

Energy Calculations Ltd

SAP ♦ CODE ♦ SBEM ♦ DESIGN

01754-761035



SAP Report Submission for Building Regulations Compliance

Client:

Project: Flat 9, 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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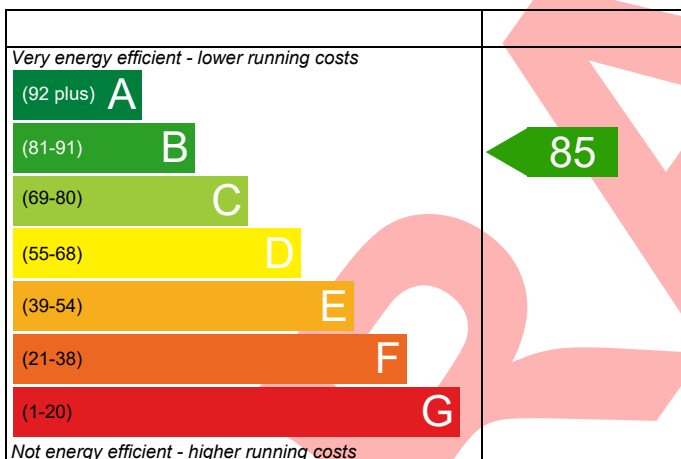
Flat 9, 18, Parkside Road,
READING,
RG30 2DB

Dwelling type: Flat, End-Terrace
Date of assessment: 16/08/2021
Produced by: Energy Calculations Limited
Total floor area: 63.68 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

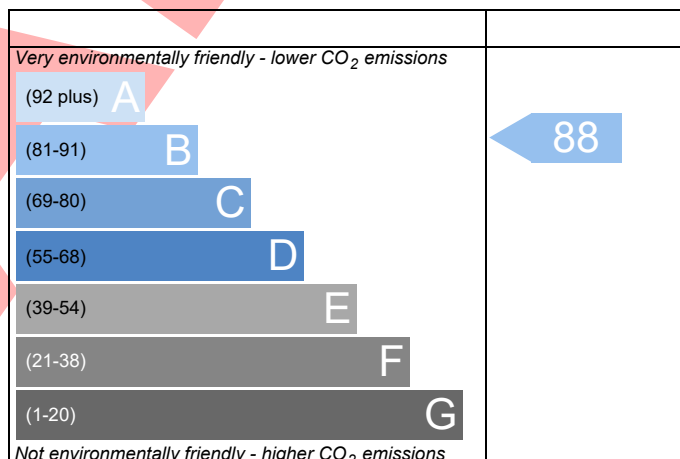


England

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	015730		Issued on Date	16/08/2021	
Assessment Reference	004	Prop Type Ref			
Property	Flat 9, 18, Parkside Road, READING, RG30 2DB				
SAP Rating	85 B	DER	16.67	TER	26.03
Environmental	88 B	% DER<TER	35.95		
CO ₂ Emissions (t/year)	0.88	DFEE	41.89	TFEE	44.39
General Requirements Compliance	Pass	% DFEE<TFEE	5.61		
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	3.40	1.02	
External wall	E3 Sill	Table K1 - Approved	0.040	1.40	0.06	
External wall	E4 Jamb	Table K1 - Approved	0.050	8.40	0.42	
External wall	E7 Party floor between dwellings (in blocks of flats)	Table K1 - Approved	0.070	22.61	1.58	
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	10.96	0.66	
External wall	E11 Eaves (insulation at rafter level)	Table K1 - Approved	0.040	6.00	0.24	
External wall	E12 Gable (insulation at ceiling level)	Table K1 - Approved	0.240	9.50	2.28	
External wall	E13 Gable (insulation at rafter level)	Table K1 - Approved	0.040	1.70	0.07	
External wall	E16 Corner (normal)	Table K1 - Approved	0.090	7.20	0.65	
External wall	E17 Corner (inverted – internal area greater than external area)	Table K1 - Approved	-0.090	7.20	-0.65	
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	19.39	0.00	
External roof	R1 Head of roof window	Table K1 - Default	0.080	3.40	0.27	
External roof	R2 Sill of roof window	Table K1 - Default	0.060	3.40	0.20	
External roof	R3 Jamb of roof window	Table K1 - Default	0.080	8.40	0.67	

Total: **8.05** W/mK:
Y-Value: **0.069** W/m²K:

FULL SAP CALCULATION PRINTOUT

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

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

DWELLING AS DESIGNED

Top-floor flat, total floor area 64 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) 26.03 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 16.67 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)44.4 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)41.9 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	(no floor)		
Roof	0.11 (max. 0.20)	0.14 (max. 0.35)	OK
Openings	1.46 (max. 2.00)	1.60 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main heating system: 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): Slight OK

Based on:

Overshading:	Average
Windows facing East:	0.63 m ² , No overhang
Windows facing West:	5.04 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
Roof U-value	0.10 W/m ² K
Photovoltaic array	300.00 kWh/Year

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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	63.6800 (1b)	x 2.4000 (2b)	= 152.8320 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.6800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 152.8320 (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) = 0.1309 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3809 (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) = 0.3523 (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	0.4492	0.4404	0.4316	0.3875	0.3787	0.3347	0.3347	0.3259	0.3523	0.3787	0.3963	0.4140 (22b)
Effective ac	0.6009	0.5970	0.5931	0.5751	0.5717	0.5560	0.5560	0.5531	0.5621	0.5717	0.5785	0.5857 (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)			5.6700	1.3258	7.5170		(27)
Door to Stairs			1.8900	1.4000	2.6460		(26)
R lights (Uw = 1.60)			3.5600	1.5038	5.3534		(27a)
Main Wall	50.2000	5.6700	44.5300	0.2200	9.7966	60.0000	2671.8000 (29a)
Wall to stairs	2.8800	1.8900	0.9900	0.1864	0.1845	190.0000	188.1000 (29a)
Plane	47.0000		47.0000	0.1000	4.7000	9.0000	423.0000 (30)
Slope	16.9900	3.5600	13.4300	0.1400	1.8802	9.0000	120.8700 (30)
Total net area of external elements Aum(A, m ²)			117.0700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.0777		(33)
Party Wall 1			46.5400	0.0000	0.0000	180.0000	8377.2000 (32)
Party Floor 1			63.6800			40.0000	2547.2000 (32d)
Internal Wall 1			72.0000			100.0000	7200.0000 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 21528.1700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							338.0680 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.0483 (36)
Total fabric heat loss							(33) + (36) = 40.1260 (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	30.3052	30.1076	29.9140	29.0044	28.8342	28.0419	28.0419	27.8952	28.3471	28.8342	29.1785	29.5384 (38)
Heat transfer coeff	70.4312	70.2337	70.0400	69.1304	68.9602	68.1680	68.1680	68.0213	68.4731	68.9602	69.3045	69.6644 (39)
Average = Sum(39)m / 12 =												69.1296 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1060	1.1029	1.0999	1.0856	1.0829	1.0705	1.0705	1.0682	1.0753	1.0829	1.0883	1.0940 (40)
HLP (average)												1.0856 (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												2.0835 (42)
Average daily hot water use (litres/day)												83.6842 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	92.0526	88.7052	85.3579	82.0105	78.6631	75.3158	75.3158	78.6631	82.0105	85.3579	88.7052	92.0526 (44)
Energy content (annual)	136.5113	119.3937	123.2036	107.4119	103.0642	88.9366	82.4128	94.5699	95.6994	111.5284	121.7420	132.2039 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1316.6778 (45)

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	20.4767	17.9091	18.4805	16.1118	15.4596	13.3405	12.3619	14.1855	14.3549	16.7293	18.2613	19.8306 (46)
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												
190.9101	168.5281	177.6024	160.0559	157.4630	141.5806	136.8116	148.9687	148.3434	165.9272	174.3860	186.6027	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h												
190.9101	168.5281	177.6024	160.0559	157.4630	141.5806	136.8116	148.9687	148.3434	165.9272	174.3860	186.6027	(64)
Heat gains from water heating, kWh/month												
88.9091	79.0059	84.4842	77.8296	77.7879	71.6866	70.9213	74.9635	73.9353	80.6022	82.5944	87.4768	(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	104.1772	104.1772	104.1772	104.1772	104.1772	104.1772	104.1772	104.1772	104.1772	104.1772	104.1772	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
17.0165	15.1139	12.2914	9.3054	6.9559	5.8725	6.3454	8.2480	11.0705	14.0565	16.4060	17.4894	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
182.1235	184.0134	179.2510	169.1124	156.3142	144.2857	136.2499	134.3600	139.1225	149.2611	162.0593	174.0878	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
33.4177	33.4177	33.4177	33.4177	33.4177	33.4177	33.4177	33.4177	33.4177	33.4177	33.4177	33.4177	(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	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	(71)
Water heating gains (Table 5)												
119.5014	117.5683	113.5541	108.0967	104.5536	99.5648	95.3243	100.7575	102.6878	108.3363	114.7145	117.5764	(72)
Total internal gains												
372.8946	370.9488	359.3497	340.7677	322.0769	303.9761	292.1728	297.6187	307.1339	325.9071	347.4329	363.4068	(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			
East				0.6300	19.6403	0.6300	0.7000	0.7700	3.7815 (76)			
West				5.0400	19.6403	0.6300	0.7000	0.7700	30.2517 (80)			
East				3.5600	26.6072	0.6300	0.7000	1.0000	37.5951 (82)			
Solar gains	71.6282	142.5824	240.9710	361.1689	451.3121	465.8558	441.9280	373.7847	283.4183	170.8017	89.7530	58.6221 (83)
Total gains	444.5228	513.5312	600.3206	701.9366	773.3890	769.8319	734.1008	671.4033	590.5522	496.7087	437.1859	422.0289 (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	84.9062	85.1450	85.3805	86.5039	86.7174	87.7252	87.7252	87.9144	87.3342	86.7174	86.2866	85.8408
alpha	6.6604	6.6763	6.6920	6.7669	6.7812	6.8483	6.8483	6.8610	6.8223	6.7812	6.7524	6.7227
util living area	0.9990	0.9972	0.9877	0.9340	0.7774	0.5616	0.4081	0.4647	0.7577	0.9730	0.9974	0.9993 (86)
Tweekday	19.0924	19.2384	19.4869	19.7854	19.9284	19.9651	19.9667	19.9686	19.9494	19.7331	19.3641	19.0785
Tweekend	20.5615	20.6253	20.7356	20.8719	20.9514	20.9721	20.9741	20.9738	20.9601	20.8420	20.6764	20.5517
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	20.3233	20.4203	20.5919	20.8000	20.9250	20.9571	20.9600	20.9596	20.9377	20.7561	20.4947	20.3082 (87)
Th 2	19.9959	19.9985	20.0009	20.0126	20.0148	20.0250	20.0250	20.0269	20.0211	20.0148	20.0104	20.0058 (88)
util rest of house												
	0.9986	0.9959	0.9820	0.9070	0.7135	0.4787	0.3180	0.3672	0.6691	0.9564	0.9959	0.9990 (89)
Tweekday	19.0924	19.2384	19.4869	19.7854	19.9284	19.9651	19.9667	19.9686	19.9494	19.7331	19.3641	19.0785
Tweekend	19.0924	19.2384	19.4869	19.7854	19.9284	19.9651	19.9667	19.9686	19.9494	19.7331	19.3641	19.0785
MIT 2	19.0924	19.2384	19.4869	19.7854	19.9284	19.9651	19.9667	19.9686	19.9494	19.7331	19.3641	19.0785 (90)
Living area fraction									fLA = Living area / (4) =			0.4680 (91)
MIT	19.6684	19.7915	20.0040	20.2602	20.3947	20.4293	20.4315	20.4323	20.4119	20.2118	19.8932	19.6539 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6684	19.7915	20.0040	20.2602	20.3947	20.4293	20.4315	20.4323	20.4119	20.2118	19.8932	19.6539 (93)

8. Space heating requirement

Utilisation	0.9984	0.9956	0.9820	0.9146	0.7393	0.5135	0.3556	0.4080	0.7063	0.9604	0.9957	0.9989 (94)
Useful gains	443.8238	511.2576	589.5260	642.0075	571.7696	395.2880	261.0447	273.9357	417.1060	477.0270	435.3070	421.5553 (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	1082.4170	1045.8835	945.8201	785.3344	599.5912	397.3749	261.1868	274.2849	432.1936	662.8330	886.6246	1076.5898 (97)

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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	475.1133	359.2686	265.0828	103.1954	20.6993	0.0000	0.0000	0.0000	0.0000	138.2397	324.9487	487.3456 (98)
Space heating												2173.8933 (98)
Space heating per m2										(98) / (4) =		34.1378 (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 %)												244.2860 (206)
Efficiency of secondary/supplementary heating system, %												100.0000 (208)
Space heating requirement												889.8969 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	475.1133	359.2686	265.0828	103.1954	20.6993	0.0000	0.0000	0.0000	0.0000	138.2397	324.9487	487.3456 (98)
Space heating efficiency (main heating system 1)	244.2860	244.2860	244.2860	244.2860	244.2860	0.0000	0.0000	0.0000	0.0000	244.2860	244.2860	244.2860 (210)
Space heating fuel (main heating system)	194.4906	147.0689	108.5133	42.2437	8.4734	0.0000	0.0000	0.0000	0.0000	56.5893	133.0198	199.4980 (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	190.9101	168.5281	177.6024	160.0559	157.4630	141.5806	136.8116	148.9687	148.3434	165.9272	174.3860	186.6027 (64)
Efficiency of water heater	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	112.6712	99.4618	104.8173	94.4617	92.9314	83.5580	80.7434	87.9183	87.5492	97.9268	102.9190	110.1291 (219)
Water heating fuel used												1155.0872 (219)
Annual totals kWh/year												
Space heating fuel - main system												889.8969 (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)												300.5166 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
Total delivered energy for all uses												2345.5008 (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	889.8969	0.5190	461.8565 (261)
Space heating - secondary	0.0000	0.5190	0.0000 (263)
Water heating (other fuel)	1155.0872	0.5190	599.4903 (264)
Space and water heating			1061.3468 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	300.5166	0.5190	155.9681 (268)
Energy saving/generation technologies			
PV Unit	-300.0000	0.5190	-155.7000 (269)
Total CO2, kg/year			1061.6149 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			16.6700 (273)

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

DER		16.6700 ZC1
Total Floor Area	TFA	63.6800
Assumed number of occupants	N	2.0835
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.9476 ZC2
CO2 emissions from cooking, equation (L16)		2.6540 ZC3
Total CO2 emissions		36.2716 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		36.2716 ZC8

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1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	63.6800 (1b)	x 2.4000 (2b)	= 152.8320 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.6800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 152.8320 (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) = 0.1309 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3809 (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) =				0.3523 (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	0.4492	0.4404	0.4316	0.3875	0.3787	0.3347	0.3347	0.3259	0.3523	0.3787	0.3963	0.4140 (22b)
Effective ac	0.6009	0.5970	0.5931	0.5751	0.5717	0.5560	0.5560	0.5531	0.5621	0.5717	0.5785	0.5857 (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			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			5.6700	1.3258	7.5170		(27)
TER Room Window (Uw = 1.70)			3.5600	1.5918	5.6667		(27a)
Main Wall	50.2000	5.6700	44.5300	0.1800	8.0154		(29a)
Wall to stairs	2.8800	1.8900	0.9900	0.1800	0.1782		(29a)
Plane	47.0000		47.0000	0.1300	6.1100		(30)
Slope	16.9900	3.5600	13.4300	0.1300	1.7459		(30)
Total net area of external elements Aum(A, m ²)			117.0700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.1232		(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)							5.5703 (36)
Total fabric heat loss						(33) + (36) =	36.6935 (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	30.3052	30.1076	29.9140	29.0044	28.8342	28.0419	28.0419	27.8952	28.3471	28.8342	29.1785	29.5384 (38)
Heat transfer coeff	66.9987	66.8011	66.6075	65.6979	65.5277	64.7354	64.7354	64.5887	65.0406	65.5277	65.8720	66.2319 (39)
Average = Sum(39)m / 12 =												65.6971 (39)
HLP	1.0521	1.0490	1.0460	1.0317	1.0290	1.0166	1.0166	1.0143	1.0214	1.0290	1.0344	1.0401 (40)
HLP (average)												1.0317 (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												2.0835 (42)
Average daily hot water use (litres/day)												83.6842 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	92.0526	88.7052	85.3579	82.0105	78.6631	75.3158	75.3158	78.6631	82.0105	85.3579	88.7052	92.0526 (44)
Energy content (annual)	136.5113	119.3937	123.2036	107.4119	103.0642	88.9366	82.4128	94.5699	95.6994	111.5284	121.7420	132.2039 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1316.6778 (45)
Water storage loss:	20.4767	17.9091	18.4805	16.1118	15.4596	13.3405	12.3619	14.1855	14.3549	16.7293	18.2613	19.8306 (46)
Store volume												210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7016 (48)

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Temperature factor from Table 2b												0.5400 (49)
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	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month												
188.2579	166.1325	174.9502	157.4892	154.8108	139.0139	134.1594	146.3165	145.7767	163.2750	171.8193	183.9505	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h												
188.2579	166.1325	174.9502	157.4892	154.8108	139.0139	134.1594	146.3165	145.7767	163.2750	171.8193	183.9505	(64)
Heat gains from water heating, kWh/month												
86.7873	77.0895	82.3625	75.7763	75.6661	69.6333	68.7995	72.8418	71.8819	78.4805	80.5411	85.3551	(65)
Total per year (kWh/year) = Sum(64)m =												1925.9522 (64)

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

Metabolic gains (Table 5), Watts												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	104.1772	104.1772	104.1772	104.1772	104.1772	104.1772	104.1772	104.1772	104.1772	104.1772	104.1772	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
17.0165	15.1139	12.2914	9.3054	6.9559	5.8725	6.3454	8.2480	11.0705	14.0565	16.4060	17.4894	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
182.1235	184.0134	179.2510	169.1124	156.3142	144.2857	136.2499	134.3600	139.1225	149.2611	162.0593	174.0878	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
33.4177	33.4177	33.4177	33.4177	33.4177	33.4177	33.4177	33.4177	33.4177	33.4177	33.4177	33.4177	(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	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	(71)
Water heating gains (Table 5)												
116.6496	114.7165	110.7022	105.2449	101.7018	96.7129	92.4725	97.9056	99.8360	105.4845	111.8626	114.7246	(72)
Total internal gains												
373.0428	371.0970	359.4978	340.9158	322.2250	304.1242	292.3210	297.7668	307.2821	326.0552	347.5811	363.5549	(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
East				0.6300	19.6403	0.6300	0.7000				0.7700			3.7815 (76)
West				5.0400	19.6403	0.6300	0.7000				0.7700			30.2517 (80)
East				3.5600	26.6072	0.6300	0.7000				1.0000			37.5951 (82)
Solar gains	71.6282	142.5824	240.9710	361.1689	451.3121	465.8558	441.9280	373.7847	283.4183	170.8017	89.7530			58.6221 (83)
Total gains	444.6710	513.6793	600.4688	702.0847	773.5372	769.9800	734.2490	671.5515	590.7004	496.8569	437.3341			422.1771 (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	66.0046	66.1998	66.3923	67.3115	67.4863	68.3122	68.3122	68.4674	67.9917	67.4863	67.1336	66.7688
alpha	5.4003	5.4133	5.4262	5.4874	5.4991	5.5541	5.5541	5.5645	5.5328	5.4991	5.4756	5.4513
util living area	0.9959	0.9903	0.9699	0.8932	0.7306	0.5300	0.3867	0.4398	0.7119	0.9453	0.9908	0.9968 (86)
MIT	19.9849	20.1484	20.4236	20.7470	20.9333	20.9906	20.9986	20.9973	20.9573	20.6806	20.2734	19.9588 (87)
Th 2	20.0401	20.0427	20.0452	20.0570	20.0592	20.0695	20.0695	20.0715	20.0656	20.0592	20.0547	20.0501 (88)
util rest of house	0.9945	0.9873	0.9604	0.8635	0.6735	0.4565	0.3056	0.3524	0.6333	0.9229	0.9873	0.9958 (89)
MIT 2	18.6934	18.9327	19.3285	19.7772	20.0000	20.0638	20.0691	20.0704	20.0348	19.7029	19.1245	18.6628 (90)
Living area fraction									fLA = Living area / (4) =			0.4680 (91)
MIT	19.2978	19.5016	19.8409	20.2310	20.4368	20.4975	20.5041	20.5042	20.4665	20.1605	19.6621	19.2693 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2978	19.5016	19.8409	20.2310	20.4368	20.4975	20.5041	20.5042	20.4665	20.1605	19.6621	19.2693 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9931	0.9850	0.9580	0.8695	0.6973	0.4907	0.3436	0.3934	0.6684	0.9257	0.9854	0.9947	(94)
Useful gains	441.6188	505.9971	575.2209	610.4639	539.3843	377.8289	252.2877	264.1714	394.8485	459.9397	430.9534	419.9310	(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	1004.8313	975.4057	888.6064	744.4245	572.4997	381.7791	252.7315	265.0832	414.0812	626.4743	827.4932	998.0676	(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	419.0301	315.4426	233.1588	96.4517	24.6379	0.0000	0.0000	0.0000	0.0000	123.9017	285.5087	430.1336	(98)
Space heating												1928.2651	(98)
Space heating per m2												30.2805	(99)
										(98) / (4) =			

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

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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													2062.3156 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	419.0301	315.4426	233.1588	96.4517	24.6379	0.0000	0.0000	0.0000	0.0000	123.9017	285.5087	430.1336	(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)	448.1606	337.3717	249.3677	103.1569	26.3507	0.0000	0.0000	0.0000	0.0000	132.5152	305.3569	460.0359	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	188.2579	166.1325	174.9502	157.4892	154.8108	139.0139	134.1594	146.3165	145.7767	163.2750	171.8193	183.9505	(64)
Efficiency of water heater (217)m	86.8884	86.4989	85.5808	83.5521	81.1168	79.8000	79.8000	79.8000	79.8000	84.0895	86.1596	87.0054	(216)
Fuel for water heating, kWh/month	216.6664	192.0632	204.4269	188.4923	190.8494	174.2029	168.1196	183.3540	182.6776	194.1682	199.4198	211.4243	(219)
Water heating fuel used												2305.8647	(219)
Annual totals kWh/year													
Space heating fuel - main system												2062.3156	(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)												300.5166	(232)
Total delivered energy for all uses												4743.6969	(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	2062.3156	0.2160	445.4602 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2305.8647	0.2160	498.0668 (264)
Space and water heating			943.5269 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	300.5166	0.5190	155.9681 (268)
Total CO2, kg/m2/year			1138.4201 (272)
Emissions per m2 for space and water heating			14.8167 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.4492 (272b)
Emissions per m2 for pumps and fans			0.6113 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.8167 * 1.55) + 2.4492 + 0.6113, rounded to 2 d.p.			26.0300 (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	63.6800 (1b)	x 2.4000 (2b)	= 152.8320 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.6800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 152.8320 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour 20.0000 / (5) = 0.1309 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3809 (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) =				0.3523 (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	0.4492	0.4404	0.4316	0.3875	0.3787	0.3347	0.3347	0.3259	0.3523	0.3787	0.3963	0.4140 (22b)
Effective ac	0.6009	0.5970	0.5931	0.5751	0.5717	0.5560	0.5560	0.5531	0.5621	0.5717	0.5785	0.5857 (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)			5.6700	1.3258	7.5170		(27)
Door to Stairs			1.8900	1.4000	2.6460		(26)
R lights (Uw = 1.60)			3.5600	1.5038	5.3534		(27a)
Main Wall	50.2000	5.6700	44.5300	0.2200	9.7966	60.0000	2671.8000 (29a)
Wall to stairs	2.8800	1.8900	0.9900	0.1864	0.1845	190.0000	188.1000 (29a)
Plane	47.0000		47.0000	0.1000	4.7000	9.0000	423.0000 (30)
Slope	16.9900	3.5600	13.4300	0.1400	1.8802	9.0000	120.8700 (30)
Total net area of external elements Aum(A, m ²)			117.0700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.0777		(33)
Party Wall 1			46.5400	0.0000	0.0000	180.0000	8377.2000 (32)
Party Floor 1			63.6800			40.0000	2547.2000 (32d)
Internal Wall 1			72.0000			100.0000	7200.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	21528.1700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							338.0680 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.0483 (36)
Total fabric heat loss						(33) + (36) =	40.1260 (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	30.3052	30.1076	29.9140	29.0044	28.8342	28.0419	28.0419	27.8952	28.3471	28.8342	29.1785	29.5384 (38)
Heat transfer coeff	70.4312	70.2337	70.0400	69.1304	68.9602	68.1680	68.1680	68.0213	68.4731	68.9602	69.3045	69.6644 (39)
Average = Sum(39)m / 12 =												69.1296 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1060	1.1029	1.0999	1.0856	1.0829	1.0705	1.0705	1.0682	1.0753	1.0829	1.0883	1.0940 (40)
HLP (average)												1.0856 (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												2.0835 (42)
Average daily hot water use (litres/day)												83.6842 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	92.0526	88.7052	85.3579	82.0105	78.6631	75.3158	75.3158	78.6631	82.0105	85.3579	88.7052	92.0526 (44)
Energy content (annual)	136.5113	119.3937	123.2036	107.4119	103.0642	88.9366	82.4128	94.5699	95.6994	111.5284	121.7420	132.2039 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1316.6778 (45)

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	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	(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	(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	(59)
Heat gains from water heating, kWh/month	29.0087	25.3712	26.1808	22.8250	21.9012	18.8990	17.5127	20.0961	20.3361	23.6998	25.8702	28.0933 (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	104.1772	104.1772	104.1772	104.1772	104.1772	104.1772	104.1772	104.1772	104.1772	104.1772	104.1772	104.1772 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.0165	15.1139	12.2914	9.3054	6.9559	5.8725	6.3454	8.2480	11.0705	14.0565	16.4060	17.4894 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	182.1235	184.0134	179.2510	169.1124	156.3142	144.2857	136.2499	134.3600	139.1225	149.2611	162.0593	174.0878 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.4177	33.4177	33.4177	33.4177	33.4177	33.4177	33.4177	33.4177	33.4177	33.4177	33.4177	33.4177 (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)	-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	-83.3418 (71)
Water heating gains (Table 5)	38.9901	37.7547	35.1892	31.7014	29.4370	26.2487	23.5386	27.0109	28.2446	31.8546	35.9308	37.7599 (72)
Total internal gains	292.3833	291.1352	280.9848	264.3724	246.9603	230.6600	220.3871	223.8721	232.6907	249.4253	268.6492	283.5902 (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
East		0.6300	19.6403	0.6300	0.7000	0.7700	3.7815 (76)
West		5.0400	19.6403	0.6300	0.7000	0.7700	30.2517 (80)
East		3.5600	26.6072	0.6300	0.7000	1.0000	37.5951 (82)

Solar gains	71.6282	142.5824	240.9710	361.1689	451.3121	465.8558	441.9280	373.7847	283.4183	170.8017	89.7530	58.6221 (83)
Total gains	364.0115	433.7175	521.9558	625.5413	698.2724	696.5158	662.3151	597.6568	516.1090	420.2269	358.4022	342.2124 (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	84.9062	85.1450	85.3805	86.5039	86.7174	87.7252	87.7252	87.9144	87.3342	86.7174	86.2866	85.8408
alpha	6.6604	6.6763	6.6920	6.7669	6.7812	6.8483	6.8483	6.8610	6.8223	6.7812	6.7524	6.7227
util living area	0.9997	0.9990	0.9943	0.9606	0.8316	0.6166	0.4518	0.5206	0.8305	0.9888	0.9992	0.9998 (86)
MIT	20.0571	20.1900	20.4230	20.7257	20.9293	20.9921	20.9992	20.9979	20.9489	20.6486	20.2957	20.0369 (87)
Th 2	19.9959	19.9985	20.0009	20.0126	20.0148	20.0250	20.0250	20.0269	20.0211	20.0148	20.0104	20.0058 (88)
util rest of house	0.9996	0.9985	0.9915	0.9420	0.7719	0.5277	0.3523	0.4122	0.7473	0.9809	0.9988	0.9997 (89)
MIT 2	19.1350	19.2699	19.5036	19.8043	19.9748	20.0223	20.0249	20.0265	19.9981	19.7387	19.3857	19.1232 (90)
Living area fraction									fLA = Living area / (4) =			0.4680 (91)
MIT	19.5665	19.7004	19.9338	20.2355	20.4215	20.4761	20.4808	20.4811	20.4430	20.1645	19.8115	19.5508 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5665	19.7004	19.9338	20.2355	20.4215	20.4761	20.4808	20.4811	20.4430	20.1645	19.8115	19.5508 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9995	0.9983	0.9913	0.9468	0.7981	0.5695	0.3990	0.4632	0.7860	0.9824	0.9986	0.9997 (94)
Useful gains	363.8342	432.9783	517.4020	592.2924	557.3219	396.6631	264.2502	276.8288	405.6867	412.8334	357.9119	342.1027 (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	1075.2386	1039.4892	940.9064	783.6252	601.4346	400.5650	264.5466	277.6021	434.3267	659.5721	880.9649	1069.4032 (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	529.2849	407.5754	315.0873	137.7597	32.8199	0.0000	0.0000	0.0000	0.0000	183.5736	376.5982	541.1116 (98)
Space heating												2523.8104 (98)
Space heating per m2										(98) / (4) =		39.6327 (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	640.7790	504.4430	516.9616	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9595	0.9847	0.9728	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	614.8235	496.7370	502.9053	0.0000	0.0000	0.0000	0.0000 (102)

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Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	847.2623	808.1888	740.9065	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	167.3559	231.7201	177.0729	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												576.1489 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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	41.8390	57.9300	44.2682	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												144.0372 (107)
Space cooling per m2												2.2619 (108)
Energy for space heating												39.6327 (99)
Energy for space cooling												2.2619 (108)
Total												41.8946 (109)
Dwelling Fabric Energy Efficiency (DFEE)												41.9 (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	63.6800 (1b)	x 2.4000 (2b)	= 152.8320 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.6800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 152.8320 (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) = 0.1309 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3809 (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) =				0.3523 (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	0.4492	0.4404	0.4316	0.3875	0.3787	0.3347	0.3347	0.3259	0.3523	0.3787	0.3963	0.4140 (22b)
Effective ac	0.6009	0.5970	0.5931	0.5751	0.5717	0.5560	0.5560	0.5531	0.5621	0.5717	0.5785	0.5857 (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			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			5.6700	1.3258	7.5170		(27)
TER Room Window (Uw = 1.70)			3.5600	1.5918	5.6667		(27a)
Main Wall	50.2000	5.6700	44.5300	0.1800	8.0154		(29a)
Wall to stairs	2.8800	1.8900	0.9900	0.1800	0.1782		(29a)
Plane	47.0000		47.0000	0.1300	6.1100		(30)
Slope	16.9900	3.5600	13.4300	0.1300	1.7459		(30)
Total net area of external elements Aum(A, m ²)			117.0700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.1232		(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)							5.5703 (36)
Total fabric heat loss						(33) + (36) =	36.6935 (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	30.3052	30.1076	29.9140	29.0044	28.8342	28.0419	28.0419	27.8952	28.3471	28.8342	29.1785	29.5384 (38)
Heat transfer coeff	66.9987	66.8011	66.6075	65.6979	65.5277	64.7354	64.7354	64.5887	65.0406	65.5277	65.8720	66.2319 (39)
Average = Sum(39)m / 12 =												65.6971 (39)
HLP	1.0521	1.0490	1.0460	1.0317	1.0290	1.0166	1.0166	1.0143	1.0214	1.0290	1.0344	1.0401 (40)
HLP (average)												1.0317 (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												2.0835 (42)
Average daily hot water use (litres/day)												83.6842 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	92.0526	88.7052	85.3579	82.0105	78.6631	75.3158	75.3158	78.6631	82.0105	85.3579	88.7052	92.0526 (44)
Energy content (annual)	136.5113	119.3937	123.2036	107.4119	103.0642	88.9366	82.4128	94.5699	95.6994	111.5284	121.7420	132.2039 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1316.6778 (45)
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

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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	29.0087	25.3712	26.1808	22.8250	21.9012	18.8990	17.5127	20.0961	20.3361	23.6998	25.8702	28.0933 (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	104.1772	104.1772	104.1772	104.1772	104.1772	104.1772	104.1772	104.1772	104.1772	104.1772	104.1772	104.1772	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.0165	15.1139	12.2914	9.3054	6.9559	5.8725	6.3454	8.2480	11.0705	14.0565	16.4060	17.4894	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	182.1235	184.0134	179.2510	169.1124	156.3142	144.2857	136.2499	134.3600	139.1225	149.2611	162.0593	174.0878	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.4177	33.4177	33.4177	33.4177	33.4177	33.4177	33.4177	33.4177	33.4177	33.4177	33.4177	33.4177	(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)	-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	(71)
Water heating gains (Table 5)	38.9901	37.7547	35.1892	31.7014	29.4370	26.2487	23.5386	27.0109	28.2446	31.8546	35.9308	37.7599	(72)
Total internal gains	292.3833	291.1352	280.9848	264.3724	246.9603	230.6600	220.3871	223.8721	232.6907	249.4253	268.6492	283.5902	(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	
East	0.6300	19.6403	0.6300	0.7000	0.7700	3.7815	(76)
West	5.0400	19.6403	0.6300	0.7000	0.7700	30.2517	(80)
East	3.5600	26.6072	0.6300	0.7000	1.0000	37.5951	(82)

Solar gains	71.6282	142.5824	240.9710	361.1689	451.3121	465.8558	441.9280	373.7847	283.4183	170.8017	89.7530	58.6221	(83)
Total gains	364.0115	433.7175	521.9558	625.5413	698.2724	696.5158	662.3151	597.6568	516.1090	420.2269	358.4022	342.2124	(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	66.0046	66.1998	66.3923	67.3115	67.4863	68.3122	68.3122	68.4674	67.9917	67.4863	67.1336	66.7688	
alpha	5.4003	5.4133	5.4262	5.4874	5.4991	5.5541	5.5541	5.5645	5.5328	5.4991	5.4756	5.4513	
util living area	0.9984	0.9956	0.9834	0.9275	0.7833	0.5809	0.4278	0.4920	0.7821	0.9719	0.9964	0.9989	(86)
MIT	19.8656	20.0329	20.3197	20.6763	20.9058	20.9853	20.9977	20.9953	20.9319	20.5882	20.1586	19.8399	(87)
Th 2	20.0401	20.0427	20.0452	20.0570	20.0592	20.0695	20.0695	20.0715	20.0656	20.0592	20.0547	20.0501	(88)
util rest of house	0.9979	0.9941	0.9777	0.9044	0.7284	0.5024	0.3386	0.3954	0.7062	0.9587	0.9950	0.9985	(89)
MIT 2	19.0021	19.1707	19.4561	19.8049	20.0002	20.0633	20.0690	20.0702	20.0301	19.7320	19.3064	18.9845	(90)
Living area fraction	19.4062	19.5742	19.8602	20.2127	20.4240	20.4948	20.5036	20.5031	fLA = Living area / (4) =	20.4521	20.1327	19.7052	0.4680 (91)
MIT	19.4062	19.5742	19.8602	20.2127	20.4240	20.4948	20.5036	20.5031	20.4521	20.1327	19.7052	19.3848	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4062	19.5742	19.8602	20.2127	20.4240	20.4948	20.5036	20.5031	20.4521	20.1327	19.7052	19.3848	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9974	0.9932	0.9764	0.9087	0.7508	0.5389	0.3804	0.4407	0.7397	0.9600	0.9943	0.9981	(94)
Useful gains	363.0786	430.7745	509.6209	568.4030	524.2435	375.3801	251.9596	263.4101	381.7403	403.3989	356.3465	341.5786	(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	1012.0947	980.2521	889.8909	743.2184	571.6612	381.6026	252.7018	265.0156	413.1425	624.6556	830.3281	1005.7158	(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	482.8680	369.2489	282.9209	125.8671	35.2788	0.0000	0.0000	0.0000	0.0000	164.6150	341.2668	494.1181	(98)
Space heating												2296.1835	(98)
Space heating per m2											(98) / (4) =	36.0582	(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	608.5132	479.0423	490.8744	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9494	0.9770	0.9634	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	577.7178	468.0011	472.9086	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	847.2623	808.1888	740.9065	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	194.0720	253.0996	199.3904	0.0000	0.0000	0.0000	0.0000	(104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Energy Calculations Ltd
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CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling											646.5621 (104)
Cooled fraction											1.0000 (105)
Intermittency factor (Table 10b)											
	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh											
	0.0000	0.0000	0.0000	0.0000	48.5180	63.2749	49.8476	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											161.6405 (107)
Space cooling per m2											2.5383 (108)
Energy for space heating											36.0582 (99)
Energy for space cooling											2.5383 (108)
Total											38.5965 (109)
Target Fabric Energy Efficiency (TFEE)											44.4 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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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	63.6800 (1b)	x 2.4000 (2b)	= 152.8320 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.6800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 152.8320 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour 20.0000 / (5) = 0.1309 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3809 (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) =				0.3523 (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	0.3875	0.3611	0.3611	0.3435	0.3435	0.2995	0.2995	0.2906	0.2995	0.3347	0.3259	0.3523 (22b)
Effective ac	0.5751	0.5652	0.5652	0.5590	0.5590	0.5448	0.5448	0.5422	0.5448	0.5560	0.5531	0.5621 (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)			5.6700	1.3258	7.5170		(27)
Door to Stairs			1.8900	1.4000	2.6460		(26)
R lights (Uw = 1.60)			3.5600	1.5038	5.3534		(27a)
Main Wall	50.2000	5.6700	44.5300	0.2200	9.7966	60.0000	2671.8000 (29a)
Wall to stairs	2.8800	1.8900	0.9900	0.1864	0.1845	190.0000	188.1000 (29a)
Plane	47.0000		47.0000	0.1000	4.7000	9.0000	423.0000 (30)
Slope	16.9900	3.5600	13.4300	0.1400	1.8802	9.0000	120.8700 (30)
Total net area of external elements Aum(A, m ²)			117.0700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.0777		(33)
Party Wall 1			46.5400	0.0000	0.0000	180.0000	8377.2000 (32)
Party Floor 1			63.6800			40.0000	2547.2000 (32d)
Internal Wall 1			72.0000			100.0000	7200.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	21528.1700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							338.0680 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.0483 (36)
Total fabric heat loss						(33) + (36) =	40.1260 (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	29.0044	28.5055	28.5055	28.1926	28.1926	27.4786	27.4786	27.3475	27.4786	28.0419	27.8952	28.3471 (38)
Heat transfer coeff	69.1304	68.6316	68.6316	68.3186	68.3186	67.6046	67.6046	67.4736	67.6046	68.1680	68.0213	68.4731 (39)
Average = Sum(39)m / 12 =												68.1650 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0856	1.0778	1.0778	1.0728	1.0728	1.0616	1.0616	1.0596	1.0616	1.0705	1.0682	1.0753 (40)
HLP (average)												1.0704 (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	2.0835 (42)
Average daily hot water use (litres/day)	83.6842 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	92.0526	88.7052	85.3579	82.0105	78.6631	75.3158	75.3158	78.6631	82.0105	85.3579	88.7052	92.0526 (44)
Energy conte	136.5113	119.3937	123.2036	107.4119	103.0642	88.9366	82.4128	94.5699	95.6994	111.5284	121.7420	132.2039 (45)
Energy content (annual)										Total = Sum(45)m =		1316.6778 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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CALCULATION OF HEAT DEMAND 09 Jan 2014

	20.4767	17.9091	18.4805	16.1118	15.4596	13.3405	12.3619	14.1855	14.3549	16.7293	18.2613	19.8306 (46)
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												
190.9101	168.5281	177.6024	160.0559	157.4630	141.5806	136.8116	148.9687	148.3434	165.9272	174.3860	186.6027	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h												
190.9101	168.5281	177.6024	160.0559	157.4630	141.5806	136.8116	148.9687	148.3434	165.9272	174.3860	186.6027	(64)
RHI water heating demand												
Heat gains from water heating, kWh/month												
88.9091	79.0059	84.4842	77.8296	77.7879	71.6866	70.9213	74.9635	73.9353	80.6022	82.5944	87.4768	(65)
												1957 (64)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	125.0126	125.0126	125.0126	125.0126	125.0126	125.0126	125.0126	125.0126	125.0126	125.0126	125.0126	125.0126 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
42.5412	37.7847	30.7286	23.2635	17.3898	14.6812	15.8635	20.6200	27.6761	35.1412	41.0150	43.7236	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
271.8262	274.6469	267.5388	252.4065	233.3047	215.3518	203.3581	200.5374	207.6455	222.7777	241.8795	259.8325	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
49.5848	49.5848	49.5848	49.5848	49.5848	49.5848	49.5848	49.5848	49.5848	49.5848	49.5848	49.5848	(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	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	(71)
Water heating gains (Table 5)												
119.5014	117.5683	113.5541	108.0967	104.5536	99.5648	95.3243	100.7575	102.6878	108.3363	114.7145	117.5764	(72)
Total internal gains	525.1245	521.2556	503.0772	475.0225	446.5038	420.8534	405.8016	413.1705	429.2651	457.5110	488.8647	512.3882 (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
East				0.6300	23.7835		0.6300		0.7000		0.7700	4.5792 (76)
West				5.0400	23.7835		0.6300		0.7000		0.7700	36.6335 (80)
East				3.5600	32.4966		0.6300		0.7000		1.0000	45.9165 (82)
Solar gains	87.1292	151.5498	253.8795	385.2440	467.9446	510.4368	479.6454	414.3436	317.9786	194.7755	107.5596	71.7095 (83)
Total gains	612.2537	672.8054	756.9567	860.2665	914.4484	931.2902	885.4470	827.5141	747.2437	652.2865	596.4242	584.0976 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	86.5039	87.1326	87.1326	87.5318	87.5318	88.4562	88.4562	88.6280	88.4562	87.7252	87.9144	87.3342
alpha	6.7669	6.8088	6.8088	6.8355	6.8355	6.8971	6.8971	6.9085	6.8971	6.8483	6.8610	6.8223
util living area	0.9920	0.9833	0.9454	0.8206	0.6109	0.3916	0.2596	0.2935	0.5563	0.8740	0.9789	0.9938 (86)
Tweekday	19.3917	19.5258	19.7393	19.9117	19.9600	19.9743	19.9745	19.9762	19.9731	19.9013	19.6433	19.3780
Tweekend	20.6886	20.7468	20.8472	20.9369	20.9695	20.9743	20.9745	20.9745	20.9725	20.9266	20.7966	20.6791
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	20.5194	20.6084	20.7642	20.9014	20.9529	20.9605	20.9606	20.9606	20.9571	20.8867	20.6824	20.5048 (87)
Th 2	20.0126	20.0190	20.0190	20.0231	20.0231	20.0323	20.0323	20.0340	20.0323	20.0250	20.0269	20.0211 (88)
util rest of house	0.9887	0.9765	0.9250	0.7717	0.5431	0.3217	0.1857	0.2148	0.4719	0.8230	0.9688	0.9911 (89)
Tweekday	19.3917	19.5258	19.7393	19.9117	19.9600	19.9743	19.9745	19.9762	19.9731	19.9013	19.6433	19.3780
Tweekend	19.3917	19.5258	19.7393	19.9117	19.9600	19.9743	19.9745	19.9762	19.9731	19.9013	19.6433	19.3780
MIT 2	19.3917	19.5258	19.7393	19.9117	19.9600	19.9743	19.9745	19.9762	19.9731	19.9013	19.6433	19.3780 (90)
Living area fraction												
MIT	19.9194	20.0324	20.2189	20.3748	20.4246	20.4358	20.4359	20.4369	20.4336	20.3624	20.1296	19.9053 (91)
Temperature adjustment												0.0000
adjusted MIT	19.9194	20.0324	20.2189	20.3748	20.4246	20.4358	20.4359	20.4369	20.4336	20.3624	20.1296	19.9053 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	605.0917	657.0737	703.7617	679.8280	522.4560	326.7689	191.7178	204.9004	379.0574	549.4071	578.5837	578.6852 (94)
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												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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CALCULATION OF HEAT DEMAND 09 Jan 2014

Month fracti	1038.2978	997.3835	886.6467	729.2898	527.7358	326.9241	191.7218	204.9104	380.8545	610.9505	838.6727	1027.4579	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating	322.3054	228.6882	136.0664	35.6125	3.9282	0.0000	0.0000	0.0000	0.0000	45.7883	187.2640	333.8869	(98)
RHI space heating demand												1293.5399	(98)
												1294	(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	63.6800 (1b)	x 2.4000 (2b)	= 152.8320 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.6800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 152.8320 (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) = 0.1309 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3809 (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) =				0.3523 (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	0.4492	0.4404	0.4316	0.3875	0.3787	0.3347	0.3347	0.3259	0.3523	0.3787	0.3963	0.4140 (22b)
	0.6009	0.5970	0.5931	0.5751	0.5717	0.5560	0.5560	0.5531	0.5621	0.5717	0.5785	0.5857 (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)			5.6700	1.3258	7.5170		(27)
Door to Stairs			1.8900	1.4000	2.6460		(26)
R lights (Uw = 1.60)			3.5600	1.5038	5.3534		(27a)
Main Wall	50.2000	5.6700	44.5300	0.2200	9.7966	60.0000	2671.8000 (29a)
Wall to stairs	2.8800	1.8900	0.9900	0.1864	0.1845	190.0000	188.1000 (29a)
Plane	47.0000		47.0000	0.1000	4.7000	9.0000	423.0000 (30)
Slope	16.9900	3.5600	13.4300	0.1400	1.8802	9.0000	120.8700 (30)
Total net area of external elements Aum(A, m ²)			117.0700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.0777		(33)
Party Wall 1			46.5400	0.0000	0.0000	180.0000	8377.2000 (32)
Party Floor 1			63.6800			40.0000	2547.2000 (32d)
Internal Wall 1			72.0000			100.0000	7200.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	21528.1700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							338.0680 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.0483 (36)
Total fabric heat loss						(33) + (36) =	40.1260 (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	30.3052	30.1076	29.9140	29.0044	28.8342	28.0419	28.0419	27.8952	28.3471	28.8342	29.1785	29.5384 (38)
Heat transfer coeff	70.4312	70.2337	70.0400	69.1304	68.9602	68.1680	68.1680	68.0213	68.4731	68.9602	69.3045	69.6644 (39)
Average = Sum(39)m / 12 =												69.1296 (39)
HLP	1.1060	1.1029	1.0999	1.0856	1.0829	1.0705	1.0705	1.0682	1.0753	1.0829	1.0883	1.0940 (40)
HLP (average)												1.0856 (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												2.0835 (42)
Average daily hot water use (litres/day)												83.6842 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	92.0526	88.7052	85.3579	82.0105	78.6631	75.3158	75.3158	78.6631	82.0105	85.3579	88.7052	92.0526 (44)
Energy conte	136.5113	119.3937	123.2036	107.4119	103.0642	88.9366	82.4128	94.5699	95.6994	111.5284	121.7420	132.2039 (45)
Energy content (annual)										Total = Sum(45)m =		1316.6778 (45)
Distribution loss (46)m = 0.15 x (45)m												

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	20.4767	17.9091	18.4805	16.1118	15.4596	13.3405	12.3619	14.1855	14.3549	16.7293	18.2613	19.8306 (46)
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	(59)
Total heat required for water heating calculated for each month												
190.9101	168.5281	177.6024	160.0559	157.4630	141.5806	136.8116	148.9687	148.3434	165.9272	174.3860	186.6027	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Output from w/h												
190.9101	168.5281	177.6024	160.0559	157.4630	141.5806	136.8116	148.9687	148.3434	165.9272	174.3860	186.6027	(64)
Heat gains from water heating, kWh/month												
88.9091	79.0059	84.4842	77.8296	77.7879	71.6866	70.9213	74.9635	73.9353	80.6022	82.5944	87.4768	(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	125.0126	125.0126	125.0126	125.0126	125.0126	125.0126	125.0126	125.0126	125.0126	125.0126	125.0126	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
42.5412	37.7847	30.7286	23.2635	17.3898	14.6812	15.8635	20.6200	27.6761	35.1412	41.0150	43.7236	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
271.8262	274.6469	267.5388	252.4065	233.3047	215.3518	203.3581	200.5374	207.6455	222.7777	241.8795	259.8325	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
49.5848	49.5848	49.5848	49.5848	49.5848	49.5848	49.5848	49.5848	49.5848	49.5848	49.5848	49.5848	(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	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	(71)
Water heating gains (Table 5)												
119.5014	117.5683	113.5541	108.0967	104.5536	99.5648	95.3243	100.7575	102.6878	108.3363	114.7145	117.5764	(72)
Total internal gains												
525.1245	521.2556	503.0772	475.0225	446.5038	420.8534	405.8016	413.1705	429.2651	457.5110	488.8647	512.3882	(73)

6. Solar gains

[Jan]		Area	Solar flux		g		FF		Access		Gains	
		m2	Table 6a		W/m2	Specific data	Specific data		factor		W	
						or Table 6b	or Table 6c		Table 6d			
East		0.6300	19.6403		0.6300		0.7000		0.7700		3.7815	(76)
West		5.0400	19.6403		0.6300		0.7000		0.7700		30.2517	(80)
East		3.5600	26.6072		0.6300		0.7000		1.0000		37.5951	(82)
Solar gains	71.6282	142.5824	240.9710	361.1689	451.3121	465.8558	441.9280	373.7847	283.4183	170.8017	89.7530	58.6221 (83)
Total gains	596.7527	663.8380	744.0481	836.1914	897.8160	886.7092	847.7296	786.9552	712.6835	628.3126	578.6177	571.0103 (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	84.9062	85.1450	85.3805	86.5039	86.7174	87.7252	87.7252	87.9144	87.3342	86.7174	86.2866	85.8408
alpha	6.6604	6.6763	6.6920	6.7669	6.7812	6.8483	6.8483	6.8610	6.8223	6.7812	6.7524	6.7227
util living area												
0.9946	0.9880	0.9633	0.8714	0.6918	0.4901	0.3536	0.3972	0.6488	0.9214	0.9870	0.9959	(86)
Tweekday	19.2815	19.4185	19.6358	19.8604	19.9429	19.9661	19.9667	19.9687	19.9578	19.8370	19.5329	19.2650
Tweekend	20.6456	20.7062	20.8054	20.9131	20.9626	20.9733	20.9742	20.9741	20.9685	20.8960	20.7526	20.6346
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	20.4531	20.5456	20.6996	20.8643	20.9423	20.9590	20.9602	20.9601	20.9508	20.8394	20.6137	20.4360 (87)
Th 2	19.9959	19.9985	20.0009	20.0126	20.0148	20.0250	20.0250	20.0269	20.0211	20.0148	20.0104	20.0058 (88)
util rest of house												
0.9924	0.9831	0.9491	0.8315	0.6273	0.4165	0.2754	0.3134	0.5636	0.8853	0.9807	0.9941	(89)
Tweekday	19.2815	19.4185	19.6358	19.8604	19.9429	19.9661	19.9667	19.9687	19.9578	19.8370	19.5329	19.2650
Tweekend	19.2815	19.4185	19.6358	19.8604	19.9429	19.9661	19.9667	19.9687	19.9578	19.8370	19.5329	19.2650
MIT 2	19.2815	19.4185	19.6358	19.8604	19.9429	19.9661	19.9667	19.9687	19.9578	19.8370	19.5329	19.2650 (90)
Living area fraction									fLA = Living area / (4) =			0.4680 (91)
MIT	19.8298	19.9459	20.1336	20.3302	20.4106	20.4307	20.4316	20.4326	20.4225	20.3061	20.0387	19.8130 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8298	19.9459	20.1336	20.3302	20.4106	20.4307	20.4316	20.4326	20.4225	20.3061	20.0387	19.8130 (93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9919	0.9828	0.9513	0.8453	0.6539	0.4472	0.3080	0.3484	0.5993	0.8973	0.9809	0.9937 (94)
Useful gains	591.9126	652.4402	707.7895	706.8323	587.0620	396.5671	261.1379	274.1757	427.1370	563.7921	567.5928	567.4212 (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												
1093.7806	1056.7315	954.8971	790.1747	600.6857	397.4694	261.1949	274.3051	432.9213	669.3353	896.7087	1087.6716	(97)

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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	373.3898	271.6838	183.8481	60.0065	10.1360	0.0000	0.0000	0.0000	0.0000	78.5241	236.9634	387.0663 (98)
Space heating												1601.6180 (98)
Space heating per m2										(98) / (4) =		25.1510 (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 %)												244.2860 (206)
Efficiency of secondary/supplementary heating system, %												100.0000 (208)
Space heating requirement												655.6324 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	373.3898	271.6838	183.8481	60.0065	10.1360	0.0000	0.0000	0.0000	0.0000	78.5241	236.9634	387.0663 (98)
Space heating efficiency (main heating system 1)	244.2860	244.2860	244.2860	244.2860	244.2860	0.0000	0.0000	0.0000	0.0000	244.2860	244.2860	244.2860 (210)
Space heating fuel (main heating system)	152.8495	111.2155	75.2594	24.5640	4.1492	0.0000	0.0000	0.0000	0.0000	32.1443	97.0025	158.4480 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	190.9101	168.5281	177.6024	160.0559	157.4630	141.5806	136.8116	148.9687	148.3434	165.9272	174.3860	186.6027 (64)
Efficiency of water heater	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	112.6712	99.4618	104.8173	94.4617	92.9314	83.5580	80.7434	87.9183	87.5492	97.9268	102.9190	110.1291 (219)
Water heating fuel used												1155.0872 (219)
Annual totals kWh/year												
Space heating fuel - main system												655.6324 (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)												300.5166 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
Total delivered energy for all uses												2111.2363 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	655.6324	13.1900	86.4779 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1155.0872	13.1900	152.3560 (247)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	300.5166	13.1900	39.6381 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit	0.0000	13.1900	0.0000 (252)
Total energy cost			278.4721 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.4200 (256)
SAP value		1.0762 (257)
SAP rating (Section 12)		84.9874
SAP band		85 (258)
		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	655.6324	0.5190	340.2732 (261)
Space heating - secondary	0.0000	0.5190	0.0000 (263)
Water heating (other fuel)	1155.0872	0.5190	599.4903 (264)
Space and water heating			939.7635 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	300.5166	0.5190	155.9681 (268)
Energy saving/generation technologies			
PV Unit	-300.0000	0.5190	-155.7000 (269)
Total kg/year			940.0316 (272)
CO2 emissions per m2			14.7600 (273)
EI value			88.4096
EI rating			88 (274)

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EI band

B

Calculation of stars for heating and DHW

Main heating energy efficiency $13.19 \times (1 + 0.29 \times 0.25) / 2.4429 = 5.791$, stars = 3
Main heating environmental impact $0.519 \times (1 + 0.29 \times 0.25) / 2.4429 = 0.2279$, 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

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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	63.6800 (1b)	x 2.4000 (2b)	= 152.8320 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.6800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 152.8320 (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) = 0.1309 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3809 (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) = 0.3523 (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	0.3875	0.3611	0.3611	0.3435	0.3435	0.2995	0.2995	0.2906	0.2995	0.3347	0.3259	0.3523 (22b)
Effective ac	0.5751	0.5652	0.5652	0.5590	0.5590	0.5448	0.5448	0.5422	0.5448	0.5560	0.5531	0.5621 (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)			5.6700	1.3258	7.5170		(27)
Door to Stairs			1.8900	1.4000	2.6460		(26)
R lights (Uw = 1.60)			3.5600	1.5038	5.3534		(27a)
Main Wall	50.2000	5.6700	44.5300	0.2200	9.7966	60.0000	2671.8000 (29a)
Wall to stairs	2.8800	1.8900	0.9900	0.1864	0.1845	190.0000	188.1000 (29a)
Plane	47.0000		47.0000	0.1000	4.7000	9.0000	423.0000 (30)
Slope	16.9900	3.5600	13.4300	0.1400	1.8802	9.0000	120.8700 (30)
Total net area of external elements Aum(A, m ²)			117.0700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.0777		(33)
Party Wall 1			46.5400	0.0000	0.0000	180.0000	8377.2000 (32)
Party Floor 1			63.6800			40.0000	2547.2000 (32d)
Internal Wall 1			72.0000			100.0000	7200.0000 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 21528.1700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							338.0680 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.0483 (36)
Total fabric heat loss							(33) + (36) = 40.1260 (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	29.0044	28.5055	28.5055	28.1926	28.1926	27.4786	27.4786	27.3475	27.4786	28.0419	27.8952	28.3471 (38)
Heat transfer coeff	69.1304	68.6316	68.6316	68.3186	68.3186	67.6046	67.6046	67.4736	67.6046	68.1680	68.0213	68.4731 (39)
Average = Sum(39)m / 12 =												68.1650 (39)
HLP	1.0856	1.0778	1.0778	1.0728	1.0728	1.0616	1.0616	1.0596	1.0616	1.0705	1.0682	1.0753 (40)
HLP (average)												1.0704 (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												2.0835 (42)
Average daily hot water use (litres/day)												83.6842 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	92.0526	88.7052	85.3579	82.0105	78.6631	75.3158	75.3158	78.6631	82.0105	85.3579	88.7052	92.0526 (44)
Energy conte	136.5113	119.3937	123.2036	107.4119	103.0642	88.9366	82.4128	94.5699	95.6994	111.5284	121.7420	132.2039 (45)
Energy content (annual)										Total = Sum(45)m =		1316.6778 (45)
Distribution loss (46)m = 0.15 x (45)m												

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	20.4767	17.9091	18.4805	16.1118	15.4596	13.3405	12.3619	14.1855	14.3549	16.7293	18.2613	19.8306 (46)
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												
190.9101	168.5281	177.6024	160.0559	157.4630	141.5806	136.8116	148.9687	148.3434	165.9272	174.3860	186.6027	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h												
190.9101	168.5281	177.6024	160.0559	157.4630	141.5806	136.8116	148.9687	148.3434	165.9272	174.3860	186.6027	(64)
Heat gains from water heating, kWh/month												
88.9091	79.0059	84.4842	77.8296	77.7879	71.6866	70.9213	74.9635	73.9353	80.6022	82.5944	87.4768	(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	125.0126	125.0126	125.0126	125.0126	125.0126	125.0126	125.0126	125.0126	125.0126	125.0126	125.0126	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
42.5412	37.7847	30.7286	23.2635	17.3898	14.6812	15.8635	20.6200	27.6761	35.1412	41.0150	43.7236	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
271.8262	274.6469	267.5388	252.4065	233.3047	215.3518	203.3581	200.5374	207.6455	222.7777	241.8795	259.8325	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
49.5848	49.5848	49.5848	49.5848	49.5848	49.5848	49.5848	49.5848	49.5848	49.5848	49.5848	49.5848	(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	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	-83.3418	(71)
Water heating gains (Table 5)												
119.5014	117.5683	113.5541	108.0967	104.5536	99.5648	95.3243	100.7575	102.6878	108.3363	114.7145	117.5764	(72)
Total internal gains												
525.1245	521.2556	503.0772	475.0225	446.5038	420.8534	405.8016	413.1705	429.2651	457.5110	488.8647	512.3882	(73)

6. Solar gains

[Jan]												
			Area	Solar flux		g		FF		Access	Gains	
			m2	Table 6a		Specific data		Specific data		factor	W	
				W/m2		or Table 6b		or Table 6c		Table 6d		
East			0.6300	23.7835		0.6300		0.7000		0.7700	4.5792 (76)	
West			5.0400	23.7835		0.6300		0.7000		0.7700	36.6335 (80)	
East			3.5600	32.4966		0.6300		0.7000		1.0000	45.9165 (82)	
Solar gains	87.1292	151.5498	253.8795	385.2440	467.9446	510.4368	479.6454	414.3436	317.9786	194.7755	107.5596	71.7095 (83)
Total gains	612.2537	672.8054	756.9567	860.2665	914.4484	931.2902	885.4470	827.5141	747.2437	652.2865	596.4242	584.0976 (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	86.5039	87.1326	87.1326	87.5318	87.5318	88.4562	88.4562	88.6280	88.4562	87.7252	87.9144	87.3342
alpha	6.7669	6.8088	6.8088	6.8355	6.8355	6.8971	6.8971	6.9085	6.8971	6.8483	6.8610	6.8223
util living area												
0.9920	0.9833	0.9454	0.8206	0.6109	0.3916	0.2596	0.2935	0.5563	0.8740	0.9789	0.9938	(86)
Tweekday	19.3917	19.5258	19.7393	19.9117	19.9600	19.9743	19.9745	19.9762	19.9731	19.9013	19.6433	19.3780
Tweekend	20.6886	20.7468	20.8472	20.9369	20.9695	20.9743	20.9745	20.9745	20.9725	20.9266	20.7966	20.6791
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	20.5194	20.6084	20.7642	20.9014	20.9529	20.9605	20.9606	20.9606	20.9571	20.8867	20.6824	20.5048 (87)
Th 2	20.0126	20.0190	20.0190	20.0231	20.0231	20.0323	20.0323	20.0340	20.0323	20.0250	20.0269	20.0211 (88)
util rest of house												
0.9887	0.9765	0.9250	0.7717	0.5431	0.3217	0.1857	0.2148	0.4719	0.8230	0.9688	0.9911	(89)
Tweekday	19.3917	19.5258	19.7393	19.9117	19.9600	19.9743	19.9745	19.9762	19.9731	19.9013	19.6433	19.3780
Tweekend	19.3917	19.5258	19.7393	19.9117	19.9600	19.9743	19.9745	19.9762	19.9731	19.9013	19.6433	19.3780
MIT 2	19.3917	19.5258	19.7393	19.9117	19.9600	19.9743	19.9745	19.9762	19.9731	19.9013	19.6433	19.3780 (90)
Living area fraction												
fLA = Living area / (4) =												0.4680 (91)
MIT	19.9194	20.0324	20.2189	20.3748	20.4246	20.4358	20.4359	20.4369	20.4336	20.3624	20.1296	19.9053 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9194	20.0324	20.2189	20.3748	20.4246	20.4358	20.4359	20.4369	20.4336	20.3624	20.1296	19.9053 (93)

8. Space heating requirement

Utilisation	0.9883	0.9766	0.9297	0.7903	0.5713	0.3509	0.2165	0.2476	0.5073	0.8423	0.9701	0.9907 (94)
Useful gains	605.0917	657.0737	703.7617	679.8280	522.4560	326.7689	191.7178	204.9004	379.0574	549.4071	578.5837	578.6852 (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												
1038.2978	997.3835	886.6467	729.2898	527.7358	326.9241	191.7218	204.9104	380.8545	610.9505	838.6727	1027.4579	(97)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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	322.3054	228.6882	136.0664	35.6125	3.9282	0.0000	0.0000	0.0000	0.0000	45.7883	187.2640	333.8869 (98)
Space heating												1293.5399 (98)
Space heating per m2										(98) / (4) =		20.3131 (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 %)												241.5920 (206)
Efficiency of secondary/supplementary heating system, %												100.0000 (208)
Space heating requirement												535.4233 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	322.3054	228.6882	136.0664	35.6125	3.9282	0.0000	0.0000	0.0000	0.0000	45.7883	187.2640	333.8869 (98)
Space heating efficiency (main heating system 1)	241.5920	241.5920	241.5920	241.5920	241.5920	0.0000	0.0000	0.0000	0.0000	241.5920	241.5920	241.5920 (210)
Space heating fuel (main heating system)	133.4090	94.6588	56.3207	14.7408	1.6260	0.0000	0.0000	0.0000	0.0000	18.9527	77.5125	138.2028 (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	190.9101	168.5281	177.6024	160.0559	157.4630	141.5806	136.8116	148.9687	148.3434	165.9272	174.3860	186.6027 (64)
Efficiency of water heater	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	112.6712	99.4618	104.8173	94.4617	92.9314	83.5580	80.7434	87.9183	87.5492	97.9268	102.9190	110.1291 (219)
Water heating fuel used												1155.0872 (219)
Annual totals kWh/year												
Space heating fuel - main system												535.4233 (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)												300.5166 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
Total delivered energy for all uses												1991.0272 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	535.4233	19.1200	102.3729 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1155.0872	19.1200	220.8527 (247)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	300.5166	19.1200	57.4588 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit	0.0000	19.1200	0.0000 (252)
Total energy cost			380.6844 (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	535.4233	0.5190	277.8847 (261)
Space heating - secondary	0.0000	0.5190	0.0000 (263)
Water heating (other fuel)	1155.0872	0.5190	599.4903 (264)
Space and water heating			877.3750 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	300.5166	0.5190	155.9681 (268)
Energy saving/generation technologies			
PV Unit	-300.0000	0.5190	-155.7000 (269)
Total kg/year			877.6431 (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	535.4233	3.0700	1643.7496 (261)
Space heating - secondary	0.0000	3.0700	0.0000 (263)
Water heating (other fuel)	1155.0872	3.0700	3546.1178 (264)
Space and water heating			5189.8674 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	300.5166	3.0700	922.5860 (268)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Energy saving/generation technologies			
PV Unit	-300.0000	3.0700	-921.0000 (269)
Primary energy kWh/year			5191.4534 (272)
Primary energy kWh/m2/year			81.5241 (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 efficiency	Environmental impact
(none)			
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	£381	£381	£0
Space heating	£102	£102	£0
Water heating	£221	£221	£0
Lighting	£57	£57	£0
Total cost of fuels	£381	£381	£0
Total cost of uses	£380	£380	£0
Delivered energy	31 kWh/m²	31 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.9 tonnes	0.9 tonnes	0.0 tonnes
CO2 emissions per m²	14 kg/m²	14 kg/m²	0 kg/m²
Primary energy	82 kWh/m²	82 kWh/m²	0 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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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
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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	EndTerrace 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	338.1 (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	302.61 (P1)
Transmission heat loss coefficient	40.13 (37)
Summer heat loss coefficient	342.73 (P2)

Overhangs	Ratio	Z_overhangs	Overhang type
Orientation			
East	0.000	1.000	None
West	0.000	1.000	None

Solar shading	Z blinds	Solar access	Z overhangs	Z summer
Orientation				
East	1.000	1.00	1.000	1.000 (P8)
East	1.000	0.90	1.000	0.900 (P8)
West	1.000	0.90	1.000	0.900 (P8)

[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Shading	Gains W
East	0.6300	117.5071	0.6300	0.7000	0.9000	26.4441
West	5.0400	117.5071	0.6300	0.7000	0.9000	211.5525
East	3.5600	190.5387	0.6300	0.7000	1.0000	269.2244
total:						507.2209

Solar gains	Jun	Jul	Aug	
	540	507	440	(P3)
Internal gains	421	406	413	
Total summer gains	961	913	853	(P5)

Summer gain/loss ratio	2.80	2.66	2.49	(P6)
Summer external temperature	16.00	17.90	17.80	
Thermal mass temperature increment (TMP = 338.1)	0.00	0.00	0.00	
Threshold temperature	18.80	20.56	20.29	(P7)
Likelihood of high internal temperature	Not significant	Slight	Not significant	

Assessment of likelihood of high internal temperature: Slight

BASIC COMPLIANCE REPORT

Energy Calculations Ltd
SAP • CODE • SBEM • DESIGN

Calculation Type: New Build (As Designed)

Property Reference	015730	Issued on Date	16/08/2021
Assessment Reference	004	Prop Type Ref	
Property	Flat 9, 18, Parkside Road, READING, RG30 2DB		
SAP Rating	85 B	DER	16.67
Environmental	88 B	TER	26.03
CO ₂ Emissions (t/year)	0.88	% DER<TER	35.95
General Requirements Compliance	Pass	DFEE	41.89
		TFEE	44.39
		% DFEE<TFEE	5.61
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)	26.03	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.67	kgCO ₂ /m ²	Pass
	-9.36 (-36.0%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	44.39	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	41.89	kWh/m ² /yr	
	-2.5 (-5.6%)	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
Roof	0.11 (max. 0.20)	0.14 (max. 0.35)	Pass
Openings	1.46 (max. 2.00)	1.60 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

Limiting System Efficiencies

4 Heating efficiency

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

5 Cylinder insulation

BASIC COMPLIANCE REPORT

Energy Calculations Ltd
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Calculation Type: New Build (As Designed)

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)

Slight

Pass

Based on:

Overshading

Average

Windows facing East

0.63 m², No overhang

Windows facing West

5.04 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

Roof U-value

0.10

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
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Calculation Type: New Build (As Designed)

Property Reference	015730	Issued on Date	16/08/2021
Assessment Reference	004	Prop Type Ref	
Property	Flat 9, 18, Parkside Road, READING, RG30 2DB		
SAP Rating	85 B	DER	16.67
Environmental	88 B	TER	26.03
CO ₂ Emissions (t/year)	0.88	% DER<TER	35.95
General Requirements Compliance	Pass	DFEE	41.89
		TFEE	44.39
		% DFEE<TFEE	5.61
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, End-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 22.61 m	Internal Floor Area 63.68 m ²
			Average Storey Height 2.40 m

7.0 Living Area	29.80	m ²
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8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	338.07	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	50.20	44.53
Wall to stairs	Cavity Wall	Cavity wall : dense plaster, dense block, filled cavity, any outside structure	0.22	190.00	2.88	0.99

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	46.54

9.2 Internal Walls					
Description	Construction		Kappa (kJ/m ² K)	Area (m ²)	
Internal Wall 1	Dense block, dense plaster		100.00	72.00	

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)
Plane	External Plane Roof	Plasterboard, insulated at ceiling level	0.10	9.00	47.00	47.00
Slope	External Slope Roof	Plasterboard, insulated slope	0.14	9.00	16.99	13.43

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

11.1 Party Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Precast concrete planks floor, screed, carpeted	40.00	63.68

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
R lights	Manufacture	Roof Window	Double Low-E Soft 0.05			0.63		0.70	1.60

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 stairs	North							1.89	
Windows	Roof Window	[2] Slope	East	None						3.56	
Windows	Window	[1] Main Wall	East	None	0.00					0.63	
Windows	Window	[1] Main Wall	West	None	0.00					5.04	

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)	3.40	0.300	No
Table K1 - Approved	E3 Sill	1.40	0.040	No
Table K1 - Approved	E4 Jamb	8.40	0.050	No
Table K1 - Approved	E7 Party floor between dwellings (in blocks of flats)	22.61	0.070	No
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	10.96	0.060	No
Table K1 - Approved	E11 Eaves (insulation at rafter level)	6.00	0.040	No
Table K1 - Approved	E12 Gable (insulation at ceiling level)	9.50	0.240	No
Table K1 - Approved	E13 Gable (insulation at rafter level)	1.70	0.040	No
Table K1 - Approved	E16 Corner (normal)	7.20	0.090	No
Table K1 - Approved	E17 Corner (inverted – internal area greater than external area)	7.20	-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)	19.39	0.000	No
Table K1 - Default	R1 Head of roof window	3.40	0.080	No
Table K1 - Default	R2 Sill of roof window	3.40	0.060	No
Table K1 - Default	R3 Jamb of roof window	8.40	0.080	No

Y-value

0.069

W/m²K

18.0 Pressure Testing

Yes

Designed AP₅₀

5.00

m³/(h.m²) @ 50 Pa

Property Tested ?

As Built AP₅₀

m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather

Windows fully open

Cross ventilation possible

Yes

SUMMARY FOR INPUT DATA

Energy Calculations Ltd
SAP • CODE • SBEM • DESIGN

Calculation Type: New Build (As Designed)

Night Ventilation

Air change rate

Mechanical Ventilation

Mechanical Ventilation System Present

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

22.0 Lighting

Internal

Total number of light fittings

Total number of L.E.L. fittings

Percentage of L.E.L. fittings %

External

External lights fitted

Light and motion sensor

23.0 Electricity Tariff

24.0 Main Heating 1

Percentage of Heat %

Database Ref. No.

Fuel Type

Main Heating

SAP Code

In Winter

In Summer

Controls

PCDF Controls

Sap Code

Is MHS Pumped

Heat Emitter

Underfloor Heating

Flow Temperature

25.0 Main Heating 2

Community Heating

28.0 Water Heating

Water Heating

Flue Gas Heat Recovery System

Waste Water Heat Recovery Instantaneous System 1

Waste Water Heat Recovery

SUMMARY FOR INPUT DATA

Energy Calculations Ltd
SAP ♦ CODE ♦ SBEM ♦ DESIGN

Calculation Type: New Build (As Designed)

Instantaneous System 2

Waste Water Heat Recovery

No

Storage System

Solar Panel

No

Water use <= 125 litres/person/day

Yes

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

L

Loss

1.86

kWh/day

Pipes insulation

Fully insulated primary pipework

31.0 Thermal Store

None

32.0 Photovoltaic Unit

More Dwellings, One Block

Apportioned

300.00

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 %			