		(28a)
B-1a	1.5000		1.5000	0.1800	0.2700		(29a)
B-1b	4.7000		4.7000	0.1800	0.8460		(29a)
B-2	17.2100	10.6100	6.6000	0.1800	1.1880		(29a)
B-3a	1.7000		1.7000	0.1800	0.3060		(29a)
B-3b+4	4.6000		4.6000	0.1800	0.8280		(29a)
B-5b	5.4000		5.4000	0.1800	0.9720		(29a)
B-6a+6b	0.2000		0.2000	0.1800	0.0360		(29a)
B-7b	2.3000		2.3000	0.1800	0.4140		(29a)
B-8b	9.4000		9.4000	0.1800	1.6920		(29a)
B-9b	12.0000		12.0000	0.1800	2.1600		(29a)
GB-2b	8.4600	3.3600	5.1000	0.1800	0.9180		(29a)
GB-3+GF5+6+F-6	34.8600	12.3600	22.5000	0.1800	4.0500		(29a)
GB-4	19.0000	5.5000	13.5000	0.1800	2.4300		(29a)
GF-1+2+3	24.7200	11.7200	13.0000	0.1800	2.3400		(29a)
GF-4	1.9000		1.9000	0.1800	0.3420		(29a)
GF-8a	7.8000		7.8000	0.1800	1.4040		(29a)
GF-9a	8.9000		8.9000	0.1800	1.6020		(29a)
F-1+2+3+4+9+S-1+6+7	60.5300	14.2300	46.3000	0.1800	8.3340		(29a)
F-7	6.8000		6.8000	0.1800	1.2240		(29a)
F-8	3.0000		3.0000	0.1800	0.5400		(29a)
S-2+3+T-1+3+4	45.8900	12.9900	32.9000	0.1800	5.9220		(29a)
S-5	3.4000	1.2000	2.2000	0.1800	0.3960		(29a)
T-2	10.8000		10.8000	0.1800	1.9440		(29a)
GB-R1+2	3.1200	0.7200	2.4000	0.1300	0.3120		(30)
GB-R3	5.9000		5.9000	0.1300	0.7670		(30)
GB-R4	15.7000		15.7000	0.1300	2.0410		(30)
F-R1	16.3000	0.9000	15.4000	0.1300	2.0020		(30)
F-R2+3+S-R1	21.0500	1.5500	19.5000	0.1300	2.5350		(30)
T-R1+3+4+5+6+7+9+10	52.7000		52.7000	0.1300	6.8510		(30)
T-R2	9.2000		9.2000	0.1300	1.1960		(30)
T-R8	1.7000		1.7000	0.1300	0.2210		(30)
Total net area of external elements Aum(A, m ²)			491.1400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	164.9920		(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)						34.6727	(36)
Total fabric heat loss						(33) + (36) =	199.6647 (37)

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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	160.9640	160.4761	159.9979	157.7516	157.3313	155.3749	155.3749	155.0126	156.1285	157.3313	158.1815	159.0704	(38)
Heat transfer coeff	360.6287	360.1408	359.6626	357.4163	356.9961	355.0396	355.0396	354.6773	355.7932	356.9961	357.8463	358.7351	(39)
Average = Sum(39)m / 12 =												357.4143	(39)
HLP	1.0502	1.0488	1.0474	1.0408	1.0396	1.0339	1.0339	1.0328	1.0361	1.0396	1.0421	1.0447	(40)
HLP (average)												1.0408	(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													3.1884	(42)
Average daily hot water use (litres/day)													109.9233	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Daily hot water use	120.9156	116.5187	112.1218	107.7248	103.3279	98.9310	98.9310	103.3279	107.7248	112.1218	116.5187	120.9156	(44)	
Energy conte	179.3144	156.8295	161.8340	141.0908	135.3800	116.8226	108.2534	124.2223	125.7059	146.4981	159.9142	173.6564	(45)	
Energy content (annual)													1729.5217	(45)
Distribution loss (46)m = 0.15 x (45)m														
	26.8972	23.5244	24.2751	21.1636	20.3070	17.5234	16.2380	18.6333	18.8559	21.9747	23.9871	26.0485	(46)	
Water storage loss:														
Store volume													400.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):													2.5234	(48)
Temperature factor from Table 2b													0.5400	(49)
Enter (49) or (54) in (55)													1.3626	(55)
Total storage loss														
	42.2417	38.1538	42.2417	40.8791	42.2417	40.8791	42.2417	42.2417	40.8791	42.2417	40.8791	42.2417	(56)	
If cylinder contains dedicated solar storage														
	42.2417	38.1538	42.2417	40.8791	42.2417	40.8791	42.2417	42.2417	40.8791	42.2417	40.8791	42.2417	(57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)	
Total heat required for water heating calculated for each month														
	244.8185	215.9945	227.3381	204.4819	200.8841	180.2137	173.7575	189.7264	189.0970	212.0022	223.3052	239.1605	(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														
	244.8185	215.9945	227.3381	204.4819	200.8841	180.2137	173.7575	189.7264	189.0970	212.0022	223.3052	239.1605	(64)	
Heat gains from water heating, kWh/month														
	112.0253	99.4778	106.2131	97.6256	97.4171	89.5564	88.3975	93.7072	92.5101	101.1139	103.8843	110.1441	(65)	

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

Metabolic gains (Table 5), Watts														
(66)m	159.4175	159.4175	159.4175	159.4175	159.4175	159.4175	159.4175	159.4175	159.4175	159.4175	159.4175	159.4175	(66)	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5														
	43.9731	39.0565	31.7629	24.0465	17.9751	15.1753	16.3975	21.3140	28.6077	36.3240	42.3955	45.1952	(67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5														
	492.5301	497.6410	484.7616	457.3430	422.7319	390.2024	368.4706	363.3597	376.2391	403.6577	438.2688	470.7983	(68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5														
	38.9418	38.9418	38.9418	38.9418	38.9418	38.9418	38.9418	38.9418	38.9418	38.9418	38.9418	38.9418	(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)														
	-127.5340	-127.5340	-127.5340	-127.5340	-127.5340	-127.5340	-127.5340	-127.5340	-127.5340	-127.5340	-127.5340	-127.5340	(71)	
Water heating gains (Table 5)														
	150.5717	148.0325	142.7596	135.5911	130.9370	124.3839	118.8139	125.9506	128.4862	135.9058	144.2838	148.0431	(72)	
Total internal gains														
	760.9001	758.5552	733.1093	690.8058	645.4693	603.5868	577.5072	584.4496	607.1582	649.7127	698.7733	737.8619	(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			
Northeast				3.3600	11.2829	0.6300	0.7000	0.7700	11.5860 (75)			
Southeast				38.0500	36.7938	0.6300	0.7000	0.7700	427.8598 (77)			
Southwest				10.7000	36.7938	0.6300	0.7000	0.7700	120.3180 (79)			
Northwest				17.7000	11.2829	0.6300	0.7000	0.7700	61.0334 (81)			
Southwest				0.9000	38.2331	0.6300	0.7000	1.0000	13.6572 (82)			
Horizontal				2.2700	26.0000	0.6300	0.7000	1.0000	23.4250 (82)			
Solar gains	657.8795	1155.8502	1670.6086	2212.0409	2602.0597	2636.5450	2519.8329	2221.6470	1857.4672	1301.9230	794.5136	558.7265 (83)
Total gains	1418.7795	1914.4054	2403.7179	2902.8467	3247.5289	3240.1318	3097.3402	2806.0966	2464.6254	1951.6358	1493.2869	1296.5883 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)														21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)															
tau	66.1268	66.2164	66.3044	66.7211	66.7997	67.1678	67.1678	67.2364	67.0255	66.7997	66.6410	66.4759			
alpha	5.4085	5.4144	5.4203	5.4481	5.4533	5.4779	5.4779	5.4824	5.4684	5.4533	5.4427	5.4317			

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

util living area	0.9997	0.9983	0.9918	0.9594	0.8542	0.6679	0.4984	0.5686	0.8437	0.9855	0.9990	0.9998 (86)
MIT	19.7175	19.9170	20.2110	20.5704	20.8476	20.9698	20.9948	20.9899	20.8951	20.5006	20.0285	19.6810 (87)
Th 2	20.0417	20.0429	20.0441	20.0495	20.0505	20.0552	20.0552	20.0561	20.0534	20.0505	20.0484	20.0463 (88)
util rest of house	0.9996	0.9978	0.9889	0.9445	0.8067	0.5829	0.3946	0.4585	0.7750	0.9781	0.9986	0.9997 (89)
MIT 2	18.3042	18.5969	19.0259	19.5413	19.9028	20.0355	20.0533	20.0519	19.9682	19.4516	18.7645	18.2541 (90)
Living area fraction									fLA = Living area / (4) =			0.1514 (91)
MIT	18.5183	18.7968	19.2053	19.6971	20.0459	20.1769	20.1959	20.1939	20.1086	19.6105	18.9559	18.4702 (92)
Temperature adjustment												0.0000
adjusted MIT	18.5183	18.7968	19.2053	19.6971	20.0459	20.1769	20.1959	20.1939	20.1086	19.6105	18.9559	18.4702 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9993	0.9966	0.9852	0.9375	0.8064	0.5944	0.4103	0.4751	0.7796	0.9732	0.9978	0.9996 (94)
Useful gains	1417.7945	1907.8912	2368.1161	2721.4471	2618.9608	1925.9458	1270.8078	1333.0561	1921.3365	1899.2402	1489.9904	1296.0305 (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	5127.5097	5004.7879	4569.6359	3859.0765	2979.4386	1980.0350	1276.6724	1345.6209	2137.8080	3216.6969	4242.5787	5119.2039 (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	2760.0281	2081.1146	1637.9307	819.0932	268.1955	0.0000	0.0000	0.0000	0.0000	980.1878	1981.8636	2844.4411 (98)
Space heating												13372.8545 (98)
Space heating per m2										(98) / (4) =		38.9425 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												93.5000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												14302.5182 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	2760.0281	2081.1146	1637.9307	819.0932	268.1955	0.0000	0.0000	0.0000	0.0000	980.1878	1981.8636	2844.4411 (98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000 (210)
Space heating fuel (main heating system)	2951.9017	2225.7910	1751.7976	876.0355	286.8401	0.0000	0.0000	0.0000	0.0000	1048.3291	2119.6402	3042.1830 (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	244.8185	215.9945	227.3381	204.4819	200.8841	180.2137	173.7575	189.7264	189.0970	212.0022	223.3052	239.1605 (64)
Efficiency of water heater	89.5220	89.3732	89.0448	88.1391	85.5855	79.8000	79.8000	79.8000	79.8000	88.3924	89.2876	79.8000 (216)
Fuel for water heating, kWh/month	273.4730	241.6771	255.3076	231.9992	234.7175	225.8317	217.7412	237.7524	236.9637	239.8422	250.0965	267.0140 (219)
Water heating fuel used												2912.4160 (219)
Annual totals kWh/year												
Space heating fuel - main system												14302.5182 (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)												776.5783 (232)
Total delivered energy for all uses												18066.5125 (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	14302.5182	0.2160	3089.3439 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2912.4160	0.2160	629.0819 (264)
Space and water heating			3718.4258 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	776.5783	0.5190	403.0441 (268)
Total CO2, kg/m2/year			4160.3949 (272)
Emissions per m2 for space and water heating			10.8283 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			1.1737 (272b)
Emissions per m2 for pumps and fans			0.1134 (272c)
Target Carbon Dioxide Emission Rate (TER) = (10.8283 * 1.00) + 1.1737 + 0.1134, rounded to 2 d.p.			12.1200 (273)