

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: 16/08/2021

EXCELLENCE
IN ENERGY
ASSESSMENT

PREDICTED ENERGY ASSESSMENT

Energy Calculations Ltd
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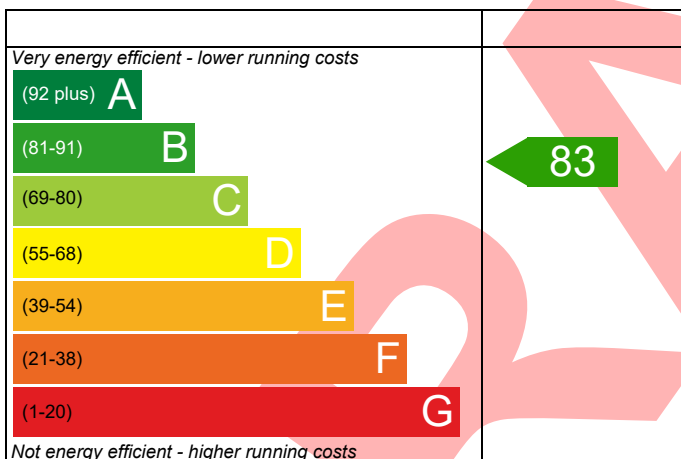
Flat 3, 18, Parkside Road,
READING,
RG30 2DB

Dwelling type: Flat, End-Terrace
Date of assessment: 16/08/2021
Produced by: Energy Calculations Limited
Total floor area: 42.9 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

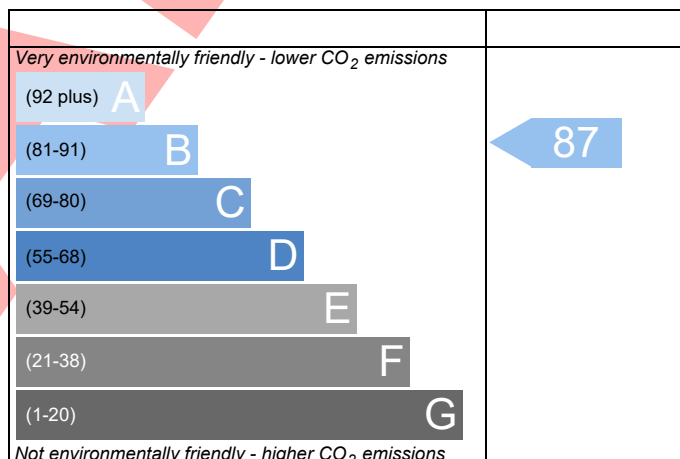


England

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	16/08/2021
Assessment Reference	004	Prop Type Ref	
Property	Flat 3, 18, Parkside Road, READING, RG30 2DB		
SAP Rating	83 B	DER	22.37
Environmental	87 B	TER	33.10
CO ₂ Emissions (t/year)	0.79	% DER<TER	32.41
General Requirements Compliance	Pass	DFEE	55.45
		TFEE	55.97
		% DFEE<TFEE	0.94
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	5.56	1.67	
External wall	E3 Sill	Table K1 - Approved	0.040	1.60	0.06	
External wall	E4 Jamb	Table K1 - Approved	0.050	17.20	0.86	
External wall	E5 Ground floor (normal)	Table K1 - Approved	0.160	19.75	3.16	
External wall	E7 Party floor between dwellings (in blocks of flats)	Table K1 - Approved	0.070	19.75	1.38	
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	9.24	1.48	

Total: **9.51** W/mK:
Y-Value: **0.101** W/m²K:

FULL SAP CALCULATION PRINTOUT

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

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

DWELLING AS DESIGNED

Ground-floor flat, total floor area 43 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) 33.10 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 22.37 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)56.0 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)55.4 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):	Slight	OK
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Based on:

Overshading:	Average
Windows facing East:	5.12 m ² , No overhang
Windows facing South:	3.00 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	42.9000 (1b)	x 2.4000 (2b)	= 102.9600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	42.9000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 102.9600 (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) = 0.1943 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4443 (18)
Number of sides sheltered					1 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.4109 (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												
	0.5239	0.5137	0.5034	0.4520	0.4418	0.3904	0.3904	0.3801	0.4109	0.4418	0.4623	0.4828 (22b)
Effective ac	0.6373	0.6319	0.6267	0.6022	0.5976	0.5762	0.5762	0.5722	0.5844	0.5976	0.6069	0.6166 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
External Door			2.2700	1.4000	3.1780			(26a)
Windows (Uw = 1.40)			8.1200	1.3258	10.7652			(27)
Main Floor			42.9000	0.1400	6.0060	110.0000	4719.0000	(28a)
Main Wall	47.4000	10.3900	37.0100	0.2200	8.1422	60.0000	2220.6000	(29a)
Flat roof	4.0000		4.0000	0.1400	0.5600	9.0000	36.0000	(30)
Total net area of external elements Aum(A, m2)			94.3000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.6514			(33)
Party Wall 1			21.9000	0.0000	0.0000	180.0000	3942.0000	(32)
Party Ceilings 1			38.9000			40.0000	1556.0000	(32b)
Internal Wall 1			35.7800			100.0000	3578.0000	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		16051.6000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							374.1632	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.5106	(36)
Total fabric heat loss					(33) + (36) =		38.1620	(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	21.6519	21.4708	21.2933	20.4596	20.3036	19.5774	19.5774	19.4430	19.8571	20.3036	20.6191	20.9491 (38)
Heat transfer coeff	59.8138	59.6328	59.4553	58.6215	58.4655	57.7394	57.7394	57.6049	58.0191	58.4655	58.7811	59.1110 (39)
Average = Sum(39)m / 12 =												58.6208 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3943	1.3900	1.3859	1.3665	1.3628	1.3459	1.3459	1.3428	1.3524	1.3628	1.3702	1.3779 (40)
HLP (average)												1.3665 (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	1.4854 (42)
Average daily hot water use (litres/day)	69.4775 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	76.4253	73.6462	70.8671	68.0880	65.3089	62.5298	62.5298	65.3089	68.0880	70.8671	73.6462	76.4253 (44)
Energy conte	113.3365	99.1248	102.2879	89.1771	85.5675	73.8383	68.4220	78.5153	79.4530	92.5948	101.0745	109.7603 (45)
Energy content (annual)										Total = Sum(45)m =		1093.1519 (45)
Distribution loss (46)m = 0.15 x (45)m												
	17.0005	14.8687	15.3432	13.3766	12.8351	11.0757	10.2633	11.7773	11.9179	13.8892	15.1612	16.4640 (46)
Water storage loss:												

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Store volume													210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.8600 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													1.0044 (55)
Total storage loss													
31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	(56)
If cylinder contains dedicated solar storage													
31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
167.7353	148.2592	156.6867	141.8211	139.9663	126.4823	122.8208	132.9141	132.0970	146.9936	153.7185	164.1591	164.1591	(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													
167.7353	148.2592	156.6867	141.8211	139.9663	126.4823	122.8208	132.9141	132.0970	146.9936	153.7185	164.1591	164.1591	(64)
Heat gains from water heating, kWh/month													
81.2034	72.2665	77.5298	71.7666	71.9702	66.6664	66.2694	69.6254	68.5333	74.3068	75.7225	80.0143	80.0143	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	74.2685	74.2685	74.2685	74.2685	74.2685	74.2685	74.2685	74.2685	74.2685	74.2685	74.2685	74.2685	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
11.6489	10.3464	8.4143	6.3701	4.7618	4.0201	4.3438	5.6463	7.5784	9.6225	11.2309	11.9726	11.9726	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
128.8898	130.2273	126.8569	119.6817	110.6244	102.1118	96.4248	95.0873	98.4577	105.6329	114.6902	123.2028	123.2028	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
30.4268	30.4268	30.4268	30.4268	30.4268	30.4268	30.4268	30.4268	30.4268	30.4268	30.4268	30.4268	30.4268	(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)													
-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	(71)
Water heating gains (Table 5)													
109.1444	107.5395	104.2067	99.6758	96.7342	92.5923	89.0717	93.5825	95.1852	99.8747	105.1701	107.5462	107.5462	(72)
Total internal gains													
294.9636	293.3937	284.7584	271.0082	257.4009	244.0046	235.1209	239.5966	246.5018	260.4107	276.3718	288.0022	288.0022	(73)

6. Solar gains

[Jan]													
	Area	Solar flux	Specific data	Specific data	FF	Access	Gains						
	m2	Table 6a	g	or Table 6b	or Table 6c	factor	W						
		W/m2				Table 6d							
East	5.1200	19.6403	0.6300		0.7000	0.7700	30.7319	(76)					
South	3.0000	46.7521	0.6300		0.7000	0.7700	42.8641	(78)					
Solar gains	73.5960	130.3184	188.4287	245.4614	282.2788	282.5051	271.4923	244.3143	208.5607	147.0529	89.1276	62.3109	(83)
Total gains	368.5596	423.7121	473.1871	516.4696	539.6797	526.5097	506.6132	483.9110	455.0625	407.4635	365.4994	350.3131	(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	74.5442	74.7706	74.9938	76.0604	76.2633	77.2225	77.2225	77.4027	76.8502	76.2633	75.8539	75.4306	
alpha	5.9696	5.9847	5.9996	6.0707	6.0842	6.1482	6.1482	6.1602	6.1233	6.0842	6.0569	6.0287	
util living area													
0.9984	0.9958	0.9875	0.9557	0.8620	0.6761	0.4979	0.5414	0.7991	0.9693	0.9958	0.9988	0.9988	(86)
Tweekday	18.7681	18.9246	19.1632	19.4599	19.6539	19.7332	19.7398	19.7420	19.7109	19.4724	19.0781	18.7563	
Tweekend	20.5046	20.5729	20.6788	20.8111	20.9129	20.9613	20.9700	20.9692	20.9440	20.8131	20.6353	20.4948	
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	20.2354	20.3394	20.5042	20.7051	20.8655	20.9406	20.9538	20.9525	20.9126	20.7115	20.4305	20.2203	(87)
Th 2	19.7677	19.7710	19.7742	19.7891	19.7919	19.8050	19.8050	19.8075	19.8000	19.7919	19.7863	19.7803	(88)
util rest of house													
0.9975	0.9937	0.9809	0.9320	0.7966	0.5629	0.3648	0.4047	0.6954	0.9478	0.9932	0.9982	0.9982	(89)
Tweekday	18.7681	18.9246	19.1632	19.4599	19.6539	19.7332	19.7398	19.7420	19.7109	19.4724	19.0781	18.7563	
Tweekend	18.7681	18.9246	19.1632	19.4599	19.6539	19.7332	19.7398	19.7420	19.7109	19.4724	19.0781	18.7563	
MIT 2	18.7681	18.9246	19.1632	19.4599	19.6539	19.7332	19.7398	19.7420	19.7109	19.4724	19.0781	18.7563	(90)
Living area fraction													
MIT	19.6436	19.7689	19.9634	20.2030	20.3769	20.4537	20.4642	20.4644	20.4280	20.2118	19.8851	19.6299	(91)
Temperature adjustment													
adjusted MIT	19.6436	19.7689	19.9634	20.2030	20.3769	20.4537	20.4642	20.4644	20.4280	20.2118	19.8851	19.6299	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.9974	0.9937	0.9821	0.9413	0.8309	0.6262	0.4388	0.4810	0.7534	0.9567	0.9934	0.9981	0.9981	(94)
Useful gains	367.6068	421.0323	464.7163	486.1661	448.4400	329.7091	222.3087	232.7406	342.8224	389.8102	363.1001	349.6384	(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													
917.7624	886.6715	800.4720	662.5967	507.3015	337.9879	223.1179	234.1282	367.1454	561.9610	751.5249	912.0785	912.0785	(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													
409.3157	312.9095	249.8022	127.0300	43.7929	0.0000	0.0000	0.0000	0.0000	128.0802	279.6658	418.4554	418.4554	(98)

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Space heating
Space heating per m2 (98) / (4) = 1969.0520 (98)
45.8986 (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 %) 214.0471 (206)
Efficiency of secondary/supplementary heating system, % 100.0000 (208)
Space heating requirement 919.9155 (211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	409.3157	312.9095	249.8022	127.0300	43.7929	0.0000	0.0000	0.0000	0.0000	128.0802	279.6658	418.4554	(98)
Space heating efficiency (main heating system 1)	214.0471	214.0471	214.0471	214.0471	214.0471	0.0000	0.0000	0.0000	0.0000	214.0471	214.0471	214.0471	(210)
Space heating fuel (main heating system)	191.2270	146.1873	116.7044	59.3468	20.4595	0.0000	0.0000	0.0000	0.0000	59.8374	130.6562	195.4969	(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	167.7353	148.2592	156.6867	141.8211	139.9663	126.4823	122.8208	132.9141	132.0970	146.9936	153.7185	164.1591	(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	98.9939	87.4995	92.4733	83.6999	82.6052	74.6472	72.4863	78.4431	77.9609	86.7526	90.7215	96.8833	(219)
Water heating fuel used												1023.1668	(219)
Annual totals kWh/year													
Space heating fuel - main system												919.9155	(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)												205.7224	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses												2148.8047	(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	919.9155	0.5190	477.4361	(261)
Space heating - secondary	0.0000	0.5190	0.0000	(263)
Water heating (other fuel)	1023.1668	0.5190	531.0236	(264)
Space and water heating			1008.4597	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	205.7224	0.5190	106.7699	(268)
Energy saving/generation technologies				
PV Unit	-300.0000	0.5190	-155.7000	(269)
Total CO2, kg/year			959.5296	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			22.3700	(273)

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

DER			22.3700 ZC1
Total Floor Area		TFA	42.9000
Assumed number of occupants		N	1.4854
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			17.8036 ZC2
CO2 emissions from cooking, equation (L16)			3.6049 ZC3
Total CO2 emissions			43.7785 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			43.7785 ZC8

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1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.9000 (1b)	x 2.4000 (2b)	= 102.9600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	42.9000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 102.9600 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					20.0000 / (5) = 0.1943 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4443 (18)
					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.4109 (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	0.5239	0.5137	0.5034	0.4520	0.4418	0.3904	0.3904	0.3801	0.4109	0.4418	0.4623	0.4828 (22b)
	0.6373	0.6319	0.6267	0.6022	0.5976	0.5762	0.5762	0.5722	0.5844	0.5976	0.6069	0.6166 (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)			8.1200	1.3258	10.7652		(27)
Main Floor			42.9000	0.1300	5.5770		(28a)
Main Wall	47.4000	10.3900	37.0100	0.1800	6.6618		(29a)
Flat roof	4.0000		4.0000	0.1300	0.5200		(30)
Total net area of external elements Aum(A, m ²)			94.3000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.2480		(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)							7.3974 (36)
Total fabric heat loss						(33) + (36) =	33.6454 (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	21.6519	21.4708	21.2933	20.4596	20.3036	19.5774	19.5774	19.4430	19.8571	20.3036	20.6191	20.9491 (38)
Heat transfer coeff	55.2972	55.1162	54.9387	54.1049	53.9489	53.2228	53.2228	53.0883	53.5025	53.9489	54.2645	54.5944 (39)
Average = Sum(39)m / 12 =												54.1042 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2890	1.2848	1.2806	1.2612	1.2576	1.2406	1.2406	1.2375	1.2471	1.2576	1.2649	1.2726 (40)
HLP (average)												1.2612 (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												1.4854 (42)
Average daily hot water use (litres/day)												69.4775 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	76.4253	73.6462	70.8671	68.0880	65.3089	62.5298	62.5298	65.3089	68.0880	70.8671	73.6462	76.4253 (44)
Energy conte	113.3365	99.1248	102.2879	89.1771	85.5675	73.8383	68.4220	78.5153	79.4530	92.5948	101.0745	109.7603 (45)
Energy content (annual)												Total = Sum(45)m = 1093.1519 (45)
Distribution loss (46)m = 0.15 x (45)m	17.0005	14.8687	15.3432	13.3766	12.8351	11.0757	10.2633	11.7773	11.9179	13.8892	15.1612	16.4640 (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	165.0831	145.8637	154.0345	139.2544	137.3141	123.9156	120.1686	130.2619	129.5303	144.3414	151.1518	161.5069 (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	165.0831	145.8637	154.0345	139.2544	137.3141	123.9156	120.1686	130.2619	129.5303	144.3414	151.1518	161.5069 (64)
Heat gains from water heating, kWh/month	79.0816	70.3501	75.4080	69.7133	69.8485	64.6131	64.1476	67.5036	66.4800	72.1850	73.6691	77.8926 (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	74.2685	74.2685	74.2685	74.2685	74.2685	74.2685	74.2685	74.2685	74.2685	74.2685	74.2685	74.2685	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	11.6489	10.3464	8.4143	6.3701	4.7618	4.0201	4.3438	5.6463	7.5784	9.6225	11.2309	11.9726	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	128.8898	130.2273	126.8569	119.6817	110.6244	102.1118	96.4248	95.0873	98.4577	105.6329	114.6902	123.2028	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4268	30.4268	30.4268	30.4268	30.4268	30.4268	30.4268	30.4268	30.4268	30.4268	30.4268	30.4268	(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)	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	(71)
Water heating gains (Table 5)	106.2925	104.6876	101.3548	96.8240	93.8824	89.7404	86.2199	90.7306	92.3333	97.0229	102.3182	104.6943	(72)
Total internal gains	295.1117	293.5418	284.9065	271.1564	257.5490	244.1528	235.2690	239.7448	246.6500	260.5589	276.5199	288.1503	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	Specific data g or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W		
East					5.1200	19.6403	0.6300	0.7000	0.7700	30.7319 (76)		
South					3.0000	46.7521	0.6300	0.7000	0.7700	42.8641 (78)		
Solar gains	73.5960	130.3184	188.4287	245.4614	282.2788	282.5051	271.4923	244.3143	208.5607	147.0529	89.1276	62.3109 (83)
Total gains	368.7077	423.8603	473.3353	516.6178	539.8278	526.6579	506.7613	484.0591	455.2107	407.6117	365.6476	350.4613 (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	53.8755	54.0525	54.2272	55.0628	55.2220	55.9754	55.9754	56.1172	55.6828	55.2220	54.9008	54.5691	
alpha	4.5917	4.6035	4.6151	4.6709	4.6815	4.7317	4.7317	4.7411	4.7122	4.6815	4.6601	4.6379	
util living area	0.9911	0.9823	0.9612	0.9056	0.7925	0.6151	0.4556	0.4945	0.7291	0.9268	0.9821	0.9928	(86)
MIT	19.8085	19.9936	20.2695	20.5991	20.8414	20.9641	20.9929	20.9896	20.9199	20.6064	20.1526	19.7811	(87)
Th 2	19.8495	19.8528	19.8560	19.8714	19.8742	19.8876	19.8876	19.8901	19.8825	19.8742	19.8684	19.8624	(88)
util rest of house	0.9882	0.9767	0.9487	0.8757	0.7319	0.5212	0.3438	0.3803	0.6400	0.8968	0.9753	0.9905	(89)
MIT 2	18.3000	18.5692	18.9644	19.4275	19.7300	19.8657	19.8853	19.8863	19.8256	19.4504	18.8124	18.2693	(90)
Living area fraction									fLA = Living area / (4) =			0.5967	(91)
MIT	19.2002	19.4192	19.7432	20.1267	20.3932	20.5212	20.5462	20.5447	20.4786	20.1402	19.6121	19.1714	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2002	19.4192	19.7432	20.1267	20.3932	20.5212	20.5462	20.5447	20.4786	20.1402	19.6121	19.1714	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9861	0.9740	0.9472	0.8832	0.7615	0.5760	0.4107	0.4486	0.6899	0.9049	0.9734	0.9887	(94)
Useful gains	363.5743	412.8553	448.3565	456.2754	411.1041	303.3767	208.1119	217.1472	314.0384	368.8555	355.9218	346.4854	(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	823.9382	800.2406	727.5612	607.4177	468.9880	315.1404	210.0291	220.0349	341.2700	514.6857	678.9648	817.3554	(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	342.5107	260.3229	207.7284	108.8225	43.0656	0.0000	0.0000	0.0000	0.0000	108.4977	232.5909	350.3273	(98)
Space heating												1653.8660	(98)
Space heating per m2										(98) / (4) =		38.5517	(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												1768.8407 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	342.5107	260.3229	207.7284	108.8225	43.0656	0.0000	0.0000	0.0000	0.0000	108.4977	232.5909	350.3273 (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)	366.3216	278.4202	222.1694	116.3877	46.0595	0.0000	0.0000	0.0000	0.0000	116.0403	248.7604	374.6816 (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	165.0831	145.8637	154.0345	139.2544	137.3141	123.9156	120.1686	130.2619	129.5303	144.3414	151.1518	161.5069 (64)
Efficiency of water heater (217)m	86.7184	86.3425	85.6122	84.1652	82.1180	79.8000	79.8000	79.8000	79.8000	84.0651	85.9601	79.8000 (216)
Fuel for water heating, kWh/month	190.3669	168.9360	179.9211	165.4538	167.2156	155.2827	150.5872	163.2354	162.3187	171.7020	175.8396	186.0113 (219)
Water heating fuel used												2036.8703 (219)
Annual totals kWh/year												
Space heating fuel - main system												1768.8407 (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)												205.7224 (232)
Total delivered energy for all uses												4086.4334 (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	1768.8407	0.2160	382.0696 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2036.8703	0.2160	439.9640 (264)
Space and water heating			822.0336 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	205.7224	0.5190	106.7699 (268)
Total CO2, kg/m2/year			967.7285 (272)
Emissions per m2 for space and water heating			19.1616 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.4888 (272b)
Emissions per m2 for pumps and fans			0.9073 (272c)
Target Carbon Dioxide Emission Rate (TER) = (19.1616 * 1.55) + 2.4888 + 0.9073, rounded to 2 d.p.			33.1000 (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	42.9000 (1b)	x 2.4000 (2b)	= 102.9600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	42.9000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 102.9600 (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) = 0.1943 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4443 (18)
					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.4109 (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												
	0.5239	0.5137	0.5034	0.4520	0.4418	0.3904	0.3904	0.3801	0.4109	0.4418	0.4623	0.4828 (22b)
Effective ac	0.6373	0.6319	0.6267	0.6022	0.5976	0.5762	0.5762	0.5722	0.5844	0.5976	0.6069	0.6166 (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)			8.1200	1.3258	10.7652		(27)
Main Floor			42.9000	0.1400	6.0060	110.0000	4719.0000 (28a)
Main Wall	47.4000	10.3900	37.0100	0.2200	8.1422	60.0000	2220.6000 (29a)
Flat roof	4.0000		4.0000	0.1400	0.5600	9.0000	36.0000 (30)
Total net area of external elements Aum(A, m ²)			94.3000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.6514		(33)
Party Wall 1			21.9000	0.0000	0.0000	180.0000	3942.0000 (32)
Party Ceilings 1			38.9000			30.0000	1167.0000 (32b)
Internal Wall 1			35.7800			100.0000	3578.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	15662.6000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							365.0956 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.5106 (36)
Total fabric heat loss						(33) + (36) =	38.1620 (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	21.6519	21.4708	21.2933	20.4596	20.3036	19.5774	19.5774	19.4430	19.8571	20.3036	20.6191	20.9491 (38)
Heat transfer coeff	59.8138	59.6328	59.4553	58.6215	58.4655	57.7394	57.7394	57.6049	58.0191	58.4655	58.7811	59.1110 (39)
Average = Sum(39)m / 12 =												58.6208 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3943	1.3900	1.3859	1.3665	1.3628	1.3459	1.3459	1.3428	1.3524	1.3628	1.3702	1.3779 (40)
HLP (average)												1.3665 (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												1.4854 (42)
Average daily hot water use (litres/day)												69.4775 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	76.4253	73.6462	70.8671	68.0880	65.3089	62.5298	62.5298	65.3089	68.0880	70.8671	73.6462	76.4253 (44)
Energy conte	113.3365	99.1248	102.2879	89.1771	85.5675	73.8383	68.4220	78.5153	79.4530	92.5948	101.0745	109.7603 (45)
Energy content (annual)										Total = Sum(45)m =		1093.1519 (45)
Distribution loss (46)m = 0.15 x (45)m												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												

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Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	24.0840	21.0640	21.7362	18.9501	18.1831	15.6906	14.5397	16.6845	16.8838	19.6764	21.4783	23.3241 (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	74.2685	74.2685	74.2685	74.2685	74.2685	74.2685	74.2685	74.2685	74.2685	74.2685	74.2685	74.2685	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	11.6489	10.3464	8.4143	6.3701	4.7618	4.0201	4.3438	5.6463	7.5784	9.6225	11.2309	11.9726	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	128.8898	130.2273	126.8569	119.6817	110.6244	102.1118	96.4248	95.0873	98.4577	105.6329	114.6902	123.2028	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4268	30.4268	30.4268	30.4268	30.4268	30.4268	30.4268	30.4268	30.4268	30.4268	30.4268	30.4268	(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)	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	(71)
Water heating gains (Table 5)	32.3710	31.3453	29.2153	26.3196	24.4397	21.7925	19.5426	22.4254	23.4497	26.4468	29.8310	31.3496	(72)
Total internal gains	218.1902	217.1995	209.7670	197.6520	185.1063	173.2049	165.5917	168.4395	174.7663	186.9827	201.0327	211.8055	(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				5.1200	19.6403	0.6300		0.7000		0.7700		30.7319 (76)	
South				3.0000	46.7521	0.6300		0.7000		0.7700		42.8641 (78)	
Solar gains	73.5960	130.3184	188.4287	245.4614	282.2788	282.5051	271.4923	244.3143	208.5607	147.0529	89.1276	62.3109 (83)	
Total gains	291.7862	347.5179	398.1957	443.1135	467.3851	455.7100	437.0840	412.7539	383.3270	334.0356	290.1603	274.1165 (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	72.7377	72.9586	73.1764	74.2171	74.4152	75.3510	75.3510	75.5269	74.9878	74.4152	74.0157	73.6026	
alpha	5.8492	5.8639	5.8784	5.9478	5.9610	6.0234	6.0234	6.0351	5.9992	5.9610	5.9344	5.9068	
util living area	0.9995	0.9984	0.9942	0.9762	0.9125	0.7546	0.5718	0.6254	0.8750	0.9871	0.9986	0.9996	(86)
MIT	19.9007	20.0465	20.2746	20.5683	20.8170	20.9599	20.9935	20.9893	20.8986	20.5657	20.1778	19.8800	(87)
Th 2	19.7677	19.7710	19.7742	19.7891	19.7919	19.8050	19.8050	19.8075	19.8000	19.7919	19.7863	19.7803	(88)
util rest of house	0.9992	0.9975	0.9910	0.9621	0.8615	0.6402	0.4220	0.4727	0.7869	0.9769	0.9977	0.9995	(89)
MIT 2	18.7829	18.9309	19.1602	19.4584	19.6820	19.7913	19.8041	19.8057	19.7546	19.4625	19.0749	18.7725	(90)
Living area fraction									fLA = Living area / (4) =			0.5967	(91)
MIT	19.4499	19.5966	19.8252	20.1207	20.3593	20.4886	20.5139	20.5120	20.4372	20.1208	19.7331	19.4334	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4499	19.5966	19.8252	20.1207	20.3593	20.4886	20.5139	20.5120	20.4372	20.1208	19.7331	19.4334	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9991	0.9973	0.9912	0.9667	0.8882	0.7089	0.5123	0.5651	0.8387	0.9804	0.9977	0.9994	(94)
Useful gains	291.5244	346.5917	394.6934	428.3694	415.1354	323.0482	223.9115	233.2617	321.4823	327.4845	289.4901	273.9469	(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	906.1741	876.3993	792.2519	657.7762	506.2711	340.0051	225.9846	236.8701	367.6808	556.6384	742.5867	900.4613	(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	457.2994	356.0307	295.7835	165.1729	67.8050	0.0000	0.0000	0.0000	0.0000	170.4905	326.2295	466.1267	(98)
Space heating												2304.9382	(98)
Space heating per m2												53.7282	(99)
										(98) / (4) =			

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	542.7503	427.2715	437.7974	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8905	0.9480	0.9304	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	483.3354	405.0356	407.3334	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	589.5541	566.7534	539.1296	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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Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	76.4774	120.3180	98.0564	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction												294.8519 (104)
Intermittency factor (Table 10b)									fC = cooled area / (4) =			1.0000 (105)
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	19.1194	30.0795	24.5141	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling per m2												73.7130 (107)
Energy for space heating												1.7183 (108)
Energy for space cooling												53.7282 (99)
Total												1.7183 (108)
Dwelling Fabric Energy Efficiency (DFEE)												55.4464 (109)
												55.4 (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	42.9000 (1b)	x 2.4000 (2b)	= 102.9600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	42.9000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 102.9600 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					20.0000 / (5) = 0.1943 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4443 (18)
Number of sides sheltered					1 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.4109 (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	0.5239	0.5137	0.5034	0.4520	0.4418	0.3904	0.3904	0.3801	0.4109	0.4418	0.4623	0.4828 (22b)
Effective ac	0.6373	0.6319	0.6267	0.6022	0.5976	0.5762	0.5762	0.5722	0.5844	0.5976	0.6069	0.6166 (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)			8.1200	1.3258	10.7652		(27)
Main Floor			42.9000	0.1300	5.5770		(28a)
Main Wall	47.4000	10.3900	37.0100	0.1800	6.6618		(29a)
Flat roof	4.0000		4.0000	0.1300	0.5200		(30)
Total net area of external elements Aum(A, m ²)			94.3000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.2480		(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)							7.3974 (36)
Total fabric heat loss							(33) + (36) = 33.6454 (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	21.6519	21.4708	21.2933	20.4596	20.3036	19.5774	19.5774	19.4430	19.8571	20.3036	20.6191	20.9491 (38)
Heat transfer coeff	55.2972	55.1162	54.9387	54.1049	53.9489	53.2228	53.2228	53.0883	53.5025	53.9489	54.2645	54.5944 (39)
Average = Sum(39)m / 12 =												54.1042 (39)
HLP	1.2890	1.2848	1.2806	1.2612	1.2576	1.2406	1.2406	1.2375	1.2471	1.2576	1.2649	1.2726 (40)
HLP (average)												1.2612 (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												1.4854 (42)
Average daily hot water use (litres/day)												69.4775 (43)
Daily hot water use	76.4253	73.6462	70.8671	68.0880	65.3089	62.5298	62.5298	65.3089	68.0880	70.8671	73.6462	76.4253 (44)
Energy conte	113.3365	99.1248	102.2879	89.1771	85.5675	73.8383	68.4220	78.5153	79.4530	92.5948	101.0745	109.7603 (45)
Energy content (annual)												Total = Sum(45)m = 1093.1519 (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	24.0840	21.0640	21.7362	18.9501	18.1831	15.6906	14.5397	16.6845	16.8838	19.6764	21.4783	(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	74.2685	74.2685	74.2685	74.2685	74.2685	74.2685	74.2685	74.2685	74.2685	74.2685	74.2685	74.2685	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	11.6489	10.3464	8.4143	6.3701	4.7618	4.0201	4.3438	5.6463	7.5784	9.6225	11.2309	11.9726	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	128.8898	130.2273	126.8569	119.6817	110.6244	102.1118	96.4248	95.0873	98.4577	105.6329	114.6902	123.2028	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4268	30.4268	30.4268	30.4268	30.4268	30.4268	30.4268	30.4268	30.4268	30.4268	30.4268	30.4268	(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)	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	(71)
Water heating gains (Table 5)	32.3710	31.3453	29.2153	26.3196	24.4397	21.7925	19.5426	22.4254	23.4497	26.4468	29.8310	31.3496	(72)
Total internal gains	218.1902	217.1995	209.7670	197.6520	185.1063	173.2049	165.5917	168.4395	174.7663	186.9827	201.0327	211.8055	(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					5.1200	19.6403	0.6300	0.7000	0.7700		30.7319 (76)	
South					3.0000	46.7521	0.6300	0.7000	0.7700		42.8641 (78)	

Solar gains	73.5960	130.3184	188.4287	245.4614	282.2788	282.5051	271.4923	244.3143	208.5607	147.0529	89.1276	62.3109 (83)
Total gains	291.7862	347.5179	398.1957	443.1135	467.3851	455.7100	437.0840	412.7539	383.3270	334.0356	290.1603	274.1165 (84)

7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	53.8755	54.0525	54.2272	55.0628	55.2220	55.9754	55.9754	56.1172	55.6828	55.2220	54.9008	54.5691
alpha	4.5917	4.6035	4.6151	4.6709	4.6815	4.7317	4.7317	4.7411	4.7122	4.6815	4.6601	4.6379
util living area	0.9965	0.9918	0.9792	0.9414	0.8519	0.6888	0.5224	0.5705	0.8091	0.9623	0.9928	0.9974 (86)
MIT	19.6491	19.8404	20.1304	20.4903	20.7776	20.9424	20.9874	20.9812	20.8730	20.4855	20.0003	19.6214 (87)
Th 2	19.8495	19.8528	19.8560	19.8714	19.8742	19.8876	19.8876	19.8901	19.8825	19.8742	19.8684	19.8624 (88)
util rest of house	0.9954	0.9891	0.9719	0.9201	0.7992	0.5918	0.3972	0.4433	0.7268	0.9442	0.9899	0.9965 (89)
MIT 2	18.6337	18.8262	19.1145	19.4725	19.7294	19.8623	19.8847	19.8851	19.8162	19.4772	18.9986	18.6163 (90)
Living area fraction									FLA = Living area / (4) =			
MIT	19.2396	19.4314	19.7207	20.0799	20.3549	20.5069	20.5427	20.5392	20.4469	20.0789	19.5963	19.2161 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2396	19.4314	19.7207	20.0799	20.3549	20.5069	20.5427	20.5392	20.4469	20.0789	19.5963	19.2161 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9945	0.9878	0.9708	0.9246	0.8236	0.6479	0.4722	0.5195	0.7715	0.9482	0.9890	0.9959	(94)
Useful gains	290.1948	343.2654	386.5702	409.6941	384.9299	295.2741	206.4031	214.4279	295.7457	316.7175	286.9562	272.9802	(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	826.1214	800.9169	726.3280	604.8856	466.9237	314.3794	209.8425	219.7441	339.5724	511.3758	678.1081	819.7943	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	398.7294	307.5418	252.7798	140.5379	61.0034	0.0000	0.0000	0.0000	0.0000	144.8258	281.6294	406.8296	(98)
Space heating												1993.8771	(98)
Space heating per m2											(98) / (4) =	46.4773	(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	500.2942	393.8486	403.4712	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8858	0.9378	0.9215	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	443.1669	369.3349	371.7812	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	589.5541	566.7534	539.1296	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	105.3988	146.8793	124.5073	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling													
Cooled fraction													376.7853 (104)
Intermittency factor (Table 10b)													
													fC = cooled area / (4) = 1.0000 (105)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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	26.3497	36.7198	31.1268	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling per m2												94.1963 (107)
Energy for space heating												2.1957 (108)
Energy for space cooling												46.4773 (99)
Total												2.1957 (108)
Target Fabric Energy Efficiency (TFEE)												48.6730 (109)
												56.0 (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	42.9000 (1b)	x 2.4000 (2b)	= 102.9600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	42.9000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 102.9600 (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) =	0.1943 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4443 (18)
Number of sides sheltered					1 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.4109 (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	0.4520	0.4212	0.4212	0.4007	0.4007	0.3493	0.3493	0.3390	0.3493	0.3904	0.3801	0.4109 (22b)
Effective ac	0.6022	0.5887	0.5887	0.5803	0.5803	0.5610	0.5610	0.5575	0.5610	0.5762	0.5722	0.5844 (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)			8.1200	1.3258	10.7652		(27)
Main Floor			42.9000	0.1400	6.0060	110.0000	4719.0000 (28a)
Main Wall	47.4000	10.3900	37.0100	0.2200	8.1422	60.0000	2220.6000 (29a)
Flat roof	4.0000		4.0000	0.1400	0.5600	9.0000	36.0000 (30)
Total net area of external elements Aum(A, m ²)			94.3000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	28.6514			(33)
Party Wall 1			21.9000	0.0000	0.0000	180.0000	3942.0000 (32)
Party Ceilings 1			38.9000			40.0000	1556.0000 (32b)
Internal Wall 1			35.7800			100.0000	3578.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	16051.6000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							374.1632 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.5106 (36)
Total fabric heat loss						(33) + (36) =	38.1620 (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	20.4596	20.0024	20.0024	19.7155	19.7155	19.0611	19.0611	18.9409	19.0611	19.5774	19.4430	19.8571 (38)
Heat transfer coeff	58.6215	58.1643	58.1643	57.8774	57.8774	57.2230	57.2230	57.1029	57.2230	57.7394	57.6049	58.0191 (39)
Average = Sum(39)m / 12 =												57.7367 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3665	1.3558	1.3558	1.3491	1.3491	1.3339	1.3339	1.3311	1.3339	1.3459	1.3428	1.3524 (40)
HLP (average)												1.3458 (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												1.4854 (42)
Average daily hot water use (litres/day)												69.4775 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	76.4253	73.6462	70.8671	68.0880	65.3089	62.5298	62.5298	65.3089	68.0880	70.8671	73.6462	76.4253 (44)
Energy conte	113.3365	99.1248	102.2879	89.1771	85.5675	73.8383	68.4220	78.5153	79.4530	92.5948	101.0745	109.7603 (45)
Energy content (annual)										Total = Sum(45)m =		1093.1519 (45)
Distribution loss (46)m = 0.15 x (45)m												
	17.0005	14.8687	15.3432	13.3766	12.8351	11.0757	10.2633	11.7773	11.9179	13.8892	15.1612	16.4640 (46)
Water storage loss:												

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Store volume													210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.8600 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													1.0044 (55)
Total storage loss													
31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	30.1320	(56)
If cylinder contains dedicated solar storage													
31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	30.1320	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	(59)
Total heat required for water heating calculated for each month													
167.7353	148.2592	156.6867	141.8211	139.9663	126.4823	122.8208	132.9141	132.0970	146.9936	153.7185	164.1591	164.1591	(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													
167.7353	148.2592	156.6867	141.8211	139.9663	126.4823	122.8208	132.9141	132.0970	146.9936	153.7185	164.1591	164.1591	(64)
RHI water heating demand													
Heat gains from water heating, kWh/month													
81.2034	72.2665	77.5298	71.7666	71.9702	66.6664	66.2694	69.6254	68.5333	74.3068	75.7225	80.0143	80.0143	(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	89.1222	89.1222	89.1222	89.1222	89.1222	89.1222	89.1222	89.1222	89.1222	89.1222	89.1222	89.1222	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
29.1221	25.8660	21.0357	15.9253	11.9044	10.0502	10.8596	14.1157	18.9460	24.0564	28.0773	29.9315	29.9315	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
192.3728	194.3691	189.3386	178.6295	165.1110	152.4056	143.9176	141.9214	146.9518	157.6610	171.1794	183.8848	183.8848	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
45.3976	45.3976	45.3976	45.3976	45.3976	45.3976	45.3976	45.3976	45.3976	45.3976	45.3976	45.3976	45.3976	(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)													
-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	(71)
Water heating gains (Table 5)													
109.1444	107.5395	104.2067	99.6758	96.7342	92.5923	89.0717	93.5825	95.1852	99.8747	105.1701	107.5462	107.5462	(72)
Total internal gains													
405.7443	402.8795	389.6860	369.3356	348.8546	330.1530	318.9539	324.7245	336.1880	356.6971	379.5318	396.4675	396.4675	(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			5.1200			23.7835			0.6300			0.7000			0.7700			37.2149 (76)
South			3.0000			54.0600			0.6300			0.7000			0.7700			49.5643 (78)
Solar gains	86.7793	134.3161	193.0964	256.2358	288.0931	305.5176	290.4890	265.6995	228.0972	162.7378	103.5318							73.8978 (83)
Total gains	492.5236	537.1956	582.7823	625.5713	636.9477	635.6706	609.4429	590.4240	564.2851	519.4349	483.0636							470.3653 (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)													
tau	76.0604	76.6583	76.6583	77.0383	77.0383	77.9193	77.9193	78.0832	77.9193	77.2225	77.4027	76.8502	
alpha	6.0707	6.1106	6.1106	6.1359	6.1359	6.1946	6.1946	6.2055	6.1946	6.1482	6.1602	6.1233	
util living area													
0.9907	0.9825	0.9555	0.8782	0.7163	0.4832	0.3191	0.3478	0.6151	0.8864	0.9768	0.9925	0.9925	(86)
Tweekday	19.0735	19.2139	19.4263	19.6266	19.7201	19.7494	19.7501	19.7523	19.7464	19.6484	19.3623	19.0631	
Tweekend	20.6331	20.6938	20.7931	20.8936	20.9534	20.9702	20.9715	20.9715	20.9659	20.9016	20.7570	20.6243	
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	20.4338	20.5264	20.6807	20.8339	20.9281	20.9543	20.9561	20.9560	20.9467	20.8482	20.6205	20.4202	(87)
Th 2	19.7891	19.7974	19.7974	19.8026	19.8026	19.8144	19.8144	19.8166	19.8144	19.8050	19.8075	19.8000	(88)
util rest of house													
0.9863	0.9743	0.9351	0.8292	0.6291	0.3788	0.2079	0.2337	0.5047	0.8292	0.9642	0.9889	0.9889	(89)
Tweekday	19.0735	19.2139	19.4263	19.6266	19.7201	19.7494	19.7501	19.7523	19.7464	19.6484	19.3623	19.0631	
Tweekend	19.0735	19.2139	19.4263	19.6266	19.7201	19.7494	19.7501	19.7523	19.7464	19.6484	19.3623	19.0631	
MIT 2	19.0735	19.2139	19.4263	19.6266	19.7201	19.7494	19.7501	19.7523	19.7464	19.6484	19.3623	19.0631	(90)
Living area fraction													
fLA = Living area / (4) =													
MIT	19.8853	19.9971	20.1748	20.3470	20.4410	20.4684	20.4697	20.4706	20.4627	20.3644	20.1131	19.8729	(92)
Temperature adjustment													
adjusted MIT	19.8853	19.9971	20.1748	20.3470	20.4410	20.4684	20.4697	20.4706	20.4627	20.3644	20.1131	19.8729	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.9867	0.9759	0.9424	0.8533	0.6772	0.4368	0.2694	0.2969	0.5662	0.8586	0.9680	0.9892	0.9892	(94)
Useful gains	485.9620	524.2707	549.2099	533.8046	431.3279	277.6391	164.1784	175.2758	319.5116	445.9736	467.6199	465.2622	(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													
878.4586	843.2149	748.8542	616.2231	448.0276	278.5859	164.2139	175.3417	324.0358	517.5966	709.2953	868.7164	868.7164	(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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	292.0175	214.3305	148.5353	59.3413	12.4246	0.0000	0.0000	0.0000	0.0000	53.2875	174.0063	300.1699 (98)
Space heating												1254.1129 (98)
RHI space heating demand												1254 (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	42.9000 (1b)	x 2.4000 (2b)	= 102.9600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	42.9000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 102.9600 (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) = 0.1943 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4443 (18)
Number of sides sheltered					1 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.4109 (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	0.5239	0.5137	0.5034	0.4520	0.4418	0.3904	0.3904	0.3801	0.4109	0.4418	0.4623	0.4828 (22b)
Effective ac	0.6373	0.6319	0.6267	0.6022	0.5976	0.5762	0.5762	0.5722	0.5844	0.5976	0.6069	0.6166 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
External Door			2.2700	1.4000	3.1780			(26a)
Windows (Uw = 1.40)			8.1200	1.3258	10.7652			(27)
Main Floor			42.9000	0.1400	6.0060	110.0000	4719.0000	(28a)
Main Wall	47.4000	10.3900	37.0100	0.2200	8.1422	60.0000	2220.6000	(29a)
Flat roof	4.0000		4.0000	0.1400	0.5600	9.0000	36.0000	(30)
Total net area of external elements Aum(A, m2)			94.3000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.6514			(33)
Party Wall 1			21.9000	0.0000	0.0000	180.0000	3942.0000	(32)
Party Ceilings 1			38.9000			40.0000	1556.0000	(32b)
Internal Wall 1			35.7800			100.0000	3578.0000	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		16051.6000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							374.1632	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.5106	(36)
Total fabric heat loss					(33) + (36) =		38.1620	(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	21.6519	21.4708	21.2933	20.4596	20.3036	19.5774	19.5774	19.4430	19.8571	20.3036	20.6191	20.9491 (38)
Heat transfer coeff	59.8138	59.6328	59.4553	58.6215	58.4655	57.7394	57.7394	57.6049	58.0191	58.4655	58.7811	59.1110 (39)
Average = Sum(39)m / 12 =												58.6208 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3943	1.3900	1.3859	1.3665	1.3628	1.3459	1.3459	1.3428	1.3524	1.3628	1.3702	1.3779 (40)
HLP (average)												1.3665 (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	1.4854 (42)
Average daily hot water use (litres/day)	69.4775 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	76.4253	73.6462	70.8671	68.0880	65.3089	62.5298	62.5298	65.3089	68.0880	70.8671	73.6462	76.4253 (44)
Energy conte	113.3365	99.1248	102.2879	89.1771	85.5675	73.8383	68.4220	78.5153	79.4530	92.5948	101.0745	109.7603 (45)
Energy content (annual)										Total = Sum(45)m =		1093.1519 (45)
Distribution loss (46)m = 0.15 x (45)m												
	17.0005	14.8687	15.3432	13.3766	12.8351	11.0757	10.2633	11.7773	11.9179	13.8892	15.1612	16.4640 (46)
Water storage loss:												

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Store volume												210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8600 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0044 (55)
Total storage loss	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364 (56)
If cylinder contains dedicated solar storage	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	167.7353	148.2592	156.6867	141.8211	139.9663	126.4823	122.8208	132.9141	132.0970	146.9936	153.7185	164.1591 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h	167.7353	148.2592	156.6867	141.8211	139.9663	126.4823	122.8208	132.9141	132.0970	146.9936	153.7185	164.1591 (64)
Heat gains from water heating, kWh/month	81.2034	72.2665	77.5298	71.7666	71.9702	66.6664	66.2694	69.6254	68.5333	74.3068	75.7225	80.0143 (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	89.1222	89.1222	89.1222	89.1222	89.1222	89.1222	89.1222	89.1222	89.1222	89.1222	89.1222	89.1222	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.1221	25.8660	21.0357	15.9253	11.9044	10.0502	10.8596	14.1157	18.9460	24.0564	28.0773	29.9315	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	192.3728	194.3691	189.3386	178.6295	165.1110	152.4056	143.9176	141.9214	146.9518	157.6610	171.1794	183.8848	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.3976	45.3976	45.3976	45.3976	45.3976	45.3976	45.3976	45.3976	45.3976	45.3976	45.3976	45.3976	(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)	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	(71)
Water heating gains (Table 5)	109.1444	107.5395	104.2067	99.6758	96.7342	92.5923	89.0717	93.5825	95.1852	99.8747	105.1701	107.5462	(72)
Total internal gains	405.7443	402.8795	389.6860	369.3356	348.8546	330.1530	318.9539	324.7245	336.1880	356.6971	379.5318	396.4675	(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					5.1200	19.6403	0.6300	0.7000	0.7700	30.7319		
South					3.0000	46.7521	0.6300	0.7000	0.7700	42.8641 (76)		

Solar gains	73.5960	130.3184	188.4287	245.4614	282.2788	282.5051	271.4923	244.3143	208.5607	147.0529	89.1276	62.3109 (83)
Total gains	479.3403	533.1980	578.1147	614.7970	631.1334	612.6581	590.4461	569.0389	544.7487	503.7499	468.6594	458.7784 (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	74.5442	74.7706	74.9938	76.0604	76.2633	77.2225	77.2225	77.4027	76.8502	76.2633	75.8539	75.4306
alpha	5.9696	5.9847	5.9996	6.0707	6.0842	6.1482	6.1482	6.1602	6.1233	6.0842	6.0569	6.0287
util living area	0.9935	0.9866	0.9681	0.9121	0.7876	0.5922	0.4289	0.4634	0.7016	0.9259	0.9850	0.9949 (86)
Tweekday	18.9473	19.0950	19.3090	19.5541	19.6869	19.7370	19.7401	19.7425	19.7243	19.5726	19.2372	18.9334
Tweekend	20.5845	20.6499	20.7471	20.8609	20.9365	20.9664	20.9708	20.9705	20.9578	20.8661	20.7076	20.5737
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	20.3587	20.4584	20.6097	20.7828	20.9020	20.9484	20.9549	20.9545	20.9342	20.7933	20.5435	20.3420 (87)
Th 2	19.7677	19.7710	19.7742	19.7891	19.7919	19.8050	19.8050	19.8075	19.8000	19.7919	19.7863	19.7803 (88)
util rest of house	0.9904	0.9805	0.9534	0.8742	0.7123	0.4874	0.3132	0.3446	0.5955	0.8850	0.9768	0.9924 (89)
Tweekday	18.9473	19.0950	19.3090	19.5541	19.6869	19.7370	19.7401	19.7425	19.7243	19.5726	19.2372	18.9334
Tweekend	18.9473	19.0950	19.3090	19.5541	19.6869	19.7370	19.7401	19.7425	19.7243	19.5726	19.2372	18.9334
MIT 2	18.9473	19.0950	19.3090	19.5541	19.6869	19.7370	19.7401	19.7425	19.7243	19.5726	19.2372	18.9334 (90)
Living area fraction	fLA = Living area / (4) =											0.5967 (91)
MIT	19.7895	19.9086	20.0852	20.2873	20.4120	20.4599	20.4650	20.4657	20.4463	20.3010	20.0167	19.7740 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7895	19.9086	20.0852	20.2873	20.4120	20.4599	20.4650	20.4657	20.4463	20.3010	20.0167	19.7740 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	474.7674	523.2168	553.6645	547.9970	475.2040	334.3522	222.8129	233.6233	356.6534	455.5772	458.6754	455.2967	(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	926.4892	895.0034	807.7090	667.5419	509.3519	338.3453	223.1636	234.2054	368.2053	567.1765	759.2600	920.5930	(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	336.0810	249.8405	189.0092	86.0723	25.4060	0.0000	0.0000	0.0000	0.0000	83.0299	216.4209	346.1805	(98)

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Space heating
Space heating per m2 (98) / (4) = 1532.0402 (98)
35.7119 (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 %) 214.0471 (206)
Efficiency of secondary/supplementary heating system, % 100.0000 (208)
Space heating requirement 715.7493 (211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	336.0810	249.8405	189.0092	86.0723	25.4060	0.0000	0.0000	0.0000	0.0000	83.0299	216.4209	346.1805	(98)
Space heating efficiency (main heating system 1)	214.0471	214.0471	214.0471	214.0471	214.0471	0.0000	0.0000	0.0000	0.0000	214.0471	214.0471	214.0471	(210)
Space heating fuel (main heating system)	157.0127	116.7223	88.3026	40.2119	11.8694	0.0000	0.0000	0.0000	0.0000	38.7905	101.1090	161.7310	(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	167.7353	148.2592	156.6867	141.8211	139.9663	126.4823	122.8208	132.9141	132.0970	146.9936	153.7185	164.1591	(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	98.9939	87.4995	92.4733	83.6999	82.6052	74.6472	72.4863	78.4431	77.9609	86.7526	90.7215	96.8833	(219)
Water heating fuel used												1023.1668	(219)
Annual totals kWh/year													
Space heating fuel - main system												715.7493	(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)												205.7224	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses												1944.6385	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	715.7493	13.1900	94.4073	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1023.1668	13.1900	134.9557	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	205.7224	13.1900	27.1348	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit	0.0000	13.1900	0.0000	(252)
Total energy cost			256.4978	(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] = 1.2256 (257)
SAP value 82.9031
SAP rating (Section 12) 83 (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	715.7493	0.5190	371.4739	(261)
Space heating - secondary	0.0000	0.5190	0.0000	(263)
Water heating (other fuel)	1023.1668	0.5190	531.0236	(264)
Space and water heating			902.4975	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	205.7224	0.5190	106.7699	(268)
Energy saving/generation technologies				
PV Unit	-300.0000	0.5190	-155.7000	(269)
Total kg/year			853.5674	(272)
CO2 emissions per m2			19.9000	(273)
EI value			86.9877	
EI rating			87	(274)
EI band			B	

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Calculation of stars for heating and DHW

Main heating energy efficiency	$13.19 \times (1 + 0.29 \times 0.25) / 2.1405 = 6.609$, stars = 3
Main heating environmental impact	$0.519 \times (1 + 0.29 \times 0.25) / 2.1405 = 0.2600$, 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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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	42.9000 (1b)	x 2.4000 (2b)	= 102.9600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	42.9000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 102.9600 (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) = 0.1943 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4443 (18)
					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.4109 (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												
	0.4520	0.4212	0.4212	0.4007	0.4007	0.3493	0.3493	0.3390	0.3493	0.3904	0.3801	0.4109 (22b)
Effective ac	0.6022	0.5887	0.5887	0.5803	0.5803	0.5610	0.5610	0.5575	0.5610	0.5762	0.5722	0.5844 (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)			8.1200	1.3258	10.7652		(27)
Main Floor			42.9000	0.1400	6.0060	110.0000	4719.0000 (28a)
Main Wall	47.4000	10.3900	37.0100	0.2200	8.1422	60.0000	2220.6000 (29a)
Flat roof	4.0000		4.0000	0.1400	0.5600	9.0000	36.0000 (30)
Total net area of external elements Aum(A, m ²)			94.3000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.6514		(33)
Party Wall 1			21.9000	0.0000	0.0000	180.0000	3942.0000 (32)
Party Ceilings 1			38.9000			40.0000	1556.0000 (32b)
Internal Wall 1			35.7800			100.0000	3578.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	16051.6000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							374.1632 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.5106 (36)
Total fabric heat loss						(33) + (36) =	38.1620 (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	20.4596	20.0024	20.0024	19.7155	19.7155	19.0611	19.0611	18.9409	19.0611	19.5774	19.4430	19.8571 (38)
Heat transfer coeff	58.6215	58.1643	58.1643	57.8774	57.8774	57.2230	57.2230	57.1029	57.2230	57.7394	57.6049	58.0191 (39)
Average = Sum(39)m / 12 =												57.7367 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3665	1.3558	1.3558	1.3491	1.3491	1.3339	1.3339	1.3311	1.3339	1.3459	1.3428	1.3524 (40)
HLP (average)												1.3458 (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												1.4854 (42)
Average daily hot water use (litres/day)												69.4775 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	76.4253	73.6462	70.8671	68.0880	65.3089	62.5298	62.5298	65.3089	68.0880	70.8671	73.6462	76.4253 (44)
Energy conte	113.3365	99.1248	102.2879	89.1771	85.5675	73.8383	68.4220	78.5153	79.4530	92.5948	101.0745	109.7603 (45)
Energy content (annual)										Total = Sum(45)m =		1093.1519 (45)
Distribution loss (46)m = 0.15 x (45)m												
	17.0005	14.8687	15.3432	13.3766	12.8351	11.0757	10.2633	11.7773	11.9179	13.8892	15.1612	16.4640 (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													
167.7353	148.2592	156.6867	141.8211	139.9663	126.4823	122.8208	132.9141	132.0970	146.9936	153.7185	164.1591	164.1591	(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													
167.7353	148.2592	156.6867	141.8211	139.9663	126.4823	122.8208	132.9141	132.0970	146.9936	153.7185	164.1591	164.1591	(64)
Heat gains from water heating, kWh/month													
81.2034	72.2665	77.5298	71.7666	71.9702	66.6664	66.2694	69.6254	68.5333	74.3068	75.7225	80.0143	80.0143	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	89.1222	89.1222	89.1222	89.1222	89.1222	89.1222	89.1222	89.1222	89.1222	89.1222	89.1222	89.1222	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
29.1221	25.8660	21.0357	15.9253	11.9044	10.0502	10.8596	14.1157	18.9460	24.0564	28.0773	29.9315	29.9315	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
192.3728	194.3691	189.3386	178.6295	165.1110	152.4056	143.9176	141.9214	146.9518	157.6610	171.1794	183.8848	183.8848	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
45.3976	45.3976	45.3976	45.3976	45.3976	45.3976	45.3976	45.3976	45.3976	45.3976	45.3976	45.3976	45.3976	(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)													
-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	-59.4148	(71)
Water heating gains (Table 5)													
109.1444	107.5395	104.2067	99.6758	96.7342	92.5923	89.0717	93.5825	95.1852	99.8747	105.1701	107.5462	107.5462	(72)
Total internal gains													
405.7443	402.8795	389.6860	369.3356	348.8546	330.1530	318.9539	324.7245	336.1880	356.6971	379.5318	396.4675	396.4675	(73)

6. Solar gains

[Jan]													
	Area	Solar flux	Specific data	g	Specific data	FF	Access	Gains					
	m2	Table 6a	or Table 6b	W/m2	or Table 6c		factor	W					
							Table 6d						
East	5.1200	23.7835	0.6300	0.7000	0.7700	37.2149	(76)						
South	3.0000	54.0600	0.6300	0.7000	0.7700	49.5643	(78)						
Solar gains	86.7793	134.3161	193.0964	256.2358	288.0931	305.5176	290.4890	265.6995	228.0972	162.7378	103.5318	73.8978	(83)
Total gains	492.5236	537.1956	582.7823	625.5713	636.9477	635.6706	609.4429	590.4240	564.2851	519.4349	483.0636	470.3653	(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	76.0604	76.6583	76.6583	77.0383	77.0383	77.9193	77.9193	78.0832	77.9193	77.2225	77.4027	76.8502	
alpha	6.0707	6.1106	6.1106	6.1359	6.1359	6.1946	6.1946	6.2055	6.1946	6.1482	6.1602	6.1233	
util living area													
0.9907	0.9825	0.9555	0.8782	0.7163	0.4832	0.3191	0.3478	0.6151	0.8864	0.9768	0.9925	(86)	
Tweekday	19.0735	19.2139	19.4263	19.6266	19.7201	19.7494	19.7501	19.7523	19.7464	19.6484	19.3623	19.0631	
Tweekend	20.6331	20.6938	20.7931	20.8936	20.9534	20.9702	20.9715	20.9715	20.9659	20.9016	20.7570	20.6243	
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	20.4338	20.5264	20.6807	20.8339	20.9281	20.9543	20.9561	20.9560	20.9467	20.8482	20.6205	20.4202	(87)
Th 2	19.7891	19.7974	19.7974	19.8026	19.8026	19.8144	19.8144	19.8166	19.8144	19.8050	19.8075	19.8000	(88)
util rest of house													
0.9863	0.9743	0.9351	0.8292	0.6291	0.3788	0.2079	0.2337	0.5047	0.8292	0.9642	0.9889	(89)	
Tweekday	19.0735	19.2139	19.4263	19.6266	19.7201	19.7494	19.7501	19.7523	19.7464	19.6484	19.3623	19.0631	
Tweekend	19.0735	19.2139	19.4263	19.6266	19.7201	19.7494	19.7501	19.7523	19.7464	19.6484	19.3623	19.0631	
MIT 2	19.0735	19.2139	19.4263	19.6266	19.7201	19.7494	19.7501	19.7523	19.7464	19.6484	19.3623	19.0631	(90)
Living area fraction													
fLA = Living area / (4) =													
MIT	19.8853	19.9971	20.1748	20.3470	20.4410	20.4684	20.4697	20.4706	20.4627	20.3644	20.1131	19.8729	(92)
Temperature adjustment													
adjusted MIT	19.8853	19.9971	20.1748	20.3470	20.4410	20.4684	20.4697	20.4706	20.4627	20.3644	20.1131	19.8729	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.9867	0.9759	0.9424	0.8533	0.6772	0.4368	0.2694	0.2969	0.5662	0.8586	0.9680	0.9892	(94)	
Useful gains	485.9620	524.2707	549.2099	533.8046	431.3279	277.6391	164.1784	175.2758	319.5116	445.9736	467.6199	465.2622	(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													
878.4586	843.2149	748.8542	616.2231	448.0276	278.5859	164.2139	175.3417	324.0358	517.5966	709.2953	868.7164	(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													
292.0175	214.3305	148.5353	59.3413	12.4246	0.0000	0.0000	0.0000	0.0000	0.0000	53.2875	174.0063	300.1699	(98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Energy Calculations Ltd
SAP ♦ CODE ♦ SBEM ♦ DESIGN

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

Space heating 1254.1129 (98)
Space heating per m2 (98) / (4) = 29.2334 (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 %)													211.4111 (206)
Efficiency of secondary/supplementary heating system, %													100.0000 (208)
Space heating requirement													593.2107 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	292.0175	214.3305	148.5353	59.3413	12.4246	0.0000	0.0000	0.0000	0.0000	53.2875	174.0063	300.1699	(98)
Space heating efficiency (main heating system 1)	211.4111	211.4111	211.4111	211.4111	211.4111	0.0000	0.0000	0.0000	0.0000	211.4111	211.4111	211.4111	(210)
Space heating fuel (main heating system)	138.1278	101.3809	70.2590	28.0692	5.8770	0.0000	0.0000	0.0000	0.0000	25.2056	82.3071	141.9840	(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	167.7353	148.2592	156.6867	141.8211	139.9663	126.4823	122.8208	132.9141	132.0970	146.9936	153.7185	164.1591	(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	98.9939	87.4995	92.4733	83.6999	82.6052	74.6472	72.4863	78.4431	77.9609	86.7526	90.7215	96.8833	(219)
Water heating fuel used												1023.1668	(219)
Annual totals kWh/year													
Space heating fuel - main system												593.2107	(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)												205.7224	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses												1822.0999	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	593.2107	19.1200	113.4219	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1023.1668	19.1200	195.6295	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	205.7224	19.1200	39.3341	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit	0.0000	19.1200	0.0000	(252)
Total energy cost			348.3855	(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	593.2107	0.5190	307.8763	(261)
Space heating - secondary	0.0000	0.5190	0.0000	(263)
Water heating (other fuel)	1023.1668	0.5190	531.0236	(264)
Space and water heating			838.8999	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	205.7224	0.5190	106.7699	(268)
Energy saving/generation technologies				
PV Unit	-300.0000	0.5190	-155.7000	(269)
Total kg/year			789.9698	(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	593.2107	3.0700	1821.1567	(261)
Space heating - secondary	0.0000	3.0700	0.0000	(263)
Water heating (other fuel)	1023.1668	3.0700	3141.1222	(264)
Space and water heating			4962.2789	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	205.7224	3.0700	631.5677	(268)
Energy saving/generation technologies				
PV Unit	-300.0000	3.0700	-921.0000	(269)

FULL SAP CALCULATION PRINTOUT

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SAP ♦ CODE ♦ SBEM ♦ DESIGN

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

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

4672.8466 (272)
108.9242 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 83
Current environmental impact rating: B 87

(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 83
Potential environmental impact rating: B 87

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

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

	Current £348	Potential £348	Saving £0
Electricity			
Space heating	£113	£113	£0
Water heating	£196	£196	£0
Lighting	£39	£39	£0
Total cost of fuels	£348	£348	£0
Total cost of uses	£348	£348	£0
Delivered energy	42 kWh/m ²	42 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	0.8 tonnes	0.8 tonnes	0.0 tonnes
CO2 emissions per m ²	18 kg/m ²	18 kg/m ²	0 kg/m ²
Primary energy	109 kWh/m ²	109 kWh/m ²	0 kWh/m ²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Energy Calculations Ltd
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	374.2 (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	203.86 (P1)
Transmission heat loss coefficient	38.16 (37)
Summer heat loss coefficient	242.02 (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	5.1200	117.5071	0.6300	0.7000	0.9000	214.9105
South	3.0000	112.2060	0.6300	0.7000	0.9000	120.2433
total:						335.1538

Solar gains	Jun	Jul	Aug	
	353	335	308	(P3)
Internal gains	330	319	325	
Total summer gains	683	654	632	(P5)
Summer gain/loss ratio	2.82	2.70	2.61	(P6)
Summer external temperature	16.00	17.90	17.80	
Thermal mass temperature increment (TMP = 374.2)	0.00	0.00	0.00	
Threshold temperature	18.82	20.60	20.41	(P7)
Likelihood of high internal temperature	Not significant	Slight	Not significant	
Assessment of likelihood of high internal temperature:	Slight			

BASIC COMPLIANCE REPORT

Energy Calculations Ltd
SAP • CODE • SBEM • DESIGN

Calculation Type: New Build (As Designed)

Property Reference	015724	Issued on Date	16/08/2021
Assessment Reference	004	Prop Type Ref	
Property	Flat 3, 18, Parkside Road, READING, RG30 2DB		
SAP Rating	83 B	DER	22.37
Environmental	87 B	TER	33.10
CO ₂ Emissions (t/year)	0.79	% DER<TER	32.41
General Requirements Compliance	Pass	DFEE	55.45
		TFEE	55.97
		% DFEE<TFEE	0.94
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)	33.10	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	22.37	kgCO ₂ /m ²	Pass
	-10.73 (-32.4%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	55.97	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	55.45	kWh/m ² /yr	
	-0.6 (-1.1%)	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)

Slight

Pass

Based on:

Overshading

Average

Windows facing East

5.12 m², No overhang

Windows facing South

3.00 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	16/08/2021
Assessment Reference	004	Prop Type Ref	
Property	Flat 3, 18, Parkside Road, READING, RG30 2DB		
SAP Rating	83 B	DER	22.37
Environmental	87 B	TER	33.10
CO ₂ Emissions (t/year)	0.79	% DER<TER	32.41
General Requirements Compliance	Pass	DFEE	55.45
		TFEE	55.97
		% DFEE<TFEE	0.94
Assessor Details	Mr. Matthew Carter, Energy Calculations Limited, Tel: 01754 761035, mcarter@energycalculations.co.uk		Assessor ID
			7869-0001
Client			

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

Orientation	West							
Property Tenure	Unknown							
Transaction Type	New dwelling							
Terrain Type	Urban							
1.0 Property Type	Flat, End-Terrace							
2.0 Number of Storeys	1							
3.0 Date Built	2020							
4.0 Sheltered Sides	1							
5.0 Sunlight/Shade	Average or unknown							
6.0 Measurements								
Ground Floor:		Heat Loss Perimeter		Internal Floor Area		Average Storey Height		
		19.75 m		42.90 m²		2.40 m		
7.0 Living Area	25.60					m²		
8.0 Thermal Mass Parameter	Precise calculation					kJ/m²K		
Thermal Mass	374.16							
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	47.40	37.01
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	21.90	
9.2 Internal Walls								
Description	Construction					Kappa (kJ/m²K)	Area (m²)	
Internal Wall 1	Dense block, dense plaster					100.00	35.78	
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	4.00	4.00
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	38.90

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	42.90

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	South							2.27	
Windows	Window	[1] Main Wall	South	None	0.00					3.00	
Windows	Window	[1] Main Wall	East	None	0.00					5.12	

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)	5.56	0.300	No
Table K1 - Approved	E3 Sill	1.60	0.040	No
Table K1 - Approved	E4 Jamb	17.20	0.050	No
Table K1 - Approved	E5 Ground floor (normal)	19.75	0.160	No
Table K1 - Approved	E7 Party floor between dwellings (in blocks of flats)	19.75	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	9.24	0.160	No

Y-value

0.101

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

Block Compliance Report - DER

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

Block Compliance Report - DFEE

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