

Energy Calculations Ltd

SAP ♦ CODE ♦ SBEM ♦ DESIGN

01754-761035



SAP Report Submission for Building Regulations Compliance

Client:

Project: Flat 10, 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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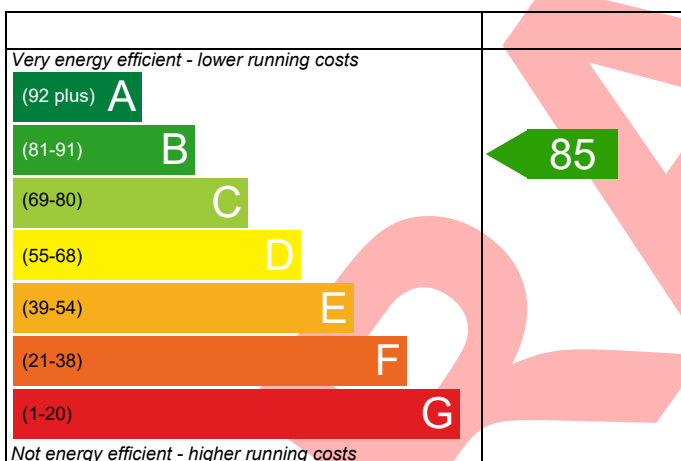
Flat 10, 18, Parkside Road,
READING,
RG30 2DB

Dwelling type: Flat, End-Terrace
Date of assessment: 01/03/2021
Produced by: Energy Calculations Limited
Total floor area: 60.7 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

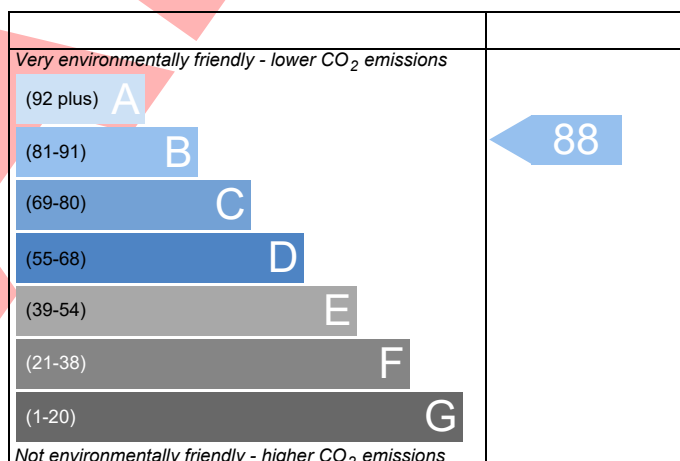


England

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	015731	Issued on Date	01/03/2021
Assessment Reference	003	Prop Type Ref	
Property	Flat 10, 18, Parkside Road, READING, RG30 2DB		

SAP Rating	85 B	DER	17.13	TER	27.10
Environmental	88 B	% DER<TER	36.79		
CO ₂ Emissions (t/year)	0.87	DFEE	45.65	TFEE	47.49
General Requirements Compliance	Pass	% DFEE<TFEE	3.89		

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	6.55	1.97	
External wall	E3 Sill	Table K1 - Approved	0.040	6.55	0.26	
External wall	E4 Jamb	Table K1 - Approved	0.050	37.44	1.87	
External wall	E7 Party floor between dwellings (in blocks of flats)	Table K1 - Approved	0.070	22.86	1.60	
External wall	E14 Flat roof	Table K1 - Default	0.080	22.86	1.83	
External wall	E16 Corner (normal)	Table K1 - Approved	0.090	7.20	0.65	
External wall	E17 Corner (inverted – internal area greater than external area)	Table K1 - Approved	-0.090	7.20	-0.65	
External wall	E18 Party wall between dwellings	Table K1 - Approved	0.060	7.20	0.43	
Party wall	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	0.000	13.19	0.00	

Total: **7.96** W/mK:
Y-Value: **0.069** W/m²K:

FULL SAP CALCULATION PRINTOUT

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

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

DWELLING AS DESIGNED

Top-floor flat, total floor area 61 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) 27.10 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 17.13 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)47.5 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)45.6 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.22 (max. 0.30)	0.22 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.14 (max. 0.20)	0.14 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

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

Secondary heating system: None

5 Cylinder insulation

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

6 Controls

Space heating controls:	Time and temperature zone control	OK
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Hot water controls:	Cylinderstat	OK
	Independent timer for DHW	OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%		
Minimum	75%	OK

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames Valley):	Slight	OK
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Based on:

Overshading:	Average
Windows facing East:	4.64 m ² , No overhang
Windows facing South:	1.96 m ² , No overhang
Windows facing West:	7.02 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

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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	60.7000 (1b)	x 2.4000 (2b)	= 145.6800 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 145.6800 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					20.0000 / (5) = 0.1373 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3873 (18)
					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3292 (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												
	0.4197	0.4115	0.4033	0.3621	0.3539	0.3127	0.3127	0.3045	0.3292	0.3539	0.3703	0.3868 (22b)
Effective ac	0.5881	0.5847	0.5813	0.5656	0.5626	0.5489	0.5489	0.5464	0.5542	0.5626	0.5686	0.5748 (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)			13.6200	1.3258	18.0568		(27)
Door to Stairs			1.8900	1.4000	2.6460		(26)
Main Wall	52.0500	13.6200	38.4300	0.2200	8.4546	60.0000	2305.8000 (29a)
Wall to stairs	2.8100	1.8900	0.9200	0.1864	0.1715	190.0000	174.8000 (29a)
Flat roof	60.7000		60.7000	0.1400	8.4980	9.0000	546.3000 (30)
Total net area of external elements Aum, m ²			115.5600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	37.8269			(33)
Party Wall 1			31.6600	0.0000	0.0000	180.0000	5698.8000 (32)
Party Floor 1			60.7000			40.0000	2428.0000 (32d)
Internal Wall 1			75.2000			100.0000	7520.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	18673.7000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							307.6392 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.9600 (36)
Total fabric heat loss						(33) + (36) =	45.7869 (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	28.2718	28.1073	27.9462	27.1891	27.0475	26.3881	26.3881	26.2660	26.6421	27.0475	27.3340	27.6336 (38)
Heat transfer coeff	74.0586	73.8942	73.7330	72.9760	72.8344	72.1750	72.1750	72.0529	72.4290	72.8344	73.1209	73.4205 (39)
Average = Sum(39)m / 12 =												72.9753 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2201	1.2174	1.2147	1.2022	1.1999	1.1890	1.1890	1.1870	1.1932	1.1999	1.2046	1.2096 (40)
HLP (average)												1.2022 (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	2.0014 (42)
Average daily hot water use (litres/day)	81.7322 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	89.9054	86.6361	83.3668	80.0976	76.8283	73.5590	73.5590	76.8283	80.0976	83.3668	86.6361	89.9054 (44)
Energy conte	133.3271	116.6088	120.3298	104.9064	100.6602	86.8621	80.4905	92.3640	93.4672	108.9270	118.9023	129.1202 (45)
Energy content (annual)										Total = Sum(45)m =		1285.9657 (45)
Distribution loss (46)m = 0.15 x (45)m												
	19.9991	17.4913	18.0495	15.7360	15.0990	13.0293	12.0736	13.8546	14.0201	16.3390	17.8353	19.3680 (46)
Water storage loss:												

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 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	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
187.7259	165.7432	174.7286	157.5504	155.0590	139.5061	134.8893	146.7628	146.1112	163.3258	171.5463	183.5190	183.5190	(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 =													
Output from w/h													
187.7259	165.7432	174.7286	157.5504	155.0590	139.5061	134.8893	146.7628	146.1112	163.3258	171.5463	183.5190	183.5190	(64)
Heat gains from water heating, kWh/month													
87.8503	78.0799	83.5287	76.9966	76.9886	70.9969	70.2821	74.2301	73.1930	79.7373	81.6502	86.4515	86.4515	(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		
100.0678	100.0678	100.0678	100.0678	100.0678	100.0678	100.0678	100.0678	100.0678	100.0678	100.0678	100.0678	100.0678	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
15.5738	13.8325	11.2493	8.5165	6.3662	5.3746	5.8074	7.5487	10.1319	12.8647	15.0150	16.0066	16.0066	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
174.7088	176.5218	171.9532	162.2274	149.9502	138.4115	130.7028	128.8899	133.4584	143.1843	155.4614	167.0002	167.0002	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
33.0068	33.0068	33.0068	33.0068	33.0068	33.0068	33.0068	33.0068	33.0068	33.0068	33.0068	33.0068	33.0068	(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)													
-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	(71)
Water heating gains (Table 5)													
118.0784	116.1904	112.2698	106.9397	103.4793	98.6067	94.4652	99.7716	101.6570	107.1737	113.4031	116.1983	116.1983	(72)
Total internal gains													
361.3813	359.5650	348.4927	330.7039	312.8160	295.4131	283.9958	289.2306	298.2676	316.2431	336.8999	352.2254	352.2254	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a		g	FF		Access		Gains	
					W/m2		Specific data or Table 6b	Specific data or Table 6c		factor Table 6d		W	
East				4.6400	19.6403		0.6300	0.7000		0.7700		27.8508 (76)	
South				1.9600	46.7521		0.6300	0.7000		0.7700		28.0046 (78)	
West				7.0200	19.6403		0.6300	0.7000		0.7700		42.1363 (80)	
Solar gains	97.9916	182.7738	283.8934	394.8658	471.8079	478.7604	457.4562	400.2044	323.2611	211.9236	120.4606	81.7525 (83)	
Total gains	459.3729	542.3387	632.3860	725.5697	784.6239	774.1735	741.4521	689.4350	621.5287	528.1666	457.3604	433.9779 (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	70.0410	70.1968	70.3503	71.0801	71.2183	71.8689	71.8689	71.9907	71.6169	71.2183	70.9392	70.6498	
alpha	5.6694	5.6798	5.6900	5.7387	5.7479	5.7913	5.7913	5.7994	5.7745	5.7479	5.7293	5.7100	
util living area													
0.9977	0.9937	0.9788	0.9213	0.7827	0.5842	0.4265	0.4772	0.7461	0.9582	0.9943	0.9983	0.9983	(86)
Tweekday	18.8414	19.0231	19.3043	19.6247	19.7998	19.8552	19.8597	19.8610	19.8342	19.5874	19.1573	18.8161	
Tweekend	20.4803	20.5604	20.6863	20.8343	20.9296	20.9636	20.9688	20.9681	20.9469	20.8111	20.6159	20.4661	
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	20.1980	20.3200	20.5159	20.7413	20.8914	20.9440	20.9519	20.9508	20.9170	20.7085	20.4003	20.1760	(87)
Th 2	19.9040	19.9061	19.9082	19.9182	19.9201	19.9288	19.9288	19.9304	19.9254	19.9201	19.9163	19.9124	(88)
util rest of house													
0.9968	0.9911	0.9701	0.8916	0.7175	0.4924	0.3237	0.3682	0.6538	0.9357	0.9915	0.9976	0.9976	(89)
Tweekday	18.8414	19.0231	19.3043	19.6247	19.7998	19.8552	19.8597	19.8610	19.8342	19.5874	19.1573	18.8161	
Tweekend	18.8414	19.0231	19.3043	19.6247	19.7998	19.8552	19.8597	19.8610	19.8342	19.5874	19.1573	18.8161	
MIT 2	18.8414	19.0231	19.3043	19.6247	19.7998	19.8552	19.8597	19.8610	19.8342	19.5874	19.1573	18.8161	(90)
Living area fraction													
fLA = Living area / (4) =													
MIT	19.4118	19.5684	19.8137	20.0942	20.2587	20.3130	20.3189	20.3192	20.2894	20.0588	19.6799	19.3878	(92)
Temperature adjustment													
adjusted MIT	19.4118	19.5684	19.8137	20.0942	20.2587	20.3130	20.3189	20.3192	20.2894	20.0588	19.6799	19.3878	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9962	0.9901	0.9692	0.8971	0.7393	0.5260	0.3614	0.4082	0.6871	0.9392	0.9907	0.9972	(94)
Useful gains	457.6298	536.9786	612.9298	650.9044	580.0573	407.2445	267.9318	281.4457	427.0313	496.0647	453.1241	432.7647	(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													
1119.1571	1083.9065	981.6591	816.9055	623.3700	412.3326	268.4087	282.3896	448.2948	688.9242	919.8542	1115.0966	1115.0966	(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													

Regs Region: England

Elmhurst Energy Systems
SAP2012 Calculator (Design
System) version 4.14r16

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Space heating	492.1763	367.5356	274.3346	119.5208	32.2247	0.0000	0.0000	0.0000	0.0000	143.4875	336.0457	507.6549 (98)
Space heating per m2												2272.9801 (98)
										(98) / (4) =		37.4461 (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 %)												254.8707 (206)
Efficiency of secondary/supplementary heating system, %												100.0000 (208)
Space heating requirement												891.8171 (211)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	492.1763	367.5356	274.3346	119.5208	32.2247	0.0000	0.0000	0.0000	0.0000	143.4875	336.0457	507.6549 (98)
Space heating efficiency (main heating system 1)	254.8707	254.8707	254.8707	254.8707	254.8707	0.0000	0.0000	0.0000	0.0000	254.8707	254.8707	254.8707 (210)
Space heating fuel (main heating system)	193.1083	144.2047	107.6368	46.8947	12.6435	0.0000	0.0000	0.0000	0.0000	56.2982	131.8495	199.1814 (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	187.7259	165.7432	174.7286	157.5504	155.0590	139.5061	134.8893	146.7628	146.1112	163.3258	171.5463	183.5190 (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	110.7920	97.8182	103.1212	92.9830	91.5126	82.3336	79.6089	86.6164	86.2318	96.3915	101.2431	108.3091 (219)
Water heating fuel used												1136.9616 (219)
Annual totals kWh/year												
Space heating fuel - main system												891.8171 (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)												275.0374 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
Total delivered energy for all uses												2303.8161 (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	891.8171	0.5190	462.8531 (261)
Space heating - secondary	0.0000	0.5190	0.0000 (263)
Water heating (other fuel)	1136.9616	0.5190	590.0831 (264)
Space and water heating			1052.9361 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	275.0374	0.5190	142.7444 (268)
Energy saving/generation technologies			
PV Unit	-300.0000	0.5190	-155.7000 (269)
Total CO2, kg/year			1039.9805 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			17.1300 (273)

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

DER		17.1300 ZC1
Total Floor Area	TFA	60.7000
Assumed number of occupants	N	2.0014
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		17.0558 ZC2
CO2 emissions from cooking, equation (L16)		2.7518 ZC3
Total CO2 emissions		36.9376 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		36.9376 ZC8

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1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	60.7000 (1b)	x 2.4000 (2b)	= 145.6800 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 145.6800 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 20.0000 / (5) = 0.1373 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3873 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3292 (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	0.4197	0.4115	0.4033	0.3621	0.3539	0.3127	0.3127	0.3045	0.3292	0.3539	0.3703	0.3868 (22b)
Effective ac	0.5881	0.5847	0.5813	0.5656	0.5626	0.5489	0.5489	0.5464	0.5542	0.5626	0.5686	0.5748 (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)			13.2900	1.3258	17.6193		(27)					
Main Wall	52.0500	13.2900	38.7600	0.1800	6.9768		(29a)					
Wall to stairs	2.8100	1.8900	0.9200	0.1800	0.1656		(29a)					
Flat roof	60.7000		60.7000	0.1300	7.8910		(30)					
Total net area of external elements Aum(A, m2)			115.5600				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	34.5427	(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.3880 (36)					
Total fabric heat loss						(33) + (36) =	40.9307 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 28.2718	Feb 28.1073	Mar 27.9462	Apr 27.1891	May 27.0475	Jun 26.3881	Jul 26.3881	Aug 26.2660	Sep 26.6421	Oct 27.0475	Nov 27.3340	Dec 27.6336 (38)
Heat transfer coeff	69.2025	69.0380	68.8769	68.1198	67.9782	67.3188	67.3188	67.1967	67.5728	67.9782	68.2647	68.5643 (39)
Average = Sum(39)m / 12 =												68.1191 (39)
HLP	Jan 1.1401	Feb 1.1374	Mar 1.1347	Apr 1.1222	May 1.1199	Jun 1.1090	Jul 1.1090	Aug 1.1070	Sep 1.1132	Oct 1.1199	Nov 1.1246	Dec 1.1296 (40)
HLP (average)												1.1222 (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												2.0014 (42)
Average daily hot water use (litres/day)												81.7322 (43)
Daily hot water use	89.9054	86.6361	83.3668	80.0976	76.8283	73.5590	73.5590	76.8283	80.0976	83.3668	86.6361	89.9054 (44)
Energy conte	133.3271	116.6088	120.3298	104.9064	100.6602	86.8621	80.4905	92.3640	93.4672	108.9270	118.9023	129.1202 (45)
Energy content (annual)												Total = Sum(45)m = 1285.9657 (45)
Distribution loss (46)m = 0.15 x (45)m	19.9991	17.4913	18.0495	15.7360	15.0990	13.0293	12.0736	13.8546	14.0201	16.3390	17.8353	19.3680 (46)
Water storage loss:												210.0000 (47)
Store volume												1.7016 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.9188 (55)
Enter (49) or (54) in (55)												

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Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842 (56)
If cylinder contains dedicated solar storage	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	185.0737	163.3476	172.0764	154.9838	152.4068	136.9395	132.2371	144.1106	143.5445	160.6736	168.9797	180.8668 (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	185.0737	163.3476	172.0764	154.9838	152.4068	136.9395	132.2371	144.1106	143.5445	160.6736	168.9797	180.8668 (64)
Heat gains from water heating, kWh/month	85.7285	76.1635	81.4069	74.9433	74.8668	68.9435	68.1604	72.1083	71.1397	77.6155	79.5969	84.3297 (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	100.0678	100.0678	100.0678	100.0678	100.0678	100.0678	100.0678	100.0678	100.0678	100.0678	100.0678	100.0678 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.5833	13.8410	11.2562	8.5217	6.3701	5.3779	5.8110	7.5533	10.1381	12.8726	15.0242	16.0164 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	174.7088	176.5218	171.9532	162.2274	149.9502	138.4115	130.7028	128.8899	133.4584	143.1843	155.4614	167.0002 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.0068	33.0068	33.0068	33.0068	33.0068	33.0068	33.0068	33.0068	33.0068	33.0068	33.0068	33.0068 (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)	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542 (71)
Water heating gains (Table 5)	115.2265	113.3385	109.4179	104.0879	100.6274	95.7549	91.6134	96.9198	98.8052	104.3219	110.5512	113.3464 (72)
Total internal gains	361.5390	359.7216	348.6477	330.8573	312.9681	295.5646	284.1476	289.3834	298.4220	316.3991	337.0573	352.3834 (73)

6. Solar gains

[Jan]			Area m2		Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
East			4.5300		19.6403		0.6300		0.7000		0.7700		27.1905 (76)
South			1.9100		46.7521		0.6300		0.7000		0.7700		27.2902 (78)
West			6.8500		19.6403		0.6300		0.7000		0.7700		41.1159 (80)
Solar gains	95.5966	178.3160	276.9886	385.2848	460.3750	467.1645	446.3742	390.5000	315.4071	206.7605	117.5182	79.7531	(83)
Total gains	457.1356	538.0377	625.6364	716.1421	773.3431	762.7291	730.5218	679.8833	613.8291	523.1596	454.5755	432.1365	(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	60.9122	61.0573	61.2002	61.8803	62.0093	62.6166	62.6166	62.7304	62.3813	62.0093	61.7490	61.4792
alpha	5.0608	5.0705	5.0800	5.1254	5.1340	5.1744	5.1744	5.1820	5.1588	5.1340	5.1166	5.0986
util living area	0.9944	0.9868	0.9631	0.8895	0.7428	0.5517	0.4032	0.4504	0.7054	0.9342	0.9878	0.9958 (86)
MIT	19.9133	20.0997	20.3854	20.7088	20.9101	20.9843	20.9974	20.9955	20.9482	20.6605	20.2230	19.8794 (87)
Th 2	19.9682	19.9704	19.9726	19.9827	19.9846	19.9935	19.9935	19.9951	19.9900	19.9846	19.9808	19.9768 (88)
util rest of house	0.9927	0.9826	0.9516	0.8580	0.6829	0.4706	0.3122	0.3542	0.6222	0.9077	0.9832	0.9944 (89)
MIT 2	18.5368	18.8081	19.2168	19.6627	19.9047	19.9840	19.9926	19.9934	19.9533	19.6130	18.9964	18.4937 (90)
Living area fraction	19.1156	19.3511	19.7081	20.1025	20.3274	20.4046	20.4150	20.4147	20.3716	20.0534	19.5121	19.0763 (92)
Temperature adjustment	19.1156	19.3511	19.7081	20.1025	20.3274	20.4046	20.4150	20.4147	20.3716	20.0534	19.5121	19.0763 (93)
adjusted MIT	19.1156	19.3511	19.7081	20.1025	20.3274	20.4046	20.4150	20.4147	20.3716	20.0534	19.5121	19.0763 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	452.8539	526.9510	593.1312	617.4004	544.5338	384.6749	256.0778	268.4202	402.1783	475.9597	445.6694	428.9962 (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	1025.2729	997.6762	909.7332	763.1132	586.4761	390.7578	256.8242	269.7776	423.7906	642.6239	847.3101	1019.9827 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	425.8797	316.3274	235.5519	104.9132	31.2050	0.0000	0.0000	0.0000	0.0000	123.9982	289.1814	439.6939 (98)
Space heating												1966.7506 (98)
Space heating per m2										(98) / (4) =		32.4012 (99)

8c. Space cooling requirement

Not applicable

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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													2103.4766 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	425.8797	316.3274	235.5519	104.9132	31.2050	0.0000	0.0000	0.0000	0.0000	123.9982	289.1814	439.6939	(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)	455.4863	338.3180	251.9271	112.2067	33.3744	0.0000	0.0000	0.0000	0.0000	132.6184	309.2849	470.2609	(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	185.0737	163.3476	172.0764	154.9838	152.4068	136.9395	132.2371	144.1106	143.5445	160.6736	168.9797	180.8668	(64)
Efficiency of water heater (217)m	86.9676	86.5481	85.6519	83.7995	81.4364	79.8000	79.8000	79.8000	79.8000	84.1328	86.2354	87.0963	(216)
Fuel for water heating, kWh/month	212.8078	188.7362	200.9021	184.9459	187.1484	171.6033	165.7107	180.5898	179.8803	190.9761	195.9517	207.6631	(219)
Water heating fuel used												2266.9153	(219)
Annual totals kWh/year													
Space heating fuel - main system												2103.4766	(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)												275.2064	(232)
Total delivered energy for all uses												4720.5984	(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	2103.4766	0.2160	454.3509 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2266.9153	0.2160	489.6537 (264)
Space and water heating			944.0047 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	275.2064	0.5190	142.8321 (268)
Total CO2, kg/m2/year			1125.7618 (272)
Emissions per m2 for space and water heating			15.5520 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.3531 (272b)
Emissions per m2 for pumps and fans			0.6413 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.5520 * 1.55) + 2.3531 + 0.6413, rounded to 2 d.p.			27.1000 (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	60.7000 (1b)	x 2.4000 (2b)	= 145.6800 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 145.6800 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
					Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					20.0000 / (5) = 0.1373 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3873 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3292 (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												
	0.4197	0.4115	0.4033	0.3621	0.3539	0.3127	0.3127	0.3045	0.3292	0.3539	0.3703	0.3868 (22b)
Effective ac	0.5881	0.5847	0.5813	0.5656	0.5626	0.5489	0.5489	0.5464	0.5542	0.5626	0.5686	0.5748 (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)			13.6200	1.3258	18.0568		(27)
Door to Stairs			1.8900	1.4000	2.6460		(26)
Main Wall	52.0500	13.6200	38.4300	0.2200	8.4546	60.0000	2305.8000 (29a)
Wall to stairs	2.8100	1.8900	0.9200	0.1864	0.1715	190.0000	174.8000 (29a)
Flat roof	60.7000		60.7000	0.1400	8.4980	9.0000	546.3000 (30)
Total net area of external elements Aum, m ²			115.5600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		37.8269		(33)
Party Wall 1			31.6600	0.0000	0.0000	180.0000	5698.8000 (32)
Party Floor 1			60.7000			40.0000	2428.0000 (32d)
Internal Wall 1			75.2000			100.0000	7520.0000 (32c)
					(28)...(30) + (32) + (32a)...(32e) =		18673.7000 (34)
Heat capacity Cm = Sum(A x k)							307.6392 (35)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							7.9600 (36)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							(33) + (36) = 45.7869 (37)
Total fabric heat loss							

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	28.2718	28.1073	27.9462	27.1891	27.0475	26.3881	26.3881	26.2660	26.6421	27.0475	27.3340	27.6336 (38)
Heat transfer coeff	74.0586	73.8942	73.7330	72.9760	72.8344	72.1750	72.1750	72.0529	72.4290	72.8344	73.1209	73.4205 (39)
Average = Sum(39)m / 12 =												72.9753 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2201	1.2174	1.2147	1.2022	1.1999	1.1890	1.1890	1.1870	1.1932	1.1999	1.2046	1.2096 (40)
HLP (average)												1.2022 (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												2.0014 (42)
Average daily hot water use (litres/day)												81.7322 (43)
Daily hot water use	89.9054	86.6361	83.3668	80.0976	76.8283	73.5590	73.5590	76.8283	80.0976	83.3668	86.6361	89.9054 (44)
Energy conte	133.3271	116.6088	120.3298	104.9064	100.6602	86.8621	80.4905	92.3640	93.4672	108.9270	118.9023	129.1202 (45)
Energy content (annual)										Total = Sum(45)m =		1285.9657 (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	28.3320	24.7794	25.5701	22.2926	21.3903	18.4582	17.1042	19.6274	19.8618	23.1470	25.2667	27.4380 (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	100.0678	100.0678	100.0678	100.0678	100.0678	100.0678	100.0678	100.0678	100.0678	100.0678	100.0678	100.0678	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.5738	13.8325	11.2493	8.5165	6.3662	5.3746	5.8074	7.5487	10.1319	12.8647	15.0150	16.0066	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	174.7088	176.5218	171.9532	162.2274	149.9502	138.4115	130.7028	128.8899	133.4584	143.1843	155.4614	167.0002	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.0068	33.0068	33.0068	33.0068	33.0068	33.0068	33.0068	33.0068	33.0068	33.0068	33.0068	33.0068	(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)	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	(71)
Water heating gains (Table 5)	38.0807	36.8741	34.3684	30.9620	28.7504	25.6364	22.9896	26.3809	27.5858	31.1115	35.0927	36.8791	(72)
Total internal gains	281.3836	280.2486	270.5913	254.7262	238.0871	222.4428	212.5202	215.8398	224.1964	240.1809	258.5895	272.9062	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.6400	19.6403	0.6300	0.7000	0.7700	27.8508	(76)
South	1.9600	46.7521	0.6300	0.7000	0.7700	28.0046	(78)
West	7.0200	19.6403	0.6300	0.7000	0.7700	42.1363	(80)

Solar gains	97.9916	182.7738	283.8934	394.8658	471.8079	478.7604	457.4562	400.2044	323.2611	211.9236	120.4606	81.7525	(83)
Total gains	379.3752	463.0224	554.4847	649.5920	709.8950	701.2032	669.9764	616.0442	547.4575	452.1044	379.0501	354.6587	(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	70.0410	70.1968	70.3503	71.0801	71.2183	71.8689	71.8689	71.9907	71.6169	71.2183	70.9392	70.6498	
alpha	5.6694	5.6798	5.6900	5.7387	5.7479	5.7913	5.7913	5.7994	5.7745	5.7479	5.7293	5.7100	
util living area	0.9991	0.9971	0.9884	0.9480	0.8311	0.6375	0.4707	0.5311	0.8109	0.9786	0.9978	0.9994	(86)
MIT	19.8895	20.0571	20.3248	20.6531	20.8865	20.9806	20.9971	20.9944	20.9274	20.5908	20.1718	19.8601	(87)
Th 2	19.9040	19.9061	19.9082	19.9182	19.9201	19.9288	19.9288	19.9304	19.9254	19.9201	19.9163	19.9124	(88)
util rest of house	0.9988	0.9959	0.9833	0.9259	0.7707	0.5407	0.3580	0.4115	0.7233	0.9655	0.9967	0.9992	(89)
MIT 2	18.8984	19.0671	19.3337	19.6552	19.8531	19.9217	19.9282	19.9292	19.8917	19.6054	19.1904	18.8759	(90)
Living area fraction									fLA = Living area / (4) =			0.4204	(91)
MIT	19.3151	19.4833	19.7504	20.0748	20.2876	20.3669	20.3776	20.3771	20.3271	20.0197	19.6030	19.2897	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3151	19.4833	19.7504	20.0748	20.2876	20.3669	20.3776	20.3771	20.3271	20.0197	19.6030	19.2897	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	378.8124	460.8369	544.7120	603.8968	562.9298	407.7274	271.7619	284.7398	415.5192	437.1855	377.6157	354.2975	(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	1111.9957	1077.6238	976.9906	815.4895	625.4721	416.2239	272.6499	286.5601	451.0254	686.0768	914.2308	1107.8922	(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	545.4884	414.4808	321.6153	152.3467	46.5315	0.0000	0.0000	0.0000	0.0000	185.1752	386.3629	560.6745	(98)
Space heating												2612.6752	(98)
Space heating per m2										(98) / (4) =		43.0424	(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	678.4449	534.0949	547.6019	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9424	0.9745	0.9610	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	639.3902	520.4864	526.2358	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	894.2838	856.3127	794.4336	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	183.5234	249.8548	199.5391	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												632.9173 (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	45.8809	62.4637	49.8848	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												158.2293 (107)
Space cooling per m2												2.6067 (108)
Energy for space heating												43.0424 (99)
Energy for space cooling												2.6067 (108)
Total												45.6492 (109)
Dwelling Fabric Energy Efficiency (DFEE)												45.6 (109)

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CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	60.7000 (1b)	x 2.4000 (2b)	= 145.6800 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	145.6800 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					20.0000 / (5) = 0.1373 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3873 (18)
Number of sides sheltered					2 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3292 (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												
	0.4197	0.4115	0.4033	0.3621	0.3539	0.3127	0.3127	0.3045	0.3292	0.3539	0.3703	0.3868 (22b)
Effective ac	0.5881	0.5847	0.5813	0.5656	0.5626	0.5489	0.5489	0.5464	0.5542	0.5626	0.5686	0.5748 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			13.2900	1.3258	17.6193		(27)
Main Wall	52.0500	13.2900	38.7600	0.1800	6.9768		(29a)
Wall to stairs	2.8100	1.8900	0.9200	0.1800	0.1656		(29a)
Flat roof	60.7000		60.7000	0.1300	7.8910		(30)
Total net area of external elements Aum(A, m ²)			115.5600				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 34.5427		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.3880 (36)
Total fabric heat loss							(33) + (36) = 40.9307 (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	28.2718	28.1073	27.9462	27.1891	27.0475	26.3881	26.3881	26.2660	26.6421	27.0475	27.3340	27.6336 (38)
Heat transfer coeff	69.2025	69.0380	68.8769	68.1198	67.9782	67.3188	67.3188	67.1967	67.5728	67.9782	68.2647	68.5643 (39)
Average = Sum(39)m / 12 =												68.1191 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1401	1.1374	1.1347	1.1222	1.1199	1.1090	1.1090	1.1070	1.1132	1.1199	1.1246	1.1296 (40)
HLP (average)												1.1222 (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												2.0014 (42)
Average daily hot water use (litres/day)												81.7322 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	89.9054	86.6361	83.3668	80.0976	76.8283	73.5590	73.5590	76.8283	80.0976	83.3668	86.6361	89.9054 (44)
Energy conte	133.3271	116.6088	120.3298	104.9064	100.6602	86.8621	80.4905	92.3640	93.4672	108.9270	118.9023	129.1202 (45)
Energy content (annual)												Total = Sum(45)m = 1285.9657 (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)

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Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	28.3320	24.7794	25.5701	22.2926	21.3903	18.4582	17.1042	19.6274	19.8618	23.1470	25.2667	27.4380 (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	100.0678	100.0678	100.0678	100.0678	100.0678	100.0678	100.0678	100.0678	100.0678	100.0678	100.0678	100.0678	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.5833	13.8410	11.2562	8.5217	6.3701	5.3779	5.8110	7.5533	10.1381	12.8726	15.0242	16.0164	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	174.7088	176.5218	171.9532	162.2274	149.9502	138.4115	130.7028	128.8899	133.4584	143.1843	155.4614	167.0002	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.0068	33.0068	33.0068	33.0068	33.0068	33.0068	33.0068	33.0068	33.0068	33.0068	33.0068	33.0068	(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)	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	(71)
Water heating gains (Table 5)	38.0807	36.8741	34.3684	30.9620	28.7504	25.6364	22.9896	26.3809	27.5858	31.1115	35.0927	36.8791	(72)
Total internal gains	281.3932	280.2571	270.5982	254.7314	238.0910	222.4461	212.5237	215.8444	224.2026	240.1888	258.5987	272.9161	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.5300	19.6403	0.6300	0.7000	0.7700	27.1905	(76)
South	1.9100	46.7521	0.6300	0.7000	0.7700	27.2902	(78)
West	6.8500	19.6403	0.6300	0.7000	0.7700	41.1159	(80)

Solar gains	95.5966	178.3160	276.9886	385.2848	460.3750	467.1645	446.3742	390.5000	315.4071	206.7605	117.5182	79.7531	(83)
Total gains	376.9897	458.5732	547.5868	640.0162	698.4661	689.6106	658.8979	606.3444	539.6097	446.9492	376.1169	352.6692	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)

Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	21.0000 (85)
tau	60.9122	61.0573	61.2002	61.8803	62.0093	62.6166	62.6166	62.7304	62.3813	62.0093	61.7490	61.4792	
alpha	5.0608	5.0705	5.0800	5.1254	5.1340	5.1744	5.1744	5.1820	5.1588	5.1340	5.1166	5.0986	
util living area	0.9977	0.9934	0.9781	0.9224	0.7926	0.6030	0.4456	0.5021	0.7709	0.9628	0.9947	0.9983	(86)
MIT	19.7917	19.9827	20.2815	20.6363	20.8777	20.9766	20.9959	20.9927	20.9217	20.5696	20.1066	19.7579	(87)
Th 2	19.9682	19.9704	19.9726	19.9827	19.9846	19.9935	19.9935	19.9951	19.9900	19.9846	19.9808	19.9768	(88)
util rest of house	0.9969	0.9912	0.9707	0.8974	0.7358	0.5173	0.3458	0.3964	0.6900	0.9457	0.9925	0.9978	(89)
MIT 2	18.8701	19.0618	19.3575	19.7019	19.9080	19.9836	19.9925	19.9932	19.9501	19.6497	19.1943	18.8433	(90)
Living area fraction									fLA = Living area / (4) =			0.4204	(91)
MIT	19.2576	19.4490	19.7460	20.0947	20.3157	20.4011	20.4144	20.4134	20.3586	20.0365	19.5778	19.2278	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2576	19.4490	19.7460	20.0947	20.3157	20.4011	20.4144	20.4134	20.3586	20.0365	19.5778	19.2278	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9962	0.9897	0.9687	0.9005	0.7555	0.5529	0.3879	0.4410	0.7217	0.9468	0.9914	0.9972	(94)
Useful gains	375.5421	453.8554	530.4482	576.3426	527.7050	381.3144	255.5792	267.4228	389.4263	423.1504	372.8900	351.6874	(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	1035.0996	1004.4335	912.3417	762.5817	585.6778	390.5218	256.7779	269.6869	422.9094	641.4738	851.7954	1030.3736	(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	490.7108	369.9885	284.1288	134.0921	43.1317	0.0000	0.0000	0.0000	0.0000	162.4326	344.8119	504.9425	(98)
Space heating												2334.2389	(98)
Space heating per m2										(98) / (4) =		38.4553	(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	632.7969	498.1593	510.6951	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9415	0.9721	0.9591	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	595.7958	484.2449	489.8240	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	880.7384	843.3686	783.1023	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	205.1587	267.1880	218.1991	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												690.5457	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	51.2897	66.7970	54.5498	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											172.6364 (107)
Space cooling per m2											2.8441 (108)
Energy for space heating											38.4553 (99)
Energy for space cooling											2.8441 (108)
Total											41.2994 (109)
Target Fabric Energy Efficiency (TFEE)											47.5 (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	60.7000 (1b)	x 2.4000 (2b)	= 145.6800 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 145.6800 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					20.0000 / (5) = 0.1373 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3873 (18)
					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3292 (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	0.3621	0.3374	0.3374	0.3210	0.3210	0.2798	0.2798	0.2716	0.2798	0.3127	0.3045	0.3292 (22b)
Effective ac	0.5656	0.5569	0.5569	0.5515	0.5515	0.5391	0.5391	0.5369	0.5391	0.5489	0.5464	0.5542 (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)			13.6200	1.3258	18.0568		(27)
Door to Stairs			1.8900	1.4000	2.6460		(26)
Main Wall	52.0500	13.6200	38.4300	0.2200	8.4546	60.0000	2305.8000 (29a)
Wall to stairs	2.8100	1.8900	0.9200	0.1864	0.1715	190.0000	174.8000 (29a)
Flat roof	60.7000		60.7000	0.1400	8.4980	9.0000	546.3000 (30)
Total net area of external elements Aum, m ²			115.5600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	37.8269			(33)
Party Wall 1			31.6600	0.0000	0.0000	180.0000	5698.8000 (32)
Party Floor 1			60.7000			40.0000	2428.0000 (32d)
Internal Wall 1			75.2000			100.0000	7520.0000 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 18673.7000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							307.6392 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.9600 (36)
Total fabric heat loss							(33) + (36) = 45.7869 (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	27.1891	26.7740	26.7740	26.5135	26.5135	25.9192	25.9192	25.8101	25.9192	26.3881	26.2660	26.6421 (38)
Heat transfer coeff	72.9760	72.5608	72.5608	72.3004	72.3004	71.7061	71.7061	71.5970	71.7061	72.1750	72.0529	72.4290 (39)
Average = Sum(39)m / 12 =												72.1725 (39)
HLP	1.2022	1.1954	1.1954	1.1911	1.1911	1.1813	1.1813	1.1795	1.1813	1.1890	1.1870	1.1932 (40)
HLP (average)												1.1890 (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												2.0014 (42)
Average daily hot water use (litres/day)												81.7322 (43)
Daily hot water use	89.9054	86.6361	83.3668	80.0976	76.8283	73.5590	73.5590	76.8283	80.0976	83.3668	86.6361	89.9054 (44)
Energy conte	133.3271	116.6088	120.3298	104.9064	100.6602	86.8621	80.4905	92.3640	93.4672	108.9270	118.9023	129.1202 (45)
Energy content (annual)										Total = Sum(45)m =		1285.9657 (45)
Distribution loss (46)m = 0.15 x (45)m	19.9991	17.4913	18.0495	15.7360	15.0990	13.0293	12.0736	13.8546	14.0201	16.3390	17.8353	19.3680 (46)
Water storage loss:												

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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	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													
187.7259	165.7432	174.7286	157.5504	155.0590	139.5061	134.8893	146.7628	146.1112	163.3258	171.5463	183.5190	183.5190	(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 =													
Output from w/h													
187.7259	165.7432	174.7286	157.5504	155.0590	139.5061	134.8893	146.7628	146.1112	163.3258	171.5463	183.5190	183.5190	(64)
RHI water heating demand													
Heat gains from water heating, kWh/month													
87.8503	78.0799	83.5287	76.9966	76.9886	70.9969	70.2821	74.2301	73.1930	79.7373	81.6502	86.4515	86.4515	(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	120.0813	120.0813	120.0813	120.0813	120.0813	120.0813	120.0813	120.0813	120.0813	120.0813	120.0813	120.0813	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
38.9344	34.5812	28.1233	21.2912	15.9154	13.4364	14.5185	18.8718	25.3296	32.1618	37.5376	40.0165	40.0165	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
260.7595	263.4653	256.6466	242.1304	223.8063	206.5843	195.0789	192.3730	199.1917	213.7079	232.0320	249.2541	249.2541	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
49.0095	49.0095	49.0095	49.0095	49.0095	49.0095	49.0095	49.0095	49.0095	49.0095	49.0095	49.0095	49.0095	(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)													
-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	(71)
Water heating gains (Table 5)													
118.0784	116.1904	112.2698	106.9397	103.4793	98.6067	94.4652	99.7716	101.6570	107.1737	113.4031	116.1983	116.1983	(72)
Total internal gains													
506.8088	503.2735	486.0763	459.3979	432.2376	407.6640	393.0993	400.0530	415.2149	442.0800	472.0092	494.5054	494.5054	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W			
East				4.6400	23.7835	0.6300	0.7000	0.7700	33.7260 (76)			
South				1.9600	54.0600	0.6300	0.7000	0.7700	32.3820 (78)			
West				7.0200	23.7835	0.6300	0.7000	0.7700	51.0252 (80)			
Solar gains	117.1332	191.0252	294.7082	416.3555	484.9626	520.7341	492.5733	439.0792	357.7891	237.7793	141.8746	98.2665 (83)
Total gains	623.9421	694.2986	780.7845	875.7534	917.2001	928.3981	885.6726	839.1322	773.0040	679.8593	613.8839	592.7719 (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	71.0801	71.4868	71.4868	71.7443	71.7443	72.3389	72.3389	72.4491	72.3389	71.8689	71.9907	71.6169	
alpha	5.7387	5.7658	5.7658	5.7830	5.7830	5.8226	5.8226	5.8299	5.8226	5.7913	5.7994	5.7745	
util living area													
0.9874	0.9753	0.9338	0.8214	0.6337	0.4156	0.2752	0.3069	0.5651	0.8607	0.9705	0.9900	0.9900	(86)
Tweekday	19.1602	19.3183	19.5624	19.7677	19.8456	19.8661	19.8666	19.8681	19.8629	19.7647	19.4529	19.1371	
Tweekend	20.6176	20.6875	20.8025	20.9080	20.9577	20.9689	20.9698	20.9697	20.9649	20.9017	20.7455	20.6045	
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	20.4099	20.5167	20.6952	20.8564	20.9347	20.9523	20.9533	20.9533	20.9453	20.8483	20.6026	20.3895	(87)
Th 2	19.9182	19.9237	19.9237	19.9271	19.9271	19.9350	19.9350	19.9364	19.9350	19.9288	19.9304	19.9254	(88)
util rest of house													
0.9826	0.9663	0.9110	0.7720	0.5600	0.3344	0.1890	0.2164	0.4730	0.8073	0.9578	0.9861	0.9861	(89)
Tweekday	19.1602	19.3183	19.5624	19.7677	19.8456	19.8661	19.8666	19.8681	19.8629	19.7647	19.4529	19.1371	
Tweekend	19.1602	19.3183	19.5624	19.7677	19.8456	19.8661	19.8666	19.8681	19.8629	19.7647	19.4529	19.1371	
MIT 2	19.1602	19.3183	19.5624	19.7677	19.8456	19.8661	19.8666	19.8681	19.8629	19.7647	19.4529	19.1371	(90)
Living area fraction													
MIT	19.6856	19.8221	20.0387	20.2254	20.3035	20.3227	20.3235	20.3243	20.3179	20.2203	19.9363	19.6637	(91)
Temperature adjustment													
adjusted MIT	19.6856	19.8221	20.0387	20.2254	20.3035	20.3227	20.3235	20.3243	20.3179	20.2203	19.9363	19.6637	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	612.2988	670.2032	713.4744	688.9433	537.9582	338.0433	195.2665	209.3257	391.7173	559.7381	588.0459	583.8509	(94)
Ext temp.	4.9000	5.5000	7.3000	9.7000	12.7000	15.6000	17.6000	17.4000	14.8000	11.4000	7.8000	4.9000	(96)
Heat loss rate W													
1078.9936	1039.2256	924.3307	760.9931	549.7339	338.6500	195.2894	209.3737	395.6702	636.6017	874.4525	1069.3173	1069.3173	(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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Space heating kWh	347.2209	247.9830	156.8771	51.8758	8.7611	0.0000	0.0000	0.0000	0.0000	57.1865	206.2127	361.1870 (98)
Space heating												1437.3042 (98)
RHI space heating demand												1437 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	60.7000 (1b)	x 2.4000 (2b)	= 145.6800 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 145.6800 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					20.0000 / (5) = 0.1373 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3873 (18)
					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3292 (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												
	0.4197	0.4115	0.4033	0.3621	0.3539	0.3127	0.3127	0.3045	0.3292	0.3539	0.3703	0.3868 (22b)
Effective ac	0.5881	0.5847	0.5813	0.5656	0.5626	0.5489	0.5489	0.5464	0.5542	0.5626	0.5686	0.5748 (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)			13.6200	1.3258	18.0568		(27)
Door to Stairs			1.8900	1.4000	2.6460		(26)
Main Wall	52.0500	13.6200	38.4300	0.2200	8.4546	60.0000	2305.8000 (29a)
Wall to stairs	2.8100	1.8900	0.9200	0.1864	0.1715	190.0000	174.8000 (29a)
Flat roof	60.7000		60.7000	0.1400	8.4980	9.0000	546.3000 (30)
Total net area of external elements Aum, m ²			115.5600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	37.8269			(33)
Party Wall 1			31.6600	0.0000	0.0000	180.0000	5698.8000 (32)
Party Floor 1			60.7000			40.0000	2428.0000 (32d)
Internal Wall 1			75.2000			100.0000	7520.0000 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 18673.7000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							307.6392 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.9600 (36)
Total fabric heat loss							(33) + (36) = 45.7869 (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	28.2718	28.1073	27.9462	27.1891	27.0475	26.3881	26.3881	26.2660	26.6421	27.0475	27.3340	27.6336 (38)
Heat transfer coeff	74.0586	73.8942	73.7330	72.9760	72.8344	72.1750	72.1750	72.0529	72.4290	72.8344	73.1209	73.4205 (39)
Average = Sum(39)m / 12 =												72.9753 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2201	1.2174	1.2147	1.2022	1.1999	1.1890	1.1890	1.1870	1.1932	1.1999	1.2046	1.2096 (40)
HLP (average)												1.2022 (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												2.0014 (42)
Average daily hot water use (litres/day)												81.7322 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	89.9054	86.6361	83.3668	80.0976	76.8283	73.5590	73.5590	76.8283	80.0976	83.3668	86.6361	89.9054 (44)
Energy conte	133.3271	116.6088	120.3298	104.9064	100.6602	86.8621	80.4905	92.3640	93.4672	108.9270	118.9023	129.1202 (45)
Energy content (annual)										Total = Sum(45)m =		1285.9657 (45)
Distribution loss (46)m = 0.15 x (45)m												
	19.9991	17.4913	18.0495	15.7360	15.0990	13.0293	12.0736	13.8546	14.0201	16.3390	17.8353	19.3680 (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 (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	187.7259	165.7432	174.7286	157.5504	155.0590	139.5061	134.8893	146.7628	146.1112	163.3258	171.5463	183.5190 (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	187.7259	165.7432	174.7286	157.5504	155.0590	139.5061	134.8893	146.7628	146.1112	163.3258	171.5463	183.5190 (64)
Heat gains from water heating, kWh/month	87.8503	78.0799	83.5287	76.9966	76.9886	70.9969	70.2821	74.2301	73.1930	79.7373	81.6502	86.4515 (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	120.0813	120.0813	120.0813	120.0813	120.0813	120.0813	120.0813	120.0813	120.0813	120.0813	120.0813	120.0813	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	38.9344	34.5812	28.1233	21.2912	15.9154	13.4364	14.5185	18.8718	25.3296	32.1618	37.5376	40.0165	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	260.7595	263.4653	256.6466	242.1304	223.8063	206.5843	195.0789	192.3730	199.1917	213.7079	232.0320	249.2541	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.0095	49.0095	49.0095	49.0095	49.0095	49.0095	49.0095	49.0095	49.0095	49.0095	49.0095	49.0095	(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)	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	(71)
Water heating gains (Table 5)	118.0784	116.1904	112.2698	106.9397	103.4793	98.6067	94.4652	99.7716	101.6570	107.1737	113.4031	116.1983	(72)
Total internal gains	506.8088	503.2735	486.0763	459.3979	432.2376	407.6640	393.0993	400.0530	415.2149	442.0800	472.0092	494.5054	(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					
East			4.6400	19.6403	0.6300	0.7000	0.7700	27.8508 (76)					
South			1.9600	46.7521	0.6300	0.7000	0.7700	28.0046 (78)					
West			7.0200	19.6403	0.6300	0.7000	0.7700	42.1363 (80)					
Solar gains	97.9916	182.7738	283.8934	394.8658	471.8079	478.7604	457.4562	400.2044	323.2611	211.9236	120.4606	81.7525	(83)
Total gains	604.8004	686.0473	769.9697	854.2637	904.0455	886.4245	850.5555	800.2574	738.4760	654.0036	592.4698	576.2579	(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	70.0410	70.1968	70.3503	71.0801	71.2183	71.8689	71.8689	71.9907	71.6169	71.2183	70.9392	70.6498
alpha	5.6694	5.6798	5.6900	5.7387	5.7479	5.7913	5.7913	5.7994	5.7745	5.7479	5.7293	5.7100
util living area	0.9911	0.9810	0.9514	0.8653	0.7076	0.5153	0.3726	0.4127	0.6520	0.9066	0.9805	0.9930 (86)
Tweekday	19.0398	19.2091	19.4551	19.7068	19.8220	19.8575	19.8599	19.8614	19.8460	19.6915	19.3319	19.0123
Tweekend	20.5689	20.6446	20.7576	20.8789	20.9457	20.9664	20.9692	20.9690	20.9581	20.8658	20.6953	20.5535
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	20.3347	20.4502	20.6260	20.8108	20.9162	20.9484	20.9525	20.9521	20.9345	20.7929	20.5243	20.3109 (87)
Th 2	19.9040	19.9061	19.9082	19.9182	19.9201	19.9288	19.9288	19.9304	19.9254	19.9201	19.9163	19.9124 (88)
util rest of house	0.9877	0.9740	0.9343	0.8246	0.6399	0.4319	0.2823	0.3176	0.5615	0.8672	0.9721	0.9904 (89)
Tweekday	19.0398	19.2091	19.4551	19.7068	19.8220	19.8575	19.8599	19.8614	19.8460	19.6915	19.3319	19.0123
Tweekend	19.0398	19.2091	19.4551	19.7068	19.8220	19.8575	19.8599	19.8614	19.8460	19.6915	19.3319	19.0123
MIT 2	19.0398	19.2091	19.4551	19.7068	19.8220	19.8575	19.8599	19.8614	19.8460	19.6915	19.3319	19.0123 (90)
Living area fraction	fLA = Living area / (4) =											0.4204 (91)
MIT	19.5842	19.7309	19.9473	20.1710	20.2820	20.3162	20.3192	20.3200	20.3037	20.1546	19.8332	19.5583 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5842	19.7309	19.9473	20.1710	20.2820	20.3162	20.3192	20.3200	20.3037	20.1546	19.8332	19.5583 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9865	0.9727	0.9350	0.8350	0.6635	0.4624	0.3153	0.3524	0.5944	0.8769	0.9713	0.9893	(94)
Useful gains	596.6128	667.2861	719.9501	713.3124	599.8490	409.9201	268.2051	282.0085	438.9827	573.5011	575.4921	570.0917	(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	1131.9272	1095.9159	991.5136	822.5093	625.0672	412.5646	268.4361	282.4442	449.3252	695.8998	931.0649	1127.6110	(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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	398.2739	288.0392	202.0432	78.6218	18.7623	0.0000	0.0000	0.0000	0.0000	91.0647	256.0124	414.7943 (98)
Space heating												1747.6117 (98)
Space heating per m2										(98) / (4) =		28.7910 (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 %)												254.8707 (206)
Efficiency of secondary/supplementary heating system, %												100.0000 (208)
Space heating requirement												685.6857 (211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	398.2739	288.0392	202.0432	78.6218	18.7623	0.0000	0.0000	0.0000	0.0000	91.0647	256.0124	414.7943 (98)
Space heating efficiency (main heating system 1)	254.8707	254.8707	254.8707	254.8707	254.8707	0.0000	0.0000	0.0000	0.0000	254.8707	254.8707	254.8707 (210)
Space heating fuel (main heating system)	156.2651	113.0139	79.2729	30.8477	7.3615	0.0000	0.0000	0.0000	0.0000	35.7298	100.4480	162.7470 (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	187.7259	165.7432	174.7286	157.5504	155.0590	139.5061	134.8893	146.7628	146.1112	163.3258	171.5463	183.5190 (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	110.7920	97.8182	103.1212	92.9830	91.5126	82.3336	79.6089	86.6164	86.2318	96.3915	101.2431	108.3091 (219)
Water heating fuel used												1136.9616 (219)
Annual totals kWh/year												
Space heating fuel - main system												685.6857 (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) 275.0374 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
Total delivered energy for all uses 2097.6847 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	685.6857	13.1900	90.4419 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1136.9616	13.1900	149.9652 (247)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	275.0374	13.1900	36.2774 (250)
Additional standing charges			0.0000 (251)

Energy saving/generation technologies
PV Unit 0.0000 13.1900 0.0000 (252)
Total energy cost 276.6846 (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] =	1.0994 (257)
SAP value		84.6632
SAP rating (Section 12)		85 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	685.6857	0.5190	355.8709 (261)
Space heating - secondary	0.0000	0.5190	0.0000 (263)
Water heating (other fuel)	1136.9616	0.5190	590.0831 (264)
Space and water heating			945.9540 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	275.0374	0.5190	142.7444 (268)

Energy saving/generation technologies
PV Unit -300.0000 0.5190 -155.7000 (269)
Total kg/year 932.9984 (272)
CO2 emissions per m2 15.3700 (273)
EI value 88.1720
EI rating 88 (274)
EI band B

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Calculation of stars for heating and DHW

Main heating energy efficiency	$13.19 \times (1 + 0.29 \times 0.25) / 2.5487 = 5.550$, stars = 3
Main heating environmental impact	$0.519 \times (1 + 0.29 \times 0.25) / 2.5487 = 0.2184$, 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	60.7000 (1b)	x 2.4000 (2b)	= 145.6800 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 145.6800 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					20.0000 / (5) = 0.1373 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3873 (18)
Number of sides sheltered					2 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3292 (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	0.3621	0.3374	0.3374	0.3210	0.3210	0.2798	0.2798	0.2716	0.2798	0.3127	0.3045	0.3292 (22b)
Effective ac	0.5656	0.5569	0.5569	0.5515	0.5515	0.5391	0.5391	0.5369	0.5391	0.5489	0.5464	0.5542 (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)			13.6200	1.3258	18.0568		(27)
Door to Stairs			1.8900	1.4000	2.6460		(26)
Main Wall	52.0500	13.6200	38.4300	0.2200	8.4546	60.0000	2305.8000 (29a)
Wall to stairs	2.8100	1.8900	0.9200	0.1864	0.1715	190.0000	174.8000 (29a)
Flat roof	60.7000		60.7000	0.1400	8.4980	9.0000	546.3000 (30)
Total net area of external elements Aum, m ²			115.5600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	37.8269			(33)
Party Wall 1			31.6600	0.0000	0.0000	180.0000	5698.8000 (32)
Party Floor 1			60.7000			40.0000	2428.0000 (32d)
Internal Wall 1			75.2000			100.0000	7520.0000 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 18673.7000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							307.6392 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.9600 (36)
Total fabric heat loss							(33) + (36) = 45.7869 (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	27.1891	26.7740	26.7740	26.5135	26.5135	25.9192	25.9192	25.8101	25.9192	26.3881	26.2660	26.6421 (38)
Heat transfer coeff	72.9760	72.5608	72.5608	72.3004	72.3004	71.7061	71.7061	71.5970	71.7061	72.1750	72.0529	72.4290 (39)
Average = Sum(39)m / 12 =												72.1725 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2022	1.1954	1.1954	1.1911	1.1911	1.1813	1.1813	1.1795	1.1813	1.1890	1.1870	1.1932 (40)
HLP (average)												1.1890 (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												2.0014 (42)
Average daily hot water use (litres/day)												81.7322 (43)
Daily hot water use	89.9054	86.6361	83.3668	80.0976	76.8283	73.5590	73.5590	76.8283	80.0976	83.3668	86.6361	89.9054 (44)
Energy conte	133.3271	116.6088	120.3298	104.9064	100.6602	86.8621	80.4905	92.3640	93.4672	108.9270	118.9023	129.1202 (45)
Energy content (annual)										Total = Sum(45)m =		1285.9657 (45)
Distribution loss (46)m = 0.15 x (45)m	19.9991	17.4913	18.0495	15.7360	15.0990	13.0293	12.0736	13.8546	14.0201	16.3390	17.8353	19.3680 (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	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	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
187.7259	165.7432	174.7286	157.5504	155.0590	139.5061	134.8893	146.7628	146.1112	163.3258	171.5463	183.5190	183.5190	(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													
187.7259	165.7432	174.7286	157.5504	155.0590	139.5061	134.8893	146.7628	146.1112	163.3258	171.5463	183.5190	183.5190	(64)
Heat gains from water heating, kWh/month													
87.8503	78.0799	83.5287	76.9966	76.9886	70.9969	70.2821	74.2301	73.1930	79.7373	81.6502	86.4515	86.4515	(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	120.0813	120.0813	120.0813	120.0813	120.0813	120.0813	120.0813	120.0813	120.0813	120.0813	120.0813	120.0813	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
38.9344	34.5812	28.1233	21.2912	15.9154	13.4364	14.5185	18.8718	25.3296	32.1618	37.5376	40.0165	40.0165	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
260.7595	263.4653	256.6466	242.1304	223.8063	206.5843	195.0789	192.3730	199.1917	213.7079	232.0320	249.2541	249.2541	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
49.0095	49.0095	49.0095	49.0095	49.0095	49.0095	49.0095	49.0095	49.0095	49.0095	49.0095	49.0095	49.0095	(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)													
-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	-80.0542	(71)
Water heating gains (Table 5)													
118.0784	116.1904	112.2698	106.9397	103.4793	98.6067	94.4652	99.7716	101.6570	107.1737	113.4031	116.1983	116.1983	(72)
Total internal gains													
506.8088	503.2735	486.0763	459.3979	432.2376	407.6640	393.0993	400.0530	415.2149	442.0800	472.0092	494.5054	494.5054	(73)

6. Solar gains

[Jan]				Area	Solar flux	g	FF	Access	Gains			
				m2	Table 6a	Specific data	Specific data	factor	W			
					W/m2	or Table 6b	or Table 6c	Table 6d				
East				4.6400	23.7835	0.6300	0.7000	0.7700	33.7260 (76)			
South				1.9600	54.0600	0.6300	0.7000	0.7700	32.3820 (78)			
West				7.0200	23.7835	0.6300	0.7000	0.7700	51.0252 (80)			
Solar gains	117.1332	191.0252	294.7082	416.3555	484.9626	520.7341	492.5733	439.0792	357.7891	237.7793	141.8746	98.2665 (83)
Total gains	623.9421	694.2986	780.7845	875.7534	917.2001	928.3981	885.6726	839.1322	773.0040	679.8593	613.8839	592.7719 (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	71.0801	71.4868	71.4868	71.7443	71.7443	72.3389	72.3389	72.4491	72.3389	71.8689	71.9907	71.6169	
alpha	5.7387	5.7658	5.7658	5.7830	5.7830	5.8226	5.8226	5.8299	5.8226	5.7913	5.7994	5.7745	
util living area													
0.9874	0.9753	0.9338	0.8214	0.6337	0.4156	0.2752	0.3069	0.5651	0.8607	0.9705	0.9900	0.9900	(86)
Tweekday	19.1602	19.3183	19.5624	19.7677	19.8456	19.8661	19.8666	19.8681	19.8629	19.7647	19.4529	19.1371	
Tweekend	20.6176	20.6875	20.8025	20.9080	20.9577	20.9689	20.9698	20.9697	20.9649	20.9017	20.7455	20.6045	
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	20.4099	20.5167	20.6952	20.8564	20.9347	20.9523	20.9533	20.9533	20.9453	20.8483	20.6026	20.3895	(87)
Th 2	19.9182	19.9237	19.9237	19.9271	19.9271	19.9350	19.9350	19.9364	19.9350	19.9288	19.9304	19.9254	(88)
util rest of house													
0.9826	0.9663	0.9110	0.7720	0.5600	0.3344	0.1890	0.2164	0.4730	0.8073	0.9578	0.9861	0.9861	(89)
Tweekday	19.1602	19.3183	19.5624	19.7677	19.8456	19.8661	19.8666	19.8681	19.8629	19.7647	19.4529	19.1371	
Tweekend	19.1602	19.3183	19.5624	19.7677	19.8456	19.8661	19.8666	19.8681	19.8629	19.7647	19.4529	19.1371	
MIT 2	19.1602	19.3183	19.5624	19.7677	19.8456	19.8661	19.8666	19.8681	19.8629	19.7647	19.4529	19.1371	(90)
Living area fraction													
fLA = Living area / (4) =													
19.6856	19.8221	20.0387	20.2254	20.3035	20.3227	20.3235	20.3243	20.3179	20.2203	19.9363	19.6637	19.6637	(92)
Temperature adjustment													
adjusted MIT	19.6856	19.8221	20.0387	20.2254	20.3035	20.3227	20.3235	20.3243	20.3179	20.2203	19.9363	19.6637	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9813	0.9653	0.9138	0.7867	0.5865	0.3641	0.2205	0.2495	0.5067	0.8233	0.9579	0.9850	(94)
Useful gains	612.2988	670.2032	713.4744	688.9433	537.9582	338.0433	195.2665	209.3257	391.7173	559.7381	588.0459	583.8509	(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													
1078.9936	1039.2256	924.3307	760.9931	549.7339	338.6500	195.2894	209.3737	395.6702	636.6017	874.4525	1069.3173	1069.3173	(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	347.2209	247.9830	156.8771	51.8758	8.7611	0.0000	0.0000	0.0000	0.0000	57.1865	206.2127	361.1870 (98)
Space heating per m2										(98) / (4) =		1437.3042 (98)
												23.6788 (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 %)												252.6816 (206)
Efficiency of secondary/supplementary heating system, %												100.0000 (208)
Space heating requirement												568.8203 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	347.2209	247.9830	156.8771	51.8758	8.7611	0.0000	0.0000	0.0000	0.0000	57.1865	206.2127	361.1870 (98)
Space heating efficiency (main heating system 1)	252.6816	252.6816	252.6816	252.6816	252.6816	0.0000	0.0000	0.0000	0.0000	252.6816	252.6816	252.6816 (210)
Space heating fuel (main heating system)	137.4144	98.1405	62.0849	20.5301	3.4673	0.0000	0.0000	0.0000	0.0000	22.6318	81.6097	142.9415 (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	187.7259	165.7432	174.7286	157.5504	155.0590	139.5061	134.8893	146.7628	146.1112	163.3258	171.5463	183.5190 (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	110.7920	97.8182	103.1212	92.9830	91.5126	82.3336	79.6089	86.6164	86.2318	96.3915	101.2431	108.3091 (219)
Water heating fuel used												1136.9616 (219)
Annual totals kWh/year												
Space heating fuel - main system												568.8203 (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)												275.0374 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
Total delivered energy for all uses												1980.8192 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	568.8203	18.9000	107.5070 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1136.9616	18.9000	214.8857 (247)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	275.0374	18.9000	51.9821 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit	0.0000	18.9000	0.0000 (252)
Total energy cost			374.3748 (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	568.8203	0.5190	295.2177 (261)
Space heating - secondary	0.0000	0.5190	0.0000 (263)
Water heating (other fuel)	1136.9616	0.5190	590.0831 (264)
Space and water heating			885.3008 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	275.0374	0.5190	142.7444 (268)
Energy saving/generation technologies			
PV Unit	-300.0000	0.5190	-155.7000 (269)
Total kg/year			872.3452 (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	568.8203	3.0700	1746.2782 (261)
Space heating - secondary	0.0000	3.0700	0.0000 (263)
Water heating (other fuel)	1136.9616	3.0700	3490.4720 (264)
Space and water heating			5236.7503 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	275.0374	3.0700	844.3648 (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			5160.1151 (272)
Primary energy kWh/m ² /year			85.0101 (273)

SAP 2012 EPC IMPROVEMENTS

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

(For testing purposes):

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

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

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0		0.00 kg/m ²
Potential energy efficiency rating:		B 85	
Potential environmental impact rating:			B 88

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	£374	£374	£0
Space heating	£108	£108	£0
Water heating	£215	£215	£0
Lighting	£52	£52	£0
Total cost of fuels	£374	£374	£0
Total cost of uses	£375	£375	£0
Delivered energy	33 kWh/m ²	33 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	0.9 tonnes	0.9 tonnes	0.0 tonnes
CO2 emissions per m ²	14 kg/m ²	14 kg/m ²	0 kg/m ²
Primary energy	85 kWh/m ²	85 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	EndTerrace Flat
Number of storeys	1
Cross ventilation possible	Yes
SAP Region	Thames Valley
Front of dwelling faces	West
Overshading	Average or unknown
Thermal mass parameter	307.6 (calculated from construction elements)
Night ventilation	No
Ventilation rate during hot weather (ach)	6.00 (Windows fully open)

Overheating Calculation

Summer ventilation heat loss coefficient	288.45 (P1)
Transmission heat loss coefficient	45.79 (37)
Summer heat loss coefficient	334.23 (P2)

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

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

[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Shading	Gains W
East	4.6400	117.5071	0.6300	0.7000	0.9000	194.7626
South	1.9600	112.2060	0.6300	0.7000	0.9000	78.5590
West	7.0200	117.5071	0.6300	0.7000	0.9000	294.6624
total:						567.9840

	Jun	Jul	Aug	
Solar gains	601	568	508	(P3)
Internal gains	408	393	400	
Total summer gains	1009	961	908	(P5)
Summer gain/loss ratio	3.02	2.88	2.72	(P6)
Summer external temperature	16.00	17.90	17.80	
Thermal mass temperature increment (TMP = 307.6)	0.00	0.00	0.00	
Threshold temperature	19.02	20.78	20.52	(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	015731	Issued on Date	01/03/2021
Assessment Reference	003	Prop Type Ref	
Property	Flat 10, 18, Parkside Road, READING, RG30 2DB		
SAP Rating	85 B	DER	17.13
Environmental	88 B	TER	27.10
CO ₂ Emissions (t/year)	0.87	% DER<TER	36.79
General Requirements Compliance	Pass	DFEE	45.65
		TFEE	47.49
		% DFEE<TFEE	3.89
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 TFE rate

1a TER and DER

Fuel for main heating	Electricity		
Fuel factor	1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	27.10	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	17.13	kgCO ₂ /m ²	Pass
	-9.97 (-36.8%)	kgCO ₂ /m ²	

1b TFE and DFEE

Target Fabric Energy Efficiency (TFEE)	47.49	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	45.65	kWh/m ² /yr	
	-1.9 (-4.0%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

Limiting System Efficiencies

4 Heating efficiency

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

5 Cylinder insulation

BASIC COMPLIANCE REPORT

Energy Calculations Ltd
SAP • CODE • SBEM • DESIGN

Calculation Type: New Build (As Designed)

Hot water storage

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

Pass

Primary pipework insulated

Yes

Pass

6 Controls

Space heating controls

Time and temperature zone control

Pass

Hot water controls

Cylinderstat

Pass

Independent timer for DHW

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100

%

Minimum

75

%

Pass

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)

Slight

Pass

Based on:

Overshading

Average

Windows facing East

4.64 m², No overhang

Windows facing South

1.96 m², No overhang

Windows facing West

7.02 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
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Calculation Type: New Build (As Designed)

Property Reference	015731	Issued on Date	01/03/2021
Assessment Reference	003	Prop Type Ref	
Property	Flat 10, 18, Parkside Road, READING, RG30 2DB		
SAP Rating	85 B	DER	17.13
Environmental	88 B	TER	27.10
CO ₂ Emissions (t/year)	0.87	% DER<TER	36.79
General Requirements Compliance	Pass	DFEE	45.65
		TFEE	47.49
		% DFEE<TFEE	3.89
Assessor Details	Mr. Matthew Carter, Energy Calculations Limited, Tel: 01754 761035, mcarter@energycalculations.co.uk		Assessor ID
			7869-0001
Client			

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

Orientation	West						
Property Tenure	Unknown						
Transaction Type	New dwelling						
Terrain Type	Urban						
1.0 Property Type	Flat, End-Terrace						
2.0 Number of Storeys	1						
3.0 Date Built	2020						
4.0 Sheltered Sides	2						
5.0 Sunlight/Shade	Average or unknown						
6.0 Measurements							
Ground Floor:		Heat Loss Perimeter		Internal Floor Area		Average Storey Height	
		22.86 m		60.70 m²		2.40 m	
7.0 Living Area	25.52			m²			
8.0 Thermal Mass Parameter	Precise calculation			kJ/m²K			
Thermal Mass	307.64						
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	52.05	38.43
Wall to stairs	Cavity Wall	Cavity wall : dense plaster, dense block, filled cavity, any outside structure		0.22	190.00	2.81	0.92
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	31.66	
9.2 Internal Walls							
Description	Construction				Kappa (kJ/m²K)	Area (m²)	
Internal Wall 1	Dense block, dense plaster				100.00	75.20	
10.0 External Roofs							
Description	Type	Construction		U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area (m²)	Nett Area (m²)
Flat roof	External Flat Roof	Plasterboard, insulated flat roof		0.14	9.00	60.70	60.70
11.1 Party Floors							

SUMMARY FOR INPUT DATA

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

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Precast concrete planks floor, screed, carpeted	40.00	60.70

12.0 Opening Types

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

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
Door	Door to Corridor	[2] Wall to stairs	North							1.89	
Windows	Window	[1] Main Wall	West	None	0.00					7.02	
Windows	Window	[1] Main Wall	South	None	0.00					1.96	
Windows	Window	[1] Main Wall	East	None	0.00					4.64	

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)	6.55	0.300	No
Table K1 - Approved	E3 Sill	6.55	0.040	No
Table K1 - Approved	E4 Jamb	37.44	0.050	No
Table K1 - Approved	E7 Party floor between dwellings (in blocks of flats)	22.86	0.070	No
Table K1 - Default	E14 Flat roof	22.86	0.080	No
Table K1 - Approved	E16 Corner (normal)	7.20	0.090	No
Table K1 - Approved	E17 Corner (inverted – internal area greater than external area)	7.20	-0.090	No
Table K1 - Approved	E18 Party wall between dwellings	7.20	0.060	No
Table K1 - Default	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.19	0.000	No

Y-value 0.069 W/m²K

18.0 Pressure Testing

Yes

Designed AP₅₀ 5.00 m³/(h.m²) @ 50 Pa

Property Tested ?

As Built AP₅₀ m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather Windows fully open

Cross ventilation possible Yes

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

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Number of open flues	0	0	0
Number of intermittent fans			2
Number of passive vents			0
Number of flueless gas fires			0

21.0 Fixed Cooling System

22.0 Lighting

Internal

Total number of light fittings	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

24.0 Main Heating 1

	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

Community Heating

28.0 Water Heating

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

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

29.0 Hot Water Cylinder

Hot Water Cylinder		
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	210.00	L
Loss	1.86	kWh/day
Pipes insulation	Fully insulated primary pipework	

31.0 Thermal Store

None

32.0 Photovoltaic Unit

More Dwellings, One Block	
Apportioned	300.00 kWh/Year

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

BLOCK COMPLIANCE

Energy Calculations Ltd
SAP • CODE • SBEM • DESIGN

Calculation Type: New Build (As Designed)

Block Reference	000516	Issued on Date	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 %			