

Energy Calculations Ltd

SAP ♦ CODE ♦ SBEM ♦ DESIGN

01754-761035



SAP Report Submission for Building Regulations Compliance

Client:

Project: Flat 8, 18, Parkside Road
READING, RG30 2DB

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

Report Issue Date: 01/03/2021

EXCELLENCE
IN ENERGY
ASSESSMENT

PREDICTED ENERGY ASSESSMENT

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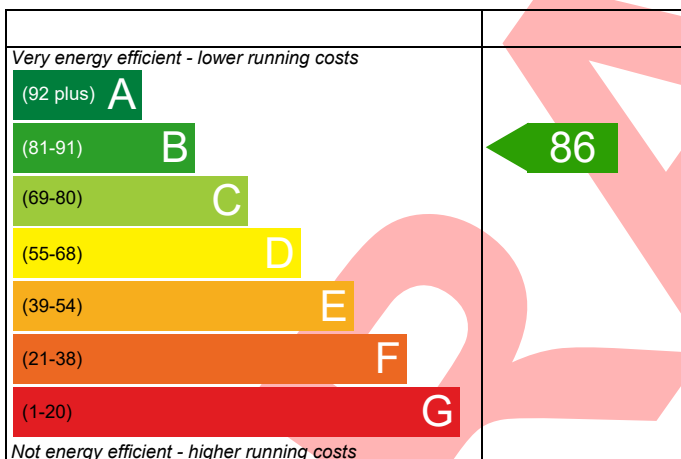
Flat 8, 18, Parkside Road,
READING,
RG30 2DB

Dwelling type: Flat, Mid-Terrace
Date of assessment: 01/03/2021
Produced by: Energy Calculations Limited
Total floor area: 78.1 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

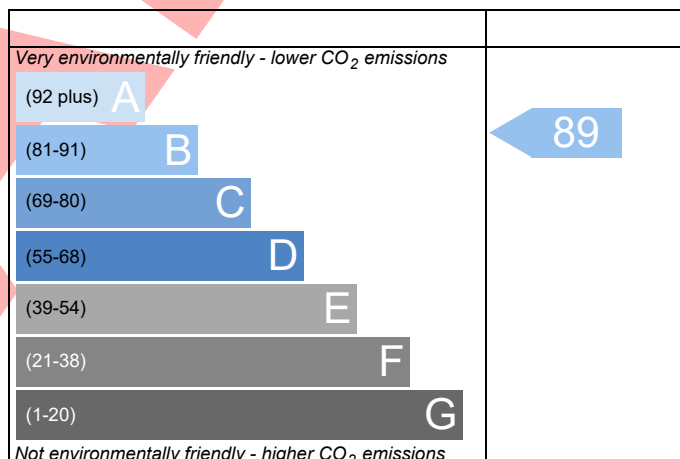


England

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	015729	Issued on Date	01/03/2021
Assessment Reference	003	Prop Type Ref	
Property	Flat 8, 18, Parkside Road, READING, RG30 2DB		

SAP Rating	86 B	DER	14.72	TER	23.84
Environmental	89 B	% DER<TER	38.25		
CO ₂ Emissions (t/year)	0.98	DFEE	41.12	TFEE	42.82
General Requirements Compliance	Pass	% DFEE<TFEE	3.99		

Assessor Details	Mr. Matthew Carter, Energy Calculations Limited, Tel: 01754 761035, mcarter@energycalculations.co.uk	Assessor ID	7869-0001
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Client	
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	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	9.24	2.77	
External wall	E3 Sill	Table K1 - Approved	0.040	9.24	0.37	
External wall	E4 Jamb	Table K1 - Approved	0.050	49.92	2.50	
External wall	E7 Party floor between dwellings (in blocks of flats)	Table K1 - Approved	0.070	32.55	2.28	
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	9.60	-0.86	
External wall	E18 Party wall between dwellings	Table K1 - Approved	0.060	12.00	0.72	
Party wall	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	0.000	11.20	0.00	

Total: **8.42** W/mK:
Y-Value: **0.108** W/m²K:

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Assessor Details	Mr. Matthew Carter, Energy Calculations Limited, Tel: 01754 761035, mcarter@energycalculations.co.uk			Assessor ID	7869-0001
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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

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

DWELLING AS DESIGNED

Mid-floor flat, total floor area 78 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) 23.84 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 14.72 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)42.8 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)41.1 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.22 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	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 North:	9.60 m ² , No overhang
Windows facing East:	3.20 m ² , No overhang
Windows facing West:	6.40 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
Photovoltaic array	300.00 kWh/Year

FULL SAP CALCULATION PRINTOUT

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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	78.1000 (1b)	x 2.4000 (2b)	= 187.4400 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.1000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	187.4400 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1601 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4101 (18)
Number of sides sheltered					3 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3178 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
	0.4052	0.3972	0.3893	0.3496	0.3416	0.3019	0.3019	0.2940	0.3178	0.3416	0.3575	0.3734 (22b)
Effective ac	0.5821	0.5789	0.5758	0.5611	0.5584	0.5456	0.5456	0.5432	0.5505	0.5584	0.5639	0.5697 (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)			19.2000	1.3258	25.4545		(27)
Door to Stairs			1.8900	1.4000	2.6460		(26)
Main Wall	56.3200	19.2000	37.1200	0.2200	8.1664	60.0000	2227.2000 (29a)
Wall to stairs	21.8000	1.8900	19.9100	0.1864	3.7108	190.0000	3782.9000 (29a)
Total net area of external elements Aum(A, m ²)			78.1200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.9777		(33)
Party Wall 1			25.8200	0.0000	0.0000	180.0000	4647.6000 (32)
Party Floor 1			78.1000			40.0000	3124.0000 (32d)
Party Ceilings 1			78.1000			40.0000	3124.0000 (32b)
Internal Wall 1			106.8000			9.0000	961.2000 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 17866.9000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							228.7695 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.4201 (36)
Total fabric heat loss							(33) + (36) = 48.3978 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	36.0051	35.8079	35.6146	34.7069	34.5371	33.7465	33.7465	33.6000	34.0510	34.5371	34.8806	35.2398 (38)
Heat transfer coeff	84.4029	84.2057	84.0125	83.1047	82.9349	82.1443	82.1443	81.9979	82.4488	82.9349	83.2785	83.6376 (39)
Average = Sum(39)m / 12 =												83.1039 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0807	1.0782	1.0757	1.0641	1.0619	1.0518	1.0518	1.0499	1.0557	1.0619	1.0663	1.0709 (40)
HLP (average)												1.0641 (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												2.4258 (42)
Average daily hot water use (litres/day)												91.8133 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	100.9946	97.3221	93.6495	89.9770	86.3045	82.6319	82.6319	86.3045	89.9770	93.6495	97.3221	100.9946 (44)
Energy conte	149.7720	130.9916	135.1716	117.8459	113.0759	97.5759	90.4184	103.7565	104.9956	122.3623	133.5680	145.0462 (45)
Energy content (annual)										Total = Sum(45)m =		1444.5800 (45)
Distribution loss (46)m = 0.15 x (45)m												
	22.4658	19.6487	20.2757	17.6769	16.9614	14.6364	13.5628	15.5635	15.7493	18.3543	20.0352	21.7569 (46)
Water storage loss:												

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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	30.1320	(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	30.1320	(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	22.5120	(59)
Total heat required for water heating calculated for each month													
204.1708	180.1260	189.5704	170.4899	167.4747	150.2199	144.8172	158.1553	157.6396	176.7611	186.2120	199.4450	199.4450	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Output from w/h													
204.1708	180.1260	189.5704	170.4899	167.4747	150.2199	144.8172	158.1553	157.6396	176.7611	186.2120	199.4450	199.4450	(64)
Heat gains from water heating, kWh/month													
93.3182	82.8622	88.4636	81.2989	81.1168	74.5592	73.5832	78.0181	77.0263	84.2045	86.5266	91.7469	91.7469	(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		
121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
19.2052	17.0579	13.8724	10.5023	7.8506	6.6278	7.1616	9.3089	12.4944	15.8645	18.5162	19.7390	19.7390	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
215.4238	217.6592	212.0260	200.0336	184.8953	170.6675	161.1624	158.9270	164.5602	176.5526	191.6909	205.9187	205.9187	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	(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)													
-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	(71)
Water heating gains (Table 5)													
125.4277	123.3069	118.9027	112.9152	109.0279	103.5544	98.9021	104.8630	106.9809	113.1781	120.1758	123.3157	123.3157	(72)
Total internal gains													
419.4440	417.4113	404.1884	382.8384	361.1612	340.2370	326.6134	332.4862	343.4228	364.9825	389.7701	408.3607	408.3607	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W		
North				9.6000	10.6334		0.6300	0.7000	0.7700		31.1971 (74)		
East				3.2000	19.6403		0.6300	0.7000	0.7700		19.2074 (76)		
West				6.4000	19.6403		0.6300	0.7000	0.7700		38.4148 (80)		
Solar gains	88.8194	172.3407	286.9439	433.4655	551.0083	574.3253	542.4601	451.5900	337.7073	204.7225	110.3339	73.3932	(83)
Total gains	508.2634	589.7520	691.1323	816.3039	912.1694	914.5623	869.0735	784.0761	681.1301	569.7049	500.1040	481.7539	(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	58.8016	58.9393	59.0749	59.7202	59.8425	60.4184	60.4184	60.5263	60.1953	59.8425	59.5956	59.3396	
alpha	4.9201	4.9293	4.9383	4.9813	4.9895	5.0279	5.0279	5.0351	5.0130	4.9895	4.9730	4.9560	
util living area													
0.9958	0.9906	0.9727	0.9065	0.7564	0.5592	0.4129	0.4747	0.7508	0.9532	0.9912	0.9967	0.9967	(86)
Tweekday	18.7573	18.9464	19.2659	19.6532	19.8779	19.9522	19.9604	19.9609	19.9139	19.5923	19.1100	18.7309	
Tweekend	20.3920	20.4754	20.6183	20.7960	20.9131	20.9560	20.9635	20.9620	20.9284	20.7617	20.5442	20.3775	
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	20.0616	20.1885	20.4109	20.6814	20.8659	20.9324	20.9436	20.9413	20.8882	20.6322	20.2883	20.0392	(87)
Th 2	20.0166	20.0187	20.0207	20.0303	20.0321	20.0404	20.0404	20.0420	20.0372	20.0321	20.0284	20.0247	(88)
util rest of house													
0.9945	0.9878	0.9645	0.8803	0.7008	0.4817	0.3244	0.3790	0.6739	0.9343	0.9881	0.9957	0.9957	(89)
Tweekday	18.7573	18.9464	19.2659	19.6532	19.8779	19.9522	19.9604	19.9609	19.9139	19.5923	19.1100	18.7309	
Tweekend	18.7573	18.9464	19.2659	19.6532	19.8779	19.9522	19.9604	19.9609	19.9139	19.5923	19.1100	18.7309	
MIT 2	18.7573	18.9464	19.2659	19.6532	19.8779	19.9522	19.9604	19.9609	19.9139	19.5923	19.1100	18.7309	(90)
Living area fraction									fLA = Living area / (4) =			0.3613	(91)
MIT	19.2286	19.3952	19.6796	20.0247	20.2349	20.3064	20.3156	20.3152	20.2660	19.9680	19.5357	19.2036	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2286	19.3952	19.6796	20.0247	20.2349	20.3064	20.3156	20.3152	20.2660	19.9680	19.5357	19.2036	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9931	0.9855	0.9610	0.8801	0.7132	0.5037	0.3500	0.4067	0.6936	0.9328	0.9860	0.9946	(94)
Useful gains	504.7650	581.1870	664.1541	718.4244	650.5650	460.6703	304.1897	318.9120	472.4361	531.4141	493.0879	479.1636	(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													
1260.0143	1220.5768	1107.2513	924.5185	707.8385	468.7464	305.2192	321.0361	508.3773	776.9355	1035.6276	1254.8663	1254.8663	(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													

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Space heating	561.9054	429.6700	329.6643	148.3877	42.6115	0.0000	0.0000	0.0000	0.0000	182.6679	390.6285	577.1228 (98)
Space heating per m2												2662.6582 (98)
										(98) / (4) =		34.0929 (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 %)												281.6025 (206)
Efficiency of secondary/supplementary heating system, %												100.0000 (208)
Space heating requirement												945.5379 (211)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	561.9054	429.6700	329.6643	148.3877	42.6115	0.0000	0.0000	0.0000	0.0000	182.6679	390.6285	577.1228 (98)
Space heating efficiency (main heating system 1)	281.6025	281.6025	281.6025	281.6025	281.6025	0.0000	0.0000	0.0000	0.0000	281.6025	281.6025	281.6025 (210)
Space heating fuel (main heating system)	199.5385	152.5803	117.0673	52.6940	15.1318	0.0000	0.0000	0.0000	0.0000	64.8673	138.7163	204.9424 (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	204.1708	180.1260	189.5704	170.4899	167.4747	150.2199	144.8172	158.1553	157.6396	176.7611	186.2120	199.4450 (64)
Efficiency of water heater (217)m	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400 (216)
Fuel for water heating, kWh/month	120.4974	106.3066	111.8805	100.6196	98.8401	88.6567	85.4681	93.3400	93.0357	104.3208	109.8985	117.7084 (219)
Water heating fuel used												1230.5725 (219)
Annual totals kWh/year												
Space heating fuel - main system												945.5379 (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)												339.1696 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
Total delivered energy for all uses												2515.2800 (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	945.5379	0.5190	490.7342 (261)
Space heating - secondary	0.0000	0.5190	0.0000 (263)
Water heating (other fuel)	1230.5725	0.5190	638.6671 (264)
Space and water heating			1129.4013 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	339.1696	0.5190	176.0290 (268)
Energy saving/generation technologies			
PV Unit	-300.0000	0.5190	-155.7000 (269)
Total CO2, kg/year			1149.7303 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			14.7200 (273)

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

DER		14.7200 ZC1
Total Floor Area	TFA	78.1000
Assumed number of occupants	N	2.4258
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.3451 ZC2
CO2 emissions from cooking, equation (L16)		2.2691 ZC3
Total CO2 emissions		33.3343 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		33.3343 ZC8

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1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	78.1000 (1b)	x 2.4000 (2b)	= 187.4400 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.1000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 187.4400 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1601 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4101 (18)
Number of sides sheltered					3 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3178 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
	0.4052	0.3972	0.3893	0.3496	0.3416	0.3019	0.3019	0.2940	0.3178	0.3416	0.3575	0.3734 (22b)
Effective ac	0.5821	0.5789	0.5758	0.5611	0.5584	0.5456	0.5456	0.5432	0.5505	0.5584	0.5639	0.5697 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900		(26)					
TER Opening Type (Uw = 1.40)			17.6400	1.3258	23.3864		(27)					
Main Wall	56.3200	17.6400	38.6800	0.1800	6.9624		(29a)					
Wall to stairs	21.8000	1.8900	19.9100	0.1800	3.5838		(29a)					
Total net area of external elements Aum(A, m2)			78.1200				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 35.8226		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								6.2025 (36)				
Total fabric heat loss								(33) + (36) = 42.0251 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 36.0051	Feb 35.8079	Mar 35.6146	Apr 34.7069	May 34.5371	Jun 33.7465	Jul 33.7465	Aug 33.6000	Sep 34.0510	Oct 34.5371	Nov 34.8806	Dec 35.2398 (38)
Heat transfer coeff	78.0301	77.8330	77.6397	76.7320	76.5621	75.7715	75.7715	75.6251	76.0761	76.5621	76.9057	77.2649 (39)
Average = Sum(39)m / 12 =												76.7311 (39)
HLP	Jan 0.9991	Feb 0.9966	Mar 0.9941	Apr 0.9825	May 0.9803	Jun 0.9702	Jul 0.9702	Aug 0.9683	Sep 0.9741	Oct 0.9803	Nov 0.9847	Dec 0.9893 (40)
HLP (average)												0.9825 (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												2.4258 (42)
Average daily hot water use (litres/day)												91.8133 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.9946	97.3221	93.6495	89.9770	86.3045	82.6319	82.6319	86.3045	89.9770	93.6495	97.3221	100.9946 (44)
Energy conte	149.7720	130.9916	135.1716	117.8459	113.0759	97.5759	90.4184	103.7565	104.9956	122.3623	133.5680	145.0462 (45)
Energy content (annual)										Total = Sum(45)m =		1444.5800 (45)
Distribution loss (46)m = 0.15 x (45)m												
	22.4658	19.6487	20.2757	17.6769	16.9614	14.6364	13.5628	15.5635	15.7493	18.3543	20.0352	21.7569 (46)
Water storage loss:												
Store volume												210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7016 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9188 (55)
Total storage loss												

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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 (56)
Primary 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 (57)
Total heat required for water heating calculated for each month	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)
Solar input	201.5186	177.7304	186.9182	167.9232	164.8225	147.6533	142.1650	155.5031	155.0730	174.1089	183.6454	196.7928 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	Solar input (sum of months) = Sum (63)m = 0.0000 (63)											
	201.5186	177.7304	186.9182	167.9232	164.8225	147.6533	142.1650	155.5031	155.0730	174.1089	183.6454	196.7928 (64)
	Total per year (kWh/year) = Sum (64)m = 2053.8544 (64)											
	91.1965	80.9458	86.3418	79.2456	78.9950	72.5059	71.4614	75.8963	74.9729	82.0827	84.4732	89.6251 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.2018	17.0549	13.8699	10.5004	7.8492	6.6266	7.1603	9.3072	12.4921	15.8617	18.5129	19.7355	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	215.4238	217.6592	212.0260	200.0336	184.8953	170.6675	161.1624	158.9270	164.5602	176.5526	191.6909	205.9187	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	(71)
Water heating gains (Table 5)	122.5759	120.4550	116.0508	110.0634	106.1761	100.7026	96.0503	102.0112	104.1291	110.3263	117.3240	120.4639	(72)
Total internal gains	419.5888	417.5564	404.3341	382.9847	361.3079	340.3840	326.7603	332.6327	343.5687	365.1278	389.9150	408.5054	(73)

6. Solar gains

[Jan]														
				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W	
North				8.8200	10.6334		0.6300		0.7000		0.7700		28.6624 (74)	
East				2.9400	19.6403		0.6300		0.7000		0.7700		17.6468 (76)	
West				5.8800	19.6403		0.6300		0.7000		0.7700		35.2936 (80)	
Solar gains	81.6028	158.3380	263.6297	398.2464	506.2389	527.6613	498.3853	414.8983	310.2686	188.0888	101.3693	67.4300	(83)	
Total gains	501.1916	575.8945	667.9638	781.2311	867.5468	868.0454	825.1456	747.5310	653.8373	553.2166	491.2843	475.9354	(84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.5066	69.6827	69.8562	70.6826	70.8393	71.5785	71.5785	71.7171	71.2920	70.8393	70.5229	70.1950	
alpha	5.6338	5.6455	5.6571	5.7122	5.7226	5.7719	5.7719	5.7811	5.7528	5.7226	5.7015	5.6797	
util living area	0.9972	0.9933	0.9781	0.9138	0.7561	0.5499	0.4028	0.4624	0.7449	0.9584	0.9935	0.9979	(86)
MIT	20.0067	20.1574	20.4153	20.7339	20.9304	20.9906	20.9987	20.9972	20.9530	20.6699	20.2798	19.9803	(87)
Th 2	20.0841	20.0862	20.0882	20.0980	20.0998	20.1083	20.1083	20.1098	20.1050	20.0998	20.0961	20.0923	(88)
util rest of house	0.9962	0.9911	0.9710	0.8883	0.7014	0.4771	0.3218	0.3745	0.6693	0.9405	0.9911	0.9972	(89)
MIT 2	18.7578	18.9787	19.3515	19.7978	20.0368	20.1025	20.1078	20.1087	20.0700	19.7236	19.1653	18.7255	(90)
Living area fraction	19.2091	19.4046	19.7359	20.1360	20.3597	20.4234	20.4297	20.4298	fLA = Living area / (4) =	20.0655	19.5680	0.3613	(91)
MIT	19.2091	19.4046	19.7359	20.1360	20.3597	20.4234	20.4297	20.4298	20.3891	20.0655	19.5680	19.1789	(92)
Temperature adjustment	19.2091	19.4046	19.7359	20.1360	20.3597	20.4234	20.4297	20.4298	20.3891	20.0655	19.5680	0.0000	
adjusted MIT	19.2091	19.4046	19.7359	20.1360	20.3597	20.4234	20.4297	20.4298	20.3891	20.0655	19.5680	19.1789	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9950	0.9889	0.9676	0.8896	0.7180	0.5032	0.3511	0.4063	0.6947	0.9397	0.9891	0.9962	(94)
Useful gains	498.6995	569.5106	646.2930	694.9464	622.8683	436.8323	289.7292	303.7400	454.2222	519.8674	485.9322	474.1292	(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	1163.3571	1128.9369	1027.6312	862.1611	663.0070	441.2448	290.1812	304.7508	478.4480	724.6993	958.8601	1157.3423	(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	494.5052	375.9344	283.7156	120.3946	29.8631	0.0000	0.0000	0.0000	0.0000	152.3949	340.5081	508.3106	(98)
Space heating	2305.6266 (98)												
Space heating per m2	(98) / (4) = 29.5215 (99)												

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2465.9108 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	494.5052	375.9344	283.7156	120.3946	29.8631	0.0000	0.0000	0.0000	0.0000	152.3949	340.5081	508.3106	(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)	528.8826	402.0689	303.4392	128.7642	31.9392	0.0000	0.0000	0.0000	0.0000	162.9892	364.1798	543.6477	(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	201.5186	177.7304	186.9182	167.9232	164.8225	147.6533	142.1650	155.5031	155.0730	174.1089	183.6454	196.7928	(64)
Efficiency of water heater (217)m	87.1180	86.7654	85.9242	83.9444	81.2740	79.8000	79.8000	79.8000	79.8000	84.4609	86.4392	79.8000	(216)
Fuel for water heating, kWh/month	231.3170	204.8402	217.5384	200.0410	202.7986	185.0291	178.1517	194.8660	194.3271	206.1413	212.4562	225.5883	(219)
Water heating fuel used												2453.0948	(219)
Annual totals kWh/year													
Space heating fuel - main system												2465.9108	(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)												339.1096	(232)
Total delivered energy for all uses												5333.1152	(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	2465.9108	0.2160	532.6367 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2453.0948	0.2160	529.8685 (264)
Space and water heating			1062.5052 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	339.1096	0.5190	175.9979 (268)
Total CO2, kg/m2/year			1277.4281 (272)
Emissions per m2 for space and water heating			13.6044 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.2535 (272b)
Emissions per m2 for pumps and fans			0.4984 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.6044 * 1.55) + 2.2535 + 0.4984, rounded to 2 d.p.			23.8400 (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	78.1000 (1b)	x 2.4000 (2b)	= 187.4400 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.1000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 187.4400 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 30.0000 / (5) = 0.1601 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4101 (18)
Number of sides sheltered					3 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3178 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
	0.4052	0.3972	0.3893	0.3496	0.3416	0.3019	0.3019	0.2940	0.3178	0.3416	0.3575	0.3734 (22b)
Effective ac	0.5821	0.5789	0.5758	0.5611	0.5584	0.5456	0.5456	0.5432	0.5505	0.5584	0.5639	0.5697 (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)			19.2000	1.3258	25.4545		(27)
Door to Stairs			1.8900	1.4000	2.6460		(26)
Main Wall	56.3200	19.2000	37.1200	0.2200	8.1664	60.0000	2227.2000 (29a)
Wall to stairs	21.8000	1.8900	19.9100	0.1864	3.7108	190.0000	3782.9000 (29a)
Total net area of external elements Aum(A, m ²)			78.1200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		39.9777		(33)
Party Wall 1			25.8200	0.0000	0.0000	180.0000	4647.6000 (32)
Party Floor 1			78.1000			40.0000	3124.0000 (32d)
Party Ceilings 1			78.1000			30.0000	2343.0000 (32b)
Internal Wall 1			106.8000			9.0000	961.2000 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 17085.9000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							218.7695 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.4201 (36)
Total fabric heat loss						(33) + (36) =	48.3978 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	36.0051	35.8079	35.6146	34.7069	34.5371	33.7465	33.7465	33.6000	34.0510	34.5371	34.8806	35.2398 (38)
Heat transfer coeff	84.4029	84.2057	84.0125	83.1047	82.9349	82.1443	82.1443	81.9979	82.4488	82.9349	83.2785	83.6376 (39)
Average = Sum(39)m / 12 =												83.1039 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0807	1.0782	1.0757	1.0641	1.0619	1.0518	1.0518	1.0499	1.0557	1.0619	1.0663	1.0709 (40)
HLP (average)												1.0641 (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												2.4258 (42)
Average daily hot water use (litres/day)												91.8133 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	100.9946	97.3221	93.6495	89.9770	86.3045	82.6319	82.6319	86.3045	89.9770	93.6495	97.3221	100.9946 (44)
Energy conte	149.7720	130.9916	135.1716	117.8459	113.0759	97.5759	90.4184	103.7565	104.9956	122.3623	133.5680	145.0462 (45)
Energy content (annual)										Total = Sum(45)m =		1444.5800 (45)
Distribution loss (46)m = 0.15 x (45)m												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												

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Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	31.8266	27.8357	28.7240	25.0422	24.0286	20.7349	19.2139	22.0482	22.3116	26.0020	28.3832	30.8223 (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	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.2052	17.0579	13.8724	10.5023	7.8506	6.6278	7.1616	9.3089	12.4944	15.8645	18.5162	19.7390	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	215.4238	217.6592	212.0260	200.0336	184.8953	170.6675	161.1624	158.9270	164.5602	176.5526	191.6909	205.9187	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	(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)	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	(71)
Water heating gains (Table 5)	42.7776	41.4222	38.6075	34.7809	32.2965	28.7984	25.8252	29.6347	30.9883	34.9489	39.4211	41.4279	(72)
Total internal gains	336.7939	335.5266	323.8932	304.7041	284.4298	265.4810	253.5365	257.2579	267.4302	286.7533	309.0155	326.4728	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W

North	9.6000	10.6334	0.6300	0.7000	0.7700	31.1971 (74)
East	3.2000	19.6403	0.6300	0.7000	0.7700	19.2074 (76)
West	6.4000	19.6403	0.6300	0.7000	0.7700	38.4148 (80)

Solar gains	88.8194	172.3407	286.9439	433.4655	551.0083	574.3253	542.4601	451.5900	337.7073	204.7225	110.3339	73.3932	(83)
Total gains	425.6133	507.8673	610.8371	738.1696	835.4381	839.8063	795.9966	708.8479	605.1374	491.4758	419.3494	399.8661	(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	56.2313	56.3630	56.4926	57.1097	57.2266	57.7774	57.7774	57.8806	57.5640	57.2266	56.9905	56.7458	
alpha	4.7488	4.7575	4.7662	4.8073	4.8151	4.8518	4.8518	4.8587	4.8376	4.8151	4.7994	4.7831	
util living area	0.9976	0.9941	0.9811	0.9279	0.7934	0.6002	0.4486	0.5202	0.8021	0.9702	0.9951	0.9982	(86)
MIT	19.6672	19.8480	20.1616	20.5646	20.8526	20.9705	20.9941	20.9885	20.8864	20.4760	19.9953	19.6360	(87)
Th 2	20.0166	20.0187	20.0207	20.0303	20.0321	20.0404	20.0404	20.0420	20.0372	20.0321	20.0284	20.0247	(88)
util rest of house	0.9969	0.9924	0.9753	0.9065	0.7413	0.5202	0.3535	0.4176	0.7309	0.9575	0.9934	0.9977	(89)
MIT 2	18.7957	18.9774	19.2890	19.6829	19.9347	20.0267	20.0388	20.0384	19.9729	19.6087	19.1325	18.7710	(90)
Living area fraction									fLA = Living area / (4) =			0.3613	(91)
MIT	19.1106	19.2920	19.6043	20.0015	20.2664	20.3677	20.3840	20.3817	20.3030	19.9221	19.4443	19.0835	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1106	19.2920	19.6043	20.0015	20.2664	20.3677	20.3840	20.3817	20.3030	19.9221	19.4443	19.0835	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	423.9263	503.1270	593.8589	668.6114	630.6420	460.4744	308.8456	322.3739	455.3247	469.7018	415.9736	398.6768	(94)
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	1250.0569	1211.8880	1100.9247	922.5856	710.4520	473.7875	310.8311	326.4911	511.4315	773.1264	1028.0121	1244.8234	(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	614.6412	476.2874	377.2569	182.8615	59.3786	0.0000	0.0000	0.0000	0.0000	225.7479	440.6678	629.5331	(98)
Space heating												3006.3743	(98)
Space heating per m2										(98) / (4) =		38.4939	(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	772.1562	607.8677	623.1838	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9333	0.9654	0.9455	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	720.6236	586.8304	589.2497	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1071.8820	1018.8115	918.4410	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)

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Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	252.9060	321.3939	244.9184	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												819.2183 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	63.2265	80.3485	61.2296	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												204.8046 (107)
Space cooling per m2												2.6223 (108)
Energy for space heating												38.4939 (99)
Energy for space cooling												2.6223 (108)
Total												41.1162 (109)
Dwelling Fabric Energy Efficiency (DFEE)												41.1 (109)

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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	78.1000 (1b)	x 2.4000 (2b)	= 187.4400 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.1000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 187.4400 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) = 0.1601 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4101 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3178 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
	0.4052	0.3972	0.3893	0.3496	0.3416	0.3019	0.3019	0.2940	0.3178	0.3416	0.3575	0.3734 (22b)
Effective ac	0.5821	0.5789	0.5758	0.5611	0.5584	0.5456	0.5456	0.5432	0.5505	0.5584	0.5639	0.5697 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opaque door			1.8900	1.0000	1.8900			(26)					
TER Opening Type (Uw = 1.40)			17.6400	1.3258	23.3864			(27)					
Main Wall	56.3200	17.6400	38.6800	0.1800	6.9624			(29a)					
Wall to stairs	21.8000	1.8900	19.9100	0.1800	3.5838			(29a)					
Total net area of external elements Aum(A, m2)			78.1200					(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	35.8226		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								6.2025 (36)					
Total fabric heat loss						(33) + (36) =		42.0251 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 36.0051	Feb 35.8079	Mar 35.6146	Apr 34.7069	May 34.5371	Jun 33.7465	Jul 33.7465	Aug 33.6000	Sep 34.0510	Oct 34.5371	Nov 34.8806	Dec 35.2398	(38)
Heat transfer coeff	78.0301	77.8330	77.6397	76.7320	76.5621	75.7715	75.7715	75.6251	76.0761	76.5621	76.9057	77.2649	(39)
Average = Sum(39)m / 12 =												76.7311	(39)
HLP	Jan 0.9991	Feb 0.9966	Mar 0.9941	Apr 0.9825	May 0.9803	Jun 0.9702	Jul 0.9702	Aug 0.9683	Sep 0.9741	Oct 0.9803	Nov 0.9847	Dec 0.9893	(40)
HLP (average)												0.9825	(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												2.4258 (42)
Average daily hot water use (litres/day)												91.8133 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	100.9946	97.3221	93.6495	89.9770	86.3045	82.6319	82.6319	86.3045	89.9770	93.6495	97.3221	100.9946 (44)
Energy conte	149.7720	130.9916	135.1716	117.8459	113.0759	97.5759	90.4184	103.7565	104.9956	122.3623	133.5680	145.0462 (45)
Energy content (annual)										Total = Sum(45)m =		1444.5800 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)

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Heat gains from water heating, kWh/month
31.8266 27.8357 28.7240 25.0422 24.0286 20.7349 19.2139 22.0482 22.3116 26.0020 28.3832 30.8223 (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 121.2911 121.2911 121.2911 121.2911 121.2911 121.2911 121.2911 121.2911 121.2911 121.2911 121.2911 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
19.2018 17.0549 13.8699 10.5004 7.8492 6.6266 7.1603 9.3072 12.4921 15.8617 18.5129 19.7355 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
215.4238 217.6592 212.0260 200.0336 184.8953 170.6675 161.1624 158.9270 164.5602 176.5526 191.6909 205.9187 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
35.1291 35.1291 35.1291 35.1291 35.1291 35.1291 35.1291 35.1291 35.1291 35.1291 35.1291 35.1291 (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)
-97.0329 -97.0329 -97.0329 -97.0329 -97.0329 -97.0329 -97.0329 -97.0329 -97.0329 -97.0329 -97.0329 -97.0329 (71)
Water heating gains (Table 5)
42.7776 41.4222 38.6075 34.7809 32.2965 28.7984 25.8252 29.6347 30.9883 34.9489 39.4211 41.4279 (72)
Total internal gains
336.7905 335.5236 323.8907 304.7022 284.4284 265.4799 253.5352 257.2563 267.4280 286.7505 309.0122 326.4693 (73)

6. Solar gains

[Jan]
Area m2 Solar flux Table 6a W/m2 Specific data or Table 6b g Specific data or Table 6c FF Access factor Table 6d Gains W
North 8.8200 10.6334 0.6300 0.7000 0.7700 28.6624 (74)
East 2.9400 19.6403 0.6300 0.7000 0.7700 17.6468 (76)
West 5.8800 19.6403 0.6300 0.7000 0.7700 35.2936 (80)
Solar gains 81.6028 158.3380 263.6297 398.2464 506.2389 527.6613 498.3853 414.8983 310.2686 188.0888 101.3693 67.4300 (83)
Total gains 418.3933 493.8616 587.5204 702.9487 790.6672 793.1412 751.9204 672.1546 577.6965 474.8392 410.3815 393.8994 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
tau 69.5066 69.6827 69.8562 70.6826 70.8393 71.5785 71.5785 71.7171 71.2920 70.8393 70.5229 70.1950
alpha 5.6338 5.6455 5.6571 5.7122 5.7226 5.7719 5.7719 5.7811 5.7528 5.7226 5.7015 5.6797
util living area 0.9989 0.9968 0.9878 0.9414 0.8033 0.5970 0.4411 0.5119 0.8082 0.9784 0.9974 0.9992 (86)
MIT 19.9055 20.0588 20.3249 20.6692 20.9046 20.9858 20.9979 20.9953 20.9279 20.5884 20.1821 19.8796 (87)
Th 2 20.0841 20.0862 20.0882 20.0980 20.0998 20.1083 20.1083 20.1098 20.1050 20.0998 20.0961 20.0923 (88)
util rest of house 0.9985 0.9958 0.9835 0.9219 0.7514 0.5200 0.3530 0.4158 0.7369 0.9679 0.9963 0.9989 (89)
MIT 2 19.0777 19.2323 19.4977 19.8360 20.0389 20.1021 20.1077 20.1085 20.0663 19.7676 19.3638 19.0586 (90)
Living area fraction fLA = Living area / (4) = 0.3613 (91)
MIT 19.3768 19.5310 19.7966 20.1371 20.3517 20.4214 20.4294 20.4289 20.3776 20.0642 19.6595 19.3552 (92)
Temperature adjustment 0.0000
adjusted MIT 19.3768 19.5310 19.7966 20.1371 20.3517 20.4214 20.4294 20.4289 20.3776 20.0642 19.6595 19.3552 (93)

8. Space heating requirement

Utilisation 0.9981 0.9949 0.9818 0.9229 0.7668 0.5476 0.3849 0.4507 0.7604 0.9674 0.9956 0.9986 (94)
Useful gains 417.5959 491.3498 576.8339 648.7525 606.3089 434.3491 289.4246 302.9629 439.2966 459.3621 408.5832 393.3621 (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 1176.4463 1138.7715 1032.3441 862.2428 662.3933 441.0985 290.1568 304.6895 477.5766 724.5977 965.8972 1170.9676 (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 564.5847 435.0674 338.8996 153.7130 41.7268 0.0000 0.0000 0.0000 0.0000 197.3353 401.2661 578.5385 (98)
Space heating 2711.1314 (98)
Space heating per m2 34.7136 (99)
(98) / (4) =

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 712.2523 560.7093 574.7509 0.0000 0.0000 0.0000 0.0000 (100)
Utilisation 0.0000 0.0000 0.0000 0.0000 0.0000 0.9579 0.9815 0.9680 0.0000 0.0000 0.0000 0.0000 (101)
Useful loss 0.0000 0.0000 0.0000 0.0000 0.0000 682.2876 550.3249 556.3669 0.0000 0.0000 0.0000 0.0000 (102)
Total gains 0.0000 0.0000 0.0000 0.0000 0.0000 1017.3368 967.2922 875.5505 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 241.2354 310.2237 237.4726 0.0000 0.0000 0.0000 0.0000 (104)
Space cooling 788.9317 (104)
Cooled fraction fC = cooled area / (4) = 1.0000 (105)
Intermittency factor (Table 10b)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	60.3088	77.5559	59.3681	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling per m2												197.2329 (107)
Energy for space heating												2.5254 (108)
Energy for space cooling												34.7136 (99)
Total												2.5254 (108)
Target Fabric Energy Efficiency (TFEE)												37.2390 (109)
												42.8 (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	78.1000 (1b)	x 2.4000 (2b)	= 187.4400 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.1000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 187.4400 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1601 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4101 (18)
Number of sides sheltered					3 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3178 (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												
	0.3496	0.3257	0.3257	0.3098	0.3098	0.2701	0.2701	0.2622	0.2701	0.3019	0.2940	0.3178 (22b)
Effective ac	0.5611	0.5531	0.5531	0.5480	0.5480	0.5365	0.5365	0.5344	0.5365	0.5456	0.5432	0.5505 (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)			19.2000	1.3258	25.4545		(27)
Door to Stairs			1.8900	1.4000	2.6460		(26)
Main Wall	56.3200	19.2000	37.1200	0.2200	8.1664	60.0000	2227.2000 (29a)
Wall to stairs	21.8000	1.8900	19.9100	0.1864	3.7108	190.0000	3782.9000 (29a)
Total net area of external elements Aum(A, m ²)			78.1200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.9777		(33)
Party Wall 1			25.8200	0.0000	0.0000	180.0000	4647.6000 (32)
Party Floor 1			78.1000			40.0000	3124.0000 (32d)
Party Ceilings 1			78.1000			40.0000	3124.0000 (32b)
Internal Wall 1			106.8000			9.0000	961.2000 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 17866.9000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							228.7695 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.4201 (36)
Total fabric heat loss							(33) + (36) = 48.3978 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	34.7069	34.2091	34.2091	33.8968	33.8968	33.1842	33.1842	33.0535	33.1842	33.7465	33.6000	34.0510 (38)
Heat transfer coeff	83.1047	82.6069	82.6069	82.2946	82.2946	81.5821	81.5821	81.4513	81.5821	82.1443	81.9979	82.4488 (39)
Average = Sum(39)m / 12 =												82.1414 (39)
HLP	1.0641	1.0577	1.0577	1.0537	1.0537	1.0446	1.0446	1.0429	1.0446	1.0518	1.0499	1.0557 (40)
HLP (average)												1.0517 (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												2.4258 (42)
Average daily hot water use (litres/day)												91.8133 (43)
Daily hot water use	100.9946	97.3221	93.6495	89.9770	86.3045	82.6319	82.6319	86.3045	89.9770	93.6495	97.3221	100.9946 (44)
Energy conte	149.7720	130.9916	135.1716	117.8459	113.0759	97.5759	90.4184	103.7565	104.9956	122.3623	133.5680	145.0462 (45)
Energy content (annual)										Total = Sum(45)m =		1444.5800 (45)
Distribution loss (46)m = 0.15 x (45)m	22.4658	19.6487	20.2757	17.6769	16.9614	14.6364	13.5628	15.5635	15.7493	18.3543	20.0352	21.7569 (46)
Water storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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CALCULATION OF HEAT DEMAND 09 Jan 2014

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													
	204.1708	180.1260	189.5704	170.4899	167.4747	150.2199	144.8172	158.1553	157.6396	176.7611	186.2120	199.4450	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
								Solar input (sum of months) = Sum(63)m =				0.0000	(63)
Output from w/h													
	204.1708	180.1260	189.5704	170.4899	167.4747	150.2199	144.8172	158.1553	157.6396	176.7611	186.2120	199.4450	(64)
								Total per year (kWh/year) = Sum(64)m =				2085.0820	(64)
RHI water heating demand												2085	(64)
Heat gains from water heating, kWh/month													
	93.3182	82.8622	88.4636	81.2989	81.1168	74.5592	73.5832	78.0181	77.0263	84.2045	86.5266	91.7469	(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	145.5493	145.5493	145.5493	145.5493	145.5493	145.5493	145.5493	145.5493	145.5493	145.5493	145.5493	145.5493 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	48.0130	42.6447	34.6810	26.2557	19.6265	16.5695	17.9039	23.2722	31.2359	39.6611	46.2904	49.3474 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	321.5280	324.8645	316.4567	298.5576	275.9632	254.7276	240.5409	237.2045	245.6122	263.5113	286.1058	307.3413 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	51.9807	51.9807	51.9807	51.9807	51.9807	51.9807	51.9807	51.9807	51.9807	51.9807	51.9807	51.9807 (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)												
	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329 (71)
Water heating gains (Table 5)												
	125.4277	123.3069	118.9027	112.9152	109.0279	103.5544	98.9021	104.8630	106.9809	113.1781	120.1758	123.3157 (72)
Total internal gains												
	595.4659	591.3132	570.5375	538.2257	505.1147	475.3487	457.8441	465.8368	484.3262	516.8478	553.0691	580.5016 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d			Gains W
North				9.6000	12.7500		0.6300		0.7000	0.7700			37.4070 (74)
East				3.2000	23.7835		0.6300		0.7000	0.7700			23.2593 (76)
West				6.4000	23.7835		0.6300		0.7000	0.7700			46.5187 (80)

Solar gains	107.1850	182.3156	302.2578	463.9268	574.0039	632.3386	591.5980	502.6593	379.4477	232.7614	131.2945		88.9912 (83)
Total gains	702.6509	773.6288	872.7954	1002.1525	1079.1187	1107.6872	1049.4421	968.4961	863.7739	749.6092	684.3636		669.4929 (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	59.7202	60.0800	60.0800	60.3081	60.3081	60.8348	60.8348	60.9325	60.8348	60.4184	60.5263	60.1953
alpha	4.9813	5.0053	5.0053	5.0205	5.0205	5.0557	5.0557	5.0622	5.0557	5.0279	5.0351	5.0130
util living area												
	0.9804	0.9666	0.9211	0.8012	0.6080	0.3954	0.2641	0.3023	0.5687	0.8545	0.9610	0.9837 (86)
Tweekday	19.1262	19.2929	19.5728	19.8296	19.9382	19.9665	19.9677	19.9691	19.9586	19.8138	19.4509	19.1031
Tweekend	20.5522	20.6260	20.7563	20.8842	20.9479	20.9637	20.9651	20.9650	20.9560	20.8708	20.6944	20.5391
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	20.3088	20.4214	20.6239	20.8191	20.9196	20.9442	20.9462	20.9460	20.9313	20.8006	20.5229	20.2887 (87)
Th 2	20.0303	20.0355	20.0355	20.0388	20.0388	20.0463	20.0463	20.0477	20.0463	20.0404	20.0420	20.0372 (88)
util rest of house												
	0.9749	0.9576	0.9008	0.7591	0.5459	0.3267	0.1901	0.2226	0.4882	0.8105	0.9487	0.9791 (89)
Tweekday	19.1262	19.2929	19.5728	19.8296	19.9382	19.9665	19.9677	19.9691	19.9586	19.8138	19.4509	19.1031
Tweekend	19.1262	19.2929	19.5728	19.8296	19.9382	19.9665	19.9677	19.9691	19.9586	19.8138	19.4509	19.1031
MIT 2	19.1262	19.2929	19.5728	19.8296	19.9382	19.9665	19.9677	19.9691	19.9586	19.8138	19.4509	19.1031 (90)
Living area fraction									fLA = Living area / (4) =			0.3613 (91)
MIT	19.5535	19.7007	19.9526	20.1872	20.2928	20.3198	20.3212	20.3221	20.3101	20.1704	19.8382	19.5315 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5535	19.7007	19.9526	20.1872	20.2928	20.3198	20.3212	20.3221	20.3101	20.1704	19.8382	19.5315 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9716	0.9538	0.8988	0.7660	0.5627	0.3465	0.2115	0.2456	0.5111	0.8171	0.9455	0.9761 (94)
Useful gains	682.7028	737.9068	784.4783	767.6867	607.2591	383.8436	221.9360	237.8596	441.4322	612.5199	647.0852	653.4625 (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												
	1217.7764	1173.0730	1045.1917	863.0358	624.8447	385.0478	222.0040	238.0071	449.5229	720.4346	987.1096	1206.3500 (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)

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[illegible]

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	78.1000 (1b)	x 2.4000 (2b)	= 187.4400 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.1000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 187.4400 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 30.0000 / (5) = 0.1601 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4101 (18)
Number of sides sheltered					3 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3178 (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	0.4052	0.3972	0.3893	0.3496	0.3416	0.3019	0.3019	0.2940	0.3178	0.3416	0.3575	0.3734 (22b)
Effective ac	0.5821	0.5789	0.5758	0.5611	0.5584	0.5456	0.5456	0.5432	0.5505	0.5584	0.5639	0.5697 (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)			19.2000	1.3258	25.4545		(27)
Door to Stairs			1.8900	1.4000	2.6460		(26)
Main Wall	56.3200	19.2000	37.1200	0.2200	8.1664	60.0000	2227.2000 (29a)
Wall to stairs	21.8000	1.8900	19.9100	0.1864	3.7108	190.0000	3782.9000 (29a)
Total net area of external elements Aum(A, m ²)			78.1200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.9777		(33)
Party Wall 1			25.8200	0.0000	0.0000	180.0000	4647.6000 (32)
Party Floor 1			78.1000			40.0000	3124.0000 (32d)
Party Ceilings 1			78.1000			40.0000	3124.0000 (32b)
Internal Wall 1			106.8000			9.0000	961.2000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	17866.9000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							228.7695 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.4201 (36)
Total fabric heat loss						(33) + (36) =	48.3978 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	36.0051	35.8079	35.6146	34.7069	34.5371	33.7465	33.7465	33.6000	34.0510	34.5371	34.8806	35.2398 (38)
Heat transfer coeff	84.4029	84.2057	84.0125	83.1047	82.9349	82.1443	82.1443	81.9979	82.4488	82.9349	83.2785	83.6376 (39)
Average = Sum(39)m / 12 =												83.1039 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0807	1.0782	1.0757	1.0641	1.0619	1.0518	1.0518	1.0499	1.0557	1.0619	1.0663	1.0709 (40)
HLP (average)												1.0641 (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												2.4258 (42)
Average daily hot water use (litres/day)												91.8133 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	100.9946	97.3221	93.6495	89.9770	86.3045	82.6319	82.6319	86.3045	89.9770	93.6495	97.3221	100.9946 (44)
Energy conte	149.7720	130.9916	117.8459	113.0759	97.5759	90.4184	103.7565	104.9956	122.3623	133.5680	145.0462	145.0462 (45)
Energy content (annual)												Total = Sum(45)m = 1444.5800 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	22.4658	19.6487	20.2757	17.6769	16.9614	14.6364	13.5628	15.5635	15.7493	18.3543	20.0352	21.7569 (46)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Energy Calculations Ltd
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CALCULATION OF ENERGY RATINGS 09 Jan 2014

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	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	31.1364	(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	23.2624	(59)
Total heat required for water heating calculated for each month													
204.1708	180.1260	189.5704	170.4899	167.4747	150.2199	144.8172	158.1553	157.6396	176.7611	186.2120	199.4450	199.4450	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Output from w/h													
204.1708	180.1260	189.5704	170.4899	167.4747	150.2199	144.8172	158.1553	157.6396	176.7611	186.2120	199.4450	199.4450	(64)
Heat gains from water heating, kWh/month													
93.3182	82.8622	88.4636	81.2989	81.1168	74.5592	73.5832	78.0181	77.0263	84.2045	86.5266	91.7469	91.7469	(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		
145.5493	145.5493	145.5493	145.5493	145.5493	145.5493	145.5493	145.5493	145.5493	145.5493	145.5493	145.5493	145.5493	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
48.0130	42.6447	34.6810	26.2557	19.6265	16.5695	17.9039	23.2722	31.2359	39.6611	46.2904	49.3474	49.3474	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
321.5280	324.8645	316.4567	298.5576	275.9632	254.7276	240.5409	237.2045	245.6122	263.5113	286.1058	307.3413	307.3413	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
51.9807	51.9807	51.9807	51.9807	51.9807	51.9807	51.9807	51.9807	51.9807	51.9807	51.9807	51.9807	51.9807	(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)													
-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	(71)
Water heating gains (Table 5)													
125.4277	123.3069	118.9027	112.9152	109.0279	103.5544	98.9021	104.8630	106.9809	113.1781	120.1758	123.3157	123.3157	(72)
Total internal gains													
595.4659	591.3132	570.5375	538.2257	505.1147	475.3487	457.8441	465.8368	484.3262	516.8478	553.0691	580.5016	580.5016	(73)

6. Solar gains

[Jan]				Area	Solar flux		g	FF		Access		Gains	
				m2	Table 6a		Specific data	Specific data		factor		W	
					W/m2		or Table 6b	or Table 6c		Table 6d			
North				9.6000	10.6334		0.6300	0.7000		0.7700		31.1971 (74)	
East				3.2000	19.6403		0.6300	0.7000		0.7700		19.2074 (76)	
West				6.4000	19.6403		0.6300	0.7000		0.7700		38.4148 (80)	
Solar gains	88.8194	172.3407	286.9439	433.4655	551.0083	574.3253	542.4601	451.5900	337.7073	204.7225	110.3339	73.3932	(83)
Total gains	684.2853	763.6539	857.4815	971.6912	1056.1230	1049.6740	1000.3043	917.4268	822.0335	721.5702	663.4030	653.8949	(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	58.8016	58.9393	59.0749	59.7202	59.8425	60.4184	60.4184	60.5263	60.1953	59.8425	59.5956	59.3396	
alpha	4.9201	4.9293	4.9383	4.9813	4.9895	5.0279	5.0279	5.0351	5.0130	4.9895	4.9730	4.9560	
util living area													
0.9851	0.9733	0.9403	0.8468	0.6819	0.4930	0.3599	0.4084	0.6543	0.8978	0.9722	0.9878	0.9878	(86)
Tweekday	18.9953	19.1693	19.4474	19.7542	19.9074	19.9563	19.9608	19.9620	19.9357	19.7244	19.3187	18.9667	
Tweekend	20.4984	20.5762	20.7033	20.8486	20.9323	20.9599	20.9642	20.9635	20.9452	20.8283	20.6390	20.4827	
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	20.2259	20.3444	20.5420	20.7636	20.8955	20.9383	20.9448	20.9437	20.9145	20.7350	20.4364	20.2016	(87)
Th 2	20.0166	20.0187	20.0207	20.0303	20.0321	20.0404	20.0404	20.0420	20.0372	20.0321	20.0284	20.0247	(88)
util rest of house													
0.9810	0.9661	0.9247	0.8116	0.6247	0.4224	0.2822	0.3247	0.5767	0.8648	0.9634	0.9844	0.9844	(89)
Tweekday	18.9953	19.1693	19.4474	19.7542	19.9074	19.9563	19.9608	19.9620	19.9357	19.7244	19.3187	18.9667	
Tweekend	18.9953	19.1693	19.4474	19.7542	19.9074	19.9563	19.9608	19.9620	19.9357	19.7244	19.3187	18.9667	
MIT 2	18.9953	19.1693	19.4474	19.7542	19.9074	19.9563	19.9608	19.9620	19.9357	19.7244	19.3187	18.9667	(90)
Living area fraction													
fLA = Living area / (4) =													0.3613 (91)
MIT	19.4399	19.5939	19.8429	20.1189	20.2644	20.3111	20.3164	20.3167	20.2893	20.0896	19.7226	19.4129	(92)
Temperature adjustment													0.0000
adjusted MIT	19.4399	19.5939	19.8429	20.1189	20.2644	20.3111	20.3164	20.3167	20.2893	20.0896	19.7226	19.4129	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9780	0.9624	0.9214	0.8151	0.6390	0.4426	0.3046	0.3489	0.5979	0.8670	0.9601	0.9817	(94)
Useful gains	669.1992	734.9221	790.0850	792.0662	674.8620	464.5755	304.7345	320.1025	491.5037	625.6132	636.9013	641.9349	(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													
1277.8533	1237.3137	1120.9713	932.3446	710.2914	469.1352	305.2782	321.1621	510.3033	787.0170	1051.1866	1272.3723	1272.3723	(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													

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Space heating	452.8387	337.6071	246.1794	101.0004	26.3595	0.0000	0.0000	0.0000	0.0000	120.0844	298.2854	469.0455 (98)
Space heating per m2												2051.4005 (98)
												(98) / (4) = 26.2663 (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 %)												281.6025 (206)
Efficiency of secondary/supplementary heating system, %												100.0000 (208)
Space heating requirement												728.4738 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	452.8387	337.6071	246.1794	101.0004	26.3595	0.0000	0.0000	0.0000	0.0000	120.0844	298.2854	469.0455 (98)
Space heating efficiency (main heating system 1)	281.6025	281.6025	281.6025	281.6025	281.6025	0.0000	0.0000	0.0000	0.0000	281.6025	281.6025	281.6025 (210)
Space heating fuel (main heating system)	160.8078	119.8878	87.4209	35.8663	9.3605	0.0000	0.0000	0.0000	0.0000	42.6432	105.9243	166.5630 (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	204.1708	180.1260	189.5704	170.4899	167.4747	150.2199	144.8172	158.1553	157.6396	176.7611	186.2120	199.4450 (64)
Efficiency of water heater (217)m	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400 (216)
Fuel for water heating, kWh/month	120.4974	106.3066	111.8805	100.6196	98.8401	88.6567	85.4681	93.3400	93.0357	104.3208	109.8985	117.7084 (219)
Water heating fuel used												1230.5725 (219)
Annual totals kWh/year												
Space heating fuel - main system												728.4738 (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)												339.1696 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
Total delivered energy for all uses												2298.2159 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	728.4738	13.1900	96.0857 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1230.5725	13.1900	162.3125 (247)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	339.1696	13.1900	44.7365 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit	0.0000	13.1900	0.0000 (252)
Total energy cost			303.1347 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.0343 (257)
SAP value		85.5722
SAP rating (Section 12)		86 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	728.4738	0.5190	378.0779 (261)
Space heating - secondary	0.0000	0.5190	0.0000 (263)
Water heating (other fuel)	1230.5725	0.5190	638.6671 (264)
Space and water heating			1016.7450 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	339.1696	0.5190	176.0290 (268)
Energy saving/generation technologies			
PV Unit	-300.0000	0.5190	-155.7000 (269)
Total kg/year			1037.0741 (272)
CO2 emissions per m2			13.2800 (273)
EI value			88.7110
EI rating			89 (274)
EI band			B

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Calculation of stars for heating and DHW

Main heating energy efficiency	$13.19 \times (1 + 0.29 \times 0.25) / 2.8160 = 5.023$, stars = 4
Main heating environmental impact	$0.519 \times (1 + 0.29 \times 0.25) / 2.8160 = 0.1977$, stars = 5
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	78.1000 (1b)	x 2.4000 (2b)	= 187.4400 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.1000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 187.4400 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 30.0000 / (5) = 0.1601 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4101 (18)
Number of sides sheltered					3 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3178 (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												
	0.3496	0.3257	0.3257	0.3098	0.3098	0.2701	0.2701	0.2622	0.2701	0.3019	0.2940	0.3178 (22b)
Effective ac	0.5611	0.5531	0.5531	0.5480	0.5480	0.5365	0.5365	0.5344	0.5365	0.5456	0.5432	0.5505 (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)			19.2000	1.3258	25.4545		(27)
Door to Stairs			1.8900	1.4000	2.6460		(26)
Main Wall	56.3200	19.2000	37.1200	0.2200	8.1664	60.0000	2227.2000 (29a)
Wall to stairs	21.8000	1.8900	19.9100	0.1864	3.7108	190.0000	3782.9000 (29a)
Total net area of external elements Aum(A, m ²)			78.1200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.9777		(33)
Party Wall 1			25.8200	0.0000	0.0000	180.0000	4647.6000 (32)
Party Floor 1			78.1000			40.0000	3124.0000 (32d)
Party Ceilings 1			78.1000			40.0000	3124.0000 (32b)
Internal Wall 1			106.8000			9.0000	961.2000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	17866.9000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							228.7695 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.4201 (36)
Total fabric heat loss						(33) + (36) =	48.3978 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	34.7069	34.2091	34.2091	33.8968	33.8968	33.1842	33.1842	33.0535	33.1842	33.7465	33.6000	34.0510 (38)
Heat transfer coeff	83.1047	82.6069	82.6069	82.2946	82.2946	81.5821	81.5821	81.4513	81.5821	82.1443	81.9979	82.4488 (39)
Average = Sum(39)m / 12 =												82.1414 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0641	1.0577	1.0577	1.0537	1.0537	1.0446	1.0446	1.0429	1.0446	1.0518	1.0499	1.0557 (40)
HLP (average)												1.0517 (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												2.4258 (42)
Average daily hot water use (litres/day)												91.8133 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	100.9946	97.3221	93.6495	89.9770	86.3045	82.6319	82.6319	86.3045	89.9770	93.6495	97.3221	100.9946 (44)
Energy conte	149.7720	130.9916	117.8459	113.0759	97.5759	90.4184	103.7565	104.9956	122.3623	133.5680	145.0462	145.0462 (45)
Energy content (annual)												Total = Sum(45)m = 1444.5800 (45)
Distribution loss (46)m = 0.15 x (45)m												
	22.4658	19.6487	20.2757	17.6769	16.9614	14.6364	13.5628	15.5635	15.7493	18.3543	20.0352	21.7569 (46)
Water storage loss:												

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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	30.1320	(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	30.1320	(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													
204.1708	180.1260	189.5704	170.4899	167.4747	150.2199	144.8172	158.1553	157.6396	176.7611	186.2120	199.4450	199.4450	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Output from w/h													
204.1708	180.1260	189.5704	170.4899	167.4747	150.2199	144.8172	158.1553	157.6396	176.7611	186.2120	199.4450	199.4450	(64)
Heat gains from water heating, kWh/month													
93.3182	82.8622	88.4636	81.2989	81.1168	74.5592	73.5832	78.0181	77.0263	84.2045	86.5266	91.7469	91.7469	(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		
145.5493	145.5493	145.5493	145.5493	145.5493	145.5493	145.5493	145.5493	145.5493	145.5493	145.5493	145.5493	145.5493	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
48.0130	42.6447	34.6810	26.2557	19.6265	16.5695	17.9039	23.2722	31.2359	39.6611	46.2904	49.3474	49.3474	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
321.5280	324.8645	316.4567	298.5576	275.9632	254.7276	240.5409	237.2045	245.6122	263.5113	286.1058	307.3413	307.3413	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
51.9807	51.9807	51.9807	51.9807	51.9807	51.9807	51.9807	51.9807	51.9807	51.9807	51.9807	51.9807	51.9807	(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)													
-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	(71)
Water heating gains (Table 5)													
125.4277	123.3069	118.9027	112.9152	109.0279	103.5544	98.9021	104.8630	106.9809	113.1781	120.1758	123.3157	123.3157	(72)
Total internal gains													
595.4659	591.3132	570.5375	538.2257	505.1147	475.3487	457.8441	465.8368	484.3262	516.8478	553.0691	580.5016	580.5016	(73)

6. Solar gains

[Jan]			Area	Solar flux	g	FF	Access	Gains				
			m2	Table 6a	Specific data	Specific data	factor	W				
				W/m2	or Table 6b	or Table 6c	Table 6d					
North			9.6000	12.7500	0.6300	0.7000	0.7700	37.4070 (74)				
East			3.2000	23.7835	0.6300	0.7000	0.7700	23.2593 (76)				
West			6.4000	23.7835	0.6300	0.7000	0.7700	46.5187 (80)				
Solar gains	107.1850	182.3156	302.2578	463.9268	574.0039	632.3386	591.5980	502.6593	379.4477	232.7614	131.2945	88.9912 (83)
Total gains	702.6509	773.6288	872.7954	1002.1525	1079.1187	1107.6872	1049.4421	968.4961	863.7739	749.6092	684.3636	669.4929 (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		
59.7202	60.0800	60.0800	60.3081	60.3081	60.8348	60.8348	60.9325	60.8348	60.4184	60.5263	60.1953	60.1953	
alpha	4.9813	5.0053	5.0053	5.0205	5.0205	5.0557	5.0557	5.0622	5.0557	5.0279	5.0351	5.0130	
util living area													
0.9804	0.9666	0.9211	0.8012	0.6080	0.3954	0.2641	0.3023	0.5687	0.8545	0.9610	0.9837	0.9837	(86)
Tweekday	19.1262	19.2929	19.5728	19.8296	19.9382	19.9665	19.9677	19.9691	19.9586	19.8138	19.4509	19.1031	
Tweekend	20.5522	20.6260	20.7563	20.8842	20.9479	20.9637	20.9651	20.9650	20.9560	20.8708	20.6944	20.5391	
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	20.3088	20.4214	20.6239	20.8191	20.9196	20.9442	20.9462	20.9460	20.9313	20.8006	20.5229	20.2887	(87)
Th 2	20.0303	20.0355	20.0355	20.0388	20.0388	20.0463	20.0463	20.0477	20.0463	20.0404	20.0420	20.0372	(88)
util rest of house													
0.9749	0.9576	0.9008	0.7591	0.5459	0.3267	0.1901	0.2226	0.4882	0.8105	0.9487	0.9791	0.9791	(89)
Tweekday	19.1262	19.2929	19.5728	19.8296	19.9382	19.9665	19.9677	19.9691	19.9586	19.8138	19.4509	19.1031	
Tweekend	19.1262	19.2929	19.5728	19.8296	19.9382	19.9665	19.9677	19.9691	19.9586	19.8138	19.4509	19.1031	
MIT 2	19.1262	19.2929	19.5728	19.8296	19.9382	19.9665	19.9677	19.9691	19.9586	19.8138	19.4509	19.1031	(90)
Living area fraction													
fLA = Living area / (4) =													0.3613 (91)
MIT	19.5535	19.7007	19.9526	20.1872	20.2928	20.3198	20.3212	20.3221	20.3101	20.1704	19.8382	19.5315	(92)
Temperature adjustment													0.0000
adjusted MIT	19.5535	19.7007	19.9526	20.1872	20.2928	20.3198	20.3212	20.3221	20.3101	20.1704	19.8382	19.5315	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9716	0.9538	0.8988	0.7660	0.5627	0.3465	0.2115	0.2456	0.5111	0.8171	0.9455	0.9761	(94)
Useful gains	682.7028	737.9068	784.4783	767.6867	607.2591	383.8436	221.9360	237.8596	441.4322	612.5199	647.0852	653.4625	(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													
1217.7764	1173.0730	1045.1917	863.0358	624.8447	385.0478	222.0040	238.0071	449.5229	720.4346	987.1096	1206.3500	1206.3500	(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													

FULL SAP CALCULATION PRINTOUT

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

Space heating	398.0948	292.4317	193.9707	68.6513	13.0837	0.0000	0.0000	0.0000	0.0000	80.2885	244.8176	411.3483 (98)
Space heating per m2												1702.6866 (98)
										(98) / (4) =		21.8014 (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 %)												279.1307 (206)
Efficiency of secondary/supplementary heating system, %												100.0000 (208)
Space heating requirement												609.9961 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	398.0948	292.4317	193.9707	68.6513	13.0837	0.0000	0.0000	0.0000	0.0000	80.2885	244.8176	411.3483 (98)
Space heating efficiency (main heating system 1)	279.1307	279.1307	279.1307	279.1307	279.1307	0.0000	0.0000	0.0000	0.0000	279.1307	279.1307	279.1307 (210)
Space heating fuel (main heating system)	142.6195	104.7652	69.4910	24.5947	4.6873	0.0000	0.0000	0.0000	0.0000	28.7638	87.7071	147.3676 (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	204.1708	180.1260	189.5704	170.4899	167.4747	150.2199	144.8172	158.1553	157.6396	176.7611	186.2120	199.4450 (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	120.4974	106.3066	111.8805	100.6196	98.8401	88.6567	85.4681	93.3400	93.0357	104.3208	109.8985	117.7084 (219)
Water heating fuel used												1230.5725 (219)
Annual totals kWh/year												
Space heating fuel - main system												609.9961 (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)												339.1696 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
Total delivered energy for all uses												2179.7382 (238)

10a. Fuel costs - using BEDF prices (472)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	609.9961	18.9000	115.2893 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1230.5725	18.9000	232.5782 (247)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	339.1696	18.9000	64.1030 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit	0.0000	18.9000	0.0000 (252)
Total energy cost			411.9705 (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	609.9961	0.5190	316.5880 (261)
Space heating - secondary	0.0000	0.5190	0.0000 (263)
Water heating (other fuel)	1230.5725	0.5190	638.6671 (264)
Space and water heating			955.2551 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	339.1696	0.5190	176.0290 (268)
Energy saving/generation technologies			
PV Unit	-300.0000	0.5190	-155.7000 (269)
Total kg/year			975.5841 (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	609.9961	3.0700	1872.6881 (261)
Space heating - secondary	0.0000	3.0700	0.0000 (263)
Water heating (other fuel)	1230.5725	3.0700	3777.8575 (264)
Space and water heating			5650.5456 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	339.1696	3.0700	1041.2506 (268)
Energy saving/generation technologies			

FULL SAP CALCULATION PRINTOUT

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PV Unit	-300.0000	3.0700	-921.0000 (269)
Primary energy kWh/year			5770.7962 (272)
Primary energy kWh/m ² /year			73.8898 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	B 86
Current environmental impact rating:	B 89

(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/m ²

Potential energy efficiency rating:	B 86
Potential environmental impact rating:	B 89

Fuel prices for cost data on this page from database revision number 472 TEST (30 Jan 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	£412	£412	£0
Space heating	£115	£115	£0
Water heating	£233	£233	£0
Lighting	£64	£64	£0
Total cost of fuels	£412	£412	£0
Total cost of uses	£412	£412	£0
Delivered energy	28 kWh/m ²	28 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	1.0 tonnes	1.0 tonnes	0.0 tonnes
CO2 emissions per m ²	12 kg/m ²	12 kg/m ²	0 kg/m ²
Primary energy	74 kWh/m ²	74 kWh/m ²	0 kWh/m ²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Energy Calculations Ltd
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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
SAP ♦ CODE ♦ SBEM ♦ DESIGN

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

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

No improvements selected / applicable

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

Overheating Calculation Input Data

Dwelling type	MidTerrace Flat
Number of storeys	1
Cross ventilation possible	Yes
SAP Region	Thames Valley
Front of dwelling faces	West
Overshading	Average or unknown
Thermal mass parameter	228.8 (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	371.13 (P1)
Transmission heat loss coefficient	48.40 (37)
Summer heat loss coefficient	419.53 (P2)

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

Solar shading	Z blinds	Solar access	Z overhangs	Z summer
Orientation				
North	1.000	0.90	1.000	0.900 (P8)
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
North	9.6000	81.1852	0.6300	0.7000	0.9000	278.4015
East	3.2000	117.5071	0.6300	0.7000	0.9000	134.3190
West	6.4000	117.5071	0.6300	0.7000	0.9000	268.6381
total:						681.3586

	Jun	Jul	Aug	
Solar gains	729	681	581	(P3)
Internal gains	475	458	466	
Total summer gains	1204	1139	1047	(P5)
Summer gain/loss ratio	2.87	2.72	2.49	(P6)
Summer external temperature	16.00	17.90	17.80	
Thermal mass temperature increment (TMP = 228.8)	0.40	0.40	0.40	
Threshold temperature	19.27	21.01	20.69	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	
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	015729	Issued on Date	01/03/2021	
Assessment Reference	003	Prop Type Ref		
Property	Flat 8, 18, Parkside Road, READING, RG30 2DB			
SAP Rating	86 B	DER	14.72	
Environmental	89 B	TER	23.84	
CO₂ Emissions (t/year)	0.98	% DER<TER	38.25	
General Requirements Compliance	Pass	DFEE	41.12	
		TFEE	42.82	
		% DFEE<TFEE	3.99	
Assessor Details	Mr. Matthew Carter, Energy Calculations Limited, Tel: 01754 761035, mcarter@energycalculations.co.uk		Assessor ID	7869-0001
Client				

SUMMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Electricity		
Fuel factor	1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	23.84	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.72	kgCO ₂ /m ²	Pass
	-9.12 (-38.3%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	42.82	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	41.12	kWh/m ² /yr	
	-1.7 (-4.0%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.22 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

Limiting System Efficiencies

4 Heating efficiency

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

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 North

9.60 m², No overhang

Windows facing East

3.20 m², No overhang

Windows facing West

6.40 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

Photovoltaic array

300.00

kWh/Year

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

SUMMARY FOR INPUT DATA

Energy Calculations Ltd
SAP • CODE • SBEM • DESIGN

Calculation Type: New Build (As Designed)

Property Reference	015729	Issued on Date	01/03/2021
Assessment Reference	003	Prop Type Ref	
Property	Flat 8, 18, Parkside Road, READING, RG30 2DB		
SAP Rating	86 B	DER	14.72
Environmental	89 B	TER	23.84
CO ₂ Emissions (t/year)	0.98	% DER<TER	38.25
General Requirements Compliance	Pass	DFEE	41.12
		TFEE	42.82
		% DFEE<TFEE	3.99
Assessor Details	Mr. Matthew Carter, Energy Calculations Limited, Tel: 01754 761035, mcarter@energycalculations.co.uk		Assessor ID
			7869-0001
Client			

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

Orientation	West					
Property Tenure	Unknown					
Transaction Type	New dwelling					
Terrain Type	Urban					
1.0 Property Type	Flat, Mid-Terrace					
2.0 Number of Storeys	1					
3.0 Date Built	2020					
4.0 Sheltered Sides	3					
5.0 Sunlight/Shade	Average or unknown					
6.0 Measurements						
Ground Floor:		Heat Loss Perimeter		Internal Floor Area		Average Storey Height
		32.55 m		78.10 m²		2.40 m
7.0 Living Area	28.22		m²			
8.0 Thermal Mass Parameter	Precise calculation					
Thermal Mass	228.77		kJ/m²K			
9.0 External Walls						
Description	Type	Construction		U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area (m²)
						Nett Area (m²)
Main Wall	Cavity Wall	Cavity wall : plasterboard on dabs, AAC block, filled cavity, any outside structure		0.22	60.00	56.32
Wall to stairs	Cavity Wall	Cavity wall : dense plaster, dense block, filled cavity, any outside structure		0.22	190.00	21.80
9.1 Party Walls						
Description	Type	Construction		U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)
Party Wall 1	Solid Wall	Dense plaster both sides, dense blocks, cavity or cavity fill		0.00	180.00	25.82
9.2 Internal Walls						
Description	Construction				Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame				9.00	106.80
10.1 Party Ceilings						
Description	Construction				Kappa (kJ/m²K)	Area (m²)
Party Ceilings 1	Precast concrete planks floor, screed, carpeted				30.00	78.10
11.1 Party Floors						

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Precast concrete planks floor, screed, carpeted	40.00	78.10

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	Manufacturer	Half Glazed Door	Double Low-E Soft 0.05			0.63		0.70	1.40
Windows	Manufacturer	Window	Double Low-E Soft 0.05			0.63		0.70	1.40
Door to Stairs	SAP table	Door to Corridor							1.40

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
Door	Door to Corridor	[2] Wall to stairs	South							1.89	
Windows	Window	[1] Main Wall	East	None	0.00					3.20	
Windows	Window	[1] Main Wall	North	None	0.00					9.60	
Windows	Window	[1] Main Wall	West	None	0.00					6.40	

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)	9.24	0.300	No
Table K1 - Approved	E3 Sill	9.24	0.040	No
Table K1 - Approved	E4 Jamb	49.92	0.050	No
Table K1 - Approved	E7 Party floor between dwellings (in blocks of flats)	32.55	0.070	No
Table K1 - Approved	E16 Corner (normal)	7.20	0.090	No
Table K1 - Approved	E17 Corner (inverted – internal area greater than external area)	9.60	-0.090	No
Table K1 - Approved	E18 Party wall between dwellings	12.00	0.060	No
Table K1 - Default	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.20	0.000	No

Y-value 0.108 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

Night Ventilation No

Air change rate 6.00

Mechanical Ventilation

Mechanical Ventilation System Present No

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0

SUMMARY FOR INPUT DATA

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

Number of intermittent fans	3
Number of passive vents	0
Number of flueless gas fires	0

21.0 Fixed Cooling System

No

22.0 Lighting

Internal

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

External

External lights fitted	Yes
Light and motion sensor	Yes

23.0 Electricity Tariff

Standard

24.0 Main Heating 1

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

25.0 Main Heating 2

None

Community Heating

None

28.0 Water Heating

HWP From main heating 1	HWP From main heating 1
Water Heating	Main Heating 1
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
SAP Code	901
Immersion Only Heating Hot Water	Yes

29.0 Hot Water Cylinder

Hot Water Cylinder

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

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	01/03/2021
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
015722-003	1	73.4	16.43	27.83	40.96 %
015723-003	1	53	21.18	34.27	38.19 %
015724-003	1	50	19.12	28.78	33.57 %
015725-003	1	62.62	17.20	27.70	37.90 %
015726-003	1	45.84	19.12	29.28	34.69 %
015727-003	1	50.5	18.06	27.97	35.44 %
015728-003	1	44.2	21.03	31.09	32.37 %
015729-003	1	78.1	14.72	23.84	38.25 %
015730-003	1	63.8	17.28	28.45	39.26 %
015731-003	1	60.7	17.13	27.10	36.79 %
015732-003	1	43.25	21.26	29.47	27.86 %
015733-003	1	78.25	15.78	27.04	41.63 %
Totals:	12	703.66	218.31	342.81	
Average DER = 17.80 kgCO ₂ /m ²		% DER/TER	PASS		
Average TER = 28.24 kgCO ₂ /m ²		36.97 %			

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
015722-003	1	73.4	51.81	54.01	4.08 %
015723-003	1	53	67.01	66.99	-0.03 %
015724-003	1	50	45.25	46.33	2.34 %
015725-003	1	62.62	49.26	49.72	0.92 %
015726-003	1	45.84	46.34	45.82	-1.15 %
015727-003	1	50.5	45.03	44.75	-0.61 %
015728-003	1	44.2	47.58	50.81	6.35 %
015729-003	1	78.1	41.12	42.82	3.99 %
015730-003	1	63.8	50.50	52.76	4.28 %
015731-003	1	60.7	45.65	47.49	3.89 %
015732-003	1	43.25	42.47	43.04	1.31 %
015733-003	1	78.25	50.76	53.42	4.97 %
Totals:	12	703.66	582.78	597.97	
Average DFEE = 48.63 kWh/m ² /yr		% DFEE/TFEE	PASS		
Average TFEE = 50.00 kWh/m ² /yr		2.74 %			