

Energy Calculations Ltd

SAP ♦ CODE ♦ SBEM ♦ DESIGN

01754-761035



SAP Report Submission for Building Regulations Compliance

Client:

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

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

Report Issue Date: 16/08/2021

EXCELLENCE
IN ENERGY
ASSESSMENT

PREDICTED ENERGY ASSESSMENT

Energy Calculations Ltd
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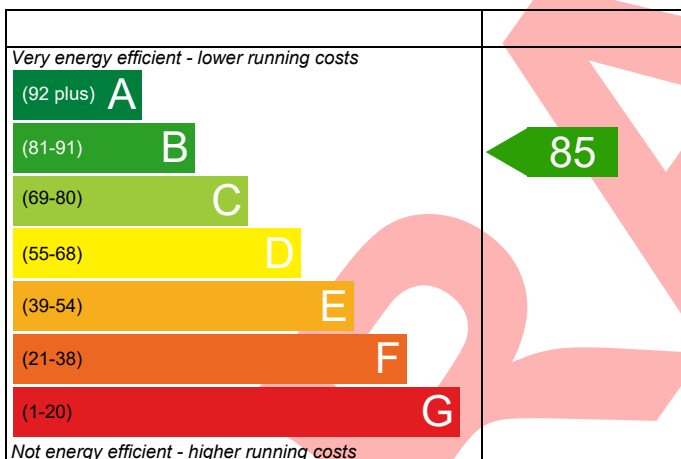
Flat 10, 18, Parkside Road,
READING,
RG30 2DB

Dwelling type: Flat, Mid-Terrace
Date of assessment: 16/08/2021
Produced by: Energy Calculations Limited
Total floor area: 50.64 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP2012 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.

Energy Efficiency Rating

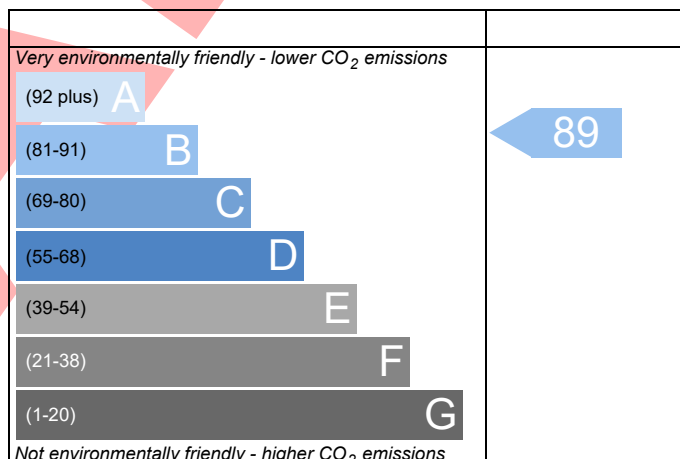


England

EU Directive
2002/91/EC

The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

Environmental Impact (CO₂) Rating



England

EU Directive
2002/91/EC

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions. The higher the rating the less impact it has on the environment.

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

THERMAL BRIDGING

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Calculation Type: New Build (As Designed)

Property Reference	015731	Issued on Date	16/08/2021
Assessment Reference	004	Prop Type Ref	
Property	Flat 10, 18, Parkside Road, READING, RG30 2DB		
SAP Rating	85 B	DER	18.50
Environmental	89 B	TER	26.84
CO ₂ Emissions (t/year)	0.76	% DER<TER	31.08
General Requirements Compliance	Pass	DFEE	36.75
		TFEE	39.96
		% DFEE<TFEE	8.04
Assessor Details	Mr. Matthew Carter, Energy Calculations Limited, Tel: 01754 761035, mcarter@energycalculations.co.uk		Assessor ID
			7869-0001
Client			

	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Table K1 - Approved	0.300	3.60	1.08	
External wall	E3 Sill	Table K1 - Approved	0.040	3.60	0.14	
External wall	E4 Jamb	Table K1 - Approved	0.050	8.40	0.42	
External wall	E7 Party floor between dwellings (in blocks of flats)	Table K1 - Approved	0.070	14.71	1.03	
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	9.62	0.58	
External wall	E11 Eaves (insulation at rafter level)	Table K1 - Approved	0.040	2.89	0.12	
External wall	E13 Gable (insulation at rafter level)	Table K1 - Approved	0.040	2.80	0.11	
External wall	E16 Corner (normal)	Table K1 - Approved	0.090	7.20	0.65	
External wall	E17 Corner (inverted – internal area greater than external area)	Table K1 - Approved	-0.090	4.80	-0.43	
External wall	E18 Party wall between dwellings	Table K1 - Approved	0.060	4.80	0.29	
Party wall	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	0.000	17.42	0.00	
External roof	R1 Head of roof window	Table K1 - Default	0.080	0.80	0.06	
External roof	R2 Sill of roof window	Table K1 - Default	0.060	0.80	0.05	
External roof	R3 Jamb of roof window	Table K1 - Default	0.080	1.80	0.14	

Total: **4.24** W/mK:
Y-Value: **0.050** W/m²K:

FULL SAP CALCULATION PRINTOUT

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

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

DWELLING AS DESIGNED

Top-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 26.84 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 18.50 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)40.0 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)36.7 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.22 (max. 0.30)	0.22 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.12 (max. 0.20)	0.14 (max. 0.35)	OK
Openings	1.42 (max. 2.00)	1.60 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

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

Secondary heating system: None

5 Cylinder insulation

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

6 Controls

Space heating controls:	Time and temperature zone control	OK
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Hot water controls:

Cylinderstat	OK
Independent timer for DHW	OK

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames Valley): Slight OK

Based on:

Overshading:	Average
Windows facing West:	5.88 m ² , No overhang
Air change rate:	6.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Roof U-value	0.10 W/m ² K
Photovoltaic array	300.00 kWh/Year

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.6400 (1b)	x 2.3200 (2b)	= 117.4848 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.6400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 117.4848 (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) = 0.1702 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4202 (18)
Number of sides sheltered					3 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3257 (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												
	0.4152	0.4071	0.3990	0.3583	0.3501	0.3094	0.3094	0.3013	0.3257	0.3501	0.3664	0.3827 (22b)
Effective ac	0.5862	0.5829	0.5796	0.5642	0.5613	0.5479	0.5479	0.5454	0.5530	0.5613	0.5671	0.5732 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.40)			5.8800	1.3258	7.7955		(27)
Door to Stairs			1.8900	1.4000	2.6460		(26)
R lights (Uw = 1.60)			0.7200	1.5038	1.0827		(27a)
Main Wall	28.6000	5.8800	22.7200	0.2200	4.9984	60.0000	1363.2000 (29a)
Wall to Hall	4.3200	1.8900	2.4300	0.2060	0.5005	190.0000	461.7000 (29a)
Slope roof	21.7900	0.7200	21.0700	0.1400	2.9498	9.0000	189.6300 (30)
Roof plane	30.0000		30.0000	0.1000	3.0000	9.0000	270.0000 (30)
Total net area of external elements Aum(A, m ²)			84.7100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	22.9728			(33)
Party Wall 1			41.8000	0.0000	0.0000	180.0000	7524.0000 (32)
Party Floor 1			50.6400			40.0000	2025.6000 (32d)
Internal Wall 1			56.0000			9.0000	504.0000 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 12338.1300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							243.6440 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.2385 (36)
Total fabric heat loss							(33) + (36) = 27.2113 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	22.7275	22.5977	22.4705	21.8729	21.7611	21.2407	21.2407	21.1443	21.4411	21.7611	21.9873	22.2238 (38)
Heat transfer coeff	49.9388	49.8090	49.6818	49.0843	48.9725	48.4520	48.4520	48.3556	48.6525	48.9725	49.1986	49.4351 (39)
Average = Sum(39)m / 12 =												49.0837 (39)
HLP	0.9862	0.9836	0.9811	0.9693	0.9671	0.9568	0.9568	0.9549	0.9608	0.9671	0.9715	0.9762 (40)
HLP (average)												0.9693 (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												1.7090 (42)
Average daily hot water use (litres/day)												74.7877 (43)
Daily hot water use	82.2665	79.2750	76.2835	73.2920	70.3004	67.3089	67.3089	70.3004	73.2920	76.2835	79.2750	82.2665 (44)
Energy conte	121.9988	106.7009	110.1058	95.9929	92.1075	79.4818	73.6515	84.5162	85.5256	99.6718	108.7996	118.1493 (45)
Energy content (annual)												Total = Sum(45)m = 1176.7019 (45)
Distribution loss (46)m = 0.15 x (45)m												

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Water storage loss:	18.2998	16.0051	16.5159	14.3989	13.8161	11.9223	11.0477	12.6774	12.8288	14.9508	16.3199	17.7224 (46)
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												
176.3976	155.8353	164.5046	148.6369	146.5063	132.1258	128.0503	138.9150	138.1696	154.0706	161.4436	172.5481	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h												
176.3976	155.8353	164.5046	148.6369	146.5063	132.1258	128.0503	138.9150	138.1696	154.0706	161.4436	172.5481	(64)
Heat gains from water heating, kWh/month												
84.0836	74.7856	80.1292	74.0328	74.1448	68.5429	68.0082	71.6207	70.5525	76.6599	78.2911	82.8037	(65)

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

Metabolic gains (Table 5), Watts												
(66)m	85.4478	85.4478	85.4478	85.4478	85.4478	85.4478	85.4478	85.4478	85.4478	85.4478	85.4478	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
14.3960	12.7864	10.3986	7.8724	5.8847	4.9681	5.3683	6.9779	9.3657	11.8919	13.8796	14.7961	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
148.8960	150.4411	146.5476	138.2587	127.7955	117.9615	111.3918	109.8467	113.7403	122.0292	132.4924	142.3264	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
31.5448	31.5448	31.5448	31.5448	31.5448	31.5448	31.5448	31.5448	31.5448	31.5448	31.5448	31.5448	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	(71)
Water heating gains (Table 5)												
113.0157	111.2881	107.7006	102.8234	99.6570	95.1985	91.4088	96.2644	97.9895	103.0375	108.7376	111.2953	(72)
Total internal gains												
324.9421	323.1500	313.2811	297.5889	281.9715	266.7624	256.8033	261.7233	269.7298	285.5929	303.7439	317.0521	(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	
West				5.8800	19.6403	0.6300		0.7000		0.7700	35.2936 (80)	
North				0.7200	17.5997	0.6300		0.7000		1.0000	5.0294 (82)	
Solar gains	40.3231	78.8063	131.7699	198.6001	251.2209	261.1319	246.9469	206.5105	155.0505	93.8375	50.2122	33.2308 (83)
Total gains	365.2651	401.9562	445.0510	496.1889	533.1924	527.8943	503.7501	468.2338	424.7803	379.4304	353.9561	350.2829 (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	68.6291	68.8080	68.9842	69.8240	69.9834	70.7351	70.7351	70.8761	70.4437	69.9834	69.6617	69.3285
alpha	5.5753	5.5872	5.5989	5.6549	5.6656	5.7157	5.7157	5.7251	5.6962	5.6656	5.6441	5.6219
util living area												
	0.9943	0.9894	0.9731	0.9147	0.7758	0.5755	0.4214	0.4715	0.7356	0.9440	0.9881	0.9955 (86)
Tweekday	19.1096	19.2522	19.4995	19.8050	19.9837	20.0439	20.0493	20.0505	20.0207	19.7912	19.4094	19.0915
Tweekend	20.5229	20.5858	20.6964	20.8359	20.9293	20.9633	20.9684	20.9677	20.9471	20.8254	20.6518	20.5119
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	20.2637	20.3592	20.5315	20.7438	20.8908	20.9436	20.9512	20.9502	20.9173	20.7306	20.4562	20.2466 (87)
Th 2	20.0949	20.0970	20.0991	20.1090	20.1109	20.1195	20.1195	20.1211	20.1162	20.1109	20.1071	20.1032 (88)
util rest of house												
	0.9926	0.9861	0.9648	0.8899	0.7229	0.5014	0.3381	0.3833	0.6611	0.9221	0.9839	0.9941 (89)
Tweekday	19.1096	19.2522	19.4995	19.8050	19.9837	20.0439	20.0493	20.0505	20.0207	19.7912	19.4094	19.0915
Tweekend	19.1096	19.2522	19.4995	19.8050	19.9837	20.0439	20.0493	20.0505	20.0207	19.7912	19.4094	19.0915
MIT 2	19.1096	19.2522	19.4995	19.8050	19.9837	20.0439	20.0493	20.0505	20.0207	19.7912	19.4094	19.0915 (90)
Living area fraction												
MIT	19.7431	19.8599	20.0660	20.3204	20.4817	20.5378	20.5444	20.5444	20.5129	20.3069	19.9841	19.7256 (91)
Temperature adjustment												0.0000
adjusted MIT	19.7431	19.8599	20.0660	20.3204	20.4817	20.5378	20.5444	20.5444	20.5129	20.3069	19.9841	19.7256 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9918	0.9851	0.9644	0.8964	0.7460	0.5371	0.3785	0.4261	0.6960	0.9276	0.9832	0.9934 (94)
Ext temp.	362.2621	395.9683	429.2261	444.7694	397.7352	283.5526	190.6498	199.5135	295.6465	351.9658	348.0016	347.9552 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Month fracti	771.2129	745.1408	673.9852	560.5600	430.0605	287.6991	191.1164	200.4063	312.0039	475.3700	633.8789	767.5105 (97)
1.0000	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)

FULL SAP CALCULATION PRINTOUT

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Space heating kWh	304.2594	234.6439	182.1008	83.3692	24.0500	0.0000	0.0000	0.0000	0.0000	91.8128	205.8316	312.1491 (98)
Space heating												1438.2169 (98)
Space heating per m2												(98) / (4) = 28.4008 (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 %)												184.8072 (206)
Efficiency of secondary/supplementary heating system, %												100.0000 (208)
Space heating requirement												778.2254 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	304.2594	234.6439	182.1008	83.3692	24.0500	0.0000	0.0000	0.0000	0.0000	91.8128	205.8316	312.1491 (98)
Space heating efficiency (main heating system 1)	184.8072	184.8072	184.8072	184.8072	184.8072	0.0000	0.0000	0.0000	0.0000	184.8072	184.8072	184.8072 (210)
Space heating fuel (main heating system)	164.6361	126.9668	98.5355	45.1114	13.0136	0.0000	0.0000	0.0000	0.0000	49.6803	111.3764	168.9053 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	176.3976	155.8353	164.5046	148.6369	146.5063	132.1258	128.0503	138.9150	138.1696	154.0706	161.4436	172.5481 (64)
Efficiency of water heater	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400 (216)
(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 (217)
Fuel for water heating, kWh/month	104.1062	91.9708	97.0872	87.7224	86.4650	77.9779	75.5727	81.9848	81.5449	90.9293	95.2807	101.8344 (219)
Water heating fuel used												1072.4763 (219)
Annual totals kWh/year												
Space heating fuel - main system												778.2254 (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)												254.2385 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
Total delivered energy for all uses												2104.9403 (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	778.2254	0.5190	403.8990 (261)
Space heating - secondary	0.0000	0.5190	0.0000 (263)
Water heating (other fuel)	1072.4763	0.5190	556.6152 (264)
Space and water heating			960.5142 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	254.2385	0.5190	131.9498 (268)
Energy saving/generation technologies			
PV Unit	-300.0000	0.5190	-155.7000 (269)
Total CO2, kg/year			936.7640 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			18.5000 (273)

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

DER			18.5000 ZC1
Total Floor Area		TFA	50.6400
Assumed number of occupants		N	1.7090
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			17.4235 ZC2
CO2 emissions from cooking, equation (L16)			3.1599 ZC3
Total CO2 emissions			39.0834 ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000 ZC7
Net CO2 emissions			39.0834 ZC8

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1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.6400 (1b)	x 2.3200 (2b)	= 117.4848 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.6400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 117.4848 (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) = 0.1702 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4202 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3257 (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	0.4152	0.4071	0.3990	0.3583	0.3501	0.3094	0.3094	0.3013	0.3257	0.3501	0.3664	0.3827 (22b)
Effective ac	0.5862	0.5829	0.5796	0.5642	0.5613	0.5479	0.5479	0.5454	0.5530	0.5613	0.5671	0.5732 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			5.8800	1.3258	7.7955		(27)
TER Room Window (Uw = 1.70)			0.7200	1.5918	1.1461		(27a)
Main Wall	28.6000	5.8800	22.7200	0.1800	4.0896		(29a)
Wall to Hall	4.3200	1.8900	2.4300	0.1800	0.4374		(29a)
Slope roof	21.7900	0.7200	21.0700	0.1300	2.7391		(30)
Roof plane	30.0000		30.0000	0.1300	3.9000		(30)
Total net area of external elements Aum(A, m ²)			84.7100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.9976		(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)							3.4865 (36)
Total fabric heat loss						(33) + (36) =	25.4841 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	22.7275	22.5977	22.4705	21.8729	21.7611	21.2407	21.2407	21.1443	21.4411	21.7611	21.9873	22.2238 (38)
Heat transfer coeff	48.2116	48.0818	47.9546	47.3570	47.2452	46.7248	46.7248	46.6284	46.9253	47.2452	47.4714	47.7079 (39)
Average = Sum(39)m / 12 =												47.3565 (39)
HLP	0.9520	0.9495	0.9470	0.9352	0.9330	0.9227	0.9227	0.9208	0.9266	0.9330	0.9374	0.9421 (40)
HLP (average)												0.9352 (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												1.7090 (42)
Average daily hot water use (litres/day)												74.7877 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	82.2665	79.2750	76.2835	73.2920	70.3004	67.3089	67.3089	70.3004	73.2920	76.2835	79.2750	82.2665 (44)
Energy content (annual)	121.9988	106.7009	110.1058	95.9929	92.1075	79.4818	73.6515	84.5162	85.5256	99.6718	108.7996	118.1493 (45)
Distribution loss (46)m = 0.15 x (45)m	18.2998	16.0051	16.5159	14.3989	13.8161	11.9223	11.0477	12.6774	12.8288	14.9508	16.3199	17.7224 (46)
Water storage loss:												210.0000 (47)
Store volume												1.7016 (48)
a) If manufacturer declared loss factor is known (kWh/day):												

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Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9188 (55)
Total storage loss												
28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)
If cylinder contains dedicated solar storage												
28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month												
173.7454	153.4398	161.8524	146.0703	143.8541	129.5591	125.3981	136.2628	135.6029	151.4184	158.8770	169.8959	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h												
173.7454	153.4398	161.8524	146.0703	143.8541	129.5591	125.3981	136.2628	135.6029	151.4184	158.8770	169.8959	(64)
Heat gains from water heating, kWh/month												
81.9619	72.8691	78.0075	71.9795	72.0230	66.4896	65.8864	69.4989	68.4991	74.5382	76.2377	80.6819	(65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
85.4478	85.4478	85.4478	85.4478	85.4478	85.4478	85.4478	85.4478	85.4478	85.4478	85.4478	85.4478	85.4478 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
14.3960	12.7864	10.3986	7.8724	5.8847	4.9681	5.3683	6.9779	9.3657	11.8919	13.8796	14.7961	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
148.8960	150.4411	146.5476	138.2587	127.7955	117.9615	111.3918	109.8467	113.7403	122.0292	132.4924	142.3264	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
31.5448	31.5448	31.5448	31.5448	31.5448	31.5448	31.5448	31.5448	31.5448	31.5448	31.5448	31.5448	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	(71)
Water heating gains (Table 5)												
110.1638	108.4362	104.8487	99.9716	96.8051	92.3466	88.5570	93.4125	95.1377	100.1857	105.8858	108.4434	(72)
Total internal gains												
325.0902	323.2981	313.4293	297.7370	282.1197	266.9106	256.9514	261.8715	269.8780	285.7411	303.8921	317.2003	(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
West					5.8800	19.6403	0.6300	0.7000			0.7700	35.2936 (80)
North					0.7200	17.5997	0.6300	0.7000			1.0000	5.0294 (82)

Solar gains	40.3231	78.8063	131.7699	198.6001	251.2209	261.1319	246.9469	206.5105	155.0505	93.8375	50.2122	33.2308 (83)
Total gains	365.4133	402.1044	445.1992	496.3371	533.3405	528.0425	503.8983	468.3819	424.9285	379.5786	354.1042	350.4311 (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	72.9423	73.1392	73.3332	74.2586	74.4343	75.2634	75.2634	75.4190	74.9419	74.4343	74.0797	73.7125
alpha	5.8628	5.8759	5.8889	5.9506	5.9623	6.0176	6.0176	6.0279	5.9961	5.9623	5.9386	5.9142
util living area	0.9947	0.9896	0.9727	0.9099	0.7621	0.5581	0.4069	0.4557	0.7202	0.9415	0.9883	0.9958 (86)
MIT	20.1502	20.2759	20.4949	20.7657	20.9364	20.9917	20.9989	20.9980	20.9657	20.7413	20.4022	20.1277 (87)
Th 2	20.1235	20.1256	20.1278	20.1377	20.1396	20.1483	20.1483	20.1499	20.1449	20.1396	20.1358	20.1319 (88)
util rest of house	0.9930	0.9864	0.9642	0.8842	0.7092	0.4875	0.3287	0.3727	0.6466	0.9187	0.9841	0.9944 (89)
MIT 2	18.9963	19.1800	19.4952	19.8739	20.0817	20.1431	20.1479	20.1491	20.1198	19.8512	19.3719	18.9699 (90)
Living area fraction	0.9930	0.9864	0.9642	0.8842	0.7092	0.4875	0.3287	0.3727	0.6466	0.9187	0.9841	0.9944 (89)
MIT	19.6298	19.7816	20.0440	20.3634	20.5509	20.6089	20.6151	20.6151	20.5841	20.3398	19.9375	19.6055 (92)
Temperature adjustment	19.6298	19.7816	20.0440	20.3634	20.5509	20.6089	20.6151	20.6151	20.5841	20.3398	19.9375	19.6055 (93)
adjusted MIT	19.6298	19.7816	20.0440	20.3634	20.5509	20.6089	20.6151	20.6151	20.5841	20.3398	19.9375	19.6055 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9918	0.9849	0.9633	0.8915	0.7354	0.5261	0.3717	0.4183	0.6857	0.9247	0.9829	0.9934 (94)
Useful gains	362.4170	396.0303	428.8391	442.4984	392.2251	277.7915	187.2951	195.9333	291.3622	351.0068	348.0616	348.1217 (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	739.0729	715.5357	649.4975	542.8750	418.1642	280.7651	187.6036	196.5425	304.2704	460.1608	609.4135	734.9623 (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	280.2320	214.7076	164.1699	72.2712	19.2987	0.0000	0.0000	0.0000	0.0000	81.2106	188.1734	287.8094 (98)
Space heating												1307.8727 (98)
Space heating per m2												(98) / (4) = 25.8269 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1398.7944 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	280.2320	214.7076	164.1699	72.2712	19.2987	0.0000	0.0000	0.0000	0.0000	81.2106	188.1734	287.8094	(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)	299.7134	229.6338	175.5827	77.2954	20.6403	0.0000	0.0000	0.0000	0.0000	86.8562	201.2550	307.8176	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	173.7454	153.4398	161.8524	146.0703	143.8541	129.5591	125.3981	136.2628	135.6029	151.4184	158.8770	169.8959	(64)
Efficiency of water heater (217)m	86.0825	85.7101	84.8518	83.0502	80.9318	79.8000	79.8000	79.8000	79.8000	83.2355	85.2661	86.2093	(216)
Fuel for water heating, kWh/month	201.8359	179.0219	190.7473	175.8820	177.7472	162.3548	157.1405	170.7554	169.9285	181.9156	186.3308	197.0739	(219)
Water heating fuel used												2150.7336	(219)
Annual totals kWh/year													
Space heating fuel - main system												1398.7944	(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)												254.2385	(232)
Total delivered energy for all uses												3878.7665	(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	1398.7944	0.2160	302.1396 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2150.7336	0.2160	464.5585 (264)
Space and water heating			766.6980 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	254.2385	0.5190	131.9498 (268)
Total CO2, kg/m2/year			937.5729 (272)
Emissions per m2 for space and water heating			15.1402 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.6056 (272b)
Emissions per m2 for pumps and fans			0.7687 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.1402 * 1.55) + 2.6056 + 0.7687, rounded to 2 d.p.			26.8400 (273)

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CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.6400 (1b)	x 2.3200 (2b)	= 117.4848 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.6400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 117.4848 (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) = 0.1702 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4202 (18)
					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3257 (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												
	0.4152	0.4071	0.3990	0.3583	0.3501	0.3094	0.3094	0.3013	0.3257	0.3501	0.3664	0.3827 (22b)
Effective ac	0.5862	0.5829	0.5796	0.5642	0.5613	0.5479	0.5479	0.5454	0.5530	0.5613	0.5671	0.5732 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.40)			5.8800	1.3258	7.7955		(27)
Door to Stairs			1.8900	1.4000	2.6460		(26)
R lights (Uw = 1.60)			0.7200	1.5038	1.0827		(27a)
Main Wall	28.6000	5.8800	22.7200	0.2200	4.9984	60.0000	1363.2000 (29a)
Wall to Hall	4.3200	1.8900	2.4300	0.2060	0.5005	190.0000	461.7000 (29a)
Slope roof	21.7900	0.7200	21.0700	0.1400	2.9498	9.0000	189.6300 (30)
Roof plane	30.0000		30.0000	0.1000	3.0000	9.0000	270.0000 (30)
Total net area of external elements Aum(A, m ²)			84.7100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	22.9728			(33)
Party Wall 1			41.8000	0.0000	0.0000	180.0000	7524.0000 (32)
Party Floor 1			50.6400			40.0000	2025.6000 (32d)
Internal Wall 1			56.0000			9.0000	504.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	12338.1300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							243.6440 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.2385 (36)
Total fabric heat loss						(33) + (36) =	27.2113 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	22.7275	22.5977	22.4705	21.8729	21.7611	21.2407	21.2407	21.1443	21.4411	21.7611	21.9873	22.2238 (38)
Heat transfer coeff	49.9388	49.8090	49.6818	49.0843	48.9725	48.4520	48.4520	48.3556	48.6525	48.9725	49.1986	49.4351 (39)
Average = Sum(39)m / 12 =												49.0837 (39)
HLP	0.9862	0.9836	0.9811	0.9693	0.9671	0.9568	0.9568	0.9549	0.9608	0.9671	0.9715	0.9762 (40)
HLP (average)												0.9693 (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												1.7090 (42)
Average daily hot water use (litres/day)												74.7877 (43)
Daily hot water use	82.2665	79.2750	76.2835	73.2920	70.3004	67.3089	67.3089	70.3004	73.2920	76.2835	79.2750	82.2665 (44)
Energy conte	121.9988	106.7009	110.1058	95.9929	92.1075	79.4818	73.6515	84.5162	85.5256	99.6718	108.7996	118.1493 (45)
Energy content (annual)												Total = Sum(45)m = 1176.7019 (45)
Distribution loss (46)m = 0.15 x (45)m												

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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	25.9247	22.6739	23.3975	20.3985	19.5728	16.8899	15.6510	17.9597	18.1742	21.1803	23.1199	25.1067 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	85.4478	85.4478	85.4478	85.4478	85.4478	85.4478	85.4478	85.4478	85.4478	85.4478	85.4478	85.4478 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	14.3960	12.7864	10.3986	7.8724	5.8847	4.9681	5.3683	6.9779	9.3657	11.8919	13.8796	14.7961 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	148.8960	150.4411	146.5476	138.2587	127.7955	117.9615	111.3918	109.8467	113.7403	122.0292	132.4924	142.3264 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5448	31.5448	31.5448	31.5448	31.5448	31.5448	31.5448	31.5448	31.5448	31.5448	31.5448	31.5448 (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)	-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	-68.3582 (71)
Water heating gains (Table 5)	34.8451	33.7410	31.4482	28.3312	26.3076	23.4582	21.0362	24.1394	25.2419	28.4681	32.1110	33.7456 (72)
Total internal gains	246.7715	245.6029	237.0288	223.0967	208.6221	195.0222	186.4306	189.5983	196.9822	211.0235	227.1173	239.5025 (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	
West				5.8800	19.6403	0.6300		0.7000	0.7700		35.2936 (80)	
North				0.7200	17.5997	0.6300		0.7000	1.0000		5.0294 (82)	
Solar gains	40.3231	78.8063	131.7699	198.6001	251.2209	261.1319	246.9469	206.5105	155.0505	93.8375	50.2122	33.2308 (83)
Total gains	287.0946	324.4091	368.7987	421.6968	459.8430	456.1541	433.3775	396.1088	352.0327	304.8610	277.3295	272.7333 (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	68.6291	68.8080	68.9842	69.8240	69.9834	70.7351	70.7351	70.8761	70.4437	69.9834	69.6617	69.3285
alpha	5.5753	5.5872	5.5989	5.6549	5.6656	5.7157	5.7157	5.7251	5.6962	5.6656	5.6441	5.6219
util living area												
	0.9983	0.9962	0.9884	0.9534	0.8459	0.6539	0.4876	0.5523	0.8297	0.9773	0.9963	0.9987 (86)
MIT	19.9315	20.0650	20.3046	20.6242	20.8697	20.9768	20.9963	20.9928	20.9145	20.5859	20.2022	19.9084 (87)
Th 2	20.0949	20.0970	20.0991	20.1090	20.1109	20.1195	20.1195	20.1211	20.1162	20.1109	20.1071	20.1032 (88)
util rest of house												
	0.9977	0.9950	0.9844	0.9374	0.7995	0.5745	0.3923	0.4515	0.7624	0.9667	0.9949	0.9983 (89)
MIT 2	19.1143	19.2491	19.4883	19.8057	20.0241	20.1089	20.1185	20.1190	20.0685	19.7757	19.3945	19.0981 (90)
Living area fraction									fLA = Living area / (4) =			0.5490 (91)
MIT	19.5629	19.6970	19.9365	20.2551	20.4884	20.5854	20.6004	20.5987	20.5329	20.2205	19.8379	19.5429 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5629	19.6970	19.9365	20.2551	20.4884	20.5854	20.6004	20.5987	20.5329	20.2205	19.8379	19.5429 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9973	0.9943	0.9835	0.9404	0.8205	0.6175	0.4447	0.5071	0.7964	0.9683	0.9944	0.9980 (94)
Useful gains	286.3197	322.5475	362.7237	396.5710	377.2816	281.6716	192.7437	200.8494	280.3697	295.1945	275.7706	272.1768 (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	762.2118	737.0237	667.5479	557.3551	430.3875	290.0029	193.8265	203.0302	312.9768	471.1389	626.6887	758.4798 (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	354.0637	278.5280	226.7892	115.7645	39.5108	0.0000	0.0000	0.0000	0.0000	130.9026	252.6611	361.8094 (98)
Space heating												1760.0294 (98)
Space heating per m2										(98) / (4) =		34.7557 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	455.4487	358.5447	367.5026	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.9367	0.9709	0.9561	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	426.6233	348.1076	351.3842	0.0000	0.0000	0.0000	0.0000 (102)
	0.0000	0.0000	0.0000	0.0000	0.0000	589.3378	562.2412	521.9104	0.0000	0.0000	0.0000	0.0000 (103)

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Month fraction	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	117.1545	159.3154	126.8715	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												403.3413 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	29.2886	39.8288	31.7179	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												100.8353 (107)
Space cooling per m2												1.9912 (108)
Energy for space heating												34.7557 (99)
Energy for space cooling												1.9912 (108)
Total												36.7469 (109)
Dwelling Fabric Energy Efficiency (DFEE)												36.7 (109)

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CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.6400 (1b)	x 2.3200 (2b)	= 117.4848 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.6400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 117.4848 (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) = 0.1702 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4202 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3257 (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	0.4152	0.4071	0.3990	0.3583	0.3501	0.3094	0.3094	0.3013	0.3257	0.3501	0.3664	0.3827 (22b)
Effective ac	0.5862	0.5829	0.5796	0.5642	0.5613	0.5479	0.5479	0.5454	0.5530	0.5613	0.5671	0.5732 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			5.8800	1.3258	7.7955		(27)
TER Room Window (Uw = 1.70)			0.7200	1.5918	1.1461		(27a)
Main Wall	28.6000	5.8800	22.7200	0.1800	4.0896		(29a)
Wall to Hall	4.3200	1.8900	2.4300	0.1800	0.4374		(29a)
Slope roof	21.7900	0.7200	21.0700	0.1300	2.7391		(30)
Roof plane	30.0000		30.0000	0.1300	3.9000		(30)
Total net area of external elements Aum(A, m ²)			84.7100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	21.9976		(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)							3.4865 (36)
Total fabric heat loss						(33) + (36) =	25.4841 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	22.7275	22.5977	22.4705	21.8729	21.7611	21.2407	21.2407	21.1443	21.4411	21.7611	21.9873	22.2238 (38)
Heat transfer coeff	48.2116	48.0818	47.9546	47.3570	47.2452	46.7248	46.7248	46.6284	46.9253	47.2452	47.4714	47.7079 (39)
Average = Sum(39)m / 12 =												47.3565 (39)
HLP	0.9520	0.9495	0.9470	0.9352	0.9330	0.9227	0.9227	0.9208	0.9266	0.9330	0.9374	0.9421 (40)
HLP (average)												0.9352 (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												1.7090 (42)
Average daily hot water use (litres/day)												74.7877 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	82.2665	79.2750	76.2835	73.2920	70.3004	67.3089	67.3089	70.3004	73.2920	76.2835	79.2750	82.2665 (44)
Energy content (annual)	121.9988	106.7009	110.1058	95.9929	92.1075	79.4818	73.6515	84.5162	85.5256	99.6718	108.7996	118.1493 (45)
Distribution loss (46)m = 0.15 x (45)m												1176.7019 (45)
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

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If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Heat gains from water heating, kWh/month	25.9247	22.6739	23.3975	20.3985	19.5728	16.8899	15.6510	17.9597	18.1742	21.1803	23.1199	25.1067 (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	85.4478	85.4478	85.4478	85.4478	85.4478	85.4478	85.4478	85.4478	85.4478	85.4478	85.4478	85.4478	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	14.3960	12.7864	10.3986	7.8724	5.8847	4.9681	5.3683	6.9779	9.3657	11.8919	13.8796	14.7961	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	148.8960	150.4411	146.5476	138.2587	127.7955	117.9615	111.3918	109.8467	113.7403	122.0292	132.4924	142.3264	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5448	31.5448	31.5448	31.5448	31.5448	31.5448	31.5448	31.5448	31.5448	31.5448	31.5448	31.5448	(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)	-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	(71)
Water heating gains (Table 5)	34.8451	33.7410	31.4482	28.3312	26.3076	23.4582	21.0362	24.1394	25.2419	28.4681	32.1110	33.7456	(72)
Total internal gains	246.7715	245.6029	237.0288	223.0967	208.6221	195.0222	186.4306	189.5983	196.9822	211.0235	227.1173	239.5025	(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
West					5.8800	19.6403	0.6300	0.7000	0.7700			35.2936 (80)
North					0.7200	17.5997	0.6300	0.7000	1.0000			5.0294 (82)

Solar gains	40.3231	78.8063	131.7699	198.6001	251.2209	261.1319	246.9469	206.5105	155.0505	93.8375	50.2122	33.2308 (83)
Total gains	287.0946	324.4091	368.7987	421.6968	459.8430	456.1541	433.3775	396.1088	352.0327	304.8610	277.3295	272.7333 (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	72.9423	73.1392	73.3332	74.2586	74.4343	75.2634	75.2634	75.4190	74.9419	74.4343	74.0797	73.7125	
alpha	5.8628	5.8759	5.8889	5.9506	5.9623	6.0176	6.0176	6.0279	5.9961	5.9623	5.9386	5.9142	
util living area	0.9985	0.9965	0.9886	0.9517	0.8362	0.6368	0.4716	0.5353	0.8189	0.9771	0.9966	0.9989	(86)
MIT	20.0025	20.1322	20.3631	20.6686	20.8940	20.9834	20.9976	20.9952	20.9313	20.6264	20.2602	19.9802	(87)
Th 2	20.1235	20.1256	20.1278	20.1377	20.1396	20.1483	20.1483	20.1499	20.1449	20.1396	20.1358	20.1319	(88)
util rest of house	0.9980	0.9953	0.9847	0.9351	0.7889	0.5600	0.3818	0.4396	0.7508	0.9663	0.9953	0.9985	(89)
MIT 2	19.2070	19.3380	19.5686	19.8717	20.0701	20.1409	20.1476	20.1485	20.1075	19.8382	19.4744	19.1917	(90)
Living area fraction	19.6437	19.7740	20.0047	20.3092	20.5224	20.6034	20.6143	20.6133	20.5598	20.2709	19.9058	19.6246	(91)
MIT	19.6437	19.7740	20.0047	20.3092	20.5224	20.6034	20.6143	20.6133	20.5598	20.2709	19.9058	19.6246	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6437	19.7740	20.0047	20.3092	20.5224	20.6034	20.6143	20.6133	20.5598	20.2709	19.9058	19.6246	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9976	0.9947	0.9840	0.9388	0.8111	0.6018	0.4312	0.4923	0.7859	0.9683	0.9948	0.9982	(94)
Useful gains	286.4100	322.6984	362.9120	395.9095	372.9898	274.5204	186.8749	195.0047	276.6542	295.1938	275.8967	272.2483	(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	739.7442	715.1683	647.6147	540.3042	416.8177	280.5091	187.5658	196.4607	303.1255	456.9041	607.9094	735.8727	(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	(98)
Space heating kWh	337.2806	263.7398	211.8188	103.9642	32.6080	0.0000	0.0000	0.0000	0.0000	120.3125	239.0491	344.9365	(98)
Space heating												1653.7095	(98)
Space heating per m2												32.6562	(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	439.2129	345.7634	354.3758	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9503	0.9786	0.9667	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	417.3660	338.3798	342.5711	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	589.3378	562.2412	521.9104	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	123.8197	166.5528	133.4284	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												423.8010	(104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Cooled fraction											FC = cooled area / (4) =	1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	30.9549	41.6382	33.3571	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												105.9502 (107)
Space cooling per m2												2.0922 (108)
Energy for space heating												32.6562 (99)
Energy for space cooling												2.0922 (108)
Total												34.7484 (109)
Target Fabric Energy Efficiency (TFEE)												40.0 (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	50.6400 (1b)	x 2.3200 (2b)	= 117.4848 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.6400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 117.4848 (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) = 0.1702 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4202 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3257 (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	0.3583	0.3338	0.3338	0.3175	0.3175	0.2768	0.2768	0.2687	0.2768	0.3094	0.3013	0.3257 (22b)
Effective ac	0.5642	0.5557	0.5557	0.5504	0.5504	0.5383	0.5383	0.5361	0.5383	0.5479	0.5454	0.5530 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.40)			5.8800	1.3258	7.7955		(27)
Door to Stairs			1.8900	1.4000	2.6460		(26)
R lights (Uw = 1.60)			0.7200	1.5038	1.0827		(27a)
Main Wall	28.6000	5.8800	22.7200	0.2200	4.9984	60.0000	1363.2000 (29a)
Wall to Hall	4.3200	1.8900	2.4300	0.2060	0.5005	190.0000	461.7000 (29a)
Slope roof	21.7900	0.7200	21.0700	0.1400	2.9498	9.0000	189.6300 (30)
Roof plane	30.0000		30.0000	0.1000	3.0000	9.0000	270.0000 (30)
Total net area of external elements Aum(A, m ²)			84.7100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	22.9728			(33)
Party Wall 1			41.8000	0.0000	0.0000	180.0000	7524.0000 (32)
Party Floor 1			50.6400			40.0000	2025.6000 (32d)
Internal Wall 1			56.0000			9.0000	504.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	12338.1300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							243.6440 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.2385 (36)
Total fabric heat loss						(33) + (36) =	27.2113 (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	21.8729	21.5452	21.5452	21.3396	21.3396	20.8706	20.8706	20.7845	20.8706	21.2407	21.1443	21.4411 (38)
Heat transfer coeff	49.0843	48.7566	48.7566	48.5509	48.5509	48.0819	48.0819	47.9958	48.0819	48.4520	48.3556	48.6525 (39)
Average = Sum(39)m / 12 =												48.4501 (39)
HLP	0.9693	0.9628	0.9628	0.9587	0.9587	0.9495	0.9495	0.9478	0.9495	0.9568	0.9549	0.9608 (40)
HLP (average)												0.9568 (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												1.7090 (42)
Average daily hot water use (litres/day)												74.7877 (43)
Daily hot water use	82.2665	79.2750	76.2835	73.2920	70.3004	67.3089	67.3089	70.3004	73.2920	76.2835	79.2750	82.2665 (44)
Energy conte	121.9988	106.7009	110.1058	95.9929	92.1075	79.4818	73.6515	84.5162	85.5256	99.6718	108.7996	118.1493 (45)
Energy content (annual)										Total = Sum(45)m =		1176.7019 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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CALCULATION OF HEAT DEMAND 09 Jan 2014

	18.2998	16.0051	16.5159	14.3989	13.8161	11.9223	11.0477	12.6774	12.8288	14.9508	16.3199	17.7224 (46)
Water storage loss:												
Store volume												210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8600 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0044 (55)
Total storage loss												
31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(56)
If cylinder contains dedicated solar storage												
31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
176.3976	155.8353	164.5046	148.6369	146.5063	132.1258	128.0503	138.9150	138.1696	154.0706	161.4436	172.5481	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h												
176.3976	155.8353	164.5046	148.6369	146.5063	132.1258	128.0503	138.9150	138.1696	154.0706	161.4436	172.5481	(64)
RHI water heating demand												
Heat gains from water heating, kWh/month												
84.0836	74.7856	80.1292	74.0328	74.1448	68.5429	68.0082	71.6207	70.5525	76.6599	78.2911	82.8037	(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	102.5374	102.5374	102.5374	102.5374	102.5374	102.5374	102.5374	102.5374	102.5374	102.5374	102.5374	102.5374 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
35.9901	31.9661	25.9966	19.6811	14.7118	12.4203	13.4206	17.4446	23.4142	29.7296	34.6989	36.9904	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
222.2329	224.5390	218.7277	206.3563	190.7395	176.0620	166.2565	163.9504	169.7616	182.1331	197.7498	212.4274	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
46.9627	46.9627	46.9627	46.9627	46.9627	46.9627	46.9627	46.9627	46.9627	46.9627	46.9627	46.9627	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	(71)
Water heating gains (Table 5)												
113.0157	111.2881	107.7006	102.8234	99.6570	95.1985	91.4088	96.2644	97.9895	103.0375	108.7376	111.2953	(72)
Total internal gains	452.3805	448.9350	433.5667	410.0025	386.2501	364.8226	352.2277	358.8012	372.3071	396.0421	422.3282	441.8549 (73)

6. Solar gains

[Jan]												Gains
					Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b		Specific data FF or Table 6c	Access factor Table 6d		W
West					5.8800	23.7835	0.6300		0.7000	0.7700		42.7390 (80)
North					0.7200	21.1020	0.6300		0.7000	1.0000		6.0303 (82)
Solar gains	48.7693	83.4796	138.8091	212.3496	261.3571	287.1180	268.9505	229.5935	174.1395	106.7804	59.8699	40.3921 (83)
Total gains	501.1498	532.4146	572.3758	622.3522	647.6072	651.9406	621.1782	588.3946	546.4466	502.8225	482.1981	482.2469 (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	69.8240	70.2933	70.2933	70.5910	70.5910	71.2796	71.2796	Aug	Sep	Oct	Nov	Dec
alpha	5.6549	5.6862	5.6862	5.7061	5.7061	5.7520	5.7520	5.7605	5.7520	5.7157	5.7251	5.6962
util living area	0.9707	0.9554	0.9077	0.7924	0.6059	0.3971	0.2631	0.2935	0.5378	0.8160	0.9421	0.9748 (86)
Tweekday	19.4707	19.5920	19.7898	19.9648	20.0357	20.0559	20.0564	20.0579	20.0526	19.9718	19.7287	19.4568
Tweekend	20.6805	20.7342	20.8280	20.9164	20.9591	20.9687	20.9694	20.9694	20.9654	20.9171	20.7941	20.6712
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	20.5069	20.5889	20.7345	20.8695	20.9369	20.9519	20.9528	20.9528	20.9460	20.8720	20.6785	20.4926 (87)
Th 2	20.1090	20.1144	20.1144	20.1179	20.1179	20.1256	20.1256	20.1271	20.1256	20.1195	20.1211	20.1162 (88)
util rest of house	0.9629	0.9438	0.8850	0.7507	0.5473	0.3334	0.1955	0.2224	0.4654	0.7682	0.9252	0.9678 (89)
Tweekday	19.4707	19.5920	19.7898	19.9648	20.0357	20.0559	20.0564	20.0579	20.0526	19.9718	19.7287	19.4568
Tweekend	19.4707	19.5920	19.7898	19.9648	20.0357	20.0559	20.0564	20.0579	20.0526	19.9718	19.7287	19.4568
MIT 2	19.4707	19.5920	19.7898	19.9648	20.0357	20.0559	20.0564	20.0579	20.0526	19.9718	19.7287	19.4568 (90)
Living area fraction									fLA = Living area / (4) =			0.5490 (91)
MIT	20.0395	20.1392	20.3084	20.4615	20.5305	20.5478	20.5485	20.5492	20.5431	20.4660	20.2501	20.0254 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0395	20.1392	20.3084	20.4615	20.5305	20.5478	20.5485	20.5492	20.5431	20.4660	20.2501	20.0254 (93)

8. Space heating requirement

Utilisation	0.9622	0.9441	0.8904	0.7676	0.5751	0.3642	0.2282	Aug	Sep	Oct	Nov	Dec
Useful gains	482.1851	502.6786	509.6468	477.7289	372.4437	237.4396	141.7462	151.1018	273.4167	396.2674	447.4530	466.3399 (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	743.1132	713.7582	634.2452	522.4795	380.1758	237.8981	141.7685	151.1465	276.1380	439.2648	602.0318	735.8895 (97)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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CALCULATION OF HEAT DEMAND 09 Jan 2014

Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh												
	194.1305	141.8455	92.7011	32.2204	5.7527	0.0000	0.0000	0.0000	0.0000	31.9901	111.2967	200.5449 (98)
Space heating												810.4820 (98)
RHI space heating demand												810 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.6400 (1b)	x 2.3200 (2b)	= 117.4848 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.6400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 117.4848 (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) = 0.1702 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4202 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3257 (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												
	0.4152	0.4071	0.3990	0.3583	0.3501	0.3094	0.3094	0.3013	0.3257	0.3501	0.3664	0.3827 (22b)
Effective ac	0.5862	0.5829	0.5796	0.5642	0.5613	0.5479	0.5479	0.5454	0.5530	0.5613	0.5671	0.5732 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.40)			5.8800	1.3258	7.7955		(27)
Door to Stairs			1.8900	1.4000	2.6460		(26)
R lights (Uw = 1.60)			0.7200	1.5038	1.0827		(27a)
Main Wall	28.6000	5.8800	22.7200	0.2200	4.9984	60.0000	1363.2000 (29a)
Wall to Hall	4.3200	1.8900	2.4300	0.2060	0.5005	190.0000	461.7000 (29a)
Slope roof	21.7900	0.7200	21.0700	0.1400	2.9498	9.0000	189.6300 (30)
Roof plane	30.0000		30.0000	0.1000	3.0000	9.0000	270.0000 (30)
Total net area of external elements Aum(A, m ²)			84.7100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	22.9728			(33)
Party Wall 1			41.8000	0.0000	0.0000	180.0000	7524.0000 (32)
Party Floor 1			50.6400			40.0000	2025.6000 (32d)
Internal Wall 1			56.0000			9.0000	504.0000 (32c)
Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =				12338.1300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							243.6440 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.2385 (36)
Total fabric heat loss			(33) + (36) =				27.2113 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	22.7275	22.5977	22.4705	21.8729	21.7611	21.2407	21.2407	21.1443	21.4411	21.7611	21.9873	22.2238 (38)
Heat transfer coeff	49.9388	49.8090	49.6818	49.0843	48.9725	48.4520	48.4520	48.3556	48.6525	48.9725	49.1986	49.4351 (39)
Average = Sum(39)m / 12 =												49.0837 (39)
HLP	0.9862	0.9836	0.9811	0.9693	0.9671	0.9568	0.9568	0.9549	0.9608	0.9671	0.9715	0.9762 (40)
HLP (average)												0.9693 (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												1.7090 (42)
Average daily hot water use (litres/day)												74.7877 (43)
Daily hot water use	82.2665	79.2750	76.2835	73.2920	70.3004	67.3089	67.3089	70.3004	73.2920	76.2835	79.2750	82.2665 (44)
Energy conte	121.9988	106.7009	110.1058	95.9929	92.1075	79.4818	73.6515	84.5162	85.5256	99.6718	108.7996	118.1493 (45)
Energy content (annual)												Total = Sum(45)m = 1176.7019 (45)
Distribution loss (46)m = 0.15 x (45)m												

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	18.2998	16.0051	16.5159	14.3989	13.8161	11.9223	11.0477	12.6774	12.8288	14.9508	16.3199	17.7224 (46)
Water storage loss:												
Store volume												210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8600 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0044 (55)
Total storage loss												
31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(56)
If cylinder contains dedicated solar storage												
31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	(59)
Total heat required for water heating calculated for each month												
176.3976	155.8353	164.5046	148.6369	146.5063	132.1258	128.0503	138.9150	138.1696	154.0706	161.4436	172.5481	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h												
176.3976	155.8353	164.5046	148.6369	146.5063	132.1258	128.0503	138.9150	138.1696	154.0706	161.4436	172.5481	(64)
Heat gains from water heating, kWh/month												
84.0836	74.7856	80.1292	74.0328	74.1448	68.5429	68.0082	71.6207	70.5525	76.6599	78.2911	82.8037	(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	102.5374	102.5374	102.5374	102.5374	102.5374	102.5374	102.5374	102.5374	102.5374	102.5374	102.5374	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
35.9901	31.9661	25.9966	19.6811	14.7118	12.4203	13.4206	17.4446	23.4142	29.7296	34.6989	36.9904	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
222.2329	224.5390	218.7277	206.3563	190.7395	176.0620	166.2565	163.9504	169.7616	182.1331	197.7498	212.4274	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
46.9627	46.9627	46.9627	46.9627	46.9627	46.9627	46.9627	46.9627	46.9627	46.9627	46.9627	46.9627	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	(71)
Water heating gains (Table 5)												
113.0157	111.2881	107.7006	102.8234	99.6570	95.1985	91.4088	96.2644	97.9895	103.0375	108.7376	111.2953	(72)
Total internal gains	452.3805	448.9350	433.5667	410.0025	386.2501	364.8226	352.2277	358.8012	372.3071	396.0421	422.3282	441.8549 (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
West				5.8800	19.6403	0.6300		0.7000		0.7700		35.2936 (80)
North				0.7200	17.5997	0.6300		0.7000		1.0000		5.0294 (82)
Solar gains	40.3231	78.8063	131.7699	198.6001	251.2209	261.1319	246.9469	206.5105	155.0505	93.8375	50.2122	33.2308 (83)
Total gains	492.7035	527.7412	565.3366	608.6026	637.4710	625.9545	599.1746	565.3116	527.3576	489.8796	472.5403	475.0857 (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	68.6291	68.8080	68.9842	69.8240	69.9834	70.7351	70.7351	70.8761	70.4437	69.9834	69.6617	69.3285
alpha	5.5753	5.5872	5.5989	5.6549	5.6656	5.7157	5.7157	5.7251	5.6962	5.6656	5.6441	5.6219
util living area	0.9775	0.9648	0.9306	0.8392	0.6805	0.4908	0.3552	0.3923	0.6180	0.8660	0.9580	0.9810 (86)
Tweekday	19.3585	19.4837	19.6857	19.9073	20.0127	20.0473	20.0496	20.0512	20.0363	19.9108	19.6213	19.3394
Tweekend	20.6350	20.6913	20.7845	20.8899	20.9484	20.9665	20.9689	20.9687	20.9598	20.8882	20.7495	20.6232
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	20.4367	20.5225	20.6675	20.8281	20.9204	20.9486	20.9520	20.9517	20.9373	20.8274	20.6088	20.4184 (87)
Th 2	20.0949	20.0970	20.0991	20.1090	20.1109	20.1195	20.1195	20.1211	20.1162	20.1109	20.1071	20.1032 (88)
util rest of house	0.9715	0.9555	0.9130	0.8037	0.6258	0.4253	0.2844	0.3180	0.5462	0.8277	0.9455	0.9758 (89)
Tweekday	19.3585	19.4837	19.6857	19.9073	20.0127	20.0473	20.0496	20.0512	20.0363	19.9108	19.6213	19.3394
Tweekend	19.3585	19.4837	19.6857	19.9073	20.0127	20.0473	20.0496	20.0512	20.0363	19.9108	19.6213	19.3394
MIT 2	19.3585	19.4837	19.6857	19.9073	20.0127	20.0473	20.0496	20.0512	20.0363	19.9108	19.6213	19.3394 (90)
Living area fraction									fLA = Living area / (4) =			0.5490 (91)
MIT	19.9504	20.0540	20.2247	20.4128	20.5110	20.5421	20.5450	20.5455	20.5309	20.4140	20.1634	19.9317 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9504	20.0540	20.2247	20.4128	20.5110	20.5421	20.5450	20.5455	20.5309	20.4140	20.1634	19.9317 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9704	0.9550	0.9157	0.8165	0.6510	0.4570	0.3187	0.3540	0.5806	0.8417	0.9464	0.9747 (94)
Useful gains	478.0962	503.9943	517.6627	496.9260	414.9914	286.0599	190.9537	200.1170	306.1726	412.3526	447.2080	463.0498 (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	781.5625	754.8042	681.8664	565.0984	431.4950	287.9058	191.1436	200.4594	312.8796	480.6161	642.7015	777.6994 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)

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Space heating kWh	225.7789	168.5442	122.1675	49.0841	12.2787	0.0000	0.0000	0.0000	0.0000	50.7880	140.7553	234.0993 (98)
Space heating												1003.4962 (98)
Space heating per m2												(98) / (4) = 19.8163 (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 %)												184.8072 (206)
Efficiency of secondary/supplementary heating system, %												100.0000 (208)
Space heating requirement												542.9961 (211)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	225.7789	168.5442	122.1675	49.0841	12.2787	0.0000	0.0000	0.0000	0.0000	50.7880	140.7553	234.0993 (98)
Space heating efficiency (main heating system 1)	184.8072	184.8072	184.8072	184.8072	184.8072	0.0000	0.0000	0.0000	0.0000	184.8072	184.8072	184.8072 (210)
Space heating fuel (main heating system)	122.1699	91.2000	66.1054	26.5596	6.6441	0.0000	0.0000	0.0000	0.0000	27.4816	76.1633	126.6721 (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	176.3976	155.8353	164.5046	148.6369	146.5063	132.1258	128.0503	138.9150	138.1696	154.0706	161.4436	172.5481 (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	104.1062	91.9708	97.0872	87.7224	86.4650	77.9779	75.5727	81.9848	81.5449	90.9293	95.2807	101.8344 (219)
Water heating fuel used												1072.4763 (219)
Annual totals kWh/year												
Space heating fuel - main system												542.9961 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)
Electricity for lighting (calculated in Appendix L)												254.2385 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
Total delivered energy for all uses												1869.7110 (238)

10a. Fuel costs - using Table 12 prices

	Fuel	Fuel price	Fuel cost
	kWh/year	p/kWh	£/year
Space heating - main system 1	542.9961	13.1900	71.6212 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1072.4763	13.1900	141.4596 (247)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	254.2385	13.1900	33.5341 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit	0.0000	13.1900	0.0000 (252)
Total energy cost			246.6149 (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] =	1.0830 (257)
SAP value		84.8921
SAP rating (Section 12)		85 (258)
SAP band		B

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

	Energy	Emission factor	Emissions
	kWh/year	kg CO2/kWh	kg CO2/year
Space heating - main system 1	542.9961	0.5190	281.8150 (261)
Space heating - secondary	0.0000	0.5190	0.0000 (263)
Water heating (other fuel)	1072.4763	0.5190	556.6152 (264)
Space and water heating			838.4302 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	254.2385	0.5190	131.9498 (268)
Energy saving/generation technologies			
PV Unit	-300.0000	0.5190	-155.7000 (269)
Total kg/year			814.6800 (272)
CO2 emissions per m2			16.0900 (273)
EI value			88.5856
EI rating			89 (274)
EI band			B

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Calculation of stars for heating and DHW

Main heating energy efficiency	$13.19 \times (1 + 0.29 \times 0.25) / 1.8481 = 7.655$, stars = 2
Main heating environmental impact	$0.519 \times (1 + 0.29 \times 0.25) / 1.8481 = 0.3012$, stars = 4
Water heating energy efficiency	$13.19 / 1.6944 = 7.784$, stars = 2
Water heating environmental impact	$0.519 / 1.6944 = 0.3063$, stars = 4

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.6400 (1b)	x 2.3200 (2b)	= 117.4848 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.6400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 117.4848 (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) = 0.1702 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4202 (18)
Number of sides sheltered					3 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3257 (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	0.3583	0.3338	0.3338	0.3175	0.3175	0.2768	0.2768	0.2687	0.2768	0.3094	0.3013	0.3257 (22b)
Effective ac	0.5642	0.5557	0.5557	0.5504	0.5504	0.5383	0.5383	0.5361	0.5383	0.5479	0.5454	0.5530 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.40)			5.8800	1.3258	7.7955		(27)
Door to Stairs			1.8900	1.4000	2.6460		(26)
R lights (Uw = 1.60)			0.7200	1.5038	1.0827		(27a)
Main Wall	28.6000	5.8800	22.7200	0.2200	4.9984	60.0000	1363.2000 (29a)
Wall to Hall	4.3200	1.8900	2.4300	0.2060	0.5005	190.0000	461.7000 (29a)
Slope roof	21.7900	0.7200	21.0700	0.1400	2.9498	9.0000	189.6300 (30)
Roof plane	30.0000		30.0000	0.1000	3.0000	9.0000	270.0000 (30)
Total net area of external elements Aum(A, m ²)			84.7100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	22.9728			(33)
Party Wall 1			41.8000	0.0000	0.0000	180.0000	7524.0000 (32)
Party Floor 1			50.6400			40.0000	2025.6000 (32d)
Internal Wall 1			56.0000			9.0000	504.0000 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 12338.1300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							243.6440 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.2385 (36)
Total fabric heat loss							(33) + (36) = 27.2113 (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	21.8729	21.5452	21.5452	21.3396	21.3396	20.8706	20.8706	20.7845	20.8706	21.2407	21.1443	21.4411 (38)
Heat transfer coeff	49.0843	48.7566	48.7566	48.5509	48.5509	48.0819	48.0819	47.9958	48.0819	48.4520	48.3556	48.6525 (39)
Average = Sum(39)m / 12 =												48.4501 (39)
HLP	0.9693	0.9628	0.9628	0.9587	0.9587	0.9495	0.9495	0.9478	0.9495	0.9568	0.9549	0.9608 (40)
HLP (average)												0.9568 (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												1.7090 (42)
Average daily hot water use (litres/day)												74.7877 (43)
Daily hot water use	82.2665	79.2750	76.2835	73.2920	70.3004	67.3089	67.3089	70.3004	73.2920	76.2835	79.2750	82.2665 (44)
Energy conte	121.9988	106.7009	110.1058	95.9929	92.1075	79.4818	73.6515	84.5162	85.5256	99.6718	108.7996	118.1493 (45)
Energy content (annual)												Total = Sum(45)m = 1176.7019 (45)
Distribution loss (46)m = 0.15 x (45)m												

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	18.2998	16.0051	16.5159	14.3989	13.8161	11.9223	11.0477	12.6774	12.8288	14.9508	16.3199	17.7224 (46)
Water storage loss:												
Store volume												210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8600 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0044 (55)
Total storage loss												
31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(56)
If cylinder contains dedicated solar storage												
31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
176.3976	155.8353	164.5046	148.6369	146.5063	132.1258	128.0503	138.9150	138.1696	154.0706	161.4436	172.5481	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h												
176.3976	155.8353	164.5046	148.6369	146.5063	132.1258	128.0503	138.9150	138.1696	154.0706	161.4436	172.5481	(64)
Heat gains from water heating, kWh/month												
84.0836	74.7856	80.1292	74.0328	74.1448	68.5429	68.0082	71.6207	70.5525	76.6599	78.2911	82.8037	(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	102.5374	102.5374	102.5374	102.5374	102.5374	102.5374	102.5374	102.5374	102.5374	102.5374	102.5374	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
35.9901	31.9661	25.9966	19.6811	14.7118	12.4203	13.4206	17.4446	23.4142	29.7296	34.6989	36.9904	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
222.2329	224.5390	218.7277	206.3563	190.7395	176.0620	166.2565	163.9504	169.7616	182.1331	197.7498	212.4274	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
46.9627	46.9627	46.9627	46.9627	46.9627	46.9627	46.9627	46.9627	46.9627	46.9627	46.9627	46.9627	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	-68.3582	(71)
Water heating gains (Table 5)												
113.0157	111.2881	107.7006	102.8234	99.6570	95.1985	91.4088	96.2644	97.9895	103.0375	108.7376	111.2953	(72)
Total internal gains												
452.3805	448.9350	433.5667	410.0025	386.2501	364.8226	352.2277	358.8012	372.3071	396.0421	422.3282	441.8549	(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
West					5.8800	23.7835	0.6300	0.7000			0.7700	42.7390 (80)
North					0.7200	21.1020	0.6300	0.7000			1.0000	6.0303 (82)
Solar gains	48.7693	83.4796	138.8091	212.3496	261.3571	287.1180	268.9505	229.5935	174.1395	106.7804	59.8699	40.3921 (83)
Total gains	501.1498	532.4146	572.3758	622.3522	647.6072	651.9406	621.1782	588.3946	546.4466	502.8225	482.1981	482.2469 (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	69.8240	70.2933	70.2933	70.5910	70.5910	71.2796	71.2796	71.4075	71.2796	70.7351	70.8761	70.4437
alpha	5.6549	5.6862	5.6862	5.7061	5.7061	5.7520	5.7520	5.7605	5.7520	5.7157	5.7251	5.6962
util living area												
0.9707	0.9554	0.9077	0.7924	0.6059	0.3971	0.2631	0.2935	0.5378	0.8160	0.9421	0.9748	(86)
Tweekday	19.4707	19.5920	19.7898	19.9648	20.0357	20.0559	20.0564	20.0579	20.0526	19.9718	19.7287	19.4568
Tweekend	20.6805	20.7342	20.8280	20.9164	20.9591	20.9687	20.9694	20.9694	20.9654	20.9171	20.7941	20.6712
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	20.5069	20.5889	20.7345	20.8695	20.9369	20.9519	20.9528	20.9528	20.9460	20.8720	20.6785	20.4926 (87)
Th 2	20.1090	20.1144	20.1144	20.1179	20.1179	20.1256	20.1256	20.1271	20.1256	20.1195	20.1211	20.1162 (88)
util rest of house												
0.9629	0.9438	0.8850	0.7507	0.5473	0.3334	0.1955	0.2224	0.4654	0.7682	0.9252	0.9678	(89)
Tweekday	19.4707	19.5920	19.7898	19.9648	20.0357	20.0559	20.0564	20.0579	20.0526	19.9718	19.7287	19.4568
Tweekend	19.4707	19.5920	19.7898	19.9648	20.0357	20.0559	20.0564	20.0579	20.0526	19.9718	19.7287	19.4568
MIT 2	19.4707	19.5920	19.7898	19.9648	20.0357	20.0559	20.0564	20.0579	20.0526	19.9718	19.7287	19.4568 (90)
Living area fraction												
MIT	20.0395	20.1392	20.3084	20.4615	20.5305	20.5478	20.5485	20.5492	20.5431	20.4660	20.2501	0.5490 (91)
Temperature adjustment												0.0000
adjusted MIT	20.0395	20.1392	20.3084	20.4615	20.5305	20.5478	20.5485	20.5492	20.5431	20.4660	20.2501	20.0254 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	482.1851	502.6786	509.6468	477.7289	372.4437	237.4396	141.7462	151.1018	273.4167	396.2674	447.4530	466.3399 (94)
Ext temp.	4.9000	5.5000	7.3000	9.7000	12.7000	15.6000	17.6000	17.4000	14.8000	11.4000	7.8000	4.9000 (96)
Heat loss rate W												
743.1132	713.7582	634.2452	522.4795	380.1758	237.8981	141.7685	151.1465	276.1380	439.2648	602.0318	735.8895	(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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Space heating kWh	194.1305	141.8455	92.7011	32.2204	5.7527	0.0000	0.0000	0.0000	0.0000	31.9901	111.2967	200.5449 (98)
Space heating												810.4820 (98)
Space heating per m2											(98) / (4) =	16.0048 (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 %)												182.7998 (206)
Efficiency of secondary/supplementary heating system, %												100.0000 (208)
Space heating requirement												443.3713 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	194.1305	141.8455	92.7011	32.2204	5.7527	0.0000	0.0000	0.0000	0.0000	31.9901	111.2967	200.5449 (98)
Space heating efficiency (main heating system 1)	182.7998	182.7998	182.7998	182.7998	182.7998	0.0000	0.0000	0.0000	0.0000	182.7998	182.7998	182.7998 (210)
Space heating fuel (main heating system)	106.1984	77.5961	50.7118	17.6261	3.1470	0.0000	0.0000	0.0000	0.0000	17.5001	60.8845	109.7074 (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	176.3976	155.8353	164.5046	148.6369	146.5063	132.1258	128.0503	138.9150	138.1696	154.0706	161.4436	172.5481 (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	104.1062	91.9708	97.0872	87.7224	86.4650	77.9779	75.5727	81.9848	81.5449	90.9293	95.2807	101.8344 (219)
Water heating fuel used												1072.4763 (219)
Annual totals kWh/year												
Space heating fuel - main system												443.3713 (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)												254.2385 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
Total delivered energy for all uses												1770.0862 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	443.3713	19.1200	84.7726 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1072.4763	19.1200	205.0575 (247)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	254.2385	19.1200	48.6104 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit	0.0000	19.1200	0.0000 (252)
Total energy cost			338.4405 (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	443.3713	0.5190	230.1097 (261)
Space heating - secondary	0.0000	0.5190	0.0000 (263)
Water heating (other fuel)	1072.4763	0.5190	556.6152 (264)
Space and water heating			786.7249 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	254.2385	0.5190	131.9498 (268)
Energy saving/generation technologies			
PV Unit	-300.0000	0.5190	-155.7000 (269)
Total kg/year			762.9747 (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	443.3713	3.0700	1361.1499 (261)
Space heating - secondary	0.0000	3.0700	0.0000 (263)
Water heating (other fuel)	1072.4763	3.0700	3292.5023 (264)
Space and water heating			4653.6522 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	254.2385	3.0700	780.5123 (268)

FULL SAP CALCULATION PRINTOUT

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

Energy saving/generation technologies			
PV Unit	-300.0000	3.0700	-921.0000 (269)
Primary energy kWh/year			4513.1645 (272)
Primary energy kWh/m2/year			89.1225 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	B 85
Current environmental impact rating:	B 89

(For testing purposes):

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

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

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
	Total Savings £0		0.00 kg/m²

Potential energy efficiency rating:	B 85
Potential environmental impact rating:	B 89

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

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

	Current	Potential	Saving
Electricity	£338	£338	£0
Space heating	£85	£85	£0
Water heating	£205	£205	£0
Lighting	£49	£49	£0
Total cost of fuels	£338	£338	£0
Total cost of uses	£339	£339	£0
Delivered energy	35 kWh/m²	35 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.8 tonnes	0.8 tonnes	0.0 tonnes
CO2 emissions per m²	15 kg/m²	15 kg/m²	0 kg/m²
Primary energy	89 kWh/m²	89 kWh/m²	0 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Energy Calculations Ltd
SAP ♦ CODE ♦ SBEM ♦ DESIGN

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

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

No improvements selected / applicable

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

Overheating Calculation Input Data

Dwelling type	MidTerrace Flat
Number of storeys	1
Cross ventilation possible	Yes
SAP Region	Thames Valley
Front of dwelling faces	West
Overshading	Average or unknown
Thermal mass parameter	243.6 (calculated from construction elements)
Night ventilation	No
Ventilation rate during hot weather (ach)	6.00 (Windows fully open)

Overheating Calculation

Summer ventilation heat loss coefficient	232.62 (P1)
Transmission heat loss coefficient	27.21 (37)
Summer heat loss coefficient	259.83 (P2)

Overhangs	Ratio	Z_overhangs	Overhang type
Orientation			
West	0.000	1.000	None
Solar shading			
Orientation	Z blinds	Solar access	Z overhangs Z summer
North	1.000	1.00	1.000 (P8)
West	1.000	0.90	1.000 (P8)
[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b
			FF Specific data or Table 6c
West	5.8800	117.5071	0.6300 0.7000
North	0.7200	188.5731	0.6300 0.7000
total:			300.6994

Solar gains	Jun	Jul	Aug	(P3)
Internal gains	321	301	258	
Total summer gains	365	352	359	(P5)
Summer gain/loss ratio	2.64	2.51	2.38	(P6)
Summer external temperature	16.00	17.90	17.80	
Thermal mass temperature increment (TMP = 243.6)	0.29	0.29	0.29	
Threshold temperature	18.93	20.71	20.47	(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	015731	Issued on Date	16/08/2021
Assessment Reference	004	Prop Type Ref	
Property	Flat 10, 18, Parkside Road, READING, RG30 2DB		
SAP Rating	85 B	DER	18.50
Environmental	89 B	TER	26.84
CO ₂ Emissions (t/year)	0.76	% DER<TER	31.08
General Requirements Compliance	Pass	DFEE	36.75
		TFEE	39.96
		% DFEE<TFEE	8.04
Assessor Details	Mr. Matthew Carter, Energy Calculations Limited, Tel: 01754 761035, mcarter@energycalculations.co.uk		Assessor ID
			7869-0001
Client			

SUMMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Electricity		
Fuel factor	1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	26.84	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	18.50	kgCO ₂ /m ²	Pass
	-8.34 (-31.1%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	39.96	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	36.75	kWh/m ² /yr	
	-3.3 (-8.2%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.22 (max. 0.30)	0.22 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Roof	0.12 (max. 0.20)	0.14 (max. 0.35)	Pass
Openings	1.42 (max. 2.00)	1.60 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

Limiting System Efficiencies

4 Heating efficiency

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

5 Cylinder insulation

BASIC COMPLIANCE REPORT

Energy Calculations Ltd
SAP • CODE • SBEM • DESIGN

Calculation Type: New Build (As Designed)

Hot water storage

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

Pass

Primary pipework insulated

Yes

Pass

6 Controls

Space heating controls

Time and temperature zone control

Pass

Hot water controls

Cylinderstat

Pass

Independent timer for DHW

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100

%

Minimum

75

%

Pass

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)

Slight

Pass

Based on:

Overshading

Average

Windows facing West

5.88 m², No overhang

Air change rate

6.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Solid Wall

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

5.00 (design value)

Maximum

10.0

Pass

10 Key features

Party wall U-value

0.00

W/m²K

Roof U-value

0.10

W/m²K

Photovoltaic array

300.00

kWh/Year

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

SUMMARY FOR INPUT DATA

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

Property Reference	015731	Issued on Date	16/08/2021
Assessment Reference	004	Prop Type Ref	
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Environmental	89 B	TER	26.84
CO ₂ Emissions (t/year)	0.76	% DER<TER	31.08
General Requirements Compliance	Pass	DFEE	36.75
		TFEE	39.96
		% DFEE<TFEE	8.04
Assessor Details	Mr. Matthew Carter, Energy Calculations Limited, Tel: 01754 761035, mcarter@energycalculations.co.uk		Assessor ID
			7869-0001
Client			

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

Orientation	West					
Property Tenure	Unknown					
Transaction Type	New dwelling					
Terrain Type	Urban					
1.0 Property Type	Flat, Mid-Terrace					
2.0 Number of Storeys	1					
3.0 Date Built	2020					
4.0 Sheltered Sides	3					
5.0 Sunlight/Shade	Average or unknown					
6.0 Measurements						
Ground Floor:		Heat Loss Perimeter	Internal Floor Area		Average Storey Height	
		14.71 m	50.64 m ²		2.32 m	
7.0 Living Area	27.80		m ²			
8.0 Thermal Mass Parameter	Precise calculation					
Thermal Mass	243.64		kJ/m ² K			
9.0 External Walls						
Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Main Wall	Cavity Wall	Cavity wall : plasterboard on dabs, AAC block, filled cavity, any outside structure	0.22	60.00	28.60	22.72
Wall to Hall	Cavity Wall	Cavity wall : dense plaster, dense block, filled cavity, any outside structure	0.22	190.00	4.32	2.43
9.1 Party Walls						
Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)	
Party Wall 1	Solid Wall	Dense plaster both sides, dense blocks, cavity or cavity fill	0.00	180.00	41.80	
9.2 Internal Walls						
Description	Construction				Kappa (kJ/m ² K)	Area (m ²)
Internal Wall 1	Plasterboard on timber frame				9.00	56.00
10.0 External Roofs						
Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Slope roof	External Flat Roof	Plasterboard, insulated flat roof	0.14	9.00	21.79	21.07
Roof plane	External Plane Roof	Plasterboard, insulated at ceiling level	0.10	9.00	30.00	30.00

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

11.1 Party Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Precast concrete planks floor, screed, carpeted	40.00	50.64

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
External Door	Manufacture	Half Glazed Door	Double Low-E Soft 0.05			0.63		0.70	1.40
Windows	Manufacture	Window	Double Low-E Soft 0.05			0.63		0.70	1.40
Door to Stairs	SAP table	Door to Corridor							1.40
R lights	Manufacture	Roof Window	Double Low-E Soft 0.05			0.63		0.70	1.60

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
Door	Door to Corridor	[2] Wall to Hall	East							1.89	
Windows	Window	[1] Main Wall	West	None	0.00					5.88	
R lights	Roof Window	[1] Slope roof	North	None						0.72	

14.0 Conservatory

None

15.0 Draught Proofing

100 %

16.0 Draught Lobby

Yes

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported
Table K1 - Approved	E2 Other lintels (including other steel lintels)	3.60	0.300	No
Table K1 - Approved	E3 Sill	3.60	0.040	No
Table K1 - Approved	E4 Jamb	8.40	0.050	No
Table K1 - Approved	E7 Party floor between dwellings (in blocks of flats)	14.71	0.070	No
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	9.62	0.060	No
Table K1 - Approved	E11 Eaves (insulation at rafter level)	2.89	0.040	No
Table K1 - Approved	E13 Gable (insulation at rafter level)	2.80	0.040	No
Table K1 - Approved	E16 Corner (normal)	7.20	0.090	No
Table K1 - Approved	E17 Corner (inverted – internal area greater than external area)	4.80	-0.090	No
Table K1 - Approved	E18 Party wall between dwellings	4.80	0.060	No
Table K1 - Default	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	17.42	0.000	No
Table K1 - Default	R1 Head of roof window	0.80	0.080	No
Table K1 - Default	R2 Sill of roof window	0.80	0.060	No
Table K1 - Default	R3 Jamb of roof window	1.80	0.080	No

Y-value	0.050	W/m²K
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18.0 Pressure Testing

Designed AP ₅₀	Yes	
Property Tested ?	5.00	m³/(h.m²) @ 50 Pa
As Built AP ₅₀		
		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

SUMMARY FOR INPUT DATA

Energy Calculations Ltd
SAP ♦ CODE ♦ SBEM ♦ DESIGN

Calculation Type: New Build (As Designed)

Air change rate

Mechanical Ventilation

Mechanical Ventilation System Present

20.0 Fans, Open Fireplaces, Flues

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

21.0 Fixed Cooling System

22.0 Lighting

Internal

Total number of light fittings

Total number of L.E.L. fittings

Percentage of L.E.L. fittings %

External

External lights fitted

Light and motion sensor

23.0 Electricity Tariff

24.0 Main Heating 1

Percentage of Heat %

Database Ref. No.

Fuel Type

Main Heating

SAP Code

In Winter

In Summer

Controls

PCDF Controls

Sap Code

Is MHS Pumped

Heat Emitter

Underfloor Heating

Flow Temperature

25.0 Main Heating 2

Community Heating

28.0 Water Heating

Water Heating

Flue Gas Heat Recovery System

Waste Water Heat Recovery Instantaneous System 1

Waste Water Heat Recovery Instantaneous System 2

SUMMARY FOR INPUT DATA

Energy Calculations Ltd
SAP ♦ CODE ♦ SBEM ♦ DESIGN

Calculation Type: New Build (As Designed)

Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
SAP Code	901	
Immersion Only Heating Hot Water	Yes	
29.0 Hot Water Cylinder	Hot Water Cylinder	
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 %			