

Energy Calculations Ltd

SAP ♦ CODE ♦ SBEM ♦ DESIGN

01754-761035



SAP Report Submission for Building Regulations Compliance

Client:

Project: Flat 6, 18, Parkside Road
READING, RG30 2DB

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

Report Issue Date: 01/03/2021

EXCELLENCE
IN ENERGY
ASSESSMENT

PREDICTED ENERGY ASSESSMENT

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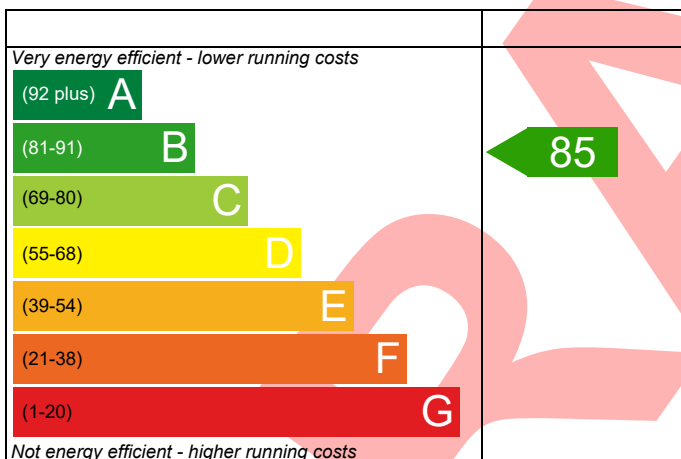
Flat 6, 18, Parkside Road,
READING,
RG30 2DB

Dwelling type: Flat, End-Terrace
Date of assessment: 01/03/2021
Produced by: Energy Calculations Limited
Total floor area: 50.5 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

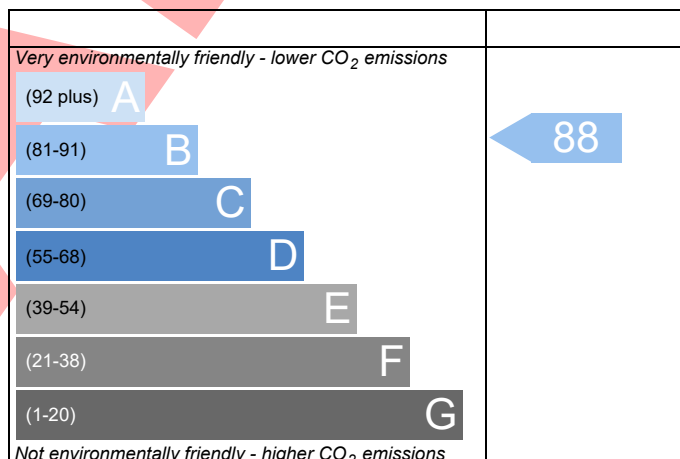


England

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	015727	Issued on Date	01/03/2021
Assessment Reference	003	Prop Type Ref	
Property	Flat 6, 18, Parkside Road, READING, RG30 2DB		

SAP Rating	85 B	DER	18.06	TER	27.97
Environmental	88 B	% DER<TER	35.44		
CO ₂ Emissions (t/year)	0.77	DFEE	45.03	TFEE	44.75
General Requirements Compliance	Fail	% DFEE<TFEE	-0.61		

Assessor Details	Mr. Matthew Carter, Energy Calculations Limited, Tel: 01754 761035, mcarter@energycalculations.co.uk	Assessor ID	7869-0001
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Client	
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	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Table K1 - Approved	0.300	7.70	2.31	
External wall	E3 Sill	Table K1 - Approved	0.040	7.70	0.31	
External wall	E4 Jamb	Table K1 - Approved	0.050	41.60	2.08	
External wall	E7 Party floor between dwellings (in blocks of flats)	Table K1 - Approved	0.070	15.28	1.07	
External wall	E14 Flat roof	Table K1 - Default	0.080	10.08	0.81	
External wall	E16 Corner (normal)	Table K1 - Approved	0.090	4.80	0.43	
External wall	E17 Corner (inverted – internal area greater than external area)	Table K1 - Approved	-0.090	14.40	-1.30	
External wall	E18 Party wall between dwellings	Table K1 - Approved	0.060	9.60	0.58	
Party wall	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	0.000	20.34	0.00	

Total: **6.29** W/mK:
Y-Value: **0.062** W/m²K:

FULL SAP CALCULATION PRINTOUT

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Client					

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

Mid-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) 27.97 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 18.06 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)44.8 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)45.0 kWh/m²/yrFail
Excess energy =0.2 kWh/m²/yr (0.4%)

2 Fabric U-values

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

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

Secondary heating system: None

5 Cylinder insulation

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

6 Controls

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

Cylinderstat	OK
Independent timer for DHW	OK

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames Valley):	Slight	OK
Based on:		
Overshading:	Average	
Windows facing South:	6.40 m ² , No overhang	
Windows facing West:	9.61 m ² , No overhang	
Air change rate:	6.00 ach	
Blinds/curtains:	None	

10 Key features

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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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	50.5000 (1b)	x 2.4000 (2b)	= 121.2000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 121.2000 (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) = 0.1650 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4150 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3528 (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	0.4498	0.4410	0.4321	0.3880	0.3792	0.3351	0.3351	0.3263	0.3528	0.3792	0.3969	0.4145 (22b)
	0.6011	0.5972	0.5934	0.5753	0.5719	0.5562	0.5562	0.5532	0.5622	0.5719	0.5787	0.5859 (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)			16.0100	1.3258	21.2254		(27)
Door to Stairs			1.8900	1.4000	2.6460		(26)
Heat Loss Floor 1			50.5000	0.1400	7.0700		(28b)
Main Wall	34.0300	16.0100	18.0200	0.2200	3.9644	60.0000	1081.2000 (29a)
Wall to stairs	2.6400	1.8900	0.7500	0.1864	0.1398	190.0000	142.5000 (29a)
Flat roof	13.6800		13.6800	0.1400	1.9152	9.0000	123.1200 (30)
Total net area of external elements Aum(A, m ²)			100.8500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.9608		(33)
Party Wall 1			48.8000	0.0000	0.0000	180.0000	8784.0000 (32)
Party Ceilings 1			36.8200			40.0000	1472.8000 (32b)
Internal Wall 1			53.5200			75.0000	4014.0000 (32c)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 15617.6200 (34)
309.2598 (35)
6.2860 (36)
(33) + (36) = 43.2468 (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	24.0435	23.8864	23.7325	23.0092	22.8739	22.2440	22.2440	22.1273	22.4866	22.8739	23.1476	23.4338 (38)
Heat transfer coeff	67.2903	67.1332	66.9792	66.2560	66.1207	65.4907	65.4907	65.3741	65.7334	66.1207	66.3944	66.6806 (39)
Average = Sum(39)m / 12 =												66.2553 (39)
HLP	1.3325	1.3294	1.3263	1.3120	1.3093	1.2968	1.2968	1.2945	1.3017	1.3093	1.3147	1.3204 (40)
HLP (average)												1.3120 (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
Average daily hot water use (litres/day)
1.7048 (42)
74.6897 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	82.1587	79.1711	76.1835	73.1959	70.2083	67.2207	67.2207	70.2083	73.1959	76.1835	79.1711	82.1587 (44)
Energy conte	121.8389	106.5611	109.9615	95.8671	91.9868	79.3776	73.5550	84.4055	85.4135	99.5412	108.6570	117.9945 (45)
Energy content (annual)												1175.1599 (45)
Distribution loss (46)m = 0.15 x (45)m	18.2758	15.9842	16.4942	14.3801	13.7980	11.9066	11.0333	12.6608	12.8120	14.9312	16.2986	17.6992 (46)

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Water storage loss:													210.0000 (47)
Store volume													
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													
	176.2377	155.6955	164.3603	148.5111	146.3856	132.0216	127.9538	138.8043	138.0575	153.9400	161.3010	172.3933	(58)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
								Solar input	(sum of months) =	Sum(63)m =	0.0000	0.0000	(63)
Output from w/h													
	176.2377	155.6955	164.3603	148.5111	146.3856	132.0216	127.9538	138.8043	138.0575	153.9400	161.3010	172.3933	(64)
								Total per year (kWh/year) =	Sum(64)m =	1815.6619	1815.6619	1815.6619	(64)
Heat gains from water heating, kWh/month													
	84.0305	74.7391	80.0812	73.9910	74.1046	68.5083	67.9761	71.5839	70.5152	76.6165	78.2437	82.7522	(65)

[illegible]

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Space heating	412.6786	285.2544	193.8497	74.9966	18.7671	0.0000	0.0000	0.0000	0.0000	92.5587	266.9081	430.7986 (98)
Space heating per m2												1775.8117 (98)
										(98) / (4) =		35.1646 (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 %)												236.2106 (206)
Efficiency of secondary/supplementary heating system, %												100.0000 (208)
Space heating requirement												751.7916 (211)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	412.6786	285.2544	193.8497	74.9966	18.7671	0.0000	0.0000	0.0000	0.0000	92.5587	266.9081	430.7986 (98)
Space heating efficiency (main heating system 1)	236.2106	236.2106	236.2106	236.2106	236.2106	0.0000	0.0000	0.0000	0.0000	236.2106	236.2106	236.2106 (210)
Space heating fuel (main heating system)	174.7079	120.7627	82.0664	31.7499	7.9451	0.0000	0.0000	0.0000	0.0000	39.1848	112.9958	182.3790 (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	176.2377	155.6955	164.3603	148.5111	146.3856	132.0216	127.9538	138.8043	138.0575	153.9400	161.3010	172.3933 (64)
Efficiency of water heater	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400 (216)
Fuel for water heating, kWh/month	104.0119	91.8883	97.0021	87.6482	86.3938	77.9164	75.5157	81.9194	81.4787	90.8522	95.1966	101.7430 (219)
Water heating fuel used												1071.5663 (219)
Annual totals kWh/year												
Space heating fuel - main system												751.7916 (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)												233.8540 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
Total delivered energy for all uses												2057.2118 (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	751.7916	0.5190	390.1798 (261)	
Space heating - secondary	0.0000	0.5190	0.0000 (263)	
Water heating (other fuel)	1071.5663	0.5190	556.1429 (264)	
Space and water heating			946.3227 (265)	
Pumps and fans	0.0000	0.0000	0.0000 (267)	
Energy for lighting	233.8540	0.5190	121.3702 (268)	
Energy saving/generation technologies				
PV Unit	-300.0000	0.5190	-155.7000 (269)	
Total CO2, kg/year			911.9929 (272)	
Dwelling Carbon Dioxide Emission Rate (DER)			18.0600 (273)	

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

DER			18.0600 ZC1
Total Floor Area		TFA	50.5000
Assumed number of occupants		N	1.7048
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			17.4292 ZC2
CO2 emissions from cooking, equation (L16)			3.1667 ZC3
Total CO2 emissions			38.6558 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			38.6558 ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.5000 (1b)	x 2.4000 (2b)	= 121.2000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 121.2000 (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) = 0.1650 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4150 (18)
Number of sides sheltered					2 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3528 (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	0.4498	0.4410	0.4321	0.3880	0.3792	0.3351	0.3351	0.3263	0.3528	0.3792	0.3969	0.4145 (22b)
Effective ac	0.6011	0.5972	0.5934	0.5753	0.5719	0.5562	0.5562	0.5532	0.5622	0.5719	0.5787	0.5859 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900			(26)				
TER Opening Type (Uw = 1.40)			10.7300	1.3258	14.2254			(27)				
Heat Loss Floor 1			50.5000	0.1300	6.5650			(28b)				
Main Wall	34.0300	10.7300	23.3000	0.1800	4.1940			(29a)				
Wall to stairs	2.6400	1.8900	0.7500	0.1800	0.1350			(29a)				
Flat roof	13.6800		13.6800	0.1300	1.7784			(30)				
Total net area of external elements Aum(A, m2)			100.8500					(31)				
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	28.7878			(33)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								4.4380 (36)				
Total fabric heat loss								(33) + (36) = 33.2258 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	24.0435	23.8864	23.7325	23.0092	22.8739	22.2440	22.2440	22.1273	22.4866	22.8739	23.1476	23.4338 (38)
Average = Sum(39)m / 12 =	57.2693	57.1122	56.9582	56.2350	56.0997	55.4697	55.4697	55.3531	55.7124	56.0997	56.3734	56.6596 (39)
												56.2343 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1340	1.1309	1.1279	1.1136	1.1109	1.0984	1.0984	1.0961	1.1032	1.1109	1.1163	1.1220 (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												1.7048 (42)
Average daily hot water use (litres/day)												74.6897 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	82.1587	79.1711	76.1835	73.1959	70.2083	67.2207	67.2207	70.2083	73.1959	76.1835	79.1711	82.1587 (44)
Energy content (annual)	121.8389	106.5611	109.9615	95.8671	91.9868	79.3776	73.5550	84.4055	85.4135	99.5412	108.6570	117.9945 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1175.1599 (45)
Water storage loss:	18.2758	15.9842	16.4942	14.3801	13.7980	11.9066	11.0333	12.6608	12.8120	14.9312	16.2986	17.6992 (46)
Store volume												210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7016 (48)
Temperature factor from Table 2b												0.5400 (49)

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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	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	173.5855	153.3000	161.7081	145.9445	143.7334	129.4549	125.3016	136.1520	135.4909	151.2878	158.7344	169.7411 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	173.5855	153.3000	161.7081	145.9445	143.7334	129.4549	125.3016	136.1520	135.4909	151.2878	158.7344	169.7411 (64)
Heat gains from water heating, kWh/month	81.9087	72.8227	77.9595	71.9377	71.9829	66.4549	65.8543	69.4621	68.4619	74.4947	76.1903	80.6304 (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
(66)m	85.2415	85.2415	85.2415	85.2415	85.2415	85.2415	85.2415	85.2415	85.2415	85.2415	85.2415	85.2415	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.2679	11.7844	9.5837	7.2555	5.4236	4.5788	4.9476	6.4310	8.6317	10.9600	12.7919	13.6366	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	148.5325	150.0738	146.1898	137.9211	127.4834	117.6735	111.1198	109.5785	113.4626	121.7312	132.1689	141.9788	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5241	31.5241	31.5241	31.5241	31.5241	31.5241	31.5241	31.5241	31.5241	31.5241	31.5241	31.5241	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.1932	-68.1932	-68.1932	-68.1932	-68.1932	-68.1932	-68.1932	-68.1932	-68.1932	-68.1932	-68.1932	-68.1932	(71)
Water heating gains (Table 5)	110.0924	108.3670	104.7842	99.9135	96.7512	92.2985	88.5139	93.3630	95.0859	100.1273	105.8199	108.3743	(72)
Total internal gains	323.4652	321.7977	312.1302	296.6625	281.2306	266.1233	256.1537	260.9450	268.7527	284.3909	302.3531	315.5622	(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	
South				4.2900	46.7521	0.6300	0.7000		0.7700		61.2957 (78)	
West				6.4400	19.6403	0.6300	0.7000		0.7700		38.6549 (80)	
Solar gains	99.9506	176.0038	252.4055	326.1469	373.1883	372.7904	358.5380	323.8611	278.4147	198.0026	120.8545	84.7531 (83)
Total gains	423.4158	497.8015	564.5357	622.8095	654.4189	638.9137	614.6917	584.8062	547.1674	482.3935	423.2076	400.3152 (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	61.2360	61.4045	61.5705	62.3623	62.5127	63.2227	63.2227	63.3559	62.9473	62.5127	62.2092	61.8950
alpha	5.0824	5.0936	5.1047	5.1575	5.1675	5.2148	5.2148	5.2237	5.1965	5.1675	5.1473	5.1263
util living area	0.9911	0.9794	0.9497	0.8723	0.7307	0.5438	0.3951	0.4322	0.6650	0.9061	0.9803	0.9931 (86)
MIT	19.9989	20.1938	20.4589	20.7432	20.9184	20.9858	20.9978	20.9965	20.9614	20.7259	20.3100	19.9638 (87)
Th 2	19.9731	19.9756	19.9781	19.9898	19.9920	20.0021	20.0021	20.0040	19.9982	19.9920	19.9875	19.9829 (88)
util rest of house	0.9883	0.9732	0.9349	0.8381	0.6707	0.4642	0.3066	0.3403	0.5828	0.8724	0.9732	0.9910 (89)
MIT 2	18.6642	18.9464	19.3221	19.7111	19.9199	19.9936	20.0014	20.0027	19.9716	19.7011	19.1252	18.6207 (90)
Living area fraction	19.3408	19.5788	19.8984	20.2343	20.4261	20.4966	20.5065	20.5065	20.4734	20.2206	19.7258	19.3016 (92)
Temperature adjustment	19.3408	19.5788	19.8984	20.2343	20.4261	20.4966	20.5065	20.5065	20.4734	20.2206	19.7258	19.3016 (93)
adjusted MIT	19.3408	19.5788	19.8984	20.2343	20.4261	20.4966	20.5065	20.5065	20.4734	20.2206	19.7258	19.3016 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9861	0.9702	0.9336	0.8471	0.6976	0.5042	0.3515	0.3870	0.6231	0.8810	0.9709	0.9891	(94)
Ext temp.	417.5100	482.9656	527.0484	527.5982	456.5002	322.1441	216.0794	226.3055	340.9282	424.9966	410.8923	395.9355	(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	861.3762	838.3364	763.1484	637.3841	489.5302	327.0822	216.6908	227.3061	355.0755	539.7131	711.7593	855.6498	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating	330.2365	238.8092	175.6584	79.0458	24.5743	0.0000	0.0000	0.0000	0.0000	85.3491	216.6242	342.0274	(98)
Space heating per m ²												1492.3249	(98)
												29.5510	(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													1596.0694	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	330.2365	238.8092	175.6584	79.0458	24.5743	0.0000	0.0000	0.0000	0.0000	85.3491	216.6242	342.0274	(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)	353.1941	255.4109	187.8699	84.5410	26.2827	0.0000	0.0000	0.0000	0.0000	91.2824	231.6837	365.8047	(211)	
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Water heating requirement	173.5855	153.3000	161.7081	145.9445	143.7334	129.4549	125.3016	136.1520	135.4909	151.2878	158.7344	169.7411	(64)	
Efficiency of water heater (217)m	86.5038	85.9921	85.0348	83.2584	81.2018	79.8000	79.8000	79.8000	79.8000	83.3545	85.6437	86.6466	(216)	
Fuel for water heating, kWh/month	200.6682	178.2722	190.1670	175.2909	177.0077	162.2242	157.0196	170.6166	169.7881	181.4992	185.3426	195.9005	(219)	
Water heating fuel used												2143.7969	(219)	
Annual totals kWh/year														
Space heating fuel - main system													1596.0694	(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)													234.3151	(232)
Total delivered energy for all uses													4049.1814	(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	1596.0694	0.2160	344.7510 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2143.7969	0.2160	463.0601 (264)
Space and water heating			807.8111 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	234.3151	0.5190	121.6095 (268)
Total CO2, kg/m2/year			968.3457 (272)
Emissions per m2 for space and water heating			15.9963 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.4081 (272b)
Emissions per m2 for pumps and fans			0.7708 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.9963 * 1.55) + 2.4081 + 0.7708, rounded to 2 d.p.			27.9700 (273)

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.5000 (1b)	x 2.4000 (2b)	= 121.2000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 121.2000 (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) = 0.1650 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4150 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3528 (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	0.4498	0.4410	0.4321	0.3880	0.3792	0.3351	0.3351	0.3263	0.3528	0.3792	0.3969	0.4145 (22b)
	0.6011	0.5972	0.5934	0.5753	0.5719	0.5562	0.5562	0.5532	0.5622	0.5719	0.5787	0.5859 (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)			16.0100	1.3258	21.2254		(27)
Door to Stairs			1.8900	1.4000	2.6460		(26)
Heat Loss Floor 1			50.5000	0.1400	7.0700		(28b)
Main Wall	34.0300	16.0100	18.0200	0.2200	3.9644	60.0000	1081.2000 (29a)
Wall to stairs	2.6400	1.8900	0.7500	0.1864	0.1398	190.0000	142.5000 (29a)
Flat roof	13.6800		13.6800	0.1400	1.9152	9.0000	123.1200 (30)
Total net area of external elements Aum(A, m ²)			100.8500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.9608		(33)
Party Wall 1			48.8000	0.0000	0.0000	180.0000	8784.0000 (32)
Party Ceilings 1			36.8200			30.0000	1104.6000 (32b)
Internal Wall 1			53.5200			75.0000	4014.0000 (32c)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 15249.4200 (34)
301.9687 (35)
6.2860 (36)
(33) + (36) = 43.2468 (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	24.0435	23.8864	23.7325	23.0092	22.8739	22.2440	22.2440	22.1273	22.4866	22.8739	23.1476	23.4338 (38)
Heat transfer coeff	67.2903	67.1332	66.9792	66.2560	66.1207	65.4907	65.4907	65.3741	65.7334	66.1207	66.3944	66.6806 (39)
Average = Sum(39)m / 12 =												66.2553 (39)
HLP	1.3325	1.3294	1.3263	1.3120	1.3093	1.2968	1.2968	1.2945	1.3017	1.3093	1.3147	1.3204 (40)
HLP (average)												1.3120 (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												1.7048 (42)
Average daily hot water use (litres/day)												74.6897 (43)
Daily hot water use	82.1587	79.1711	76.1835	73.1959	70.2083	67.2207	67.2207	70.2083	73.1959	76.1835	79.1711	82.1587 (44)
Energy conte	121.8389	106.5611	109.9615	95.8671	91.9868	79.3776	73.5550	84.4055	85.4135	99.5412	108.6570	117.9945 (45)
Energy content (annual)										Total = Sum(45)m =		1175.1599 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)

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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	(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	(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	25.8908	22.6442	23.3668	20.3718	19.5472	16.8677	15.6304	17.9362	18.1504	21.1525	23.0896	(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	85.2415	85.2415	85.2415	85.2415	85.2415	85.2415	85.2415	85.2415	85.2415	85.2415	85.2415	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.2418	11.7612	9.5649	7.2412	5.4129	4.5698	4.9378	6.4184	8.6147	10.9384	12.7667	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	148.5325	150.0738	146.1898	137.9211	127.4834	117.6735	111.1198	109.5785	113.4626	121.7312	132.1689	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5241	31.5241	31.5241	31.5241	31.5241	31.5241	31.5241	31.5241	31.5241	31.5241	31.5241	(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)	-68.1932	-68.1932	-68.1932	-68.1932	-68.1932	-68.1932	-68.1932	-68.1932	-68.1932	-68.1932	-68.1932	(71)
Water heating gains (Table 5)	34.7994	33.6968	31.4070	28.2941	26.2731	23.4274	21.0087	24.1077	25.2089	28.4308	32.0689	(72)
Total internal gains	245.1461	244.1042	235.7341	222.0289	207.7419	194.2431	185.6388	188.6771	195.8586	209.6728	225.5770	(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
South				6.4000	46.7521	0.6300		0.7000		0.7700		91.4434 (78)
West				9.6100	19.6403	0.6300		0.7000		0.7700		57.6823 (80)

Solar gains	149.1257	262.5996	376.5981	486.6312	556.8256	556.2341	534.9675	483.2230	415.4078	295.4238	180.3147	126.4507 (83)
Total gains	394.2719	506.7039	612.3322	708.6601	764.5675	750.4773	720.6063	671.9001	611.2664	505.0967	405.8917	364.3131 (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	62.9504	63.0977	63.2428	63.9331	64.0639	64.6802	64.6802	64.7956	64.4414	64.0639	63.7998	63.5260
alpha	5.1967	5.2065	5.2162	5.2622	5.2709	5.3120	5.3120	5.3197	5.2961	5.2709	5.2533	5.2351
util living area	0.9972	0.9896	0.9647	0.8873	0.7372	0.5470	0.3980	0.4441	0.6955	0.9390	0.9925	0.9981 (86)
MIT	19.8655	20.0998	20.4086	20.7307	20.9201	20.9866	20.9979	20.9964	20.9556	20.6675	20.1902	19.8229 (87)
Th 2	19.8155	19.8179	19.8203	19.8314	19.8335	19.8433	19.8433	19.8451	19.8395	19.8335	19.8293	19.8249 (88)
util rest of house	0.9960	0.9856	0.9513	0.8493	0.6667	0.4536	0.2944	0.3345	0.5979	0.9086	0.9889	0.9973 (89)
MIT 2	18.8040	19.0378	19.3389	19.6408	19.7898	19.8387	19.8429	19.8444	19.8212	19.5973	19.1383	18.7692 (90)
Living area fraction									fLA = Living area / (4) =			0.5069 (91)
MIT	19.3421	19.5762	19.8811	20.1933	20.3628	20.4206	20.4284	20.4284	20.3963	20.1398	19.6715	19.3034 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3421	19.5762	19.8811	20.1933	20.3628	20.4206	20.4284	20.4284	20.3963	20.1398	19.6715	19.3034 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9954	0.9845	0.9521	0.8622	0.7001	0.5010	0.3471	0.3903	0.6468	0.9178	0.9882	0.9969 (94)
Useful gains	392.4736	498.8591	582.9915	611.0363	535.3077	375.9887	250.1268	262.2506	395.3395	463.5987	401.1155	363.1770 (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	1012.1872	985.2585	896.2587	748.2477	572.7898	381.1947	250.7272	263.3516	413.8743	630.7769	834.6801	1007.1015 (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	461.0670	326.8604	233.0708	98.7922	27.8867	0.0000	0.0000	0.0000	0.0000	124.3806	312.1665	479.0799 (98)
Space heating												2063.3040 (98)
Space heating per m2										(98) / (4) =		40.8575 (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	615.6128	484.6314	496.8429	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9611	0.9829	0.9752	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	591.6835	476.3325	484.5395	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	941.6582	905.5208	849.5402	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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	251.9818	319.3161	271.5605	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												842.8584 (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	62.9954	79.8290	67.8901	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												210.7146 (107)
Space cooling per m2												4.1726 (108)
Energy for space heating												40.8575 (99)
Energy for space cooling												4.1726 (108)
Total												45.0301 (109)
Dwelling Fabric Energy Efficiency (DFEE)												45.0 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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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	50.5000 (1b)	x 2.4000 (2b)	= 121.2000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 121.2000 (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) = 0.1650 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4150 (18)
					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3528 (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	0.4498	0.4410	0.4321	0.3880	0.3792	0.3351	0.3351	0.3263	0.3528	0.3792	0.3969	0.4145 (22b)
	0.6011	0.5972	0.5934	0.5753	0.5719	0.5562	0.5562	0.5532	0.5622	0.5719	0.5787	0.5859 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900			(26)				
TER Opening Type (Uw = 1.40)			10.7300	1.3258	14.2254			(27)				
Heat Loss Floor 1			50.5000	0.1300	6.5650			(28b)				
Main Wall	34.0300	10.7300	23.3000	0.1800	4.1940			(29a)				
Wall to stairs	2.6400	1.8900	0.7500	0.1800	0.1350			(29a)				
Flat roof	13.6800		13.6800	0.1300	1.7784			(30)				
Total net area of external elements Aum(A, m2)			100.8500					(31)				
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	28.7878			(33)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								4.4380 (36)				
Total fabric heat loss						(33) + (36) =		33.2258 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 24.0435	Feb 23.8864	Mar 23.7325	Apr 23.0092	May 22.8739	Jun 22.2440	Jul 22.2440	Aug 22.1273	Sep 22.4866	Oct 22.8739	Nov 23.1476	Dec 23.4338 (38)
Heat transfer coeff	57.2693	57.1122	56.9582	56.2350	56.0997	55.4697	55.4697	55.3531	55.7124	56.0997	56.3734	56.6596 (39)
Average = Sum(39)m / 12 =												56.2343 (39)
HLP	Jan 1.1340	Feb 1.1309	Mar 1.1279	Apr 1.1136	May 1.1109	Jun 1.0984	Jul 1.0984	Aug 1.0961	Sep 1.1032	Oct 1.1109	Nov 1.1163	Dec 1.1220 (40)
HLP (average)												1.1136 (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												1.7048 (42)
Average daily hot water use (litres/day)												74.6897 (43)
Daily hot water use	82.1587	79.1711	76.1835	73.1959	70.2083	67.2207	67.2207	70.2083	73.1959	76.1835	79.1711	82.1587 (44)
Energy conte	121.8389	106.5611	109.9615	95.8671	91.9868	79.3776	73.5550	84.4055	85.4135	99.5412	108.6570	117.9945 (45)
Energy content (annual)										Total = Sum(45)m =		1175.1599 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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 (57)
Heat gains from water heating, kWh/month	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)
	25.8908	22.6442	23.3668	20.3718	19.5472	16.8677	15.6304	17.9362	18.1504	21.1525	23.0896	25.0738 (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	85.2415	85.2415	85.2415	85.2415	85.2415	85.2415	85.2415	85.2415	85.2415	85.2415	85.2415	85.2415	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.2679	11.7844	9.5837	7.2555	5.4236	4.5788	4.9476	6.4310	8.6317	10.9600	12.7919	13.6366	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	148.5325	150.0738	146.1898	137.9211	127.4834	117.6735	111.1198	109.5785	113.4626	121.7312	132.1689	141.9788	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5241	31.5241	31.5241	31.5241	31.5241	31.5241	31.5241	31.5241	31.5241	31.5241	31.5241	31.5241	(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)	-68.1932	-68.1932	-68.1932	-68.1932	-68.1932	-68.1932	-68.1932	-68.1932	-68.1932	-68.1932	-68.1932	-68.1932	(71)
Water heating gains (Table 5)	34.7994	33.6968	31.4070	28.2941	26.2731	23.4274	21.0087	24.1077	25.2089	28.4308	32.0689	33.7014	(72)
Total internal gains	245.1722	244.1274	235.7530	222.0432	207.7526	194.2522	185.6485	188.6898	195.8756	209.6944	225.6021	237.8893	(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
South				4.2900	46.7521	0.6300	0.7000	0.7700				61.2957
West				6.4400	19.6403	0.6300	0.7000	0.7700				38.6549 (78)

Solar gains	99.9506	176.0038	252.4055	326.1469	373.1883	372.7904	358.5380	323.8611	278.4147	198.0026	120.8545	84.7531 (83)
Total gains	345.1229	420.1312	488.1585	548.1901	580.9409	567.0426	544.1865	512.5509	474.2903	407.6970	346.4566	322.6424 (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	61.2360	61.4045	61.5705	62.3623	62.5127	63.2227	63.2227	63.3559	62.9473	62.5127	62.2092	61.8950	
alpha	5.0824	5.0936	5.1047	5.1575	5.1675	5.2148	5.2148	5.2237	5.1965	5.1675	5.1473	5.1263	
util living area	0.9964	0.9899	0.9709	0.9133	0.7897	0.6045	0.4447	0.4902	0.7397	0.9469	0.9916	0.9974	(86)
MIT	19.8576	20.0601	20.3428	20.6635	20.8821	20.9771	20.9961	20.9937	20.9370	20.6303	20.1766	19.8222	(87)
Th 2	19.9731	19.9756	19.9781	19.9898	19.9920	20.0021	20.0021	20.0040	19.9982	19.9920	19.9875	19.9829	(88)
util rest of house	0.9952	0.9866	0.9615	0.8865	0.7329	0.5193	0.3459	0.3875	0.6576	0.9243	0.9883	0.9966	(89)
MIT 2	18.9396	19.1424	19.4210	19.7320	19.9181	19.9924	20.0012	20.0024	19.9669	19.7109	19.2688	18.9124	(90)
Living area fraction	19.4050	19.6076	19.8883	20.2042	20.4068	20.4916	20.5056	20.5049	fLA = Living area / (4) =	20.4587	20.1770	19.7290	0.5069 (91)
MIT	19.4050	19.6076	19.8883	20.2042	20.4068	20.4916	20.5056	20.5049	20.4587	20.1770	19.7290	19.3736	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4050	19.6076	19.8883	20.2042	20.4068	20.4916	20.5056	20.5049	20.4587	20.1770	19.7290	19.3736	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9943	0.9851	0.9605	0.8928	0.7576	0.5621	0.3961	0.4398	0.6973	0.9291	0.9872	0.9959	(94)
Ext temp.	343.1718	413.8791	468.8700	489.4237	440.1254	318.7198	215.5669	225.4019	330.7154	378.8084	342.0383	321.3134	(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	865.0501	839.9840	762.5759	635.6910	488.4486	326.8038	216.6401	227.2187	354.2559	537.2652	711.9385	859.7301	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating	388.2775	286.3425	218.5172	105.3125	35.9525	0.0000	0.0000	0.0000	0.0000	117.8919	266.3282	400.5820	(98)
Space heating per m2												1819.2042	(98)
												36.0238	(99)
												(98) / (4) =	

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	521.4156	410.4761	420.6835	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9429	0.9734	0.9640	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	491.6195	399.5432	405.5323	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	727.2660	699.3289	663.3048	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	169.6654	223.0406	191.7827	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												584.4888	(104)
Cooled fraction												1.0000	(105)
												fC = cooled area / (4) =	

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	42.4164	55.7601	47.9457	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											146.1222 (107)
Space cooling per m2											2.8935 (108)
Energy for space heating											36.0238 (99)
Energy for space cooling											2.8935 (108)
Total											38.9174 (109)
Target Fabric Energy Efficiency (TFEE)											44.8 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.5000 (1b)	x 2.4000 (2b)	= 121.2000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 121.2000 (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 20.0000 / (5) = 0.1650 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4150 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3528 (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												
Effective ac	0.3880	0.3616	0.3616	0.3439	0.3439	0.2998	0.2998	0.2910	0.2998	0.3351	0.3263	0.3528 (22b)
Effective ac	0.5753	0.5654	0.5654	0.5591	0.5591	0.5450	0.5450	0.5423	0.5450	0.5562	0.5532	0.5622 (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)			16.0100	1.3258	21.2254		(27)
Door to Stairs			1.8900	1.4000	2.6460		(26)
Heat Loss Floor 1			50.5000	0.1400	7.0700		(28b)
Main Wall	34.0300	16.0100	18.0200	0.2200	3.9644	60.0000	1081.2000 (29a)
Wall to stairs	2.6400	1.8900	0.7500	0.1864	0.1398	190.0000	142.5000 (29a)
Flat roof	13.6800		13.6800	0.1400	1.9152	9.0000	123.1200 (30)
Total net area of external elements Aum(A, m ²)			100.8500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.9608		(33)
Party Wall 1			48.8000	0.0000	0.0000	180.0000	8784.0000 (32)
Party Ceilings 1			36.8200			40.0000	1472.8000 (32b)
Internal Wall 1			53.5200			75.0000	4014.0000 (32c)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 15617.6200 (34)
309.2598 (35)
6.2860 (36)
(33) + (36) = 43.2468 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	23.0092	22.6126	22.6126	22.3637	22.3637	21.7960	21.7960	21.6918	21.7960	22.2440	22.1273	22.4866 (38)
Heat transfer coeff	66.2560	65.8593	65.8593	65.6105	65.6105	65.0428	65.0428	64.9386	65.0428	65.4907	65.3741	65.7334 (39)
Average = Sum(39)m / 12 =												65.4884 (39)
HLP	1.3120	1.3041	1.3041	1.2992	1.2992	1.2880	1.2880	1.2859	1.2880	1.2968	1.2945	1.3017 (40)
HLP (average)												1.2968 (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												1.7048 (42)
Average daily hot water use (litres/day)												74.6897 (43)
Daily hot water use	82.1587	79.1711	76.1835	73.1959	70.2083	67.2207	67.2207	70.2083	73.1959	76.1835	79.1711	82.1587 (44)
Energy conte	121.8389	106.5611	109.9615	95.8671	91.9868	79.3776	73.5550	84.4055	85.4135	99.5412	108.6570	117.9945 (45)
Energy content (annual)										Total = Sum(45)m =		1175.1599 (45)
Distribution loss (46)m = 0.15 x (45)m	18.2758	15.9842	16.4942	14.3801	13.7980	11.9066	11.0333	12.6608	12.8120	14.9312	16.2986	17.6992 (46)

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Water storage loss:											210.0000	(47)	
Store volume													
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	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	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	22.5120	23.2624	22.5120	23.2624	(59)	
Total heat required for water heating calculated for each month													
	176.2377	155.6955	164.3603	148.5111	146.3856	132.0216	127.9538	138.8043	138.0575	153.9400	161.3010	172.3933	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =											0.0000	(63)	
Output from w/h													
	176.2377	155.6955	164.3603	148.5111	146.3856	132.0216	127.9538	138.8043	138.0575	153.9400	161.3010	172.3933	(64)
Total per year (kWh/year) = Sum(64)m =											1815.6619	(64)	
RHI water heating demand											1816	(64)	
Heat gains from water heating, kWh/month													
	84.0305	74.7391	80.0812	73.9910	74.1046	68.5083	67.9761	71.5839	70.5152	76.6165	78.2437	82.7522	(65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	102.2898	102.2898	102.2898	102.2898	102.2898	102.2898	102.2898	102.2898	102.2898	102.2898	102.2898	102.2898 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	33.1044	29.4031	23.9122	18.1031	13.5323	11.4245	12.3446	16.0459	21.5368	27.3460	31.9168	34.0245 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	221.6903	223.9907	218.1937	205.8524	190.2738	175.6321	165.8505	163.5501	169.3471	181.6884	197.2670	211.9087 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.9338	46.9338	46.9338	46.9338	46.9338	46.9338	46.9338	46.9338	46.9338	46.9338	46.9338	46.9338 (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)	-68.1932	-68.1932	-68.1932	-68.1932	-68.1932	-68.1932	-68.1932	-68.1932	-68.1932	-68.1932	-68.1932	-68.1932 (71)
Water heating gains (Table 5)	112.9442	111.2189	107.6361	102.7653	99.6030	95.1504	91.3657	96.2149	97.9378	102.9792	108.6718	111.2261 (72)
Total internal gains	448.7693	445.6431	430.7723	407.7512	384.4395	363.2373	350.5912	356.8413	369.8521	393.0439	418.8859	438.1897 (73)

[Jan					Area	Solar flux	g		FF			Access	Gains
					m2	Table 6a	Table 6b		Table 6c		factor		W
						W/m2	or Table 6b		or Table 6c		Table 6d		
South					6.4000	54.0600	0.6300		0.7000		0.7700		105.7372
West					9.6100	23.7835	0.6300		0.7000		0.7700		69.8507 (80)
Solar gains	175.5879	270.2375	385.3299	507.3352	567.7525	601.0747	571.9093	524.9132	453.6497	326.4210	209.1486	149.7573	(83)
Total gains	624.3573	715.8806	816.1022	915.0864	952.1920	964.3120	922.5005	881.7545	823.5018	719.4649	628.0345	587.9470	(84)

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	65.4768	65.8711	65.8711	66.1210	66.1210	66.6981	66.6981	66.8051	66.6981	66.2419	66.3601	65.9974
alpha	5.3651	5.3914	5.3914	5.4081	5.4081	5.4465	5.4465	5.4537	5.4465	5.4161	5.4240	5.3998
util living area	0.9758	0.9508	0.8826	0.7437	0.5596	0.3633	0.2396	0.2650	0.4845	0.7821	0.9442	0.9810 (86)
Tweekday	19.1101	19.3011	19.5397	19.7052	19.7591	19.7768	19.7772	19.7789	19.7750	19.7064	19.4216	19.0774
Tweekend	20.6283	20.7151	20.8324	20.9223	20.9589	20.9671	20.9677	20.9677	20.9646	20.9186	20.7671	20.6101
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	20.4263	20.5593	20.7414	20.8787	20.9365	20.9494	20.9502	20.9502	20.9447	20.8743	20.6363	20.3983 (87)
Th 2	19.8314	19.8376	19.8376	19.8414	19.8414	19.8503	19.8503	19.8519	19.8503	19.8433	19.8451	19.8395 (88)
util rest of house	0.9670	0.9345	0.8484	0.6864	0.4866	0.2865	0.1587	0.1806	0.3973	0.7161	0.9225	0.9739 (89)
Tweekday	19.1101	19.3011	19.5397	19.7052	19.7591	19.7768	19.7772	19.7789	19.7750	19.7064	19.4216	19.0774
Tweekend	19.1101	19.3011	19.5397	19.7052	19.7591	19.7768	19.7772	19.7789	19.7750	19.7064	19.4216	19.0774
MIT 2	19.1101	19.3011	19.5397	19.7052	19.7591	19.7768	19.7772	19.7789	19.7750	19.7064	19.4216	19.0774 (90)
Living area fraction									fLA = Living area / (4) =			0.5069 (91)
MIT	19.7773	19.9389	20.1489	20.3001	20.3560	20.3713	20.3718	20.3726	20.3679	20.2984	20.0373	19.7470 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7773	19.9389	20.1489	20.3001	20.3560	20.3713	20.3718	20.3726	20.3679	20.2984	20.0373	19.7470 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9665	0.9361	0.8584	0.7101	0.5196	0.3214	0.1954	0.2189	0.4370	0.7437	0.9267	0.9732 (94)
Useful gains	603.4625	670.1453	700.5508	649.7618	494.7175	309.8979	180.2659	193.0014	359.8305	535.0557	581.9783	572.1852 (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												
	985.7110	950.9374	846.2195	695.4785	502.3125	310.3361	180.2859	193.0395	362.1548	582.7652	800.0046	975.9436 (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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CALCULATION OF ENERGY RATINGS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
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1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.5000 (1b)	x 2.4000 (2b)	= 121.2000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 121.2000 (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) = 0.1650 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4150 (18)
					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3528 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	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												
	0.4498	0.4410	0.4321	0.3880	0.3792	0.3351	0.3351	0.3263	0.3528	0.3792	0.3969	0.4145 (22b)
Effective ac	0.6011	0.5972	0.5934	0.5753	0.5719	0.5562	0.5562	0.5532	0.5622	0.5719	0.5787	0.5859 (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)			16.0100	1.3258	21.2254		(27)
Door to Stairs			1.8900	1.4000	2.6460		(26)
Heat Loss Floor 1			50.5000	0.1400	7.0700		(28b)
Main Wall	34.0300	16.0100	18.0200	0.2200	3.9644	60.0000	1081.2000 (29a)
Wall to stairs	2.6400	1.8900	0.7500	0.1864	0.1398	190.0000	142.5000 (29a)
Flat roof	13.6800		13.6800	0.1400	1.9152	9.0000	123.1200 (30)
Total net area of external elements Aum(A, m ²)			100.8500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.9608		(33)
Party Wall 1			48.8000	0.0000	0.0000	180.0000	8784.0000 (32)
Party Ceilings 1			36.8200			40.0000	1472.8000 (32b)
Internal Wall 1			53.5200			75.0000	4014.0000 (32c)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 15617.6200 (34)
309.2598 (35)
6.2860 (36)
(33) + (36) = 43.2468 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	24.0435	23.8864	23.7325	23.0092	22.8739	22.2440	22.2440	22.1273	22.4866	22.8739	23.1476	23.4338 (38)
Heat transfer coeff	67.2903	67.1332	66.9792	66.2560	66.1207	65.4907	65.4907	65.3741	65.7334	66.1207	66.3944	66.6806 (39)
Average = Sum(39)m / 12 =												66.2553 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1.3325	1.3294	1.3263	1.3120	1.3093	1.2968	1.2968	1.2945	1.3017	1.3093	1.3147	1.3204 (40)
HLP (average)												1.3120 (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
Average daily hot water use (litres/day)
1.7048 (42)
74.6897 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	82.1587	79.1711	76.1835	73.1959	70.2083	67.2207	67.2207	70.2083	73.1959	76.1835	79.1711	82.1587 (44)
Energy conte	121.8389	106.5611	109.9615	95.8671	91.9868	79.3776	73.5550	84.4055	85.4135	99.5412	108.6570	117.9945 (45)
Energy content (annual)												
Distribution loss (46)m = 0.15 x (45)m												
	18.2758	15.9842	16.4942	14.3801	13.7980	11.9066	11.0333	12.6608	12.8120	14.9312	16.2986	17.6992 (46)

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Water storage loss:													210.0000 (47)
Store volume													
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													
	176.2377	155.6955	164.3603	148.5111	146.3856	132.0216	127.9538	138.8043	138.0575	153.9400	161.3010	172.3933	(58)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(62)
								Solar input (sum of months) =	Sum(63)m =			0.0000	(63)
Output from w/h													
	176.2377	155.6955	164.3603	148.5111	146.3856	132.0216	127.9538	138.8043	138.0575	153.9400	161.3010	172.3933	(64)
								Total per year (kWh/year) =	Sum(64)m =			1815.6619	(65)
Heat gains from water heating, kWh/month													
	84.0305	74.7391	80.0812	73.9910	74.1046	68.5083	67.9761	71.5839	70.5152	76.6165	78.2437	82.7522	(65)

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Space heating	334.9834	223.2490	143.3177	51.0147	11.9062	0.0000	0.0000	0.0000	0.0000	60.0008	203.5908	353.2464 (98)
Space heating per m2												1381.3090 (98)
											(98) / (4) =	27.3527 (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 %)												236.2106 (206)
Efficiency of secondary/supplementary heating system, %												100.0000 (208)
Space heating requirement												584.7785 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	334.9834	223.2490	143.3177	51.0147	11.9062	0.0000	0.0000	0.0000	0.0000	60.0008	203.5908	353.2464 (98)
Space heating efficiency (main heating system 1)	236.2106	236.2106	236.2106	236.2106	236.2106	0.0000	0.0000	0.0000	0.0000	236.2106	236.2106	236.2106 (210)
Space heating fuel (main heating system)	141.8156	94.5127	60.6737	21.5971	5.0405	0.0000	0.0000	0.0000	0.0000	25.4014	86.1904	149.5472 (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	176.2377	155.6955	164.3603	148.5111	146.3856	132.0216	127.9538	138.8043	138.0575	153.9400	161.3010	172.3933 (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	104.0119	91.8883	97.0021	87.6482	86.3938	77.9164	75.5157	81.9194	81.4787	90.8522	95.1966	101.7430 (219)
Water heating fuel used												1071.5663 (219)
Annual totals kWh/year												
Space heating fuel - main system												584.7785 (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)												233.8540 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
Total delivered energy for all uses												1890.1987 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	584.7785	13.1900	77.1323 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1071.5663	13.1900	141.3396 (247)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	233.8540	13.1900	30.8453 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit	0.0000	13.1900	0.0000 (252)
Total energy cost			249.3172 (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] =	1.0965 (257)
SAP value		84.7042
SAP rating (Section 12)		85 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	584.7785	0.5190	303.5000 (261)
Space heating - secondary	0.0000	0.5190	0.0000 (263)
Water heating (other fuel)	1071.5663	0.5190	556.1429 (264)
Space and water heating			859.6429 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	233.8540	0.5190	121.3702 (268)
Energy saving/generation technologies			
PV Unit	-300.0000	0.5190	-155.7000 (269)
Total kg/year			825.3131 (272)
CO2 emissions per m2			16.3400 (273)
EI value			88.4197
EI rating			88 (274)
EI band			B

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Calculation of stars for heating and DHW

Main heating energy efficiency	$13.19 \times (1 + 0.29 \times 0.25) / 2.3621 = 5.989$, stars = 3
Main heating environmental impact	$0.519 \times (1 + 0.29 \times 0.25) / 2.3621 = 0.2356$, 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	50.5000 (1b)	x 2.4000 (2b)	= 121.2000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 121.2000 (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) = 0.1650 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4150 (18)
					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3528 (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												
Effective ac	0.3880	0.3616	0.3616	0.3439	0.3439	0.2998	0.2998	0.2910	0.2998	0.3351	0.3263	0.3528 (22b)
	0.5753	0.5654	0.5654	0.5591	0.5591	0.5450	0.5450	0.5423	0.5450	0.5562	0.5532	0.5622 (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)			16.0100	1.3258	21.2254		(27)
Door to Stairs			1.8900	1.4000	2.6460		(26)
Heat Loss Floor 1			50.5000	0.1400	7.0700		(28b)
Main Wall	34.0300	16.0100	18.0200	0.2200	3.9644	60.0000	1081.2000 (29a)
Wall to stairs	2.6400	1.8900	0.7500	0.1864	0.1398	190.0000	142.5000 (29a)
Flat roof	13.6800		13.6800	0.1400	1.9152	9.0000	123.1200 (30)
Total net area of external elements Aum(A, m ²)			100.8500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.9608		(33)
Party Wall 1			48.8000	0.0000	0.0000	180.0000	8784.0000 (32)
Party Ceilings 1			36.8200			40.0000	1472.8000 (32b)
Internal Wall 1			53.5200			75.0000	4014.0000 (32c)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 15617.6200 (34)
309.2598 (35)
6.2860 (36)
(33) + (36) = 43.2468 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	23.0092	22.6126	22.6126	22.3637	22.3637	21.7960	21.7960	21.6918	21.7960	22.2440	22.1273	22.4866 (38)
Heat transfer coeff	66.2560	65.8593	65.8593	65.6105	65.6105	65.0428	65.0428	64.9386	65.0428	65.4907	65.3741	65.7334 (39)
Average = Sum(39)m / 12 =												65.4884 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3120	1.3041	1.3041	1.2992	1.2992	1.2880	1.2880	1.2859	1.2880	1.2968	1.2945	1.3017 (40)
HLP (average)												1.2968 (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
Average daily hot water use (litres/day)
1.7048 (42)
74.6897 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	82.1587	79.1711	76.1835	73.1959	70.2083	67.2207	67.2207	70.2083	73.1959	76.1835	79.1711	82.1587 (44)
Energy conte	121.8389	106.5611	109.9615	95.8671	91.9868	79.3776	73.5550	84.4055	85.4135	99.5412	108.6570	117.9945 (45)
Energy content (annual)												1175.1599 (45)
Distribution loss (46)m = 0.15 x (45)m	18.2758	15.9842	16.4942	14.3801	13.7980	11.9066	11.0333	12.6608	12.8120	14.9312	16.2986	17.6992 (46)

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Water storage loss:												210.0000 (47)
Store volume												1.8600 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												1.0044 (55)
Enter (49) or (54) in (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	176.2377	155.6955	164.3603	148.5111	146.3856	132.0216	127.9538	138.8043	138.0575	153.9400	161.3010	172.3933 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
	Solar input (sum of months) = Sum(63)m = 0.0000 (63)											
Output from w/h	176.2377	155.6955	164.3603	148.5111	146.3856	132.0216	127.9538	138.8043	138.0575	153.9400	161.3010	172.3933 (64)
	Total per year (kWh/year) = Sum(64)m = 1815.6619 (64)											
Heat gains from water heating, kWh/month	84.0305	74.7391	80.0812	73.9910	74.1046	68.5083	67.9761	71.5839	70.5152	76.6165	78.2437	82.7522 (65)

[illegible]

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Space heating	284.3929	188.6923	108.3775	32.9160	5.6506	0.0000	0.0000	0.0000	0.0000	35.4958	156.9789	300.3963 (98)
Space heating per m2										(98) / (4) =		22.0376 (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 %)												234.0316 (206)
Efficiency of secondary/supplementary heating system, %												100.0000 (208)
Space heating requirement												475.5343 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	284.3929	188.6923	108.3775	32.9160	5.6506	0.0000	0.0000	0.0000	0.0000	35.4958	156.9789	300.3963 (98)
Space heating efficiency (main heating system 1)	234.0316	234.0316	234.0316	234.0316	234.0316	0.0000	0.0000	0.0000	0.0000	234.0316	234.0316	234.0316 (210)
Space heating fuel (main heating system)	121.5190	80.6269	46.3089	14.0648	2.4145	0.0000	0.0000	0.0000	0.0000	15.1671	67.0760	128.3571 (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	176.2377	155.6955	164.3603	148.5111	146.3856	132.0216	127.9538	138.8043	138.0575	153.9400	161.3010	172.3933 (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	104.0119	91.8883	97.0021	87.6482	86.3938	77.9164	75.5157	81.9194	81.4787	90.8522	95.1966	101.7430 (219)
Water heating fuel used												1071.5663 (219)
Annual totals kWh/year												
Space heating fuel - main system												475.5343 (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)												233.8540 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
Total delivered energy for all uses												1780.9545 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	475.5343	18.9000	89.8760 (240)	
Space heating - secondary	0.0000	0.0000	0.0000 (242)	
Water heating (other fuel)	1071.5663	18.9000	202.5260 (247)	
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)	
Energy for lighting	233.8540	18.9000	44.1984 (250)	
Additional standing charges			0.0000 (251)	
Energy saving/generation technologies				
PV Unit	0.0000	18.9000	0.0000 (252)	
Total energy cost			336.6004 (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	475.5343	0.5190	246.8023 (261)	
Space heating - secondary	0.0000	0.5190	0.0000 (263)	
Water heating (other fuel)	1071.5663	0.5190	556.1429 (264)	
Space and water heating			802.9452 (265)	
Pumps and fans	0.0000	0.0000	0.0000 (267)	
Energy for lighting	233.8540	0.5190	121.3702 (268)	
Energy saving/generation technologies				
PV Unit	-300.0000	0.5190	-155.7000 (269)	
Total kg/year			768.6154 (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	475.5343	3.0700	1459.8902 (261)	
Space heating - secondary	0.0000	3.0700	0.0000 (263)	
Water heating (other fuel)	1071.5663	3.0700	3289.7084 (264)	
Space and water heating			4749.5986 (265)	
Pumps and fans	0.0000	0.0000	0.0000 (267)	
Energy for lighting	233.8540	3.0700	717.9317 (268)	
Energy saving/generation technologies				

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

PV Unit	-300.0000	3.0700	-921.0000 (269)
Primary energy kWh/year			4546.5303 (272)
Primary energy kWh/m2/year			90.0303 (273)

SAP 2012 EPC IMPROVEMENTS

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

(For testing purposes):

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

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

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0		0.00 kg/m²
Potential energy efficiency rating:		B 85	
Potential environmental impact rating:			B 88

Fuel prices for cost data on this page from database revision number 472 TEST (30 Jan 2021)
Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£337	£337	£0
Space heating	£90	£90	£0
Water heating	£203	£203	£0
Lighting	£44	£44	£0
Total cost of fuels	£337	£337	£0
Total cost of uses	£337	£337	£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	90 kWh/m²	90 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	EndTerrace Flat
Number of storeys	1
Cross ventilation possible	Yes
SAP Region	Thames Valley
Front of dwelling faces	West
Overshading	Average or unknown
Thermal mass parameter	309.3 (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	239.98 (P1)
Transmission heat loss coefficient	43.25 (37)
Summer heat loss coefficient	283.22 (P2)

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

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

[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Shading	Gains W
South	6.4000	112.2060	0.6300	0.7000	0.9000	256.5191
West	9.6100	117.5071	0.6300	0.7000	0.9000	403.3769
total:						659.8959

Solar gains	Jun	Jul	Aug	
	694	660	608	(P3)
Internal gains	363	351	357	
Total summer gains	1057	1010	965	(P5)
Summer gain/loss ratio	3.73	3.57	3.41	(P6)
Summer external temperature	16.00	17.90	17.80	
Thermal mass temperature increment (TMP = 309.3)	0.00	0.00	0.00	
Threshold temperature	19.73	21.47	21.21	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	
Assessment of likelihood of high internal temperature:	Slight			

BASIC COMPLIANCE REPORT

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

Property Reference	015727	Issued on Date	01/03/2021
Assessment Reference	003	Prop Type Ref	
Property	Flat 6, 18, Parkside Road, READING, RG30 2DB		
SAP Rating	85 B	DER	18.06
Environmental	88 B	TER	27.97
CO ₂ Emissions (t/year)	0.77	% DER<TER	35.44
General Requirements Compliance	Fail	DFEE	45.03
		TFEE	44.75
		% DFEE<TFEE	-0.61
Assessor Details	Mr. Matthew Carter, Energy Calculations Limited, Tel: 01754 761035, mcart@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)	27.97	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	18.06	kgCO ₂ /m ²	Pass
	-9.91 (-35.4%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	44.75	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	45.03	kWh/m ² /yr	
Excess energy	0.2 (0.4%)	kWh/m ² /yr	Fail

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

Limiting System Efficiencies

4 Heating efficiency

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

BASIC COMPLIANCE REPORT

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

5 Cylinder insulation

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

6 Controls

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

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)	Slight	Pass
Based on:		
Overshading	Average	
Windows facing South	6.40 m ² , No overhang	
Windows facing West	9.61 m ² , 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/m ² K	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/m ² K
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	015727	Issued on Date	01/03/2021
Assessment Reference	003	Prop Type Ref	
Property	Flat 6, 18, Parkside Road, READING, RG30 2DB		
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Environmental	88 B	TER	27.97
CO ₂ Emissions (t/year)	0.77	% DER<TER	35.44
General Requirements Compliance	Fail	DFEE	45.03
		TFEE	44.75
		% DFEE<TFEE	-0.61
Assessor Details	Mr. Matthew Carter, Energy Calculations Limited, Tel: 01754 761035, mcarter@energycalculations.co.uk		Assessor ID
			7869-0001
Client			

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

Orientation	West
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Urban
1.0 Property Type	Flat, End-Terrace
2.0 Number of Storeys	1
3.0 Date Built	2020
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements				
	Ground Floor:	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
		15.28 m	50.50 m ²	2.40 m

7.0 Living Area	25.60	m ²
-----------------	-------	----------------

8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	309.26	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	34.03	18.02
Wall to stairs	Cavity Wall	Cavity wall : dense plaster, dense block, filled cavity, any outside structure	0.22	190.00	2.64	0.75

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	48.80

9.2 Internal Walls					
Description	Construction		Kappa (kJ/m ² K)	Area (m ²)	
Internal Wall 1	Dense block, plasterboard on dabs		75.00	53.52	

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)
Flat roof	External Flat Roof	Plasterboard, insulated flat roof	0.14	9.00	13.68	13.68

10.1 Party Ceilings

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceilings 1	Precast concrete planks floor, screed, carpeted	30.00	36.82

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)
Heat Loss Floor 1	Exposed Floor - Solid	Other	0.14	0.00	50.50

12.0 Opening Types

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

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
Door	Door to Corridor	[2] Wall to stairs	North							1.89	
Windows	Window	[1] Main Wall	West	None	0.00					9.61	
Windows	Window	[1] Main Wall	South	None	0.00					6.40	

14.0 Conservatory

None

15.0 Draught Proofing

100

%

16.0 Draught Lobby

Yes

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported
Table K1 - Approved	E2 Other lintels (including other steel lintels)	7.70	0.300	No
Table K1 - Approved	E3 Sill	7.70	0.040	No
Table K1 - Approved	E4 Jamb	41.60	0.050	No
Table K1 - Approved	E7 Party floor between dwellings (in blocks of flats)	15.28	0.070	No
Table K1 - Default	E14 Flat roof	10.08	0.080	No
Table K1 - Approved	E16 Corner (normal)	4.80	0.090	No
Table K1 - Approved	E17 Corner (inverted – internal area greater than external area)	14.40	-0.090	No
Table K1 - Approved	E18 Party wall between dwellings	9.60	0.060	No
Table K1 - Default	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	20.34	0.000	No

Y-value	0.062	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
Air change rate	6.00

Mechanical Ventilation

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Mechanical Ventilation System Present

No

20.0 Fans, Open Fireplaces, Flues

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

21.0 Fixed Cooling System

No

22.0 Lighting

Internal

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

External

External lights fitted	Yes
Light and motion sensor	Yes

23.0 Electricity Tariff

Standard

24.0 Main Heating 1

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

25.0 Main Heating 2

None

Community Heating	None
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28.0 Water Heating

Water Heating	HWP From main heating 1
Flue Gas Heat Recovery System	Main Heating 1
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

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	01/03/2021
Block Name	Parkside Road		
Assessor Details	Mr. Matthew Carter, Energy Calculations Limited, Tel: 01754 761035, mcarter@energycalculations.co.uk		Assessor ID
			7869-0001
Client			

Block Compliance Report - DER

Block Reference: 000516		Block Name: Parkside Road			
Property-Assessment Reference	Multiplier	Floor Area (m ²)	DER (kgCO ₂ /m ²)	TER (kgCO ₂ /m ²)	% DER/TER
015722-003	1	73.4	16.43	27.83	40.96 %
015723-003	1	53	21.18	34.27	38.19 %
015724-003	1	50	19.12	28.78	33.57 %
015725-003	1	62.62	17.20	27.70	37.90 %
015726-003	1	45.84	19.12	29.28	34.69 %
015727-003	1	50.5	18.06	27.97	35.44 %
015728-003	1	44.2	21.03	31.09	32.37 %
015729-003	1	78.1	14.72	23.84	38.25 %
015730-003	1	63.8	17.28	28.45	39.26 %
015731-003	1	60.7	17.13	27.10	36.79 %
015732-003	1	43.25	21.26	29.47	27.86 %
015733-003	1	78.25	15.78	27.04	41.63 %
Totals:	12	703.66	218.31	342.81	
Average DER = 17.80 kgCO ₂ /m ²		% DER/TER	PASS		
Average TER = 28.24 kgCO ₂ /m ²		36.97 %			

Block Compliance Report - DFEE

Block Reference: 000516		Block Name: Parkside Road			
Property-Assessment Reference	Multiplier	Floor Area (m ²)	DFEE (kWh/m ² /yr)	TFEE (kWh/m ² /yr)	% DFEE/TFEE
015722-003	1	73.4	51.81	54.01	4.08 %
015723-003	1	53	67.01	66.99	-0.03 %
015724-003	1	50	45.25	46.33	2.34 %
015725-003	1	62.62	49.26	49.72	0.92 %
015726-003	1	45.84	46.34	45.82	-1.15 %
015727-003	1	50.5	45.03	44.75	-0.61 %
015728-003	1	44.2	47.58	50.81	6.35 %
015729-003	1	78.1	41.12	42.82	3.99 %
015730-003	1	63.8	50.50	52.76	4.28 %
015731-003	1	60.7	45.65	47.49	3.89 %
015732-003	1	43.25	42.47	43.04	1.31 %
015733-003	1	78.25	50.76	53.42	4.97 %
Totals:	12	703.66	582.78	597.97	
Average DFEE = 48.63 kWh/m ² /yr		% DFEE/TFEE	PASS		
Average TFEE = 50.00 kWh/m ² /yr		2.74 %			