

Energy Calculations Ltd

SAP ♦ CODE ♦ SBEM ♦ DESIGN

01754-761035



SAP Report Submission for Building Regulations Compliance

Client:

Project: Flat 6, 18, Parkside Road
READING, RG30 2DB

Contact: Matthew Carter
Energy Calculations Limited
mcarter@energycalculations.co.uk

Report Issue Date: 16/08/2021

EXCELLENCE
IN ENERGY
ASSESSMENT

PREDICTED ENERGY ASSESSMENT

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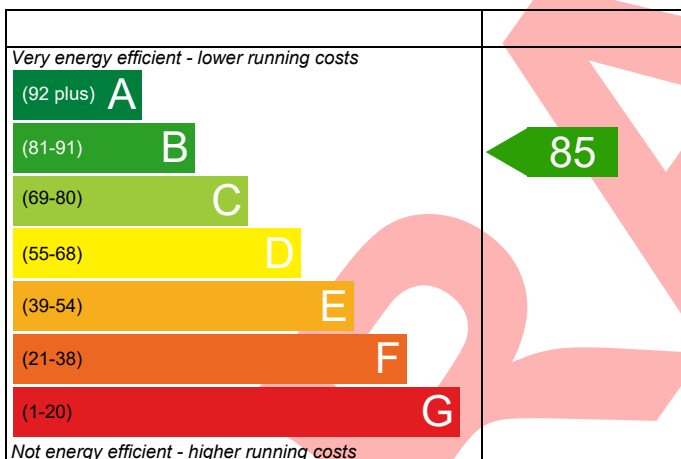
Flat 6, 18, Parkside Road,
READING,
RG30 2DB

Dwelling type: Flat, Mid-Terrace
Date of assessment: 16/08/2021
Produced by: Energy Calculations Limited
Total floor area: 73 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

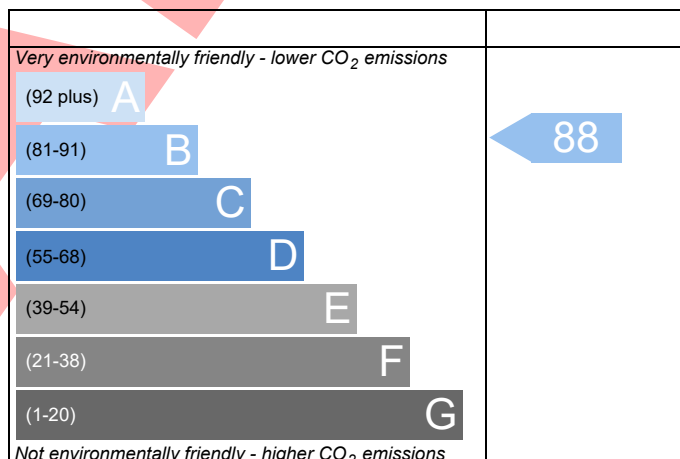


England

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.

THERMAL BRIDGING

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Calculation Type: New Build (As Designed)

Property Reference	015727		Issued on Date	16/08/2021	
Assessment Reference	004	Prop Type Ref			
Property	Flat 6, 18, Parkside Road, READING, RG30 2DB				
SAP Rating	85 B	DER	16.64	TER	24.80
Environmental	88 B	% DER<TER	32.90		
CO ₂ Emissions (t/year)	0.97	DFEE	38.64	TFEE	40.24
General Requirements Compliance	Pass	% DFEE<TFEE	3.99		
Assessor Details	Mr. Matthew Carter, Energy Calculations Limited, Tel: 01754 761035, mcarter@energycalculations.co.uk			Assessor ID	7869-0001
Client					

	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Table K1 - Approved	0.300	2.41	0.72	
External wall	E3 Sill	Table K1 - Approved	0.040	2.40	0.10	
External wall	E4 Jamb	Table K1 - Approved	0.050	6.90	0.35	
External wall	E7 Party floor between dwellings (in blocks of flats)	Table K1 - Approved	0.070	19.95	1.40	
External wall	E14 Flat roof	Table K1 - Default	0.080	10.00	0.80	
External wall	E16 Corner (normal)	Table K1 - Approved	0.090	9.60	0.86	
External wall	E17 Corner (inverted – internal area greater than external area)	Table K1 - Approved	-0.090	12.00	-1.08	
External wall	E18 Party wall between dwellings	Table K1 - Approved	0.060	9.60	0.58	
Party wall	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	0.000	20.85	0.00	

Total: **3.72** W/mK:
Y-Value: **0.030** W/m²K:

FULL SAP CALCULATION PRINTOUT

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Environmental	88 B	% DER<TER	32.90		
CO ₂ Emissions (t/year)	0.97	DFEE	38.64	TFEE	40.24
General Requirements Compliance	Pass	% DFEE<TFEE	3.99		
Assessor Details	Mr. Matthew Carter, Energy Calculations Limited, Tel: 01754 761035, mcarter@energycalculations.co.uk			Assessor ID	7869-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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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-floor flat, total floor area 73 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:Electricity

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 24.80 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 16.64 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)40.2 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)38.6 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.22 (max. 0.30)	0.22 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.14 (max. 0.25)	0.14 (max. 0.70)	OK
Roof	0.14 (max. 0.20)	0.14 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main heating system: Heat pump with radiators or underfloor - Electric
Panasonic WH-MDC05F3E5

Secondary heating system: None

5 Cylinder insulation

Hot water storage	Measured cylinder loss: 1.86 kWh/day	
Permitted by DBSCG 2.30	OK	
Primary pipework insulated:	Yes	OK

6 Controls

Space heating controls:	Time and temperature zone control	OK
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Hot water controls:

Cylinderstat	OK
Independent timer for DHW	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 (Thames Valley): Not significant OK

Based on:

Overshading:	Average
Windows facing West:	2.76 m ² , No overhang
Air change rate:	6.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Thermal bridging y-value	0.030 W/m ² K
Photovoltaic array	300.00 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.0000 (1b)	x 2.4000 (2b)	= 175.2000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 175.2000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					20.0000 / (5) = 0.1142 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3642 (18)
Number of sides sheltered					1 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3368 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
	0.4295	0.4211	0.4126	0.3705	0.3621	0.3200	0.3200	0.3116	0.3368	0.3621	0.3789	0.3958 (22b)
Effective ac	0.5922	0.5886	0.5851	0.5686	0.5656	0.5512	0.5512	0.5485	0.5567	0.5656	0.5718	0.5783 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.40)			2.7600	1.3258	3.6591		(27)
Door to Stairs			1.8900	1.4000	2.6460		(26)
Heat Loss Floor 1			73.0000	0.1400	10.2200		(28b)
Main Wall	39.0000	2.7600	36.2400	0.2200	7.9728	60.0000	2174.4000 (29a)
Wall to Hall	8.8800	1.8900	6.9900	0.2060	1.4396	190.0000	1328.1000 (29a)
Flat roof	4.2000		4.2000	0.1400	0.5880	9.0000	37.8000 (30)
Total net area of external elements Aum(A, m ²)			125.0800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.5255		(33)
Party Wall 1			50.0400	0.0000	0.0000	180.0000	9007.2000 (32)
Party Ceilings 1			68.8000			40.0000	2752.0000 (32b)
Internal Wall 1			99.2600			75.0000	7444.5000 (32c)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 22744.0000 (34)
311.5616 (35)
3.7205 (36)
(33) + (36) = 30.2460 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	34.2401	34.0330	33.8301	32.8768	32.6985	31.8682	31.8682	31.7145	32.1880	32.6985	33.0593	33.4365 (38)
Heat transfer coeff	64.4861	64.2790	64.0761	63.1228	62.9445	62.1142	62.1142	61.9605	62.4340	62.9445	63.3053	63.6825 (39)
Average = Sum(39)m / 12 =												63.1220 (39)
HLP	0.8834	0.8805	0.8778	0.8647	0.8623	0.8509	0.8509	0.8488	0.8553	0.8623	0.8672	0.8724 (40)
HLP (average)												0.8647 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3167 (42)
Average daily hot water use (litres/day)												89.2216 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	98.1438	94.5749	91.0061	87.4372	83.8683	80.2995	80.2995	83.8683	87.4372	91.0061	94.5749	98.1438 (44)
Energy conte	145.5444	127.2941	131.3561	114.5194	109.8841	94.8216	87.8662	100.8277	102.0319	118.9084	129.7978	140.9520 (45)
Energy content (annual)										Total = Sum(45)m =		1403.8037 (45)
Distribution loss (46)m = 0.15 x (45)m	21.8317	19.0941	19.7034	17.1779	16.4826	14.2232	13.1799	15.1242	15.3048	17.8363	19.4697	21.1428 (46)

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Water storage loss:												
Store volume												210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8600 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0044 (55)
Total storage loss												
	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364 (56)
If cylinder contains dedicated solar storage												
	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364 (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												
	199.9432	176.4285	185.7549	167.1634	164.2829	147.4656	142.2650	155.2265	154.6759	173.3072	182.4418	195.3508 (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												
	199.9432	176.4285	185.7549	167.1634	164.2829	147.4656	142.2650	155.2265	154.6759	173.3072	182.4418	195.3508 (64)
												Total per year (kWh/year) = Sum(64)m = 2044.3057 (64)
Heat gains from water heating, kWh/month												
	91.9126	81.6328	87.1949	80.1929	80.0555	73.6434	72.7345	77.0443	76.0408	83.0561	85.2730	90.3856 (65)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9991	0.9986	0.9968	0.9891	0.9536	0.8071	0.5895	0.6261	0.8862	0.9870	0.9978	0.9993 (94)
Useful gains	426.0996	439.0251	445.5119	445.0416	425.2894	345.3302	241.8993	252.7249	352.1006	390.2508	401.2199	412.8686 (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	1003.2154	965.1809	867.3099	714.1345	546.6123	366.5464	243.6301	255.4175	397.7953	608.8894	819.3053	996.8961 (97)
Month fracti	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	429.3741	353.5767	313.8177	193.7469	90.2642	0.0000	0.0000	0.0000	0.0000	162.6671	301.0214	434.5165 (98)

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Space heating 2278.9846 (98)
Space heating per m2 (98) / (4) = 31.2190 (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 %) 227.2422 (206)
Efficiency of secondary/supplementary heating system, % 100.0000 (208)
Space heating requirement 1002.8881 (211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	429.3741	353.5767	313.8177	193.7469	90.2642	0.0000	0.0000	0.0000	0.0000	162.6671	301.0214	434.5165
Space heating efficiency (main heating system 1)	227.2422	227.2422	227.2422	227.2422	227.2422	0.0000	0.0000	0.0000	0.0000	227.2422	227.2422	227.2422
Space heating fuel (main heating system)	188.9500	155.5947	138.0984	85.2601	39.7216	0.0000	0.0000	0.0000	0.0000	71.5831	132.4672	191.2129
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
Water heating requirement	199.9432	176.4285	185.7549	167.1634	164.2829	147.4656	142.2650	155.2265	154.6759	173.3072	182.4418	195.3508
Efficiency of water heater (217)m	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400
Fuel for water heating, kWh/month	118.0024	104.1245	109.6287	98.6564	96.9564	87.0312	83.9619	91.6115	91.2865	102.2823	107.6734	115.2920
Water heating fuel used												1206.5071
Annual totals kWh/year												
Space heating fuel - main system												1002.8881
Space heating fuel - secondary												0.0000
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000
Electricity for lighting (calculated in Appendix L)												431.6174
Energy saving/generation technologies (Appendices M ,N and Q)												
Total delivered energy for all uses												2641.0126

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	1002.8881	0.5190	520.4989
Space heating - secondary	0.0000	0.5190	0.0000
Water heating (other fuel)	1206.5071	0.5190	626.1772
Space and water heating			1146.6761
Pumps and fans	0.0000	0.0000	0.0000
Energy for lighting	431.6174	0.5190	224.0094
Energy saving/generation technologies			
PV Unit	-300.0000	0.5190	-155.7000
Total CO2, kg/year			1214.9855
Dwelling Carbon Dioxide Emission Rate (DER)			16.6400

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

	TFA	N	EF
DER			16.6400 ZC1
Total Floor Area	73.0000		
Assumed number of occupants	2.3167		
CO2 emission factor in Table 12 for electricity displaced from grid	0.5190		
CO2 emissions from appliances, equation (L14)			16.5756 ZC2
CO2 emissions from cooking, equation (L16)			2.3918 ZC3
Total CO2 emissions			35.6074 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			35.6074 ZC8

FULL SAP CALCULATION PRINTOUT

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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	73.0000 (1b)	x 2.4000 (2b)	= 175.2000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 175.2000 (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					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) =				Air changes per hour
Pressure test					30.0000 / (5) = 0.1712 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4212 (18)
					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3896 (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	0.4968	0.4871	0.4773	0.4286	0.4189	0.3702	0.3702	0.3604	0.3896	0.4189	0.4383	0.4578 (22b)
	0.6234	0.6186	0.6139	0.5919	0.5877	0.5685	0.5685	0.5650	0.5759	0.5877	0.5961	0.6048 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900			(26)				
TER Opening Type (Uw = 1.40)			2.7600	1.3258	3.6591			(27)				
Heat Loss Floor 1			73.0000	0.1300	9.4900			(28b)				
Main Wall	39.0000	2.7600	36.2400	0.1800	6.5232			(29a)				
Wall to Hall	8.8800	1.8900	6.9900	0.1800	1.2582			(29a)				
Flat roof	4.2000		4.2000	0.1300	0.5460			(30)				
Total net area of external elements Aum(A, m2)			125.0800					(31)				
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		23.3665			(33)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								3.1420 (36)				
Total fabric heat loss						(33) + (36) =		26.5085 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 36.0425	Feb 35.7655	Mar 35.4939	Apr 34.2185	May 33.9798	Jun 32.8689	Jul 32.8689	Aug 32.6632	Sep 33.2968	Oct 33.9798	Nov 34.4626	Dec 34.9673 (38)
Heat transfer coeff	62.5510	62.2740	62.0024	60.7269	60.4883	59.3774	59.3774	59.1717	59.8053	60.4883	60.9711	61.4758 (39)
Average = Sum(39)m / 12 =												60.7258 (39)
HLP	Jan 0.8569	Feb 0.8531	Mar 0.8493	Apr 0.8319	May 0.8286	Jun 0.8134	Jul 0.8134	Aug 0.8106	Sep 0.8193	Oct 0.8286	Nov 0.8352	Dec 0.8421 (40)
HLP (average)												0.8319 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3167 (42)
Average daily hot water use (litres/day)												89.2216 (43)
Daily hot water use	98.1438	94.5749	91.0061	87.4372	83.8683	80.2995	80.2995	83.8683	87.4372	91.0061	94.5749	98.1438 (44)
Energy conte	145.5444	127.2941	131.3561	114.5194	109.8841	94.8216	87.8662	100.8277	102.0319	118.9084	129.7978	140.9520 (45)
Energy content (annual)										Total = Sum(45)m =		1403.8037 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.8317	19.0941	19.7034	17.1779	16.4826	14.2232	13.1799	15.1242	15.3048	17.8363	19.4697	21.1428 (46)
Water storage loss:												
Store volume												210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7016 (48)
Temperature factor from Table 2b												0.5400 (49)

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Enter (49) or (54) in (55)												0.9188 (55)
Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842 (56)
If cylinder contains dedicated solar storage	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842 (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	197.2910	174.0329	183.1027	164.5968	161.6307	144.8990	139.6128	152.5743	152.1093	170.6550	179.8751	192.6986 (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 (64)
Output from w/h	197.2910	174.0329	183.1027	164.5968	161.6307	144.8990	139.6128	152.5743	152.1093	170.6550	179.8751	192.6986 (62)
								Total per year (kWh/year) = Sum(64)m =				2013.0780 (64)
Heat gains from water heating, kWh/month	89.7908	79.7164	85.0732	78.1396	77.9337	71.5901	70.6128	74.9225	73.9875	80.9343	83.2196	88.2638 (65)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2219.3898 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	393.9959	323.4343	285.9185	174.3045	82.6698	0.0000	0.0000	0.0000	0.0000	146.2340	272.5046	396.0679	(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)	421.3860	345.9191	305.7952	186.4219	88.4169	0.0000	0.0000	0.0000	0.0000	156.4000	291.4487	423.6020	(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	197.2910	174.0329	183.1027	164.5968	161.6307	144.8990	139.6128	152.5743	152.1093	170.6550	179.8751	192.6986	(64)
Efficiency of water heater (217)m	86.6245	86.4450	85.9983	84.9668	83.1258	79.8000	79.8000	79.8000	79.8000	84.4052	85.9192	79.8000	(216)
Fuel for water heating, kWh/month	227.7543	201.3221	212.9142	193.7190	194.4411	181.5777	174.9533	191.1959	190.6131	202.1854	209.3538	222.2709	(219)
Water heating fuel used												2402.3008	(219)
Annual totals kWh/year													
Space heating fuel - main system												2219.3898	(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)												431.6174	(232)
Total delivered energy for all uses												5128.3080	(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	2219.3898	0.2160	479.3882 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2402.3008	0.2160	518.8970 (264)
Space and water heating			998.2852 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	431.6174	0.5190	224.0094 (268)
Total CO2, kg/m2/year			1261.2196 (272)
Emissions per m2 for space and water heating			13.6751 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			3.0686 (272b)
Emissions per m2 for pumps and fans			0.5332 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.6751 * 1.55) + 3.0686 + 0.5332, rounded to 2 d.p.			24.8000 (273)

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CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.0000 (1b)	x 2.4000 (2b)	= 175.2000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 175.2000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 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					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) = 0.1712 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4212 (18)
Number of sides sheltered					1 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3896 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4968	0.4871	0.4773	0.4286	0.4189	0.3702	0.3702	0.3604	0.3896	0.4189	0.4383	0.4578 (22b)
Effective ac	0.6234	0.6186	0.6139	0.5919	0.5877	0.5685	0.5685	0.5650	0.5759	0.5877	0.5961	0.6048 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.40)			2.7600	1.3258	3.6591		(27)
Door to Stairs			1.8900	1.4000	2.6460		(26)
Heat Loss Floor 1			73.0000	0.1400	10.2200		(28b)
Main Wall	39.0000	2.7600	36.2400	0.2200	7.9728	60.0000	2174.4000 (29a)
Wall to Hall	8.8800	1.8900	6.9900	0.2060	1.4396	190.0000	1328.1000 (29a)
Flat roof	4.2000		4.2000	0.1400	0.5880	9.0000	37.8000 (30)
Total net area of external elements Aum(A, m ²)			125.0800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.5255		(33)
Party Wall 1			50.0400	0.0000	0.0000	180.0000	9007.2000 (32)
Party Ceilings 1			68.8000			30.0000	2064.0000 (32b)
Internal Wall 1			99.2600			75.0000	7444.5000 (32c)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 22056.0000 (34)
302.1370 (35)
3.7205 (36)
(33) + (36) = 30.2460 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	36.0425	35.7655	35.4939	34.2185	33.9798	32.8689	32.8689	32.6632	33.2968	33.9798	34.4626	34.9673 (38)
Heat transfer coeff	66.2886	66.0115	65.7400	64.4645	64.2258	63.1149	63.1149	62.9092	63.5428	64.2258	64.7086	65.2133 (39)
Average = Sum(39)m / 12 =												64.4633 (39)
HLP	0.9081	0.9043	0.9005	0.8831	0.8798	0.8646	0.8646	0.8618	0.8704	0.8798	0.8864	0.8933 (40)
HLP (average)												0.8831 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3167 (42)
Average daily hot water use (litres/day)												89.2216 (43)
Daily hot water use	98.1438	94.5749	91.0061	87.4372	83.8683	80.2995	80.2995	83.8683	87.4372	91.0061	94.5749	98.1438 (44)
Energy conte	145.5444	127.2941	131.3561	114.5194	109.8841	94.8216	87.8662	100.8277	102.0319	118.9084	129.7978	140.9520 (45)
Energy content (annual)										Total = Sum(45)m =		1403.8037 (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)

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Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Heat gains from water heating, kWh/month	30.9282	27.0500	27.9132	24.3354	23.3504	20.1496	18.6716	21.4259	21.6818	25.2680	27.5820	29.9523	(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	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.4400	21.7074	17.6536	13.3649	9.9904	8.4343	9.1136	11.8462	15.9000	20.1887	23.5631	25.1192	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	204.1952	206.3141	200.9745	189.6072	175.2580	161.7717	152.7621	150.6432	155.9828	167.3501	181.6993	195.1856	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	(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)	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	(71)
Water heating gains (Table 5)	41.5701	40.2530	37.5177	33.7991	31.3849	27.9855	25.0962	28.7982	30.1136	33.9624	38.3084	40.2585	(72)
Total internal gains	327.9558	326.0249	313.8963	294.5217	274.3838	255.9421	244.7224	249.0382	259.7468	279.2517	301.3213	318.3138	(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
-----								-----					
West				2.7600	19.6403	0.6300	0.7000			0.7700			16.5664 (80)
-----								-----					
Solar gains	16.5664	32.4074	53.3704	77.8375	95.3928	97.6515	92.9682	79.8583	62.0719	38.4541	20.6564	13.6234	(83)
Total gains	344.5222	358.4323	367.2667	372.3592	369.7766	353.5936	337.6906	328.8965	321.8188	317.7058	321.9777	331.9372	(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	92.4242	92.8121	93.1955	95.0394	95.3926	97.0716	97.0716	97.3891	96.4179	95.3926	94.6809	93.9481		
alpha	7.1616	7.1875	7.2130	7.3360	7.3595	7.4714	7.4714	7.4926	7.4279	7.3595	7.3121	7.2632		
util living area	0.9998	0.9997	0.9994	0.9977	0.9886	0.9318	0.7805	0.8187	0.9711	0.9978	0.9996	0.9999	(86)	
MIT	20.1247	20.1909	20.3263	20.5292	20.7328	20.9139	20.9837	20.9767	20.8546	20.5953	20.3347	20.1213	(87)	
Th 2	20.1607	20.1639	20.1670	20.1819	20.1847	20.1977	20.1977	20.2001	20.1927	20.1847	20.1791	20.1732	(88)	
util rest of house	0.9998	0.9996	0.9991	0.9964	0.9807	0.8816	0.6607	0.7074	0.9458	0.9963	0.9995	0.9998	(89)	
MIT 2	19.3492	19.4181	19.5561	19.7713	19.9745	20.1496	20.1931	20.1927	20.0971	19.8398	19.5749	19.3565	(90)	
Living area fraction									fLA = Living area / (4) =			0.4540	(91)	
MIT	19.7012	19.7689	19.9058	20.1153	20.3187	20.4966	20.5520	20.5486	20.4410	20.1828	19.9198	19.7037	(92)	
Temperature adjustment												0.0000		
adjusted MIT	19.7012	19.7689	19.9058	20.1153	20.3187	20.4966	20.5520	20.5486	20.4410	20.1828	19.9198	19.7037	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9997	0.9995	0.9989	0.9963	0.9823	0.9033	0.7169	0.7598	0.9554	0.9963	0.9994	0.9998	(94)
Ext temp.	344.4267	358.2691	366.8784	370.9648	363.2494	319.3837	242.0867	249.9065	307.4574	316.5175	321.7830	331.8688	(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	1020.9265	981.5208	881.2953	722.9914	553.5452	372.1640	249.4299	260.9875	402.9235	615.4628	829.5507	1011.0465	(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 per m2	503.3158	418.8251	382.7262	253.4591	141.5801	0.0000	0.0000	0.0000	0.0000	222.4153	365.5927	505.3083	(98)
												2793.2227	(98)
												38.2633	(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	593.2801	467.0503	478.1098	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7970	0.8955	0.8785	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	472.8627	418.2221	420.0411	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	502.2108	482.0984	474.1462	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													

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	0.0000	0.0000	0.0000	0.0000	0.0000	21.1306	47.5240	40.2542	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												108.9087 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	5.2826	11.8810	10.0635	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												27.2272 (107)
Space cooling per m2												0.3730 (108)
Energy for space heating												38.2633 (99)
Energy for space cooling												0.3730 (108)
Total												38.6363 (109)
Dwelling Fabric Energy Efficiency (DFEE)												38.6 (109)

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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	73.0000 (1b)	x 2.4000 (2b)	= 175.2000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 175.2000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 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					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) =					Air changes per hour
Pressure test					30.0000 / (5) = 0.1712 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4212 (18)
					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3896 (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	0.4968	0.4871	0.4773	0.4286	0.4189	0.3702	0.3702	0.3604	0.3896	0.4189	0.4383	0.4578 (22b)
Effective ac	0.6234	0.6186	0.6139	0.5919	0.5877	0.5685	0.5685	0.5650	0.5759	0.5877	0.5961	0.6048 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opaque door			1.8900	1.0000	1.8900			(26)					
TER Opening Type (Uw = 1.40)			2.7600	1.3258	3.6591			(27)					
Heat Loss Floor 1			73.0000	0.1300	9.4900			(28b)					
Main Wall	39.0000	2.7600	36.2400	0.1800	6.5232			(29a)					
Wall to Hall	8.8800	1.8900	6.9900	0.1800	1.2582			(29a)					
Flat roof	4.2000		4.2000	0.1300	0.5460			(30)					
Total net area of external elements Aum(A, m2)			125.0800					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =			23.3665		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.1420	(36)					
Total fabric heat loss						(33) + (36) =	26.5085	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 36.0425	Feb 35.7655	Mar 35.4939	Apr 34.2185	May 33.9798	Jun 32.8689	Jul 32.8689	Aug 32.6632	Sep 33.2968	Oct 33.9798	Nov 34.4626	Dec 34.9673	(38)
Heat transfer coeff	62.5510	62.2740	62.0024	60.7269	60.4883	59.3774	59.3774	59.1717	59.8053	60.4883	60.9711	61.4758	(39)
Average = Sum(39)m / 12 =												60.7258	(39)
HLP	Jan 0.8569	Feb 0.8531	Mar 0.8493	Apr 0.8319	May 0.8286	Jun 0.8134	Jul 0.8134	Aug 0.8106	Sep 0.8193	Oct 0.8286	Nov 0.8352	Dec 0.8421	(40)
HLP (average)												0.8319	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3167 (42)
Average daily hot water use (litres/day)												89.2216 (43)
Daily hot water use	98.1438	94.5749	91.0061	87.4372	83.8683	80.2995	80.2995	83.8683	87.4372	91.0061	94.5749	98.1438 (44)
Energy conte	145.5444	127.2941	131.3561	114.5194	109.8841	94.8216	87.8662	100.8277	102.0319	118.9084	129.7978	140.9520 (45)
Energy content (annual)												1403.8037 (45)
Distribution loss (46)m = 0.15 x (45)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
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 (57)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
	30.9282	27.0500	27.9132	24.3354	23.3504	20.1496	18.6716	21.4259	21.6818	25.2680	27.5820	29.9523 (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	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.4400	21.7074	17.6536	13.3649	9.9904	8.4343	9.1136	11.8462	15.9000	20.1887	23.5631	25.1192	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	204.1952	206.3141	200.9745	189.6072	175.2580	161.7717	152.7621	150.6432	155.9828	167.3501	181.6993	195.1856	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	(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)	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	(71)
Water heating gains (Table 5)	41.5701	40.2530	37.5177	33.7991	31.3849	27.9855	25.0962	28.7982	30.1136	33.9624	38.3084	40.2585	(72)
Total internal gains	327.9558	326.0249	313.8963	294.5217	274.3838	255.9421	244.7224	249.0382	259.7468	279.2517	301.3213	318.3138	(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			
West				2.7600	19.6403	0.6300	0.7000	0.7700	16.5664 (80)			
Solar gains	16.5664	32.4074	53.3704	77.8375	95.3928	97.6515	92.9682	79.8583	62.0719	38.4541	20.6564	13.6234 (83)
Total gains	344.5222	358.4323	367.2667	372.3592	369.7766	353.5936	337.6906	328.8965	321.8188	317.7058	321.9777	331.9372 (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	81.0449	81.4055	81.7620	83.4793	83.8087	85.3767	85.3767	85.6735	84.7658	83.8087	83.1451	82.4625	
alpha	6.4030	6.4270	6.4508	6.5653	6.5872	6.6918	6.6918	6.7116	6.6511	6.5872	6.5430	6.4975	
util living area	0.9994	0.9991	0.9982	0.9943	0.9775	0.8991	0.7372	0.7754	0.9505	0.9945	0.9989	0.9996	(86)
MIT	20.0483	20.1234	20.2753	20.5021	20.7252	20.9149	20.9831	20.9765	20.8538	20.5721	20.2823	20.0446	(87)
Th 2	20.2043	20.2076	20.2108	20.2258	20.2286	20.2417	20.2417	20.2442	20.2367	20.2286	20.2229	20.2170	(88)
util rest of house	0.9993	0.9988	0.9975	0.9918	0.9657	0.8453	0.6283	0.6725	0.9190	0.9915	0.9985	0.9994	(89)
MIT 2	19.3202	19.3980	19.5523	19.7908	20.0116	20.1923	20.2362	20.2356	20.1391	19.8632	19.5697	19.3271	(90)
Living area fraction									fLA = Living area / (4) =			0.4540	(91)
MIT	19.6507	19.7273	19.8805	20.1137	20.3356	20.5203	20.5753	20.5719	20.4636	20.1850	19.8932	19.6528	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6507	19.7273	19.8805	20.1137	20.3356	20.5203	20.5753	20.5719	20.4636	20.1850	19.8932	19.6528	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9991	0.9986	0.9971	0.9913	0.9676	0.8674	0.6785	0.7199	0.9300	0.9913	0.9982	0.9993	(94)
Ext temp.	344.2102	357.9310	366.1973	369.1191	357.8087	306.7196	229.1324	236.7809	299.2862	314.9459	321.3985	331.7041	(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	960.2021	923.3569	829.6267	680.9766	522.3501	351.5336	236.0401	246.8595	380.5756	579.7816	780.0145	949.9735	(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 per m2	458.2980	379.9662	344.7915	224.5374	122.4188	0.0000	0.0000	0.0000	0.0000	197.0378	330.2036	459.9924	(98)
												2517.2457	(98)
												34.4828	(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	558.1474	439.3926	449.7046	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8198	0.9066	0.8922	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	457.5697	398.3696	401.2101	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	502.2108	482.0984	474.1462	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	32.1416	62.2942	54.2645	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												148.7002	(104)
Cooled fraction												1.0000	(105)
Intermittency factor (Table 10b)													

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Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	8.0354	15.5735	13.5661	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling per m2												37.1751 (107)
Energy for space heating												0.5092 (108)
Energy for space cooling												34.4828 (99)
Total												0.5092 (108)
Target Fabric Energy Efficiency (TFEE)												34.9921 (109)
												40.2 (109)

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CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.0000 (1b)	x 2.4000 (2b)	= 175.2000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 175.2000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					20.0000 / (5) = 0.1142 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3642 (18)
					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3368 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.4000	4.1000	4.1000	3.9000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000 (22)
Wind factor	1.1000	1.0250	1.0250	0.9750	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000 (22a)
Adj infilt rate												
	0.3705	0.3453	0.3453	0.3284	0.3284	0.2863	0.2863	0.2779	0.2863	0.3200	0.3116	0.3368 (22b)
Effective ac	0.5686	0.5596	0.5596	0.5539	0.5539	0.5410	0.5410	0.5386	0.5410	0.5512	0.5485	0.5567 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.40)			2.7600	1.3258	3.6591		(27)
Door to Stairs			1.8900	1.4000	2.6460		(26)
Heat Loss Floor 1			73.0000	0.1400	10.2200		(28b)
Main Wall	39.0000	2.7600	36.2400	0.2200	7.9728	60.0000	2174.4000 (29a)
Wall to Hall	8.8800	1.8900	6.9900	0.2060	1.4396	190.0000	1328.1000 (29a)
Flat roof	4.2000		4.2000	0.1400	0.5880	9.0000	37.8000 (30)
Total net area of external elements Aum(A, m ²)			125.0800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.5255		(33)
Party Wall 1			50.0400	0.0000	0.0000	180.0000	9007.2000 (32)
Party Ceilings 1			68.8000			40.0000	2752.0000 (32b)
Internal Wall 1			99.2600			75.0000	7444.5000 (32c)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 22744.0000 (34)
311.5616 (35)
3.7205 (36)
(33) + (36) = 30.2460 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	32.8768	32.3541	32.3541	32.0261	32.0261	31.2778	31.2778	31.1405	31.2778	31.8682	31.7145	32.1880 (38)
Heat transfer coeff	63.1228	62.6001	62.6001	62.2721	62.2721	61.5238	61.5238	61.3865	61.5238	62.1142	61.9605	62.4340 (39)
Average = Sum(39)m / 12 =												62.1111 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.8647	0.8575	0.8575	0.8530	0.8530	0.8428	0.8428	0.8409	0.8428	0.8509	0.8488	0.8553 (40)
HLP (average)												0.8508 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy
Average daily hot water use (litres/day)
2.3167 (42)
89.2216 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	98.1438	94.5749	91.0061	87.4372	83.8683	80.2995	80.2995	83.8683	87.4372	91.0061	94.5749	98.1438 (44)
Energy conte	145.5444	127.2941	131.3561	114.5194	109.8841	94.8216	87.8662	100.8277	102.0319	118.9084	129.7978	140.9520 (45)
Energy content (annual)										Total = Sum(45)m =		1403.8037 (45)
Distribution loss (46)m = 0.15 x (45)m	21.8317	19.0941	19.7034	17.1779	16.4826	14.2232	13.1799	15.1242	15.3048	17.8363	19.4697	21.1428 (46)

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[illegible]

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	139.0020	139.0020	139.0020	139.0020	139.0020	139.0020	139.0020	139.0020	139.0020	139.0020	139.0020	139.0020 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	61.0999	54.2684	44.1340	33.4123	24.9761	21.0859	22.7840	29.6155	39.7499	50.4716	58.9078	62.7981 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	304.7689	307.9315	299.9620	282.9958	261.5791	241.4504	228.0032	224.8406	232.8101	249.7763	271.1930	291.3217 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.2169	51.2169	51.2169	51.2169	51.2169	51.2169	51.2169	51.2169	51.2169	51.2169	51.2169	51.2169 (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)	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680 (71)
Water heating gains (Table 5)	123.5384	121.4774	117.1975	111.3790	107.6015	102.2825	97.7615	103.5541	105.6122	111.6345	118.4347	121.4860 (72)
Total internal gains	586.9581	581.2282	558.8444	525.3380	491.7075	462.3696	446.0996	455.5612	475.7232	509.4333	546.0864	573.1567 (73)

[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		
West				2.7600	23.7835	0.6300	0.7000			0.7700	20.0612 (80)	
Solar gains	20.0612	34.2794	55.9479	82.6341	98.4983	106.5934	100.5050	88.1245	69.2962	43.6350	24.6407	16.5922 (83)
Total gains	607.0193	615.5075	614.7923	607.9721	590.2059	568.9630	546.6046	543.6856	545.0194	553.0683	570.7271	589.7489 (84)

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 ² (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	100.0871	100.9229	100.9229	101.4544	101.4544	102.6883	102.6883	102.9181	102.6883	101.7123	101.9647	101.1913
alpha	7.6725	7.7282	7.7282	7.7636	7.7636	7.8459	7.8459	7.8612	7.8459	7.7808	7.7976	7.7461
util living area	0.9922	0.9889	0.9771	0.9395	0.8192	0.5803	0.3826	0.4063	0.6865	0.9165	0.9809	0.9933 (86)
Weekday	19.6940	19.7629	19.8888	20.0352	20.1335	20.1647	20.1655	20.1672	20.1621	20.0841	19.8950	19.6943
Weekend	20.7510	20.7796	20.8368	20.9048	20.9591	20.9764	20.9775	20.9775	20.9735	20.9284	20.8362	20.7480
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	0	0	0	0	0	0	0	0	0	0	0	0
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0
MIT	20.6158	20.6590	20.7481	20.8514	20.9368	20.9638	20.9653	20.9653	20.9587	20.8896	20.7442	20.6110 (87)
Th 2	20.1976	20.2037	20.2037	20.2076	20.2076	20.2164	20.2164	20.2180	20.2164	20.2095	20.2113	20.2057 (88)
util rest of house	0.9893	0.9848	0.9681	0.9157	0.7611	0.4981	0.2945	0.3181	0.6064	0.8813	0.9728	0.9908 (89)
Weekday	19.6940	19.7629	19.8888	20.0352	20.1335	20.1647	20.1655	20.1672	20.1621	20.0841	19.8950	19.6943
Weekend	19.6940	19.7629	19.8888	20.0352	20.1335	20.1647	20.1655	20.1672	20.1621	20.0841	19.8950	19.6943
MIT 2	19.6940	19.7629	19.8888	20.0352	20.1335	20.1647	20.1655	20.1672	20.1621	20.0841	19.8950	19.6943 (90)
Living area fraction									fLA = Living area / (4) =			0.4540 (91)
MIT	20.1125	20.1697	20.2789	20.4057	20.4982	20.5275	20.5286	20.5295	20.5237	20.4497	20.2805	20.1104 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1125	20.1697	20.2789	20.4057	20.4982	20.5275	20.5286	20.5295	20.5237	20.4497	20.2805	20.1104 (93)

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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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	267.8229	209.8812	161.2254	76.2680	17.1932	0.0000	0.0000	0.0000	0.0000	50.6899	156.6757	271.9827 (98)
Space heating												1211.7390 (98)
RHI space heating demand												1212 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.0000 (1b)	x 2.4000 (2b)	= 175.2000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 175.2000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					20.0000 / (5) = 0.1142 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3642 (18)
					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3368 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
	0.4295	0.4211	0.4126	0.3705	0.3621	0.3200	0.3200	0.3116	0.3368	0.3621	0.3789	0.3958 (22b)
Effective ac	0.5922	0.5886	0.5851	0.5686	0.5656	0.5512	0.5512	0.5485	0.5567	0.5656	0.5718	0.5783 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.40)			2.7600	1.3258	3.6591		(27)
Door to Stairs			1.8900	1.4000	2.6460		(26)
Heat Loss Floor 1			73.0000	0.1400	10.2200		(28b)
Main Wall	39.0000	2.7600	36.2400	0.2200	7.9728	60.0000	2174.4000 (29a)
Wall to Hall	8.8800	1.8900	6.9900	0.2060	1.4396	190.0000	1328.1000 (29a)
Flat roof	4.2000		4.2000	0.1400	0.5880	9.0000	37.8000 (30)
Total net area of external elements Aum(A, m ²)			125.0800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.5255		(33)
Party Wall 1			50.0400	0.0000	0.0000	180.0000	9007.2000 (32)
Party Ceilings 1			68.8000			40.0000	2752.0000 (32b)
Internal Wall 1			99.2600			75.0000	7444.5000 (32c)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 22744.0000 (34)
311.5616 (35)
3.7205 (36)
(33) + (36) = 30.2460 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	34.2401	34.0330	33.8301	32.8768	32.6985	31.8682	31.8682	31.7145	32.1880	32.6985	33.0593	33.4365 (38)
Heat transfer coeff	64.4861	64.2790	64.0761	63.1228	62.9445	62.1142	62.1142	61.9605	62.4340	62.9445	63.3053	63.6825 (39)
Average = Sum(39)m / 12 =												63.1220 (39)
HLP	0.8834	0.8805	0.8778	0.8647	0.8623	0.8509	0.8509	0.8488	0.8553	0.8623	0.8672	0.8724 (40)
HLP (average)												0.8647 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy
Average daily hot water use (litres/day)
2.3167 (42)
89.2216 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	98.1438	94.5749	91.0061	87.4372	83.8683	80.2995	80.2995	83.8683	87.4372	91.0061	94.5749	98.1438 (44)
Energy conte	145.5444	127.2941	131.3561	114.5194	109.8841	94.8216	87.8662	100.8277	102.0319	118.9084	129.7978	140.9520 (45)
Energy content (annual)												
Distribution loss (46)m = 0.15 x (45)m	21.8317	19.0941	19.7034	17.1779	16.4826	14.2232	13.1799	15.1242	15.3048	17.8363	19.4697	21.1428 (46)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9918	0.9887	0.9793	0.9478	0.8556	0.6478	0.4516	0.4766	0.7232	0.9302	0.9822	0.9932 (94)
Useful gains	598.5882	606.6832	599.5434	571.6885	502.3191	362.7563	243.4635	255.1678	388.9541	509.6290	556.6624	582.7665 (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												
	1014.9891	976.6135	877.7947	722.6851	551.6961	367.6570	243.7414	255.5867	400.1746	616.8736	829.8129	1008.3630 (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												
	309.8023	248.5931	207.0190	108.7175	36.7365	0.0000	0.0000	0.0000	0.0000	79.7900	196.6683	316.6438 (98)

FULL SAP CALCULATION PRINTOUT

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Space heating 1503.9705 (98)
Space heating per m2 (98) / (4) = 20.6023 (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 %) 227.2422 (206)
Efficiency of secondary/supplementary heating system, % 100.0000 (208)
Space heating requirement 661.8360 (211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	309.8023	248.5931	207.0190	108.7175	36.7365	0.0000	0.0000	0.0000	0.0000	79.7900	196.6683	316.6438 (98)
Space heating efficiency (main heating system 1)	227.2422	227.2422	227.2422	227.2422	227.2422	0.0000	0.0000	0.0000	0.0000	227.2422	227.2422	227.2422 (210)
Space heating fuel (main heating system)	136.3313	109.3957	91.1006	47.8421	16.1662	0.0000	0.0000	0.0000	0.0000	35.1123	86.5457	139.3420 (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	199.9432	176.4285	185.7549	167.1634	164.2829	147.4656	142.2650	155.2265	154.6759	173.3072	182.4418	195.3508 (64)
Efficiency of water heater (217)m	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400 (216)
Fuel for water heating, kWh/month	118.0024	104.1245	109.6287	98.6564	96.9564	87.0312	83.9619	91.6115	91.2865	102.2823	107.6734	115.2920 (219)
Water heating fuel used												1206.5071 (219)
Annual totals kWh/year												
Space heating fuel - main system												661.8360 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)
Electricity for lighting (calculated in Appendix L)												431.6174 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
Total delivered energy for all uses												2299.9605 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	661.8360	13.1900	87.2962 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1206.5071	13.1900	159.1383 (247)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	431.6174	13.1900	56.9303 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit	0.0000	13.1900	0.0000 (252)
Total energy cost			303.3648 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12): 0.4200 (256)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] = 1.0798 (257)
SAP value 84.9372
SAP rating (Section 12) 85 (258)
SAP band B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	661.8360	0.5190	343.4929 (261)
Space heating - secondary	0.0000	0.5190	0.0000 (263)
Water heating (other fuel)	1206.5071	0.5190	626.1772 (264)
Space and water heating			969.6701 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	431.6174	0.5190	224.0094 (268)
Energy saving/generation technologies			
PV Unit	-300.0000	0.5190	-155.7000 (269)
Total kg/year			1037.9795 (272)
CO2 emissions per m2			14.2200 (273)
EI value			88.2128
EI rating			88 (274)
EI band			B

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Calculation of stars for heating and DHW

Main heating energy efficiency	$13.19 \times (1 + 0.29 \times 0.25) / 2.2724 = 6.225$, stars = 3
Main heating environmental impact	$0.519 \times (1 + 0.29 \times 0.25) / 2.2724 = 0.2449$, stars = 4
Water heating energy efficiency	$13.19 / 1.6944 = 7.784$, stars = 2
Water heating environmental impact	$0.519 / 1.6944 = 0.3063$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.0000 (1b)	x 2.4000 (2b)	= 175.2000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 175.2000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) = 0.1142 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3642 (18)
Number of sides sheltered					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3368 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.4000	4.1000	4.1000	3.9000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000 (22)
Wind factor	1.1000	1.0250	1.0250	0.9750	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000 (22a)
Adj infilt rate												
Effective ac	0.3705	0.3453	0.3453	0.3284	0.3284	0.2863	0.2863	0.2779	0.2863	0.3200	0.3116	0.3368 (22b)
Effective ac	0.5686	0.5596	0.5596	0.5539	0.5539	0.5410	0.5410	0.5386	0.5410	0.5512	0.5485	0.5567 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.40)			2.7600	1.3258	3.6591		(27)
Door to Stairs			1.8900	1.4000	2.6460		(26)
Heat Loss Floor 1			73.0000	0.1400	10.2200		(28b)
Main Wall	39.0000	2.7600	36.2400	0.2200	7.9728	60.0000	2174.4000 (29a)
Wall to Hall	8.8800	1.8900	6.9900	0.2060	1.4396	190.0000	1328.1000 (29a)
Flat roof	4.2000		4.2000	0.1400	0.5880	9.0000	37.8000 (30)
Total net area of external elements Aum(A, m ²)			125.0800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.5255		(33)
Party Wall 1			50.0400	0.0000	0.0000	180.0000	9007.2000 (32)
Party Ceilings 1			68.8000			40.0000	2752.0000 (32b)
Internal Wall 1			99.2600			75.0000	7444.5000 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 22744.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 311.5616 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.7205 (36)
Total fabric heat loss (33) + (36) = 30.2460 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	32.8768	32.3541	32.3541	32.0261	32.0261	31.2778	31.2778	31.1405	31.2778	31.8682	31.7145	32.1880 (38)
Heat transfer coeff	63.1228	62.6001	62.6001	62.2721	62.2721	61.5238	61.5238	61.3865	61.5238	62.1142	61.9605	62.4340 (39)
Average = Sum(39)m / 12 =												62.1111 (39)
HLP	0.8647	0.8575	0.8575	0.8530	0.8530	0.8428	0.8428	0.8409	0.8428	0.8509	0.8488	Dec 0.8553 (40)
HLP (average)												0.8508 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3167 (42)
Average daily hot water use (litres/day)												89.2216 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	98.1438	94.5749	91.0061	87.4372	83.8683	80.2995	80.2995	83.8683	87.4372	91.0061	94.5749	98.1438 (44)
Energy content (annual)	145.5444	127.2941	131.3561	114.5194	109.8841	94.8216	87.8662	100.8277	102.0319	118.9084	129.7978	140.9520 (45)
Distribution loss (46)m = 0.15 x (45)m	21.8317	19.0941	19.7034	17.1779	16.4826	14.2232	13.1799	15.1242	15.3048	17.8363	19.4697	21.1428 (46)

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Water storage loss:												
Store volume											210.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):											1.8600 (48)	
Temperature factor from Table 2b											0.5400 (49)	
Enter (49) or (54) in (55)											1.0044 (55)	
Total storage loss												
	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364 (56)
If cylinder contains dedicated solar storage												
	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364 (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 (58)
Total heat required for water heating calculated for each month												
	199.9432	176.4285	185.7549	167.1634	164.2829	147.4656	142.2650	155.2265	154.6759	173.3072	182.4418	195.3508 (59)
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	199.9432	176.4285	185.7549	167.1634	164.2829	147.4656	142.2650	155.2265	154.6759	173.3072	182.4418	195.3508 (64)
											Total per year (kWh/year) = Sum(64)m =	2044.3057 (64)
Heat gains from water heating, kWh/month												
	91.9126	81.6328	87.1949	80.1929	80.0555	73.6434	72.7345	77.0443	76.0408	83.0561	85.2730	90.3856 (65)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9889	0.9846	0.9691	0.9223	0.7836	0.5310	0.3296	0.3533	0.6385	0.8932	0.9737	0.9904 (94)
Useful gains	600.2762	606.0022	595.7814	560.7397	462.4997	302.1394	180.1565	192.0747	348.0095	493.9855	555.6922	584.0808 (95)
Ext temp.	4.9000	5.5000	7.3000	9.7000	12.7000	15.6000	17.6000	17.4000	14.8000	11.4000	7.8000	4.9000 (96)
Heat loss rate W	960.2532	918.3254	812.4821	666.6676	485.6088	303.1571	180.1765	192.1096	352.1447	562.1171	773.2973	949.6489 (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	267.8229	209.8812	161.2254	76.2680	17.1932	0.0000	0.0000	0.0000	0.0000	50.6899	156.6757	271.9827 (98)

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Space heating
Space heating per m2 (98) / (4) = 1211.7390 (98)
16.5992 (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 %) 224.3114 (206)
Efficiency of secondary/supplementary heating system, % 100.0000 (208)
Space heating requirement 540.2040 (211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	267.8229	209.8812	161.2254	76.2680	17.1932	0.0000	0.0000	0.0000	0.0000	50.6899	156.6757	271.9827	(98)
Space heating efficiency (main heating system 1)	224.3114	224.3114	224.3114	224.3114	224.3114	0.0000	0.0000	0.0000	0.0000	224.3114	224.3114	224.3114	(210)
Space heating fuel (main heating system)	119.3978	93.5669	71.8757	34.0010	7.6649	0.0000	0.0000	0.0000	0.0000	22.5980	69.8474	121.2523	(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	199.9432	176.4285	185.7549	167.1634	164.2829	147.4656	142.2650	155.2265	154.6759	173.3072	182.4418	195.3508	(64)
Efficiency of water heater (217)m	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	(216)
Fuel for water heating, kWh/month	118.0024	104.1245	109.6287	98.6564	96.9564	87.0312	83.9619	91.6115	91.2865	102.2823	107.6734	115.2920	(219)
Water heating fuel used												1206.5071	(219)
Annual totals kWh/year													
Space heating fuel - main system												540.2040	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												431.6174	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses												2178.3285	(238)

10a. Fuel costs - using BEDF prices (480)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	540.2040	19.1200	103.2870	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1206.5071	19.1200	230.6842	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	431.6174	19.1200	82.5252	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit	0.0000	19.1200	0.0000	(252)
Total energy cost			416.4964	(255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	540.2040	0.5190	280.3659	(261)
Space heating - secondary	0.0000	0.5190	0.0000	(263)
Water heating (other fuel)	1206.5071	0.5190	626.1772	(264)
Space and water heating			906.5431	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	431.6174	0.5190	224.0094	(268)
Energy saving/generation technologies				
PV Unit	-300.0000	0.5190	-155.7000	(269)
Total kg/year			974.8525	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	540.2040	3.0700	1658.4262	(261)
Space heating - secondary	0.0000	3.0700	0.0000	(263)
Water heating (other fuel)	1206.5071	3.0700	3703.9768	(264)
Space and water heating			5362.4031	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	431.6174	3.0700	1325.0655	(268)
Energy saving/generation technologies				
PV Unit	-300.0000	3.0700	-921.0000	(269)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Energy Calculations Ltd
SAP ♦ CODE ♦ SBEM ♦ DESIGN

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

Primary energy kWh/year
Primary energy kWh/m²/year

5766.4685 (272)
78.9927 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 85
Current environmental impact rating: B 88

(For testing purposes):

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

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

Recommended measures Typical annual savings Energy Environmental
(none) efficiency impact

Total Savings £0 0.00 kg/m²

Potential energy efficiency rating: B 85
Potential environmental impact rating: B 88

Fuel prices for cost data on this page from database revision number 480 TEST (28 Jul 2021)
Recommendation texts revision number 4.9c (22 Feb 2014)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£416	£416	£0
Space heating	£103	£103	£0
Water heating	£231	£231	£0
Lighting	£83	£83	£0
Total cost of fuels	£416	£416	£0
Total cost of uses	£417	£417	£0
Delivered energy	30 kWh/m ²	30 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	1.0 tonnes	1.0 tonnes	0.0 tonnes
CO2 emissions per m ²	13 kg/m ²	13 kg/m ²	0 kg/m ²
Primary energy	79 kWh/m ²	79 kWh/m ²	0 kWh/m ²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Energy Calculations Ltd
SAP ♦ CODE ♦ SBEM ♦ DESIGN

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Energy Calculations Ltd
SAP ♦ CODE ♦ SBEM ♦ DESIGN

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

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

No improvements selected / applicable

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

Overheating Calculation Input Data

Dwelling type	MidTerrace Flat
Number of storeys	1
Cross ventilation possible	Yes
SAP Region	Thames Valley
Front of dwelling faces	West
Overshading	Average or unknown
Thermal mass parameter	311.6 (calculated from construction elements)
Night ventilation	No
Ventilation rate during hot weather (ach)	6.00 (Windows fully open)

Overheating Calculation

Summer ventilation heat loss coefficient	346.90 (P1)
Transmission heat loss coefficient	30.25 (37)
Summer heat loss coefficient	377.14 (P2)

Overhangs	Ratio	Z_overhangs	Overhang type
Orientation			
West	0.000	1.000	None
Solar shading			
Orientation	Z blinds	Solar access	Z overhangs Z summer
West	1.000	0.90	1.000 0.900 (P8)
[Jul]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b
West	2.7600	117.5071	0.6300
total:			0.7000
			0.9000
			115.8502
			115.8502

	Jun	Jul	Aug	
Solar gains	123	116	102	(P3)
Internal gains	462	446	456	
Total summer gains	585	562	557	(P5)
Summer gain/loss ratio	1.55	1.49	1.48	(P6)
Summer external temperature	16.00	17.90	17.80	
Thermal mass temperature increment (TMP = 311.6)	0.00	0.00	0.00	
Threshold temperature	17.55	19.39	19.28	(P7)
Likelihood of high internal temperature	Not significant	Not significant	Not significant	
Assessment of likelihood of high internal temperature:	Not significant			

BASIC COMPLIANCE REPORT

Energy Calculations Ltd
SAP • CODE • SBEM • DESIGN

Calculation Type: New Build (As Designed)

Property Reference	015727	Issued on Date	16/08/2021
Assessment Reference	004	Prop Type Ref	
Property	Flat 6, 18, Parkside Road, READING, RG30 2DB		
SAP Rating	85 B	DER	16.64
Environmental	88 B	TER	24.80
CO ₂ Emissions (t/year)	0.97	% DER<TER	32.90
General Requirements Compliance	Pass	DFEE	38.64
		TFEE	40.24
		% DFEE<TFEE	3.99
Assessor Details	Mr. Matthew Carter, Energy Calculations Limited, Tel: 01754 761035, mcarter@energycalculations.co.uk		Assessor ID
			7869-0001
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	Electricity		
Fuel factor	1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	24.80	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.64	kgCO ₂ /m ²	Pass
	-8.16 (-32.9%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	40.24	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	38.64	kWh/m ² /yr	
	-1.6 (-4.0%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.22 (max. 0.30)	0.22 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.14 (max. 0.25)	0.14 (max. 0.70)	Pass
Roof	0.14 (max. 0.20)	0.14 (max. 0.35)	Pass
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Heat pump with radiators or underfloor - Electric Panasonic WH-MDC05F3E5	
Secondary heating system	None	

BASIC COMPLIANCE REPORT

Energy Calculations Ltd
SAP • CODE • SBEM • DESIGN

Calculation Type: New Build (As Designed)

5 Cylinder insulation

Hot water storage

Measured cylinder loss: 1.86 kWh/day
Permitted by DBSCG 2.30

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

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 West

2.76 m², No overhang

Air change rate

6.00 ach

Blinds/curtains

None

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

Air permeability at 50 pascals

5.00 (design value)

Maximum

10.0

Pass

10 Key features

Party wall U-value

0.00

W/m²K

Thermal bridging y-value

0.030

W/m²K

Photovoltaic array

300.00

kWh/Year

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

SUMMARY FOR INPUT DATA

Energy Calculations Ltd
SAP • CODE • SBEM • DESIGN

Calculation Type: New Build (As Designed)

Property Reference	015727	Issued on Date	16/08/2021
Assessment Reference	004	Prop Type Ref	
Property	Flat 6, 18, Parkside Road, READING, RG30 2DB		
SAP Rating	85 B	DER	16.64
Environmental	88 B	TER	24.80
CO ₂ Emissions (t/year)	0.97	% DER<TER	32.90
General Requirements Compliance	Pass	DFEE	38.64
		TFEE	40.24
		% DFEE<TFEE	3.99
Assessor Details	Mr. Matthew Carter, Energy Calculations Limited, Tel: 01754 761035, mcarter@energycalculations.co.uk		Assessor ID
			7869-0001
Client			

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

Orientation	West
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Urban
1.0 Property Type	Flat, Mid-Terrace
2.0 Number of Storeys	1
3.0 Date Built	2020
4.0 Sheltered Sides	1
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements			
	Ground Floor:	Heat Loss Perimeter 19.95 m	Internal Floor Area 73.00 m ²
			Average Storey Height 2.40 m

7.0 Living Area	33.14	m ²
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8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	311.56	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)
Main Wall	Cavity Wall	Cavity wall : plasterboard on dabs, AAC block, filled cavity, any outside structure	0.22	60.00	39.00	36.24
Wall to Hall	Cavity Wall	Cavity wall : dense plaster, dense block, filled cavity, any outside structure	0.22	190.00	8.88	6.99

9.1 Party Walls					
Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)
Party Wall 1	Solid Wall	Dense plaster both sides, dense blocks, cavity or cavity fill	0.00	180.00	50.04

9.2 Internal Walls					
Description	Construction		Kappa (kJ/m ² K)	Area (m ²)	
Internal Wall 1	Dense block, plasterboard on dabs		75.00	99.26	

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)
Flat roof	External Flat Roof	Plasterboard, insulated flat roof	0.14	9.00	4.20	4.20

10.1 Party Ceilings

SUMMARY FOR INPUT DATA

Energy Calculations Ltd
SAP • CODE • SBEM • DESIGN

Calculation Type: New Build (As Designed)

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceilings 1	Precast concrete planks floor, screed, carpeted	30.00	68.80

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)
Heat Loss Floor 1	Exposed Floor - Solid	Other	0.14	0.00	73.00

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
External Door	Manufacture	Half Glazed Door	Double Low-E Soft 0.05			0.63		0.70	1.40
Windows	Manufacture	Window	Double Low-E Soft 0.05			0.63		0.70	1.40
Door to Stairs	SAP table	Door to Corridor							1.40

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
Door	Door to Corridor	[2] Wall to Hall	South							1.89	
Windows	Window	[1] Main Wall	West	None	0.00					2.76	

14.0 Conservatory

None

15.0 Draught Proofing

100

 %

16.0 Draught Lobby

Yes

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported
Table K1 - Approved	E2 Other lintels (including other steel lintels)	2.41	0.300	No
Table K1 - Approved	E3 Sill	2.40	0.040	No
Table K1 - Approved	E4 Jamb	6.90	0.050	No
Table K1 - Approved	E7 Party floor between dwellings (in blocks of flats)	19.95	0.070	No
Table K1 - Default	E14 Flat roof	10.00	0.080	No
Table K1 - Approved	E16 Corner (normal)	9.60	0.090	No
Table K1 - Approved	E17 Corner (inverted – internal area greater than external area)	12.00	-0.090	No
Table K1 - Approved	E18 Party wall between dwellings	9.60	0.060	No
Table K1 - Default	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	20.85	0.000	No

Y-value	0.030	W/m²K
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18.0 Pressure Testing

Yes

Designed AP ₅₀	5.00	m³/(h.m²) @ 50 Pa
Property Tested ?		
As Built AP ₅₀		m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Windows fully open
Cross ventilation possible	Yes
Night Ventilation	No
Air change rate	6.00

Mechanical Ventilation

Mechanical Ventilation System Present	No
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SUMMARY FOR INPUT DATA

Energy Calculations Ltd
SAP ♦ CODE ♦ SBEM ♦ DESIGN

Calculation Type: New Build (As Designed)

20.0 Fans, Open Fireplaces, Flues

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

21.0 Fixed Cooling System

No

22.0 Lighting

Internal

Total number of light fittings	9	
Total number of L.E.L. fittings	9	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	Yes
Light and motion sensor	Yes

23.0 Electricity Tariff

Standard

24.0 Main Heating 1

Percentage of Heat	100	%
Database Ref. No.	102968	
Fuel Type	Electricity	
Main Heating	PET	
SAP Code	224	
In Winter	0.0	
In Summer	0.0	
Controls	CHD Time and temperature zone control	
PCDF Controls	0	
Sap Code	2207	
Is MHS Pumped	Pump in heated space	
Heat Emitter	Underfloor	
Underfloor Heating	Yes - Pipes in thin screed	
Flow Temperature	<= 35°C	

25.0 Main Heating 2

None

Community Heating	None
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28.0 Water Heating

Water Heating	HWP From main heating 1
Flue Gas Heat Recovery System	Main Heating 1
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

SUMMARY FOR INPUT DATA

Energy Calculations Ltd
SAP • CODE • SBEM • DESIGN

Calculation Type: New Build (As Designed)

SAP Code	901
Immersion Only Heating Hot Water	Yes
29.0 Hot Water Cylinder	Hot Water Cylinder
Cylinder Stat	Yes
Cylinder In Heated Space	Yes
Independent Time Control	Yes
Insulation Type	Measured Loss
Cylinder Volume	210.00
Loss	1.86
Pipes insulation	Fully insulated primary pipework
31.0 Thermal Store	None
32.0 Photovoltaic Unit	More Dwellings, One Block
Apportioned	300.00

L
kWh/day

kWh/Year

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

BLOCK COMPLIANCE

Energy Calculations Ltd
SAP • CODE • SBEM • DESIGN

Calculation Type: New Build (As Designed)

Block Reference	000516	Issued on Date	16/08/2021
Block Name	Parkside Road		
Assessor Details	Mr. Matthew Carter, Energy Calculations Limited, Tel: 01754 761035, mcarter@energycalculations.co.uk	Assessor ID	7869-0001
Client			

Block Compliance Report - DER

Block Reference: 000516		Block Name: Parkside Road			
Property-Assessment Reference	Multiplier	Floor Area (m ²)	DER (kgCO ₂ /m ²)	TER (kgCO ₂ /m ²)	% DER/TER
015722-004	1	70	17.89	29.47	39.29 %
015723-004	1	50	21.33	31.34	31.93 %
015724-004	1	42.9	22.37	33.10	32.41 %
015725-004	1	65	16.86	25.77	34.58 %
015726-004	1	77.6	15.49	25.88	40.14 %
015727-004	1	73	16.64	24.80	32.90 %
015728-004	1	77	15.36	26.08	41.11 %
015729-004	1	70.3	17.18	27.75	38.08 %
015730-004	1	63.68	16.67	26.03	35.95 %
015731-004	1	50.64	18.50	26.84	31.08 %
015732-004	1	77	16.15	28.08	42.48 %
Totals:	11	717.12	194.44	305.12	
Average DER = 17.32 kgCO ₂ /m ²		% DER/TER	PASS		
Average TER = 27.44 kgCO ₂ /m ²		36.88 %			

Block Compliance Report - DFEE

Block Reference: 000516		Block Name: Parkside Road			
Property-Assessment Reference	Multiplier	Floor Area (m ²)	DFEE (kWh/m ² /yr)	TFEE (kWh/m ² /yr)	% DFEE/TFEE
015722-004	1	70	58.41	58.58	0.29 %
015723-004	1	50	54.32	54.44	0.22 %
015724-004	1	42.9	55.45	55.97	0.94 %
015725-004	1	65	43.28	43.82	1.21 %
015726-004	1	77.6	45.82	48.35	5.22 %
015727-004	1	73	38.64	40.24	3.99 %
015728-004	1	77	47.54	49.93	4.79 %
015729-004	1	70.3	46.03	51.12	9.95 %
015730-004	1	63.68	41.89	44.39	5.61 %
015731-004	1	50.64	36.75	39.96	8.04 %
015732-004	1	77	52.10	56.40	7.62 %
Totals:	11	717.12	520.23	543.19	
Average DFEE = 47.15 kWh/m ² /yr		% DFEE/TFEE	PASS		
Average TFEE = 49.35 kWh/m ² /yr		4.46 %			