

Energy Calculations Ltd

SAP ♦ CODE ♦ SBEM ♦ DESIGN

01754-761035



SAP Report Submission for Building Regulations Compliance

Client:

Project: Flat 3, 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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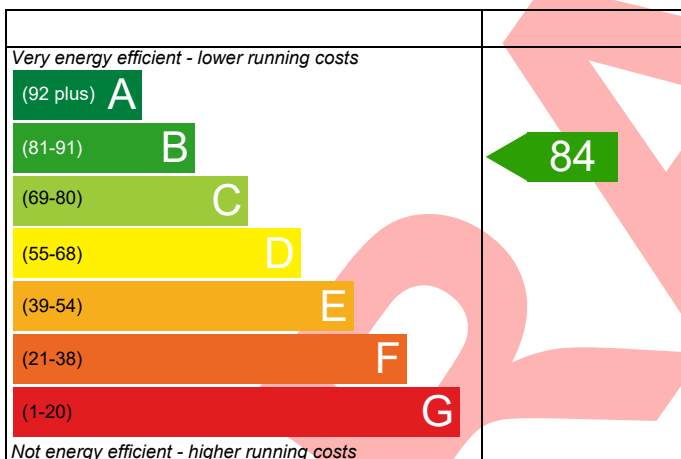
Flat 3, 18, Parkside Road,
READING,
RG30 2DB

Dwelling type: Flat, End-Terrace
Date of assessment: 01/03/2021
Produced by: Energy Calculations Limited
Total floor area: 50 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

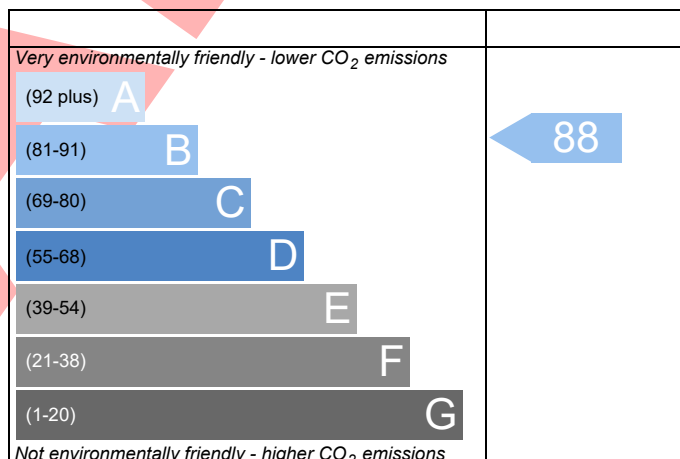


England

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	015724	Issued on Date	01/03/2021
Assessment Reference	003	Prop Type Ref	
Property	Flat 3, 18, Parkside Road, READING, RG30 2DB		
SAP Rating	84 B	DER	19.12
Environmental	88 B	TER	28.78
CO ₂ Emissions (t/year)	0.78	% DER<TER	33.57
General Requirements Compliance	Pass	DFEE	45.25
		TFEE	46.33
		% DFEE<TFEE	2.34
Assessor Details	Mr. Matthew Carter, Energy Calculations Limited, Tel: 01754 761035, mcarter@energycalculations.co.uk		Assessor ID
			7869-0001
Client			

	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Table K1 - Approved	0.300	5.52	1.66	
External wall	E3 Sill	Table K1 - Approved	0.040	4.42	0.18	
External wall	E4 Jamb	Table K1 - Approved	0.050	27.40	1.37	
External wall	E5 Ground floor (normal)	Table K1 - Approved	0.160	18.01	2.88	
External wall	E7 Party floor between dwellings (in blocks of flats)	Table K1 - Approved	0.070	12.87	0.90	
External wall	E14 Flat roof	Table K1 - Default	0.080	5.00	0.40	
External wall	E16 Corner (normal)	Table K1 - Approved	0.090	4.74	0.43	
External wall	E17 Corner (inverted – internal area greater than external area)	Table K1 - Approved	-0.090	2.37	-0.21	
External wall	E18 Party wall between dwellings	Table K1 - Approved	0.060	4.74	0.28	
Party wall	P1 Party wall - Ground floor	Table K1 - Default	0.160	5.09	0.81	

Total: **8.70** W/mK:
Y-Value: **0.091** 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

Ground-floor flat, total floor area 50 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) 28.78 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 19.12 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)46.3 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)45.2 kWh/m²/yrOK

2 Fabric U-values

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

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

Secondary heating system: None

5 Cylinder insulation

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

6 Controls

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

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames Valley):	Not significant	OK
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Based on:

Overshading:	Average
Windows facing East:	2.79 m ² , No overhang
Windows facing South:	5.72 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	50.0000 (1b)	x 2.4000 (2b)	= 120.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 120.0000 (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) = 0.1667 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4167 (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) = 0.3542 (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	0.4516	0.4427	0.4339	0.3896	0.3807	0.3365	0.3365	0.3276	0.3542	0.3807	0.3984	0.4161 (22b)
Effective ac	0.6020	0.5980	0.5941	0.5759	0.5725	0.5566	0.5566	0.5537	0.5627	0.5725	0.5794	0.5866 (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
External Door			2.2700	1.4000	3.1780		(26a)
Windows (Uw = 1.40)			8.5100	1.3258	11.2822		(27)
Main Floor			50.0000	0.1400	7.0000	110.0000	5500.0000 (28a)
Main Wall	43.2200	10.7800	32.4400	0.2200	7.1368	60.0000	1946.4000 (29a)
Flat roof	2.2000		2.2000	0.1400	0.3080	9.0000	19.8000 (30)
Total net area of external elements Aum(A, m ²)			95.4200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.9050		(33)
Party Wall 1			30.5000	0.0000	0.0000	180.0000	5490.0000 (32)
Party Ceilings 1			47.8000			40.0000	1912.0000 (32b)
Internal Wall 1			44.5500			100.0000	4455.0000 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 19323.2000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							386.4640 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.6974 (36)
Total fabric heat loss							(33) + (36) = 37.6024 (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	23.8374	23.6806	23.5269	22.8051	22.6701	22.0414	22.0414	21.9250	22.2836	22.6701	22.9433	23.2289 (38)
Heat transfer coeff	61.4398	61.2830	61.1293	60.4075	60.2725	59.6438	59.6438	59.5274	59.8860	60.2725	60.5457	60.8313 (39)
Average = Sum(39)m / 12 =												60.4069 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2288	1.2257	1.2226	1.2082	1.2054	1.1929	1.1929	1.1905	1.1977	1.2054	1.2109	1.2166 (40)
HLP (average)												1.2081 (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												1.6901 (42)
Average daily hot water use (litres/day)												74.3399 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	81.7739	78.8003	75.8267	72.8531	69.8795	66.9059	66.9059	69.8795	72.8531	75.8267	78.8003	81.7739 (44)
Energy content (annual)	121.2683	106.0620	109.4465	95.4181	91.5560	79.0058	73.2105	84.0101	85.0135	99.0750	108.1481	117.4419 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1169.6560 (45)
Water storage loss:	18.1902	15.9093	16.4170	14.3127	13.7334	11.8509	10.9816	12.6015	12.7520	14.8613	16.2222	17.6163 (46)

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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	30.1320	(56)
If cylinder contains dedicated solar storage													
31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	30.1320	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
175.6671	155.1964	163.8453	148.0621	145.9548	131.6498	127.6093	138.4089	137.6575	153.4738	160.7921	171.8407	171.8407	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =													(63)
Output from w/h													
175.6671	155.1964	163.8453	148.0621	145.9548	131.6498	127.6093	138.4089	137.6575	153.4738	160.7921	171.8407	171.8407	(64)
Heat gains from water heating, kWh/month													
83.8408	74.5731	79.9100	73.8417	73.9614	68.3846	67.8615	71.4524	70.3822	76.4615	78.0745	82.5685	82.5685	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
13.5349	12.0215	9.7766	7.4015	5.5327	4.6709	5.0471	6.5604	8.8054	11.1805	13.0493	13.9110	13.9110	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
147.2339	148.7618	144.9117	136.7153	126.3689	116.6447	110.1484	108.6205	112.4706	120.6670	131.0134	140.7376	140.7376	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	(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)													
-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	(71)
Water heating gains (Table 5)													
112.6892	110.9719	107.4059	102.5580	99.4105	94.9787	91.2117	96.0382	97.7530	102.7708	108.4367	110.9791	110.9791	(72)
Total internal gains													
321.8095	320.1068	310.4457	295.0263	279.6636	264.6459	254.7588	259.5707	267.3806	282.9698	300.8509	313.9793	313.9793	(73)

6. Solar gains

[Jan]													
	Area	Solar flux	Specific data	Specific data	FF	Access	Gains						
	m2	Table 6a	g	Specific data		factor	W						
		W/m2	or Table 6b	or Table 6c		Table 6d							
East	2.7900	19.6403	0.6300	0.7000	0.7700	16.7465	(76)						
South	5.7200	46.7521	0.6300	0.7000	0.7700	81.7276	(78)						
Solar gains	98.4741	166.6084	224.4500	271.3850	297.2365	291.9622	282.7950	264.0931	240.8535	183.2405	117.7559	84.3916	(83)
Total gains	420.2836	486.7151	534.8957	566.4113	576.9001	556.6080	537.5538	523.6638	508.2341	466.2103	418.6069	398.3709	(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	87.3629	87.5864	87.8065	88.8557	89.0548	89.9935	89.9935	90.1695	89.6296	89.0548	88.6530	88.2367	
alpha	6.8242	6.8391	6.8538	6.9237	6.9370	6.9996	6.9996	7.0113	6.9753	6.9370	6.9102	6.8824	
util living area	0.9987	0.9959	0.9873	0.9556	0.8611	0.6696	0.4865	0.5202	0.7686	0.9637	0.9960	0.9991	(86)
Tweekday	19.0696	19.2195	19.4229	19.6595	19.8086	19.8648	19.8685	19.8704	19.8527	19.6814	19.3389	19.0517	
Tweekend	20.5923	20.6580	20.7485	20.8548	20.9343	20.9691	20.9743	20.9740	20.9605	20.8624	20.7064	20.5808	
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	20.3708	20.4710	20.6118	20.7733	20.8986	20.9526	20.9603	20.9599	20.9383	20.7877	20.5416	20.3530	(87)
Th 2	19.8970	19.8995	19.9020	19.9135	19.9156	19.9257	19.9257	19.9276	19.9218	19.9156	19.9113	19.9067	(88)
util rest of house	0.9980	0.9939	0.9806	0.9323	0.7984	0.5658	0.3688	0.4006	0.6696	0.9394	0.9935	0.9986	(89)
Tweekday	19.0696	19.2195	19.4229	19.6595	19.8086	19.8648	19.8685	19.8704	19.8527	19.6814	19.3389	19.0517	
Tweekend	19.0696	19.2195	19.4229	19.6595	19.8086	19.8648	19.8685	19.8704	19.8527	19.6814	19.3389	19.0517	
MIT 2	19.0696	19.2195	19.4229	19.6595	19.8086	19.8648	19.8685	19.8704	19.8527	19.6814	19.3389	19.0517	(90)
Living area fraction													
MIT	19.7618	19.8853	20.0554	20.2520	20.3885	20.4435	20.4494	20.4500	20.4302	20.2699	19.9788	19.7440	(91)
Temperature adjustment													
adjusted MIT	19.7618	19.8853	20.0554	20.2520	20.3885	20.4435	20.4494	20.4500	20.4302	20.2699	19.9788	19.7440	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	419.3847	483.7185	525.1413	532.7871	477.6366	343.4922	229.2488	240.5187	365.2975	442.3259	415.9528	397.7690	(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	949.9722	918.3432	828.6320	685.7484	523.6779	348.5299	229.5903	241.0851	379.0932	582.8317	779.7535	945.5637	(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	394.7571	292.0679	225.7971	110.1322	34.2547	0.0000	0.0000	0.0000	0.0000	104.5363	261.9365	407.5593	(98)

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Space heating 1831.0410 (98)
Space heating per m2 (98) / (4) = 36.6208 (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 %) 219.3278 (206)
Efficiency of secondary/supplementary heating system, % 100.0000 (208)
Space heating requirement 834.8421 (211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	394.7571	292.0679	225.7971	110.1322	34.2547	0.0000	0.0000	0.0000	0.0000	104.5363	261.9365	407.5593
Space heating efficiency (main heating system 1)	219.3278	219.3278	219.3278	219.3278	219.3278	0.0000	0.0000	0.0000	0.0000	219.3278	219.3278	219.3278
Space heating fuel (main heating system)	179.9850	133.1650	102.9496	50.2135	15.6180	0.0000	0.0000	0.0000	0.0000	47.6621	119.4269	185.8220
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water heating requirement	175.6671	155.1964	163.8453	148.0621	145.9548	131.6498	127.6093	138.4089	137.6575	153.4738	160.7921	171.8407
Efficiency of water heater (217)m	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400
Fuel for water heating, kWh/month	103.6751	91.5937	96.6981	87.3832	86.1395	77.6970	75.3124	81.6861	81.2426	90.5771	94.8962	101.4168
Water heating fuel used												1068.3180
Annual totals kWh/year												
Space heating fuel - main system												834.8421
Space heating fuel - secondary												0.0000
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000
Electricity for lighting (calculated in Appendix L)												239.0298
Energy saving/generation technologies (Appendices M ,N and Q)												
Total delivered energy for all uses												2142.1899

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	834.8421	0.5190	433.2831 (261)
Space heating - secondary	0.0000	0.5190	0.0000 (263)
Water heating (other fuel)	1068.3180	0.5190	554.4570 (264)
Space and water heating			987.7401 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	239.0298	0.5190	124.0565 (268)
Energy saving/generation technologies			
PV Unit	-300.0000	0.5190	-155.7000 (269)
Total CO2, kg/year			956.0966 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			19.1200 (273)

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

	TFA	N	EF
DER			19.1200 ZC1
Total Floor Area	50.0000		
Assumed number of occupants	1.6901		
CO2 emission factor in Table 12 for electricity displaced from grid			0.5190
CO2 emissions from appliances, equation (L14)			17.4495 ZC2
CO2 emissions from cooking, equation (L16)			3.1912 ZC3
Total CO2 emissions			39.7608 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			39.7608 ZC8

FULL SAP CALCULATION PRINTOUT

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1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.0000 (1b)	x 2.4000 (2b)	= 120.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 120.0000 (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) =	0.1667 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4167 (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) =		0.3542 (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	0.4516	0.4427	0.4339	0.3896	0.3807	0.3365	0.3365	0.3276	0.3542	0.3807	0.3984	0.4161 (22b)
Effective ac	0.6020	0.5980	0.5941	0.5759	0.5725	0.5566	0.5566	0.5537	0.5627	0.5725	0.5794	0.5866 (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 Semi-glazed door			2.2700	1.2000	2.7240		(26a)
TER Opening Type (Uw = 1.40)			8.5100	1.3258	11.2822		(27)
Main Floor			50.0000	0.1300	6.5000		(28a)
Main Wall	43.2200	10.7800	32.4400	0.1800	5.8392		(29a)
Flat roof	2.2000		2.2000	0.1300	0.2860		(30)
Total net area of external elements Aum(A, m ²)			95.4200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6314		(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)							6.9544 (36)
Total fabric heat loss						(33) + (36) =	33.5858 (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	23.8374	23.6806	23.5269	22.8051	22.6701	22.0414	22.0414	21.9250	22.2836	22.6701	22.9433	23.2289 (38)
Heat transfer coeff	57.4232	57.2664	57.1127	56.3909	56.2559	55.6272	55.6272	55.5108	55.8694	56.2559	56.5291	56.8147 (39)
Average = Sum(39)m / 12 =												56.3903 (39)
HLP	1.1485	1.1453	1.1423	1.1278	1.1251	1.1125	1.1125	1.1102	1.1174	1.1251	1.1306	1.1363 (40)
HLP (average)												1.1278 (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												1.6901 (42)
Average daily hot water use (litres/day)												74.3399 (43)
Daily hot water use	81.7739	78.8003	75.8267	72.8531	69.8795	66.9059	66.9059	69.8795	72.8531	75.8267	78.8003	81.7739 (44)
Energy conte	121.2683	106.0620	109.4465	95.4181	91.5560	79.0058	73.2105	84.0101	85.0135	99.0750	108.1481	117.4419 (45)
Energy content (annual)												1169.6560 (45)
Distribution loss (46)m = 0.15 x (45)m	18.1902	15.9093	16.4170	14.3127	13.7334	11.8509	10.9816	12.6015	12.7520	14.8613	16.2222	17.6163 (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	173.0149	152.8009	161.1931	145.4955	143.3026	129.0832	124.9571	135.7567	135.0908	150.8216	158.2255	169.1885 (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	173.0149	152.8009	161.1931	145.4955	143.3026	129.0832	124.9571	135.7567	135.0908	150.8216	158.2255	169.1885 (64)
Heat gains from water heating, kWh/month	81.7190	72.6567	77.7882	71.7884	71.8396	66.3313	65.7398	69.3306	68.3289	74.3397	76.0211	80.4467 (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	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.5349	12.0215	9.7766	7.4015	5.5327	4.6709	5.0471	6.5604	8.8054	11.1805	13.0493	13.9110 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.2339	148.7618	144.9117	136.7153	126.3689	116.6447	110.1484	108.6205	112.4706	120.6670	131.0134	140.7376 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505 (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)	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040 (71)
Water heating gains (Table 5)	109.8373	108.1201	104.5541	99.7061	96.5586	92.1268	88.3599	93.1864	94.9012	99.9190	105.5849	108.1273 (72)
Total internal gains	321.9577	320.2549	310.5939	295.1745	279.8118	264.7940	254.9069	259.7188	267.5287	283.1180	300.9991	314.1274 (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						2.7900	19.6403	0.6300	0.7000	0.7700	16.7465 (76)	
South						5.7200	46.7521	0.6300	0.7000	0.7700	81.7276 (78)	
Solar gains	98.4741	166.6084	224.4500	271.3850	297.2365	291.9622	282.7950	264.0931	240.8535	183.2405	117.7559	84.3916 (83)
Total gains	420.4317	486.8633	535.0439	566.5595	577.0483	556.7562	537.7019	523.8120	508.3823	466.3584	418.7550	398.5191 (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	60.4672	60.6328	60.7959	61.5741	61.7219	62.4195	62.4195	62.5504	62.1489	61.7219	61.4236	61.1148
alpha	5.0311	5.0422	5.0531	5.1049	5.1148	5.1613	5.1613	5.1700	5.1433	5.1148	5.0949	5.0743
util living area	0.9911	0.9807	0.9581	0.9032	0.7929	0.6150	0.4509	0.4813	0.7042	0.9152	0.9807	0.9930 (86)
MIT	19.9811	20.1644	20.4065	20.6783	20.8762	20.9742	20.9956	20.9939	20.9481	20.7014	20.2930	19.9479 (87)
Th 2	19.9615	19.9640	19.9665	19.9782	19.9804	19.9906	19.9906	19.9925	19.9867	19.9804	19.9759	19.9713 (88)
util rest of house	0.9883	0.9749	0.9453	0.8742	0.7360	0.5282	0.3497	0.3791	0.6208	0.8835	0.9737	0.9908 (89)
MIT 2	18.6300	18.8956	19.2410	19.6206	19.8667	19.9745	19.9891	19.9902	19.9499	19.6607	19.0921	18.5891 (90)
Living area fraction									fLA = Living area / (4) =			0.5320 (91)
MIT	19.3488	19.5706	19.8610	20.1833	20.4037	20.5064	20.5246	20.5242	20.4809	20.2143	19.7310	19.3120 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3488	19.5706	19.8610	20.1833	20.4037	20.5064	20.5246	20.5242	20.4809	20.2143	19.7310	19.3120 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	414.6017	473.2849	504.9434	498.9328	439.1195	319.3456	217.0706	227.1387	337.1477	415.8506	406.8740	394.1320 (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	864.1505	840.1304	763.0861	636.2757	489.6358	328.5545	218.3125	228.9350	356.4995	540.8635	714.0169	858.5817 (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	334.4643	246.5202	192.0582	98.8869	37.5842	0.0000	0.0000	0.0000	0.0000	93.0096	221.1429	345.5505 (98)
Space heating												1569.2167 (98)
Space heating per m2										(98) / (4) =		31.3843 (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												1678.3067 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	334.4643	246.5202	192.0582	98.8869	37.5842	0.0000	0.0000	0.0000	0.0000	93.0096	221.1429	345.5505 (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)	357.7158	263.6580	205.4098	105.7614	40.1970	0.0000	0.0000	0.0000	0.0000	99.4755	236.5165	369.5727 (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	173.0149	152.8009	161.1931	145.4955	143.3026	129.0832	124.9571	135.7567	135.0908	150.8216	158.2255	169.1885 (64)
Efficiency of water heater (217)m	86.5438	86.0832	85.2820	83.8096	81.8097	79.8000	79.8000	79.8000	79.8000	83.5689	85.7069	79.8000 (216)
Fuel for water heating, kWh/month	199.9161	177.5036	189.0118	173.6025	175.1657	161.7584	156.5879	170.1212	169.2868	180.4757	184.6122	86.6798 (217)
Water heating fuel used												195.1878 (219)
Annual totals kWh/year												2133.2296 (219)
Space heating fuel - main system												1678.3067 (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)												239.0298 (232)
Total delivered energy for all uses												4125.5661 (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	1678.3067	0.2160	362.5142 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2133.2296	0.2160	460.7776 (264)
Space and water heating			823.2918 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	239.0298	0.5190	124.0565 (268)
Total CO2, kg/m2/year			986.2733 (272)
Emissions per m2 for space and water heating			16.4658 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.4811 (272b)
Emissions per m2 for pumps and fans			0.7785 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.4658 * 1.55) + 2.4811 + 0.7785, rounded to 2 d.p.			28.7800 (273)

FULL SAP CALCULATION PRINTOUT

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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	50.0000 (1b)	x 2.4000 (2b)	= 120.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 120.0000 (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) =	0.1667 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4167 (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) =		0.3542 (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	0.4516	0.4427	0.4339	0.3896	0.3807	0.3365	0.3365	0.3276	0.3542	0.3807	0.3984	0.4161 (22b)
Effective ac	0.6020	0.5980	0.5941	0.5759	0.5725	0.5566	0.5566	0.5537	0.5627	0.5725	0.5794	0.5866 (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
External Door			2.2700	1.4000	3.1780		(26a)
Windows (Uw = 1.40)			8.5100	1.3258	11.2822		(27)
Main Floor			50.0000	0.1400	7.0000	110.0000	5500.0000 (28a)
Main Wall	43.2200	10.7800	32.4400	0.2200	7.1368	60.0000	1946.4000 (29a)
Flat roof	2.2000		2.2000	0.1400	0.3080	9.0000	19.8000 (30)
Total net area of external elements Aum(A, m ²)			95.4200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.9050		(33)
Party Wall 1			30.5000	0.0000	0.0000	180.0000	5490.0000 (32)
Party Ceilings 1			47.8000			30.0000	1434.0000 (32b)
Internal Wall 1			44.5500			100.0000	4455.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	18845.2000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							376.9040 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.6974 (36)
Total fabric heat loss						(33) + (36) =	37.6024 (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	23.8374	23.6806	23.5269	22.8051	22.6701	22.0414	22.0414	21.9250	22.2836	22.6701	22.9433	23.2289 (38)
Heat transfer coeff	61.4398	61.2830	61.1293	60.4075	60.2725	59.6438	59.6438	59.5274	59.8860	60.2725	60.5457	60.8313 (39)
Average = Sum(39)m / 12 =												60.4069 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2288	1.2257	1.2226	1.2082	1.2054	1.1929	1.1929	1.1905	1.1977	1.2054	1.2109	1.2166 (40)
HLP (average)												1.2081 (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												1.6901 (42)
Average daily hot water use (litres/day)												74.3399 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	81.7739	78.8003	75.8267	72.8531	69.8795	66.9059	66.9059	69.8795	72.8531	75.8267	78.8003	81.7739 (44)
Energy content (annual)	121.2683	106.0620	109.4465	95.4181	91.5560	79.0058	73.2105	84.0101	85.0135	99.0750	108.1481	117.4419 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1169.6560 (45)
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)

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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	25.7695	22.5382	23.2574	20.2764	19.4556	16.7887	15.5572	17.8522	18.0654	21.0534	22.9815	24.9564 (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	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.5349	12.0215	9.7766	7.4015	5.5327	4.6709	5.0471	6.5604	8.8054	11.1805	13.0493	13.9110	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.2339	148.7618	144.9117	136.7153	126.3689	116.6447	110.1484	108.6205	112.4706	120.6670	131.0134	140.7376	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	(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)	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	(71)
Water heating gains (Table 5)	34.6364	33.5390	31.2599	28.1616	26.1501	23.3177	20.9103	23.9948	25.0908	28.2976	31.9187	33.5435	(72)
Total internal gains	243.7568	242.6738	234.2997	220.6299	206.4032	192.9849	184.4573	187.5273	194.7183	208.4966	224.3329	236.5437	(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					2.7900	19.6403	0.6300	0.7000	0.7700		16.7465 (76)	
South					5.7200	46.7521	0.6300	0.7000	0.7700		81.7276 (78)	
Solar gains	98.4741	166.6084	224.4500	271.3850	297.2365	291.9622	282.7950	264.0931	240.8535	183.2405	117.7559	84.3916 (83)
Total gains	342.2308	409.2822	458.7497	492.0150	503.6397	484.9471	467.2523	451.6205	435.5719	391.7371	342.0889	320.9353 (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	85.2018	85.4197	85.6345	86.6577	86.8518	87.7673	87.7673	87.9389	87.4124	86.8518	86.4599	86.0540	
alpha	6.6801	6.6946	6.7090	6.7772	6.7901	6.8512	6.8512	6.8626	6.8275	6.7901	6.7640	6.7369	
util living area	0.9996	0.9984	0.9942	0.9766	0.9132	0.7488	0.5569	0.5985	0.8481	0.9842	0.9987	0.9997	(86)
MIT	20.0925	20.2327	20.4286	20.6668	20.8661	20.9752	20.9970	20.9953	20.9417	20.6789	20.3351	20.0683	(87)
Th 2	19.8970	19.8995	19.9020	19.9135	19.9156	19.9257	19.9257	19.9276	19.9218	19.9156	19.9113	19.9067	(88)
util rest of house	0.9993	0.9975	0.9909	0.9627	0.8641	0.6421	0.4238	0.4637	0.7581	0.9721	0.9978	0.9996	(89)
MIT 2	19.0793	19.2213	19.4177	19.6586	19.8358	19.9174	19.9253	19.9268	19.8972	19.6752	19.3337	19.0633	(90)
Living area fraction									fLA = Living area / (4) =			0.5320	(91)
MIT	19.6183	19.7594	19.9555	20.1950	20.3840	20.4801	20.4954	20.4952	20.4529	20.2092	19.8664	19.5979	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6183	19.7594	19.9555	20.1950	20.3840	20.4801	20.4954	20.4952	20.4529	20.2092	19.8664	19.5979	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9993	0.9974	0.9911	0.9670	0.8878	0.6996	0.4952	0.5361	0.8063	0.9761	0.9977	0.9995	(94)
Ext temp.	341.9777	408.2142	454.6676	475.7730	447.1170	339.2743	231.3610	242.1345	351.1875	382.3796	341.3187	320.7803	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	941.1555	910.6281	822.5262	682.3003	523.4034	350.7134	232.3392	243.7778	380.4482	579.1676	772.9526	936.6774	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating	445.7883	337.6222	273.6868	148.6997	56.7571	0.0000	0.0000	0.0000	0.0000	146.4103	310.7763	458.2275	(98)
Space heating per m2												2177.9682	(98)
												43.5594	(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	560.6521	441.3644	452.4084	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9180	0.9671	0.9576	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	514.6539	426.8298	433.2203	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	630.9789	609.1010	591.8291	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh													

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	0.0000	0.0000	0.0000	0.0000	0.0000	83.7540	135.6098	118.0050	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												337.3688 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	20.9385	33.9024	29.5012	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												84.3422 (107)
Space cooling per m2												1.6868 (108)
Energy for space heating												43.5594 (99)
Energy for space cooling												1.6868 (108)
Total												45.2462 (109)
Dwelling Fabric Energy Efficiency (DFEE)												45.2 (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	50.0000 (1b)	x 2.4000 (2b)	= 120.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 120.0000 (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) = 0.1667 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4167 (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) =		0.3542 (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	0.4516	0.4427	0.4339	0.3896	0.3807	0.3365	0.3365	0.3276	0.3542	0.3807	0.3984	0.4161 (22b)
Effective ac	0.6020	0.5980	0.5941	0.5759	0.5725	0.5566	0.5566	0.5537	0.5627	0.5725	0.5794	0.5866 (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 Semi-glazed door			2.2700	1.2000	2.7240		(26a)
TER Opening Type (Uw = 1.40)			8.5100	1.3258	11.2822		(27)
Main Floor			50.0000	0.1300	6.5000		(28a)
Main Wall	43.2200	10.7800	32.4400	0.1800	5.8392		(29a)
Flat roof	2.2000		2.2000	0.1300	0.2860		(30)
Total net area of external elements Aum(A, m ²)			95.4200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6314		(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)							6.9544 (36)
Total fabric heat loss						(33) + (36) =	33.5858 (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	23.8374	23.6806	23.5269	22.8051	22.6701	22.0414	22.0414	21.9250	22.2836	22.6701	22.9433	23.2289 (38)
Heat transfer coeff	57.4232	57.2664	57.1127	56.3909	56.2559	55.6272	55.6272	55.5108	55.8694	56.2559	56.5291	56.8147 (39)
Average = Sum(39)m / 12 =												56.3903 (39)
HLP	1.1485	1.1453	1.1423	1.1278	1.1251	1.1125	1.1125	1.1102	1.1174	1.1251	1.1306	1.1363 (40)
HLP (average)												1.1278 (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												1.6901 (42)
Average daily hot water use (litres/day)												74.3399 (43)
Daily hot water use	81.7739	78.8003	75.8267	72.8531	69.8795	66.9059	66.9059	69.8795	72.8531	75.8267	78.8003	81.7739 (44)
Energy conte	121.2683	106.0620	109.4465	95.4181	91.5560	79.0058	73.2105	84.0101	85.0135	99.0750	108.1481	117.4419 (45)
Energy content (annual)												Total = Sum(45)m = 1169.6560 (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	(59)
Heat gains from water heating, kWh/month	25.7695	22.5382	23.2574	20.2764	19.4556	16.7887	15.5572	17.8522	18.0654	21.0534	22.9815	24.9564 (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	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.5349	12.0215	9.7766	7.4015	5.5327	4.6709	5.0471	6.5604	8.8054	11.1805	13.0493	13.9110	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.2339	148.7618	144.9117	136.7153	126.3689	116.6447	110.1484	108.6205	112.4706	120.6670	131.0134	140.7376	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	(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)	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	(71)
Water heating gains (Table 5)	34.6364	33.5390	31.2599	28.1616	26.1501	23.3177	20.9103	23.9948	25.0908	28.2976	31.9187	33.5435	(72)
Total internal gains	243.7568	242.6738	234.2997	220.6299	206.4032	192.9849	184.4573	187.5273	194.7183	208.4966	224.3329	236.5437	(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					2.7900	19.6403	0.6300	0.7000			0.7700	16.7465	(76)
South					5.7200	46.7521	0.6300	0.7000			0.7700	81.7276	(78)

Solar gains	98.4741	166.6084	224.4500	271.3850	297.2365	291.9622	282.7950	264.0931	240.8535	183.2405	117.7559	84.3916	(83)
Total gains	342.2308	409.2822	458.7497	492.0150	503.6397	484.9471	467.2523	451.6205	435.5719	391.7371	342.0889	320.9353	(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)													21.0000 (85)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	60.4672	60.6328	60.7959	61.5741	61.7219	62.4195	62.4195	62.5504	62.1489	61.7219	61.4236	61.1148	
alpha	5.0311	5.0422	5.0531	5.1049	5.1148	5.1613	5.1613	5.1700	5.1433	5.1148	5.0949	5.0743	
util living area	0.9964	0.9907	0.9768	0.9392	0.8520	0.6876	0.5148	0.5521	0.7822	0.9535	0.9918	0.9974	(86)
MIT	19.8389	20.0290	20.2852	20.5847	20.8224	20.9573	20.9920	20.9887	20.9153	20.6009	20.1584	19.8054	(87)
Th 2	19.9615	19.9640	19.9665	19.9782	19.9804	19.9906	19.9906	19.9925	19.9867	19.9804	19.9759	19.9713	(88)
util rest of house	0.9952	0.9876	0.9690	0.9182	0.8022	0.5975	0.4014	0.4379	0.7020	0.9330	0.9886	0.9965	(89)
MIT 2	18.9117	19.1021	19.3559	19.6520	19.8637	19.9715	19.9886	19.9894	19.9430	19.6743	19.2414	18.8862	(90)
Living area fraction									fLA = Living area / (4) =			0.5320	(91)
MIT	19.4050	19.5952	19.8503	20.1482	20.3738	20.4960	20.5224	20.5210	20.4603	20.1673	19.7292	19.3752	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4050	19.5952	19.8503	20.1482	20.3738	20.4960	20.5224	20.5210	20.4603	20.1673	19.7292	19.3752	(93)

8. Space heating requirement

Utilisation	0.9944	0.9863	0.9679	0.9222	0.8229	0.6444	0.4620	0.4990	0.7419	0.9374	0.9876	0.9958	(94)
Useful gains	340.2990	403.6609	444.0466	453.7132	414.4677	312.4811	215.8888	225.3559	323.1564	367.2258	337.8437	319.5941	(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	867.3750	841.5424	762.4721	634.2953	487.9504	327.9763	218.1940	228.7602	355.3451	538.2144	713.9193	862.1770	(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	392.1446	294.2563	236.9086	130.0192	54.6711	0.0000	0.0000	0.0000	0.0000	127.2155	270.7744	403.6817	(98)
Space heating												1909.6714	(98)
Space heating per m2										(98) / (4) =		38.1934	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

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	522.8961	411.6416	421.8822	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9053	0.9529	0.9430	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	473.3719	392.2461	397.8541	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	630.9789	609.1010	591.8291	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	113.4770	161.3400	144.3175	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												419.1345	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)													

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	28.3693	40.3350	36.0794	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling per m2												104.7836 (107)
Energy for space heating												2.0957 (108)
Energy for space cooling												38.1934 (99)
Total												2.0957 (108)
Target Fabric Energy Efficiency (TFEE)												40.2891 (109)
												46.3 (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	50.0000 (1b)	x 2.4000 (2b)	= 120.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 120.0000 (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) = 0.1667 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4167 (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) =	0.3542 (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												
	0.3896	0.3630	0.3630	0.3453	0.3453	0.3010	0.3010	0.2922	0.3010	0.3365	0.3276	0.3542 (22b)
Effective ac	0.5759	0.5659	0.5659	0.5596	0.5596	0.5453	0.5453	0.5427	0.5453	0.5566	0.5537	0.5627 (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
External Door			2.2700	1.4000	3.1780		(26a)
Windows (Uw = 1.40)			8.5100	1.3258	11.2822		(27)
Main Floor			50.0000	0.1400	7.0000	110.0000	5500.0000 (28a)
Main Wall	43.2200	10.7800	32.4400	0.2200	7.1368	60.0000	1946.4000 (29a)
Flat roof	2.2000		2.2000	0.1400	0.3080	9.0000	19.8000 (30)
Total net area of external elements Aum(A, m ²)			95.4200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.9050		(33)
Party Wall 1			30.5000	0.0000	0.0000	180.0000	5490.0000 (32)
Party Ceilings 1			47.8000			40.0000	1912.0000 (32b)
Internal Wall 1			44.5500			100.0000	4455.0000 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =	19323.2000 (34)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K						386.4640 (35)	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)						8.6974 (36)	
Total fabric heat loss					(33) + (36) =	37.6024 (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	22.8051	22.4093	22.4093	22.1610	22.1610	21.5944	21.5944	21.4904	21.5944	22.0414	21.9250	22.2836 (38)
Heat transfer coeff	60.4075	60.0117	60.0117	59.7634	59.7634	59.1968	59.1968	59.0928	59.1968	59.6438	59.5274	59.8860 (39)
Average = Sum(39)m / 12 =												59.6415 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2082	1.2002	1.2002	1.1953	1.1953	1.1839	1.1839	1.1819	1.1839	1.1929	1.1905	1.1977 (40)
HLP (average)												1.1928 (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												1.6901 (42)
Average daily hot water use (litres/day)												74.3399 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	81.7739	78.8003	75.8267	72.8531	69.8795	66.9059	66.9059	69.8795	72.8531	75.8267	78.8003	81.7739 (44)
Energy conte	121.2683	106.0620	109.4465	95.4181	91.5560	79.0058	73.2105	84.0101	85.0135	99.0750	108.1481	117.4419 (45)
Energy content (annual)										Total = Sum(45)m =		1169.6560 (45)
Distribution loss (46)m = 0.15 x (45)m												
	18.1902	15.9093	16.4170	14.3127	13.7334	11.8509	10.9816	12.6015	12.7520	14.8613	16.2222	17.6163 (46)
Water storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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CALCULATION OF HEAT DEMAND 09 Jan 2014

Store volume													210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.8600 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													1.0044 (55)
Total storage loss													
31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	30.1320	(56)
If cylinder contains dedicated solar storage													
31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	30.1320	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
175.6671	155.1964	163.8453	148.0621	145.9548	131.6498	127.6093	138.4089	137.6575	153.4738	160.7921	171.8407	171.8407	(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													
175.6671	155.1964	163.8453	148.0621	145.9548	131.6498	127.6093	138.4089	137.6575	153.4738	160.7921	171.8407	171.8407	(64)
RHI water heating demand													
Heat gains from water heating, kWh/month													
83.8408	74.5731	79.9100	73.8417	73.9614	68.3846	67.8615	71.4524	70.3822	76.4615	78.0745	82.5685	82.5685	(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	101.4061	101.4061	101.4061	101.4061	101.4061	101.4061	101.4061	101.4061	101.4061	101.4061	101.4061	101.4061	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
33.8371	30.0538	24.4414	18.5037	13.8318	11.6774	12.6178	16.4011	22.0135	27.9512	32.6232	34.7776	34.7776	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
219.7522	222.0325	216.2861	204.0527	188.6103	174.0966	164.4006	162.1202	167.8666	180.1000	195.5424	210.0561	210.0561	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
46.8307	46.8307	46.8307	46.8307	46.8307	46.8307	46.8307	46.8307	46.8307	46.8307	46.8307	46.8307	46.8307	(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)													
-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	(71)
Water heating gains (Table 5)													
112.6892	110.9719	107.4059	102.5580	99.4105	94.9787	91.2117	96.0382	97.7530	102.7708	108.4367	110.9791	110.9791	(72)
Total internal gains													
446.9112	443.6910	428.7662	405.7472	382.4853	361.3854	348.8628	355.1922	368.2659	391.4547	417.2350	436.4455	436.4455	(73)

6. Solar gains

[Jan]												Area	Solar flux	g	FF	Access	Gains
												m2	Table 6a	or Table 6b	or Table 6c	factor	W
													W/m2			Table 6d	
East												2.7900	23.7835	0.6300	0.7000	0.7700	20.2792
South												5.7200	54.0600	0.6300	0.7000	0.7700	94.5026 (76)
Solar gains	114.7819	169.5016	226.8384	279.8113	300.4775	313.2510	299.9764	283.9860	259.8537	200.0588	135.1549	98.9843	(83)				
Total gains	561.6931	613.1927	655.6046	685.5584	682.9627	674.6364	648.8392	639.1782	628.1196	591.5135	552.3900	535.4298	(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	88.8557	89.4418	89.4418	89.8135	89.8135	90.6731	90.6731	90.8327	90.6731	89.9935	19.1695	89.6296	
alpha	6.9237	6.9628	6.9628	6.9876	6.9876	7.0449	7.0449	7.0555	7.0449	6.9996	7.0113	6.9753	
util living area													
0.9904	0.9806	0.9498	0.8681	0.7032	0.4725	0.3101	0.3327	0.5787	0.8603	0.9733	0.9926	0.9926	(86)
Tweekday	19.3506	19.4765	19.6492	19.7959	19.8572	19.8760	19.8762	19.8780	19.8749	19.8181	19.5953	19.3345	
Tweekend	20.7117	20.7668	20.8486	20.9241	20.9648	20.9744	20.9750	20.9750	20.9728	20.9345	20.8178	20.7011	
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	20.5551	20.6393	20.7664	20.8815	20.9457	20.9608	20.9614	20.9614	20.9575	20.8990	20.7156	20.5388	(87)
Th 2	19.9135	19.9198	19.9198	19.9238	19.9238	19.9329	19.9329	19.9345	19.9329	19.9257	19.9276	19.9218	(88)
util rest of house													
0.9859	0.9717	0.9280	0.8192	0.6224	0.3799	0.2128	0.2343	0.4822	0.8000	0.9593	0.9890	0.9890	(89)
Tweekday	19.3506	19.4765	19.6492	19.7959	19.8572	19.8760	19.8762	19.8780	19.8749	19.8181	19.5953	19.3345	
Tweekend	19.3506	19.4765	19.6492	19.7959	19.8572	19.8760	19.8762	19.8780	19.8749	19.8181	19.5953	19.3345	
MIT 2	19.3506	19.4765	19.6492	19.7959	19.8572	19.8760	19.8762	19.8780	19.8749	19.8181	19.5953	19.3345	(90)
Living area fraction													
fLA = Living area / (4) =													
19.9914	20.0951	20.2435	20.3734	20.4363	20.4531	20.4535	20.4544	20.4508	20.3931	20.1913	19.9751	19.9751	(92)
Temperature adjustment													
adjusted MIT	19.9914	20.0951	20.2435	20.3734	20.4363	20.4531	20.4535	20.4544	20.4508	20.3931	20.1913	19.9751	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.9863	0.9734	0.9354	0.8411	0.6620	0.4252	0.2603	0.2824	0.5296	0.8283	0.9633	0.9892	0.9892	(94)
Useful gains	553.9852	596.8773	613.2212	576.6353	452.1144	286.8833	168.9105	180.4740	332.6525	489.9486	532.1283	529.6434	(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													
911.6323	875.8770	776.7638	637.8782	462.3474	287.2869	168.9200	180.4913	334.5111	536.3847	737.6216	902.7896	902.7896	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													

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Space heating	266.0895	187.4878	121.6757	44.0949	7.6134	0.0000	0.0000	0.0000	0.0000	34.5485	147.9552	277.6208 (98)
RHI space heating demand												1087.0857 (98)
												1087 (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	50.0000 (1b)	x 2.4000 (2b)	= 120.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 120.0000 (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) = 0.1667 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4167 (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) =	0.3542 (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												
	0.4516	0.4427	0.4339	0.3896	0.3807	0.3365	0.3365	0.3276	0.3542	0.3807	0.3984	0.4161 (22b)
Effective ac	0.6020	0.5980	0.5941	0.5759	0.5725	0.5566	0.5566	0.5537	0.5627	0.5725	0.5794	0.5866 (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
External Door			2.2700	1.4000	3.1780		(26a)
Windows (Uw = 1.40)			8.5100	1.3258	11.2822		(27)
Main Floor			50.0000	0.1400	7.0000	110.0000	5500.0000 (28a)
Main Wall	43.2200	10.7800	32.4400	0.2200	7.1368	60.0000	1946.4000 (29a)
Flat roof	2.2000		2.2000	0.1400	0.3080	9.0000	19.8000 (30)
Total net area of external elements Aum(A, m ²)			95.4200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.9050		(33)
Party Wall 1			30.5000	0.0000	0.0000	180.0000	5490.0000 (32)
Party Ceilings 1			47.8000			40.0000	1912.0000 (32b)
Internal Wall 1			44.5500			100.0000	4455.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	19323.2000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							386.4640 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.6974 (36)
Total fabric heat loss						(33) + (36) =	37.6024 (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	23.8374	23.6806	23.5269	22.8051	22.6701	22.0414	22.0414	21.9250	22.2836	22.6701	22.9433	23.2289 (38)
Heat transfer coeff	61.4398	61.2830	61.1293	60.4075	60.2725	59.6438	59.6438	59.5274	59.8860	60.2725	60.5457	60.8313 (39)
Average = Sum(39)m / 12 =												60.4069 (39)
HLP	1.2288	1.2257	1.2226	1.2082	1.2054	1.1929	1.1929	1.1905	1.1977	1.2054	1.2109	1.2166 (40)
HLP (average)												1.2081 (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												1.6901 (42)
Average daily hot water use (litres/day)												74.3399 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	81.7739	78.8003	75.8267	72.8531	69.8795	66.9059	66.9059	69.8795	72.8531	75.8267	78.8003	81.7739 (44)
Energy conte	121.2683	106.0620	109.4465	95.4181	91.5560	79.0058	73.2105	84.0101	85.0135	99.0750	108.1481	117.4419 (45)
Energy content (annual)												Total = Sum(45)m = 1169.6560 (45)
Distribution loss (46)m = 0.15 x (45)m												
	18.1902	15.9093	16.4170	14.3127	13.7334	11.8509	10.9816	12.6015	12.7520	14.8613	16.2222	17.6163 (46)
Water storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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CALCULATION OF ENERGY RATINGS 09 Jan 2014

store volume													210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.8600 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													1.0044 (55)
Total storage loss													
	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(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													
	175.6671	155.1964	163.8453	148.0621	145.9548	131.6498	127.6093	138.4089	137.6575	153.4738	160.7921	171.8407	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
								Solar input (sum of months) =	Sum(63)m =			0.0000	(64)
Output from w/h													
	175.6671	155.1964	163.8453	148.0621	145.9548	131.6498	127.6093	138.4089	137.6575	153.4738	160.7921	171.8407	(63)
								Total per year (kWh/year) =	Sum(64)m =			1810.1580	(64)
Heat gains from water heating, kWh/month													
	83.8408	74.5731	79.9100	73.8417	73.9614	68.3846	67.8615	71.4524	70.3822	76.4615	78.0745	82.5685	(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	101.4061	101.4061	101.4061	101.4061	101.4061	101.4061	101.4061	101.4061	101.4061	101.4061	101.4061	101.4061 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	33.8371	30.0538	24.4414	18.5037	13.8318	11.6774	12.6178	16.4011	22.0135	27.9512	32.6232	34.7776 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.7522	222.0325	216.2861	204.0527	188.6103	174.0966	164.4006	162.1202	167.8666	180.1000	195.5424	210.0561 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.8307	46.8307	46.8307	46.8307	46.8307	46.8307	46.8307	46.8307	46.8307	46.8307	46.8307	46.8307 (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)	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040 (71)
Water heating gains (Table 5)	112.6892	110.9719	107.4059	102.5580	99.4105	94.9787	91.2117	96.0382	97.7530	102.7708	108.4367	110.9791 (72)
Total internal gains	446.9112	443.6910	428.7662	405.7472	382.4853	361.3854	348.8628	355.1922	368.2659	391.4547	417.2350	436.4455 (73)

6. Solar gains

[Jan]													
	Area												
	m2												
East	2.7900												
South	5.7200												
Solar gains	98.4741	166.6084	224.4500	271.3850	297.2365	291.9622	282.7950	264.0931	240.8535	183.2405	117.7559	84.3916	(83)
Total gains	545.3853	610.2994	653.2162	677.1322	679.7218	653.3476	631.6579	619.2853	609.1194	574.6952	534.9910	520.8372	(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	87.3629	87.5864	87.8065	88.8557	89.0548	89.9935	89.9935	90.1695	89.6296	89.0548	88.6530	88.2367
alpha	6.8242	6.8391	6.8538	6.9237	6.9370	6.9996	6.9996	7.0113	6.9753	6.9370	6.9102	6.8824
util living area												
	0.9937	0.9854	0.9643	0.9046	0.7762	0.5785	0.4149	0.4414	0.6631	0.9086	0.9836	0.9952 (86)
Tweekday	19.2421	19.3817	19.5585	19.7429	19.8349	19.8672	19.8686	19.8706	19.8602	19.7649	19.4901	19.2223
Tweekend	20.6693	20.7315	20.8126	20.8998	20.9538	20.9725	20.9746	20.9746	20.9689	20.9085	20.7754	20.6567
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	20.4896	20.5846	20.7108	20.8435	20.9287	20.9577	20.9609	20.9607	20.9514	20.8588	20.6494	20.4702 (87)
Th 2	19.8970	19.8995	19.9020	19.9135	19.9156	19.9257	19.9257	19.9276	19.9218	19.9156	19.9113	19.9067 (88)
util rest of house												
	0.9907	0.9787	0.9484	0.8660	0.7046	0.4846	0.3140	0.3390	0.5673	0.8636	0.9748	0.9930 (89)
Tweekday	19.2421	19.3817	19.5585	19.7429	19.8349	19.8672	19.8686	19.8706	19.8602	19.7649	19.4901	19.2223
Tweekend	19.2421	19.3817	19.5585	19.7429	19.8349	19.8672	19.8686	19.8706	19.8602	19.7649	19.4901	19.2223
MIT 2	19.2421	19.3817	19.5585	19.7429	19.8349	19.8672	19.8686	19.8706	19.8602	19.7649	19.4901	19.2223 (90)
Living area fraction												
MIT	19.9058	20.0216	20.1715	20.3285	20.4168	20.4474	20.4497	20.4505	20.4407	20.3468	20.1068	19.8862 (91)
Temperature adjustment												0.0000
adjusted MIT	19.9058	20.0216	20.1715	20.3285	20.4168	20.4474	20.4497	20.4505	20.4407	20.3468	20.1068	19.8862 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9907	0.9796	0.9528	0.8821	0.7392	0.5307	0.3633	0.3890	0.6145	0.8834	0.9767	0.9929	(94)
Useful gains	540.3210	597.8539	622.4128	597.2908	502.4268	346.7369	229.4881	240.9205	374.3022	507.6859	522.5459	517.1396	(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													
	958.8153	926.7002	835.7312	690.3649	525.3832	348.7588	229.6108	241.1182	379.7209	587.4651	787.5066	954.2125	(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													
	311.3598	220.9847	158.7089	67.0134	17.0796	0.0000	0.0000	0.0000	0.0000	59.3557	190.7717	325.1822	(98)

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Space heating
Space heating per m2 (98) / (4) = 1350.4560 (98)
27.0091 (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 %) 219.3278 (206)
Efficiency of secondary/supplementary heating system, % 100.0000 (208)
Space heating requirement 615.7250 (211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	311.3598	220.9847	158.7089	67.0134	17.0796	0.0000	0.0000	0.0000	0.0000	59.3557	190.7717	325.1822	(98)
Space heating efficiency (main heating system 1)	219.3278	219.3278	219.3278	219.3278	219.3278	0.0000	0.0000	0.0000	0.0000	219.3278	219.3278	219.3278	(210)
Space heating fuel (main heating system)	141.9609	100.7554	72.3615	30.5540	7.7873	0.0000	0.0000	0.0000	0.0000	27.0626	86.9802	148.2631	(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	175.6671	155.1964	163.8453	148.0621	145.9548	131.6498	127.6093	138.4089	137.6575	153.4738	160.7921	171.8407	(64)
Efficiency of water heater (217)m	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	(216)
Fuel for water heating, kWh/month	103.6751	91.5937	96.6981	87.3832	86.1395	77.6970	75.3124	81.6861	81.2426	90.5771	94.8962	101.4168	(219)
Water heating fuel used												1068.3180	(219)
Annual totals kWh/year													
Space heating fuel - main system												615.7250	(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)												239.0298	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses												1923.0728	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	615.7250	13.1900	81.2141	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1068.3180	13.1900	140.9111	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	239.0298	13.1900	31.5280	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit	0.0000	13.1900	0.0000	(252)
Total energy cost			253.6533	(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] = 1.1214 (257)
SAP value 84.3563
SAP rating (Section 12) 84 (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	615.7250	0.5190	319.5612	(261)
Space heating - secondary	0.0000	0.5190	0.0000	(263)
Water heating (other fuel)	1068.3180	0.5190	554.4570	(264)
Space and water heating			874.0183	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	239.0298	0.5190	124.0565	(268)
Energy saving/generation technologies				
PV Unit	-300.0000	0.5190	-155.7000	(269)
Total kg/year			842.3748	(272)
CO2 emissions per m2			16.8500	(273)
EI value			88.1181	
EI rating			88	(274)
EI band			B	

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Calculation of stars for heating and DHW

Main heating energy efficiency	$13.19 \times (1 + 0.29 \times 0.25) / 2.1933 = 6.450$, stars = 3
Main heating environmental impact	$0.519 \times (1 + 0.29 \times 0.25) / 2.1933 = 0.2538$, stars = 4
Water heating energy efficiency	$13.19 / 1.6944 = 7.784$, stars = 2
Water heating environmental impact	$0.519 / 1.6944 = 0.3063$, stars = 4

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.0000 (1b)	x 2.4000 (2b)	= 120.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 120.0000 (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) = 0.1667 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4167 (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) = 0.3542 (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												
	0.3896	0.3630	0.3630	0.3453	0.3453	0.3010	0.3010	0.2922	0.3010	0.3365	0.3276	0.3542 (22b)
Effective ac	0.5759	0.5659	0.5659	0.5596	0.5596	0.5453	0.5453	0.5427	0.5453	0.5566	0.5537	0.5627 (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
External Door			2.2700	1.4000	3.1780		(26a)
Windows (Uw = 1.40)			8.5100	1.3258	11.2822		(27)
Main Floor			50.0000	0.1400	7.0000	110.0000	5500.0000 (28a)
Main Wall	43.2200	10.7800	32.4400	0.2200	7.1368	60.0000	1946.4000 (29a)
Flat roof	2.2000		2.2000	0.1400	0.3080	9.0000	19.8000 (30)
Total net area of external elements Aum(A, m ²)			95.4200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.9050		(33)
Party Wall 1			30.5000	0.0000	0.0000	180.0000	5490.0000 (32)
Party Ceilings 1			47.8000			40.0000	1912.0000 (32b)
Internal Wall 1			44.5500			100.0000	4455.0000 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 19323.2000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							386.4640 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.6974 (36)
Total fabric heat loss							(33) + (36) = 37.6024 (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	22.8051	22.4093	22.4093	22.1610	22.1610	21.5944	21.5944	21.4904	21.5944	22.0414	21.9250	22.2836 (38)
Heat transfer coeff	60.4075	60.0117	60.0117	59.7634	59.7634	59.1968	59.1968	59.0928	59.1968	59.6438	59.5274	59.8860 (39)
Average = Sum(39)m / 12 =												59.6415 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2082	1.2002	1.2002	1.1953	1.1953	1.1839	1.1839	1.1819	1.1839	1.1929	1.1905	1.1977 (40)
HLP (average)												1.1928 (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												1.6901 (42)
Average daily hot water use (litres/day)												74.3399 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	81.7739	78.8003	75.8267	72.8531	69.8795	66.9059	66.9059	69.8795	72.8531	75.8267	78.8003	81.7739 (44)
Energy conte	121.2683	106.0620	109.4465	95.4181	91.5560	79.0058	73.2105	84.0101	85.0135	99.0750	108.1481	117.4419 (45)
Energy content (annual)												Total = Sum(45)m = 1169.6560 (45)
Distribution loss (46)m = 0.15 x (45)m												
	18.1902	15.9093	16.4170	14.3127	13.7334	11.8509	10.9816	12.6015	12.7520	14.8613	16.2222	17.6163 (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													
175.6671	155.1964	163.8453	148.0621	145.9548	131.6498	127.6093	138.4089	137.6575	153.4738	160.7921	171.8407	171.8407	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =													(63)
Output from w/h													
175.6671	155.1964	163.8453	148.0621	145.9548	131.6498	127.6093	138.4089	137.6575	153.4738	160.7921	171.8407	171.8407	(64)
Heat gains from water heating, kWh/month													
83.8408	74.5731	79.9100	73.8417	73.9614	68.3846	67.8615	71.4524	70.3822	76.4615	78.0745	82.5685	82.5685	(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	101.4061	101.4061	101.4061	101.4061	101.4061	101.4061	101.4061	101.4061	101.4061	101.4061	101.4061	101.4061	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
33.8371	30.0538	24.4414	18.5037	13.8318	11.6774	12.6178	16.4011	22.0135	27.9512	32.6232	34.7776	34.7776	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
219.7522	222.0325	216.2861	204.0527	188.6103	174.0966	164.4006	162.1202	167.8666	180.1000	195.5424	210.0561	210.0561	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
46.8307	46.8307	46.8307	46.8307	46.8307	46.8307	46.8307	46.8307	46.8307	46.8307	46.8307	46.8307	46.8307	(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)													
-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	(71)
Water heating gains (Table 5)													
112.6892	110.9719	107.4059	102.5580	99.4105	94.9787	91.2117	96.0382	97.7530	102.7708	108.4367	110.9791	110.9791	(72)
Total internal gains													
446.9112	443.6910	428.7662	405.7472	382.4853	361.3854	348.8628	355.1922	368.2659	391.4547	417.2350	436.4455	436.4455	(73)

6. Solar gains

[Jan]													
	Area	Solar flux	Specific data	Specific data	FF	Access	Gains						
	m2	Table 6a	g	Specific data		factor	W						
		W/m2	or Table 6b	or Table 6c		Table 6d							
East	2.7900	23.7835	0.6300	0.7000	0.7700	20.2792	(76)						
South	5.7200	54.0600	0.6300	0.7000	0.7700	94.5026	(78)						
Solar gains	114.7819	169.5016	226.8384	279.8113	300.4775	313.2510	299.9764	283.9860	259.8537	200.0588	135.1549	98.9843	(83)
Total gains	561.6931	613.1927	655.6046	685.5584	682.9627	674.6364	648.8392	639.1782	628.1196	591.5135	552.3900	535.4298	(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	88.8557	89.4418	89.4418	89.8135	89.8135	90.6731	90.6731	90.8327	90.6731	89.9935	90.1695	89.6296	
alpha	6.9237	6.9628	6.9628	6.9876	6.9876	7.0449	7.0449	7.0555	7.0449	6.9996	7.0113	6.9753	
util living area													
0.9904	0.9806	0.9498	0.8681	0.7032	0.4725	0.3101	0.3327	0.5787	0.8603	0.9733	0.9926	(86)	
Tweekday	19.3506	19.4765	19.6492	19.7959	19.8572	19.8760	19.8762	19.8780	19.8749	19.8181	19.5953	19.3345	
Tweekend	20.7117	20.7668	20.8486	20.9241	20.9648	20.9744	20.9750	20.9750	20.9728	20.9345	20.8178	20.7011	
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	20.5551	20.6393	20.7664	20.8815	20.9457	20.9608	20.9614	20.9614	20.9575	20.8990	20.7156	20.5388	(87)
Th 2	19.9135	19.9198	19.9198	19.9238	19.9238	19.9329	19.9329	19.9345	19.9329	19.9257	19.9276	19.9218	(88)
util rest of house													
0.9859	0.9717	0.9280	0.8192	0.6224	0.3799	0.2128	0.2343	0.4822	0.8000	0.9593	0.9890	(89)	
Tweekday	19.3506	19.4765	19.6492	19.7959	19.8572	19.8760	19.8762	19.8780	19.8749	19.8181	19.5953	19.3345	
Tweekend	19.3506	19.4765	19.6492	19.7959	19.8572	19.8760	19.8762	19.8780	19.8749	19.8181	19.5953	19.3345	
MIT 2	19.3506	19.4765	19.6492	19.7959	19.8572	19.8760	19.8762	19.8780	19.8749	19.8181	19.5953	19.3345	(90)
Living area fraction													
fLA = Living area / (4) =													
MIT	19.9914	20.0951	20.2435	20.3734	20.4363	20.4531	20.4535	20.4544	20.4508	20.3931	20.1913	19.9751	(92)
Temperature adjustment													
adjusted MIT	19.9914	20.0951	20.2435	20.3734	20.4363	20.4531	20.4535	20.4544	20.4508	20.3931	20.1913	19.9751	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.9863	0.9734	0.9354	0.8411	0.6620	0.4252	0.2603	0.2824	0.5296	0.8283	0.9633	0.9892	(94)	
Useful gains	553.9852	596.8773	613.2212	576.6353	452.1144	286.8833	168.9105	180.4740	332.6525	489.9486	532.1283	529.6434	(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													
911.6323	875.8770	776.7638	637.8782	462.3474	287.2869	168.9200	180.4913	334.5111	536.3847	737.6216	902.7896	(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													
266.0895	187.4878	121.6757	44.0949	7.6134	0.0000	0.0000	0.0000	0.0000	34.5485	147.9552	277.6208	(98)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Space heating 1087.0857 (98)
Space heating per m2 (98) / (4) = 21.7417 (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 %)													217.0722 (206)
Efficiency of secondary/supplementary heating system, %													100.0000 (208)
Space heating requirement													500.7945 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	266.0895	187.4878	121.6757	44.0949	7.6134	0.0000	0.0000	0.0000	0.0000	34.5485	147.9552	277.6208	(98)
Space heating efficiency (main heating system 1)	217.0722	217.0722	217.0722	217.0722	217.0722	0.0000	0.0000	0.0000	0.0000	217.0722	217.0722	217.0722	(210)
Space heating fuel (main heating system)	122.5811	86.3712	56.0531	20.3135	3.5073	0.0000	0.0000	0.0000	0.0000	15.9157	68.1594	127.8933	(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	175.6671	155.1964	163.8453	148.0621	145.9548	131.6498	127.6093	138.4089	137.6575	153.4738	160.7921	171.8407	(64)
Efficiency of water heater (217)m	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	(216)
Fuel for water heating, kWh/month	103.6751	91.5937	96.6981	87.3832	86.1395	77.6970	75.3124	81.6861	81.2426	90.5771	94.8962	101.4168	(217)
Water heating fuel used												1068.3180	(219)
Annual totals kWh/year													
Space heating fuel - main system												500.7945	(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)												239.0298	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses												1808.1423	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	500.7945	18.9000	94.6502	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1068.3180	18.9000	201.9121	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	239.0298	18.9000	45.1766	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit	0.0000	18.9000	0.0000	(252)
Total energy cost			341.7389	(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	500.7945	0.5190	259.9124	(261)
Space heating - secondary	0.0000	0.5190	0.0000	(263)
Water heating (other fuel)	1068.3180	0.5190	554.4570	(264)
Space and water heating			814.3694	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	239.0298	0.5190	124.0565	(268)
Energy saving/generation technologies				
PV Unit	-300.0000	0.5190	-155.7000	(269)
Total kg/year			782.7259	(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	500.7945	3.0700	1537.4392	(261)
Space heating - secondary	0.0000	3.0700	0.0000	(263)
Water heating (other fuel)	1068.3180	3.0700	3279.7363	(264)
Space and water heating			4817.1755	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	239.0298	3.0700	733.8215	(268)
Energy saving/generation technologies				
PV Unit	-300.0000	3.0700	-921.0000	(269)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

4629.9970 (272)
92.5999 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 84
Current environmental impact rating: B 88

(For testing purposes):

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

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

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

Total Savings £0 0.00 kg/m²

Potential energy efficiency rating: B 84
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	£342	£342	£0
Space heating	£95	£95	£0
Water heating	£202	£202	£0
Lighting	£45	£45	£0
Total cost of fuels	£342	£342	£0
Total cost of uses	£342	£342	£0
Delivered energy	36 kWh/m ²	36 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	0.8 tonnes	0.8 tonnes	0.0 tonnes
CO2 emissions per m ²	16 kg/m ²	16 kg/m ²	0 kg/m ²
Primary energy	93 kWh/m ²	93 kWh/m ²	0 kWh/m ²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Energy Calculations Ltd
SAP ♦ CODE ♦ SBEM ♦ DESIGN

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Energy Calculations Ltd
SAP ♦ CODE ♦ SBEM ♦ DESIGN

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

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

No improvements selected / applicable

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

Overheating Calculation Input Data

Dwelling type	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	386.5 (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	237.60 (P1)
Transmission heat loss coefficient	37.60 (37)
Summer heat loss coefficient	275.20 (P2)

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

[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	2.7900	117.5071	0.6300	0.7000	0.9000	117.1094
South	5.7200	112.2060	0.6300	0.7000	0.9000	229.2639
total:						346.3733

Solar gains	Jun	Jul	Aug	
	362	346	329	(P3)
Internal gains	361	349	355	
Total summer gains	723	695	684	(P5)
Summer gain/loss ratio	2.63	2.53	2.49	(P6)
Summer external temperature	16.00	17.90	17.80	
Thermal mass temperature increment (TMP = 386.5)	0.00	0.00	0.00	
Threshold temperature	18.63	20.43	20.29	(P7)
Likelihood of high internal temperature	Not significant	Not significant	Not significant	
Assessment of likelihood of high internal temperature:	Not significant			

BASIC COMPLIANCE REPORT

Energy Calculations Ltd
SAP • CODE • SBEM • DESIGN

Calculation Type: New Build (As Designed)

Property Reference	015724	Issued on Date	01/03/2021
Assessment Reference	003	Prop Type Ref	
Property	Flat 3, 18, Parkside Road, READING, RG30 2DB		
SAP Rating	84 B	DER	19.12
Environmental	88 B	TER	28.78
CO ₂ Emissions (t/year)	0.78	% DER<TER	33.57
General Requirements Compliance	Pass	DFEE	45.25
		TFEE	46.33
		% DFEE<TFEE	2.34
Assessor Details	Mr. Matthew Carter, Energy Calculations Limited, Tel: 01754 761035, mcarter@energycalculations.co.uk		Assessor ID
			7869-0001
Client			

SUMMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Electricity		
Fuel factor	1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	28.78	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	19.12	kgCO ₂ /m ²	Pass
	-9.66 (-33.6%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	46.33	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	45.25	kWh/m ² /yr	
	-1.1 (-2.4%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

Limiting System Efficiencies

4 Heating efficiency

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

BASIC COMPLIANCE REPORT

Energy Calculations Ltd
SAP • CODE • SBEM • DESIGN

Calculation Type: New Build (As Designed)

5 Cylinder insulation

Hot water storage

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

Pass

Primary pipework insulated

Yes

Pass

6 Controls

Space heating controls

Time and temperature zone control

Pass

Hot water controls

Cylinderstat

Pass

Independent timer for DHW

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100 %

Minimum

75 %

Pass

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)

Not significant

Pass

Based on:

Overshading

Average

Windows facing East

2.79 m², No overhang

Windows facing South

5.72 m², No overhang

Air change rate

6.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Solid Wall

0.00 W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

5.00 (design value)

Maximum

10.0

Pass

10 Key features

Party wall U-value

0.00 W/m²K

Photovoltaic array

300.00 kWh/Year

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

SUMMARY FOR INPUT DATA

Energy Calculations Ltd
SAP • CODE • SBEM • DESIGN

Calculation Type: New Build (As Designed)

Property Reference	015724	Issued on Date	01/03/2021
Assessment Reference	003	Prop Type Ref	
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General Requirements Compliance	Pass	DFEE	45.25
		TFEE	46.33
		% DFEE<TFEE	2.34
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	
			18.01 m	50.00 m²	2.40 m	

7.0 Living Area	26.60		m²
-----------------	-------	--	----

8.0 Thermal Mass Parameter	Precise calculation		kJ/m²K
Thermal Mass	386.46		

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	43.22	32.44

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	30.50	

9.2 Internal Walls						
Description	Construction				Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Dense block, dense plaster				100.00	44.55

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	2.20	2.20

10.1 Party Ceilings						
---------------------	--	--	--	--	--	--

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceilings 1	Precast concrete planks floor, screed, carpeted	30.00	47.80

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)
Main Floor	Ground Floor - Solid	Slab on ground, screed over insulation	0.14	110.00	50.00

12.0 Opening Types

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

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
Door	Half Glazed Door	[1] Main Wall	East							2.27	
Windows	Window	[1] Main Wall	South	None	0.00					5.72	
Windows	Window	[1] Main Wall	East	None	0.00					2.79	

14.0 Conservatory

None

15.0 Draught Proofing

100

 %

16.0 Draught Lobby

No

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)	5.52	0.300	No
Table K1 - Approved	E3 Sill	4.42	0.040	No
Table K1 - Approved	E4 Jamb	27.40	0.050	No
Table K1 - Approved	E5 Ground floor (normal)	18.01	0.160	No
Table K1 - Approved	E7 Party floor between dwellings (in blocks of flats)	12.87	0.070	No
Table K1 - Default	E14 Flat roof	5.00	0.080	No
Table K1 - Approved	E16 Corner (normal)	4.74	0.090	No
Table K1 - Approved	E17 Corner (inverted – internal area greater than external area)	2.37	-0.090	No
Table K1 - Approved	E18 Party wall between dwellings	4.74	0.060	No
Table K1 - Default	P1 Party wall - Ground floor	5.09	0.160	No

Y-value

0.091

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

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

20.0 Fans, Open Fireplaces, Flues

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

21.0 Fixed Cooling System

No

22.0 Lighting

Internal

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

External

External lights fitted	Yes
Light and motion sensor	Yes

23.0 Electricity Tariff

Standard

24.0 Main Heating 1

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

25.0 Main Heating 2

None

Community Heating	None
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28.0 Water Heating

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

SUMMARY FOR INPUT DATA

Energy Calculations Ltd
SAP ♦ CODE ♦ SBEM ♦ DESIGN

Calculation Type: New Build (As Designed)

SAP Code	901	
Immersion Only Heating Hot Water	Yes	
29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	210.00	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 %			