

Energy Calculations Ltd

SAP ♦ CODE ♦ SBEM ♦ DESIGN

01754-761035



SAP Report Submission for Building Regulations Compliance

Client:

Project: Flat 11, 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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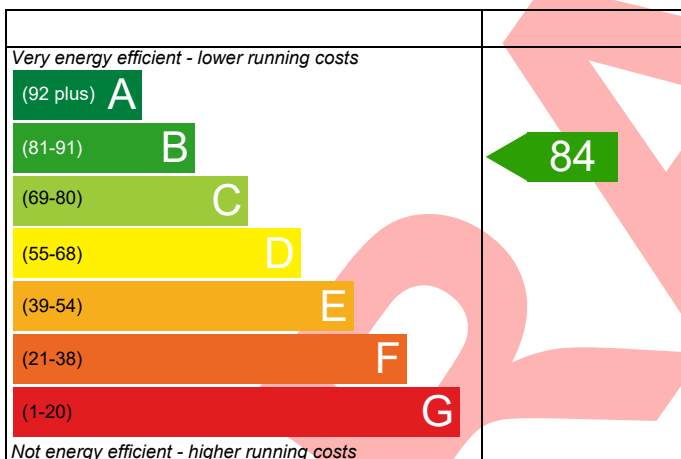
Flat 11, 18, Parkside Road,
READING,
RG30 2DB

Dwelling type: Flat, Mid-Terrace
Date of assessment: 01/03/2021
Produced by: Energy Calculations Limited
Total floor area: 43.25 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

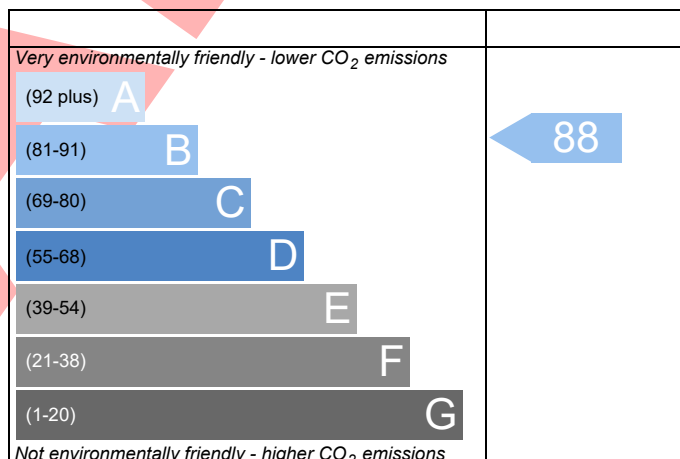


England

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	015732	Issued on Date	01/03/2021
Assessment Reference	003	Prop Type Ref	
Property	Flat 11, 18, Parkside Road, READING, RG30 2DB		

SAP Rating	84 B	DER	21.26	TER	29.47
Environmental	88 B	% DER<TER	27.86		
CO ₂ Emissions (t/year)	0.73	DFEE	42.47	TFEE	43.04
General Requirements Compliance	Pass	% DFEE<TFEE	1.31		

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	4.25	1.28	
External wall	E3 Sill	Table K1 - Approved	0.040	4.25	0.17	
External wall	E4 Jamb	Table K1 - Approved	0.050	11.80	0.59	
External wall	E7 Party floor between dwellings (in blocks of flats)	Table K1 - Approved	0.070	14.01	0.98	
External wall	E14 Flat roof	Table K1 - Default	0.080	14.01	1.12	
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	12.00	-1.08	
External wall	E18 Party wall between dwellings	Table K1 - Approved	0.060	14.40	0.86	
Party wall	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	0.000	20.49	0.00	

Total: **4.35** W/mK:
Y-Value: **0.057** W/m²K:

FULL SAP CALCULATION PRINTOUT

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

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

DWELLING AS DESIGNED

Top-floor flat, total floor area 43 m²

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

1a TER and DER

Fuel for main heating:Electricity

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 29.47 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 21.26 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)43.0 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)42.5 kWh/m²/yrOK

2 Fabric U-values

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

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

Secondary heating system: None

5 Cylinder insulation

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

6 Controls

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

Cylinderstat	OK
Independent timer for DHW	OK

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames Valley): Not significant OK

Based on:

Overshading:	Average
Windows facing West:	5.01 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

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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	43.2500 (1b)	x 2.4000 (2b)	= 103.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.2500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 103.8000 (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) = 0.1927 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4427 (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) = 0.3763 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
	0.4798	0.4703	0.4609	0.4139	0.4045	0.3575	0.3575	0.3481	0.3763	0.4045	0.4233	0.4421 (22b)
Effective ac	0.6151	0.6106	0.6062	0.5857	0.5818	0.5639	0.5639	0.5606	0.5708	0.5818	0.5896	0.5977 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.40)			5.0100	1.3258	6.6420		(27)
Door to Stairs			1.8900	1.4000	2.6460		(26)
Main Wall	30.7400	5.0100	25.7300	0.2200	5.6606	60.0000	1543.8000 (29a)
Wall to stairs	2.8800	1.8900	0.9900	0.1864	0.1845	190.0000	188.1000 (29a)
Flat roof	43.2500		43.2500	0.1400	6.0550	9.0000	389.2500 (30)
Total net area of external elements Aum, m ²			76.8700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	21.1882		(33)
Party Wall 1			49.1700	0.0000	0.0000	180.0000	8850.6000 (32)
Party Floor 1			43.2500			40.0000	1730.0000 (32d)
Internal Wall 1			34.3200			100.0000	3432.0000 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 16133.7500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							373.0347 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.3525 (36)
Total fabric heat loss							(33) + (36) = 25.5407 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	21.0690	20.9159	20.7659	20.0611	19.9293	19.3155	19.3155	19.2018	19.5519	19.9293	20.1960	20.4749 (38)
Heat transfer coeff	46.6097	46.4566	46.3065	45.6018	45.4699	44.8561	44.8561	44.7425	45.0926	45.4699	45.7367	46.0155 (39)
Average = Sum(39)m / 12 =												45.6012 (39)
HLP	1.0777	1.0741	1.0707	1.0544	1.0513	1.0371	1.0371	1.0345	1.0426	1.0513	1.0575	1.0639 (40)
HLP (average)												1.0544 (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												1.4951 (42)
Average daily hot water use (litres/day)												69.7097 (43)
Daily hot water use	76.6807	73.8923	71.1039	68.3155	65.5271	62.7387	62.7387	65.5271	68.3155	71.1039	73.8923	76.6807 (44)
Energy conte	113.7152	99.4560	102.6297	89.4751	85.8535	74.0850	68.6507	78.7776	79.7185	92.9042	101.4122	110.1271 (45)
Energy content (annual)										Total = Sum(45)m =		1096.8047 (45)
Distribution loss (46)m = 0.15 x (45)m	17.0573	14.9184	15.3945	13.4213	12.8780	11.1128	10.2976	11.8166	11.9578	13.9356	15.2118	16.5191 (46)
Water storage loss:												

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Store volume													210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.8600 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													1.0044 (55)
Total storage loss													
31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	30.1320	(56)
If cylinder contains dedicated solar storage													
31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	30.1320	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
168.1140	148.5904	157.0285	142.1191	140.2523	126.7290	123.0495	133.1764	132.3625	147.3030	154.0562	164.5259	164.5259	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =													
Output from w/h													
168.1140	148.5904	157.0285	142.1191	140.2523	126.7290	123.0495	133.1764	132.3625	147.3030	154.0562	164.5259	164.5259	(64)
Heat gains from water heating, kWh/month													
81.3293	72.3766	77.6434	71.8657	72.0653	66.7485	66.3454	69.7126	68.6216	74.4097	75.8348	80.1363	80.1363	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
74.7572	74.7572	74.7572	74.7572	74.7572	74.7572	74.7572	74.7572	74.7572	74.7572	74.7572	74.7572	74.7572	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
12.9433	11.4961	9.3493	7.0780	5.2909	4.4668	4.8265	6.2737	8.4205	10.6918	12.4789	13.3030	13.3030	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
129.7851	131.1319	127.7381	120.5131	111.3928	102.8211	97.0946	95.7478	99.1416	106.3666	115.4869	124.0587	124.0587	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
30.4757	30.4757	30.4757	30.4757	30.4757	30.4757	30.4757	30.4757	30.4757	30.4757	30.4757	30.4757	30.4757	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	(71)
Water heating gains (Table 5)													
109.3136	107.7033	104.3594	99.8134	96.8620	92.7062	89.1739	93.6997	95.3078	100.0130	105.3261	107.7101	107.7101	(72)
Total internal gains													
297.4692	295.7585	286.8740	272.8317	258.9729	245.4212	236.5222	241.1484	248.2971	262.4986	278.7191	290.4989	290.4989	(73)

6. Solar gains

[Jan]													
Area													
m2													
Solar flux													
Table 6a													
W/m2													
Specific data													
or Table 6b													
Specific data													
or Table 6c													
Access													
factor													
Table 6d													
Gains													
W													
West	5.0100	19.6403	0.6300	0.7000	0.7700	30.0716	(80)						
Solar gains	30.0716	58.8265	96.8788	141.2920	173.1586	177.2587	168.7575	144.9602	112.6741	69.8026	37.4958	24.7294	(83)
Total gains	327.5408	354.5850	383.7528	414.1237	432.1315	422.6799	405.2797	386.1086	360.9712	332.3012	316.2148	315.2284	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
96.1517	96.4685	96.7811	98.2768	98.5617	99.9105	99.9105	100.1643	99.3866	98.5617	97.9869	97.3931	97.3931	
alpha	7.4101	7.4312	7.4521	7.5518	7.5708	7.6607	7.6607	7.6776	7.6258	7.5708	7.5325	7.4929	
util living area													
0.9991	0.9979	0.9933	0.9688	0.8735	0.6675	0.4860	0.5311	0.8089	0.9784	0.9974	0.9993	0.9993	(86)
Weekday	19.2621	19.3629	19.5436	19.7878	19.9434	19.9976	20.0003	20.0024	19.9821	19.7982	19.5016	19.2588	
Weekend	20.6310	20.6746	20.7540	20.8611	20.9419	20.9732	20.9767	20.9765	20.9622	20.8633	20.7308	20.6253	
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	20.4305	20.4966	20.6204	20.7831	20.9103	20.9588	20.9640	20.9637	20.9409	20.7890	20.5797	20.4218	(87)
Th 2	20.0191	20.0220	20.0249	20.0383	20.0408	20.0525	20.0525	20.0547	20.0480	20.0408	20.0357	20.0304	(88)
util rest of house													
0.9986	0.9969	0.9898	0.9521	0.8183	0.5749	0.3820	0.4232	0.7215	0.9634	0.9958	0.9989	0.9989	(89)
Weekday	19.2621	19.3629	19.5436	19.7878	19.9434	19.9976	20.0003	20.0024	19.9821	19.7982	19.5016	19.2588	
Weekend	19.2621	19.3629	19.5436	19.7878	19.9434	19.9976	20.0003	20.0024	19.9821	19.7982	19.5016	19.2588	
MIT	19.2621	19.3629	19.5436	19.7878	19.9434	19.9976	20.0003	20.0024	19.9821	19.7982	19.5016	19.2588	(90)
Living area fraction													
fLA = Living area / (4) =													
19.8705	19.9532	20.1043	20.3060	20.4469	20.4981	20.5021	20.5029	20.4814	20.3141	20.0630	19.8644	19.8644	(92)
Temperature adjustment													
adjusted MIT	19.8705	19.9532	20.1043	20.3060	20.4469	20.4981	20.5021	20.5029	20.4814	20.3141	20.0630	19.8644	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.9985	0.9968	0.9901	0.9575	0.8435	0.6193	0.4315	0.4746	0.7637	0.9685	0.9959	0.9989	0.9989	(94)
Useful gains	327.0456	353.4577	379.9640	396.5219	364.5187	261.7857	174.8722	183.2556	275.6838	321.8455	314.9124	314.8671	(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													
725.7342	699.3214	629.9675	520.1354	397.7189	264.5673	175.0324	183.5757	287.7519	441.6983	592.8829	720.8044	720.8044	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
296.6244	232.4205	186.0025	89.0017	24.7009	0.0000	0.0000	0.0000	0.0000	89.1705	200.1387	302.0174	302.0174	(98)
Space heating													
													1420.0765 (98)

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Space heating per m2 (98) / (4) = 32.8341 (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 %)													173.6707 (206)
Efficiency of secondary/supplementary heating system, %													100.0000 (208)
Space heating requirement													817.6834 (211)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	296.6244	232.4205	186.0025	89.0017	24.7009	0.0000	0.0000	0.0000	0.0000	89.1705	200.1387	302.0174 (98)	
Space heating efficiency (main heating system 1)	173.6707	173.6707	173.6707	173.6707	173.6707	0.0000	0.0000	0.0000	0.0000	173.6707	173.6707	173.6707 (210)	
Space heating fuel (main heating system)	170.7970	133.8282	107.1007	51.2474	14.2228	0.0000	0.0000	0.0000	0.0000	51.3446	115.2403	173.9023 (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	168.1140	148.5904	157.0285	142.1191	140.2523	126.7290	123.0495	133.1764	132.3625	147.3030	154.0562	164.5259 (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	99.2174	87.6950	92.6750	83.8758	82.7740	74.7929	72.6213	78.5980	78.1176	86.9352	90.9208	97.0998 (219)	
Water heating fuel used												1025.3227 (219)	
Annual totals kWh/year													
Space heating fuel - main system												817.6834 (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)												228.5825 (232)	
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses												2071.5886 (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	817.6834	0.5190	424.3777 (261)	
Space heating - secondary	0.0000	0.5190	0.0000 (263)	
Water heating (other fuel)	1025.3227	0.5190	532.1425 (264)	
Space and water heating			956.5201 (265)	
Pumps and fans	0.0000	0.0000	0.0000 (267)	
Energy for lighting	228.5825	0.5190	118.6343 (268)	
Energy saving/generation technologies				
PV Unit	-300.0000	0.5190	-155.7000 (269)	
Total CO2, kg/year			919.4545 (272)	
Dwelling Carbon Dioxide Emission Rate (DER)			21.2600 (273)	

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

DER			21.2600 ZC1	
Total Floor Area		TFA	43.2500	
Assumed number of occupants		N	1.4951	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			17.7822 ZC2	
CO2 emissions from cooking, equation (L16)			3.5811 ZC3	
Total CO2 emissions			42.6233 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			42.6233 ZC8	

FULL SAP CALCULATION PRINTOUT

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1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	43.2500 (1b)	x 2.4000 (2b)	= 103.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.2500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 103.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	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) =
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4427 (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) =				0.3763 (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	0.4798	0.4703	0.4609	0.4139	0.4045	0.3575	0.3575	0.3481	0.3763	0.4045	0.4233	0.4421 (22b)
	0.6151	0.6106	0.6062	0.5857	0.5818	0.5639	0.5639	0.5606	0.5708	0.5818	0.5896	0.5977 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			5.0100	1.3258	6.6420		(27)
Main Wall	30.7400	5.0100	25.7300	0.1800	4.6314		(29a)
Wall to stairs	2.8800	1.8900	0.9900	0.1800	0.1782		(29a)
Flat roof	43.2500		43.2500	0.1300	5.6225		(30)
Total net area of external elements Aum(A, m ²)			76.8700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	18.9641		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.3325 (36)
Total fabric heat loss						(33) + (36) =	22.2966 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	21.0690	20.9159	20.7659	20.0611	19.9293	19.3155	19.3155	19.2018	19.5519	19.9293	20.1960	20.4749 (38)
Heat transfer coeff	43.3656	43.2126	43.0625	42.3578	42.2259	41.6121	41.6121	41.4985	41.8486	42.2259	42.4927	42.7715 (39)
Average = Sum(39)m / 12 =												42.3572 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0027	0.9991	0.9957	0.9794	0.9763	0.9621	0.9621	0.9595	0.9676	0.9763	0.9825	0.9889 (40)
HLP (average)												0.9794 (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												1.4951 (42)
Average daily hot water use (litres/day)												69.7097 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	76.6807	73.8923	71.1039	68.3155	65.5271	62.7387	62.7387	65.5271	68.3155	71.1039	73.8923	76.6807 (44)
Energy conte	113.7152	99.4560	102.6297	89.4751	85.8535	74.0850	68.6507	78.7776	79.7185	92.9042	101.4122	110.1271 (45)
Energy content (annual)												Total = Sum(45)m = 1096.8047 (45)
Distribution loss (46)m = 0.15 x (45)m	17.0573	14.9184	15.3945	13.4213	12.8780	11.1128	10.2976	11.8166	11.9578	13.9356	15.2118	16.5191 (46)
Water storage loss:												210.0000 (47)
Store volume												1.7016 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.9188 (55)
Enter (49) or (54) in (55)												

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Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842 (56)
If cylinder contains dedicated solar storage	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	165.4618	146.1949	154.3763	139.5524	137.6001	124.1624	120.3972	130.5242	129.7958	144.6508	151.4895	161.8737 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	165.4618	146.1949	154.3763	139.5524	137.6001	124.1624	120.3972	130.5242	129.7958	144.6508	151.4895	161.8737 (64)
Heat gains from water heating, kWh/month	79.2076	70.4602	75.5217	69.8123	69.9435	64.6951	64.2236	67.5908	66.5683	72.2879	73.7814	78.0145 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	74.7572	74.7572	74.7572	74.7572	74.7572	74.7572	74.7572	74.7572	74.7572	74.7572	74.7572	74.7572 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	12.9433	11.4961	9.3493	7.0780	5.2909	4.4668	4.8265	6.2737	8.4205	10.6918	12.4789	13.3030 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	129.7851	131.1319	127.7381	120.5131	111.3928	102.8211	97.0946	95.7478	99.1416	106.3666	115.4869	124.0587 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4757	30.4757	30.4757	30.4757	30.4757	30.4757	30.4757	30.4757	30.4757	30.4757	30.4757	30.4757 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058 (71)
Water heating gains (Table 5)	106.4618	104.8515	101.5076	96.9616	94.0101	89.8544	86.3221	90.8479	92.4559	97.1612	102.4742	104.8582 (72)
Total internal gains	297.6174	295.9067	287.0221	272.9798	259.1210	245.5694	236.6704	241.2966	248.4453	262.6468	278.8672	290.6471 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
West				5.0100	19.6403	0.6300		0.7000		0.7700		30.0716 (80)
Solar gains	30.0716	58.8265	96.8788	141.2920	173.1586	177.2587	168.7575	144.9602	112.6741	69.8026	37.4958	24.7294 (83)
Total gains	327.6890	354.7332	383.9010	414.2718	432.2797	422.8281	405.4278	386.2568	361.1194	332.4494	316.3630	315.3765 (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	69.2593	69.5046	69.7468	70.9072	71.1286	72.1778	72.1778	72.3755	71.7700	71.1286	70.6821	70.2213
alpha	5.6173	5.6336	5.6498	5.7271	5.7419	5.8119	5.8119	5.8250	5.7847	5.7419	5.7121	5.6814
util living area	0.9936	0.9888	0.9743	0.9256	0.8079	0.6133	0.4492	0.4901	0.7433	0.9420	0.9867	0.9948 (86)
MIT	20.1106	20.2298	20.4406	20.7107	20.9025	20.9842	20.9978	20.9964	20.9543	20.7175	20.3762	20.0943 (87)
Th 2	20.0811	20.0841	20.0869	20.1006	20.1031	20.1150	20.1150	20.1172	20.1104	20.1031	20.0980	20.0926 (88)
util rest of house	0.9916	0.9854	0.9661	0.9025	0.7565	0.5355	0.3602	0.3982	0.6680	0.9190	0.9819	0.9931 (89)
MIT 2	18.9065	19.0814	19.3860	19.7705	20.0118	20.1049	20.1142	20.1158	20.0765	19.7886	19.3051	18.8916 (90)
Living area fraction	19.5334	19.6794	19.9352	20.2601	20.4756	20.5628	20.5743	20.5743	20.5336	20.2723	19.8628	19.5178 (92)
Temperature adjustment	19.5334	19.6794	19.9352	20.2601	20.4756	20.5628	20.5743	20.5743	20.5336	20.2723	19.8628	19.5178 (93)
adjusted MIT	19.5334	19.6794	19.9352	20.2601	20.4756	20.5628	20.5743	20.5743	20.5336	20.2723	19.8628	19.5178 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9901	0.9835	0.9645	0.9071	0.7790	0.5756	0.4066	0.4462	0.7054	0.9240	0.9803	0.9918 (94)
Ext temp.	324.4403	348.8707	370.2819	375.7738	336.7464	243.3701	164.8423	172.3288	254.7232	307.1680	310.1298	312.7883 (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	660.6076	638.6543	578.5516	481.1871	370.5574	248.1240	165.3775	173.2270	269.2365	408.4205	542.3257	655.1679 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating per m2	250.1085	194.7346	154.9527	75.8976	25.1554	0.0000	0.0000	0.0000	0.0000	75.3318	167.1811	254.7304 (98)
Space heating	(98) / (4) =											
Space heating per m2	27.7015 (99)											

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1281.3818 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	250.1085	194.7346	154.9527	75.8976	25.1554	0.0000	0.0000	0.0000	0.0000	75.3318	167.1811	254.7304	(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)	267.4957	208.2723	165.7248	81.1739	26.9042	0.0000	0.0000	0.0000	0.0000	80.5688	178.8033	272.4390	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	165.4618	146.1949	154.3763	139.5524	137.6001	124.1624	120.3972	130.5242	129.7958	144.6508	151.4895	161.8737	(64)
Efficiency of water heater (217)m	85.9134	85.5794	84.8238	83.2681	81.2854	79.8000	79.8000	79.8000	79.8000	83.1673	85.0771	86.0185	(217)
Fuel for water heating, kWh/month	192.5914	170.8295	181.9965	167.5940	169.2802	155.5919	150.8737	163.5642	162.6514	173.9276	178.0616	188.1848	(219)
Water heating fuel used												2055.1468	(219)
Annual totals kWh/year													
Space heating fuel - main system												1281.3818	(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)												228.5825	(232)
Total delivered energy for all uses												3640.1111	(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	1281.3818	0.2160	276.7785 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2055.1468	0.2160	443.9117 (264)
Space and water heating			720.6902 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	228.5825	0.5190	118.6343 (268)
Total CO2, kg/m2/year			878.2495 (272)
Emissions per m2 for space and water heating			16.6634 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.7430 (272b)
Emissions per m2 for pumps and fans			0.9000 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.6634 * 1.55) + 2.7430 + 0.9000, rounded to 2 d.p.			29.4700 (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	43.2500 (1b)	x 2.4000 (2b)	= 103.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.2500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 103.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	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) =
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4427 (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) =				0.3763 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
	0.4798	0.4703	0.4609	0.4139	0.4045	0.3575	0.3575	0.3481	0.3763	0.4045	0.4233	0.4421 (22b)
Effective ac	0.6151	0.6106	0.6062	0.5857	0.5818	0.5639	0.5639	0.5606	0.5708	0.5818	0.5896	0.5977 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.40)			5.0100	1.3258	6.6420		(27)
Door to Stairs			1.8900	1.4000	2.6460		(26)
Main Wall	30.7400	5.0100	25.7300	0.2200	5.6606	60.0000	1543.8000 (29a)
Wall to stairs	2.8800	1.8900	0.9900	0.1864	0.1845	190.0000	188.1000 (29a)
Flat roof	43.2500		43.2500	0.1400	6.0550	9.0000	389.2500 (30)
Total net area of external elements Aum, m ²			76.8700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	21.1882		(33)
Party Wall 1			49.1700	0.0000	0.0000	180.0000	8850.6000 (32)
Party Floor 1			43.2500			40.0000	1730.0000 (32d)
Internal Wall 1			34.3200			100.0000	3432.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	16133.7500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							373.0347 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.3525 (36)
Total fabric heat loss						(33) + (36) =	25.5407 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	21.0690	20.9159	20.7659	20.0611	19.9293	19.3155	19.3155	19.2018	19.5519	19.9293	20.1960	20.4749 (38)
Heat transfer coeff	46.6097	46.4566	46.3065	45.6018	45.4699	44.8561	44.8561	44.7425	45.0926	45.4699	45.7367	46.0155 (39)
Average = Sum(39)m / 12 =												45.6012 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0777	1.0741	1.0707	1.0544	1.0513	1.0371	1.0371	1.0345	1.0426	1.0513	1.0575	1.0639 (40)
HLP (average)												1.0544 (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												1.4951 (42)
Average daily hot water use (litres/day)												69.7097 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	76.6807	73.8923	71.1039	68.3155	65.5271	62.7387	62.7387	65.5271	68.3155	71.1039	73.8923	76.6807 (44)
Energy conte	113.7152	99.4560	102.6297	89.4751	85.8535	74.0850	68.6507	78.7776	79.7185	92.9042	101.4122	110.1271 (45)
Energy content (annual)										Total = Sum(45)m =		1096.8047 (45)
Distribution loss (46)m = 0.15 x (45)m												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												

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Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	24.1645	21.1344	21.8088	19.0135	18.2439	15.7431	14.5883	16.7402	16.9402	19.7421	21.5501	23.4020 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.7572	74.7572	74.7572	74.7572	74.7572	74.7572	74.7572	74.7572	74.7572	74.7572	74.7572	74.7572	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	12.9433	11.4961	9.3493	7.0780	5.2909	4.4668	4.8265	6.2737	8.4205	10.6918	12.4789	13.3030	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	129.7851	131.1319	127.7381	120.5131	111.3928	102.8211	97.0946	95.7478	99.1416	106.3666	115.4869	124.0587	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4757	30.4757	30.4757	30.4757	30.4757	30.4757	30.4757	30.4757	30.4757	30.4757	30.4757	30.4757	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	(71)
Water heating gains (Table 5)	32.4791	31.4500	29.3129	26.4076	24.5213	21.8654	19.6079	22.5003	23.5280	26.5351	29.9307	31.4543	(72)
Total internal gains	220.6347	219.5052	211.8275	199.4258	186.6322	174.5804	166.9562	169.9490	176.5174	189.0208	203.3237	214.2432	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
West				5.0100	19.6403	0.6300	0.7000	0.7700	30.0716 (80)			
Solar gains	30.0716	58.8265	96.8788	141.2920	173.1586	177.2587	168.7575	144.9602	112.6741	69.8026	37.4958	24.7294 (83)
Total gains	250.7064	278.3317	308.7063	340.7178	359.7908	351.8391	335.7137	314.9092	289.1915	258.8233	240.8195	238.9726 (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	96.1517	96.4685	96.7811	98.2768	98.5617	99.9105	99.9105	100.1643	99.3866	98.5617	97.9869	97.3931	
alpha	7.4101	7.4312	7.4521	7.5518	7.5708	7.6607	7.6607	7.6776	7.6258	7.5708	7.5325	7.4929	
util living area	0.9998	0.9996	0.9983	0.9898	0.9414	0.7778	0.5837	0.6447	0.9137	0.9953	0.9996	0.9999	(86)
MIT	20.1671	20.2583	20.4262	20.6604	20.8667	20.9787	20.9978	20.9956	20.9256	20.6590	20.3749	20.1555	(87)
Th 2	20.0191	20.0220	20.0249	20.0383	20.0408	20.0525	20.0525	20.0547	20.0480	20.0408	20.0357	20.0304	(88)
util rest of house	0.9998	0.9994	0.9974	0.9833	0.9052	0.6815	0.4606	0.5176	0.8481	0.9913	0.9993	0.9998	(89)
MIT 2	19.2584	19.3520	19.5219	19.7646	19.9559	20.0449	20.0521	20.0539	20.0116	19.7673	19.4803	19.2564	(90)
Living area fraction	19.7316	19.8239	19.9927	20.2310	20.4302	20.5311	20.5445	20.5442	fLA = Living area / (4) =			0.5207	(91)
MIT	19.7316	19.8239	19.9927	20.2310	20.4302	20.5311	20.5445	20.5442	20.4875	20.2316	19.9461	19.7246	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7316	19.8239	19.9927	20.2310	20.4302	20.5311	20.5445	20.5442	20.4875	20.2316	19.9461	19.7246	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	250.6401	278.1427	307.8879	335.5729	331.6845	257.6795	176.3147	184.1018	255.1486	256.8270	240.6476	238.9292	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(95)
Heat loss rate W	719.2598	693.3127	624.8025	516.7137	396.9607	266.0466	176.9363	185.4218	288.0306	437.9480	587.5381	714.3715	(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	348.6531	278.9942	235.7844	130.4214	48.5655	0.0000	0.0000	0.0000	0.0000	134.7540	249.7611	353.7291	(98)
Space heating												1780.6629	(98)
Space heating per m2										(98) / (4) =		41.1714	(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	421.6477	331.9354	340.0428	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9258	0.9723	0.9583	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	390.3817	322.7300	325.8604	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	469.0510	449.2094	425.8947	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	56.6419	94.1007	74.4255	0.0000	0.0000	0.0000	0.0000	(104)

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Space cooling												225.1681 (104)
Cooled fraction												1.0000 (105)
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	0.0000	14.1605	23.5252	18.6064	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												56.2920 (107)
Space cooling per m2												1.3015 (108)
Energy for space heating												41.1714 (99)
Energy for space cooling												1.3015 (108)
Total												42.4729 (109)
Dwelling Fabric Energy Efficiency (DFEE)												42.5 (109)

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CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	43.2500 (1b)	x 2.4000 (2b)	= 103.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.2500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	103.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					20.0000 / (5) = 0.1927 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4427 (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) = 0.3763 (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	0.4798	0.4703	0.4609	0.4139	0.4045	0.3575	0.3575	0.3481	0.3763	0.4045	0.4233	0.4421 (22b)
Effective ac	0.6151	0.6106	0.6062	0.5857	0.5818	0.5639	0.5639	0.5606	0.5708	0.5818	0.5896	0.5977 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			5.0100	1.3258	6.6420		(27)
Main Wall	30.7400	5.0100	25.7300	0.1800	4.6314		(29a)
Wall to stairs	2.8800	1.8900	0.9900	0.1800	0.1782		(29a)
Flat roof	43.2500		43.2500	0.1300	5.6225		(30)
Total net area of external elements Aum(A, m ²)			76.8700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	18.9641		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.3325 (36)
Total fabric heat loss							(33) + (36) = 22.2966 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	21.0690	20.9159	20.7659	20.0611	19.9293	19.3155	19.3155	19.2018	19.5519	19.9293	20.1960	20.4749 (38)
Heat transfer coeff	43.3656	43.2126	43.0625	42.3578	42.2259	41.6121	41.6121	41.4985	41.8486	42.2259	42.4927	42.7715 (39)
Average = Sum(39)m / 12 =												42.3572 (39)
HLP	1.0027	0.9991	0.9957	0.9794	0.9763	0.9621	0.9621	0.9595	0.9676	0.9763	0.9825	0.9889 (40)
HLP (average)												0.9794 (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												1.4951 (42)
Average daily hot water use (litres/day)												69.7097 (43)
Daily hot water use	76.6807	73.8923	71.1039	68.3155	65.5271	62.7387	62.7387	65.5271	68.3155	71.1039	73.8923	76.6807 (44)
Energy conte	113.7152	99.4560	102.6297	89.4751	85.8535	74.0850	68.6507	78.7776	79.7185	92.9042	101.4122	110.1271 (45)
Energy content (annual)												Total = Sum(45)m = 1096.8047 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)

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Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	24.1645	21.1344	21.8088	19.0135	18.2439	15.7431	14.5883	16.7402	16.9402	19.7421	21.5501	23.4020 (65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.7572	74.7572	74.7572	74.7572	74.7572	74.7572	74.7572	74.7572	74.7572	74.7572	74.7572	74.7572	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	12.9433	11.4961	9.3493	7.0780	5.2909	4.4668	4.8265	6.2737	8.4205	10.6918	12.4789	13.3030	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	129.7851	131.1319	127.7381	120.5131	111.3928	102.8211	97.0946	95.7478	99.1416	106.3666	115.4869	124.0587	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4757	30.4757	30.4757	30.4757	30.4757	30.4757	30.4757	30.4757	30.4757	30.4757	30.4757	30.4757	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	(71)
Water heating gains (Table 5)	32.4791	31.4500	29.3129	26.4076	24.5213	21.8654	19.6079	22.5003	23.5280	26.5351	29.9307	31.4543	(72)
Total internal gains	220.6347	219.5052	211.8275	199.4258	186.6322	174.5804	166.9562	169.9490	176.5174	189.0208	203.3237	214.2432	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c			Access factor Table 6d	Gains W	
West				5.0100	19.6403	0.6300		0.7000			0.7700	30.0716 (80)	
Solar gains	30.0716	58.8265	96.8788	141.2920	173.1586	177.2587	168.7575	144.9602	112.6741	69.8026	37.4958	24.7294	(83)
Total gains	250.7064	278.3317	308.7063	340.7178	359.7908	351.8391	335.7137	314.9092	289.1915	258.8233	240.8195	238.9726	(84)

7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.2593	69.5046	69.7468	70.9072	71.1286	72.1778	72.1778	72.3755	71.7700	71.1286	70.6821	70.2213	(85)
alpha	5.6173	5.6336	5.6498	5.7271	5.7419	5.8119	5.8119	5.8250	5.7847	5.7419	5.7121	5.6814	
util living area	0.9983	0.9966	0.9905	0.9654	0.8863	0.7140	0.5380	0.5928	0.8520	0.9797	0.9965	0.9987	(86)
MIT	19.9425	20.0659	20.2881	20.5886	20.8344	20.9661	20.9944	20.9905	20.9048	20.5839	20.2145	19.9264	(87)
Th 2	20.0811	20.0841	20.0869	20.1006	20.1031	20.1150	20.1150	20.1172	20.1104	20.1031	20.0980	20.0926	(88)
util rest of house	0.9977	0.9954	0.9871	0.9526	0.8457	0.6322	0.4337	0.4859	0.7872	0.9698	0.9951	0.9983	(89)
MIT 2	19.1122	19.2376	19.4605	19.7647	19.9897	20.0992	20.1135	20.1144	20.0568	19.7661	19.3976	19.1056	(90)
Living area fraction									fLA = Living area / (4) =			0.5207	(91)
MIT	19.5445	19.6689	19.8914	20.1937	20.4296	20.5506	20.5722	20.5706	20.4984	20.1919	19.8230	19.5330	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5445	19.6689	19.8914	20.1937	20.4296	20.5506	20.5722	20.5706	20.4984	20.1919	19.8230	19.5330	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9973	0.9947	0.9862	0.9541	0.8618	0.6740	0.4883	0.5419	0.8179	0.9710	0.9945	0.9979	(94)
Useful gains	250.0343	276.8621	304.4374	325.0821	310.0644	237.1365	163.9142	170.6474	236.5233	251.3152	239.4970	238.4816	(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	661.0896	638.2017	576.6680	478.3746	368.6141	247.6153	165.2910	173.0738	267.7619	405.0278	540.6332	655.8157	(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	305.8251	242.8202	202.5396	110.3707	43.5610	0.0000	0.0000	0.0000	0.0000	114.3622	216.8181	310.4966	(98)
Space heating												1546.7934	(98)
Space heating per m2										(98) / (4) =		35.7640	(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	391.1540	307.9297	315.3883	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9186	0.9621	0.9482	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	359.3023	296.2495	299.0632	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	469.0510	449.2094	425.8947	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	79.0191	113.8022	94.3626	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												287.1839	(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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Energy Calculations Ltd
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CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	19.7548	28.4506	23.5907	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling													71.7960 (107)
Space cooling per m2													1.6600 (108)
Energy for space heating													35.7640 (99)
Energy for space cooling													1.6600 (108)
Total													37.4240 (109)
Target Fabric Energy Efficiency (TFEE)													43.0 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	43.2500 (1b)	x 2.4000 (2b)	= 103.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.2500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 103.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	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) =	0.1927 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4427 (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) =		0.3763 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.4000	4.1000	4.1000	3.9000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000 (22)
Wind factor	1.1000	1.0250	1.0250	0.9750	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000 (22a)
Adj infilt rate	0.4139	0.3857	0.3857	0.3669	0.3669	0.3198	0.3198	0.3104	0.3198	0.3575	0.3481	0.3763 (22b)
Effective ac	0.5857	0.5744	0.5744	0.5673	0.5673	0.5511	0.5511	0.5482	0.5511	0.5639	0.5606	0.5708 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.40)			5.0100	1.3258	6.6420		(27)
Door to Stairs			1.8900	1.4000	2.6460		(26)
Main Wall	30.7400	5.0100	25.7300	0.2200	5.6606	60.0000	1543.8000 (29a)
Wall to stairs	2.8800	1.8900	0.9900	0.1864	0.1845	190.0000	188.1000 (29a)
Flat roof	43.2500		43.2500	0.1400	6.0550	9.0000	389.2500 (30)
Total net area of external elements Aum, m ²			76.8700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	21.1882			(33)
Party Wall 1			49.1700	0.0000	0.0000	180.0000	8850.6000 (32)
Party Floor 1			43.2500			40.0000	1730.0000 (32d)
Internal Wall 1			34.3200			100.0000	3432.0000 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 16133.7500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							373.0347 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.3525 (36)
Total fabric heat loss							(33) + (36) = 25.5407 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	20.0611	19.6747	19.6747	19.4322	19.4322	18.8790	18.8790	18.7775	18.8790	19.3155	19.2018	19.5519 (38)
Heat transfer coeff	45.6018	45.2153	45.2153	44.9728	44.9728	44.4197	44.4197	44.3181	44.4197	44.8561	44.7425	45.0926 (39)
Average = Sum(39)m / 12 =												44.8539 (39)
HLP	1.0544	1.0454	1.0454	1.0398	1.0398	1.0270	1.0270	1.0247	1.0270	1.0371	1.0345	1.0426 (40)
HLP (average)												1.0371 (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												1.4951 (42)
Average daily hot water use (litres/day)												69.7097 (43)
Daily hot water use	76.6807	73.8923	71.1039	68.3155	65.5271	62.7387	62.7387	65.5271	68.3155	71.1039	73.8923	76.6807 (44)
Energy conte	113.7152	99.4560	102.6297	89.4751	85.8535	74.0850	68.6507	78.7776	79.7185	92.9042	101.4122	110.1271 (45)
Energy content (annual)										Total = Sum(45)m =		1096.8047 (45)
Distribution loss (46)m = 0.15 x (45)m	17.0573	14.9184	15.3945	13.4213	12.8780	11.1128	10.2976	11.8166	11.9578	13.9356	15.2118	16.5191 (46)
Water storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Store volume													210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.8600 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													1.0044 (55)
Total storage loss													
31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	30.1320	(56)
If cylinder contains dedicated solar storage													
31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	30.1320	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	(59)
Total heat required for water heating calculated for each month													
168.1140	148.5904	157.0285	142.1191	140.2523	126.7290	123.0495	133.1764	132.3625	147.3030	154.0562	164.5259	164.5259	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =													
Output from w/h													
168.1140	148.5904	157.0285	142.1191	140.2523	126.7290	123.0495	133.1764	132.3625	147.3030	154.0562	164.5259	164.5259	(64)
RHI water heating demand													
Heat gains from water heating, kWh/month													
81.3293	72.3766	77.6434	71.8657	72.0653	66.7485	66.3454	69.7126	68.6216	74.4097	75.8348	80.1363	80.1363	(65)

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

Metabolic gains (Table 5), Watts													
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m	89.7087	89.7087	89.7087	89.7087	89.7087	89.7087	89.7087	89.7087	89.7087	89.7087	89.7087	89.7087	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
32.3582	28.7403	23.3732	17.6950	13.2272	11.1670	12.0663	15.6842	21.0514	26.7295	31.1973	33.2576	33.2576	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
193.7092	195.7193	190.6539	179.8703	166.2580	153.4643	144.9173	142.9072	147.9726	158.7562	172.3685	185.1622	185.1622	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
45.4660	45.4660	45.4660	45.4660	45.4660	45.4660	45.4660	45.4660	45.4660	45.4660	45.4660	45.4660	45.4660	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	(71)
Water heating gains (Table 5)													
109.3136	107.7033	104.3594	99.8134	96.8620	92.7062	89.1739	93.6997	95.3078	100.0130	105.3261	107.7101	107.7101	(72)
Total internal gains													
410.7499	407.5318	393.7554	372.7476	351.7161	332.7064	321.5264	327.6601	339.7006	360.8676	384.2608	401.4987	401.4987	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W

West		5.0100				23.7835	0.6300	0.7000			0.7700			36.4154 (80)

Solar gains	36.4154	62.2245	101.5577	149.9988	178.7959	193.4901	182.4385	159.9651	125.7876	79.2070	44.7282	30.1184	(83)	
Total gains	447.1653	469.7563	495.3131	522.7464	530.5120	526.1965	503.9649	487.6252	465.4883	440.0747	428.9890	431.6172	(84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
tau	98.2768	99.1168	99.1168	99.6512	99.6512	100.8922	100.8922	101.1234	100.8922	99.9105	100.1643	99.3866	
alpha	7.5518	7.6078	7.6078	7.6434	7.6434	7.7261	7.7261	7.7416	7.7261	7.6607	7.6276	7.6258	
util living area													
0.9906	0.9838	0.9572	0.8714	0.6887	0.4553	0.2997	0.3271	0.5874	0.8747	0.9749	0.9922	0.9922	(86)
Tweekday	19.5519	19.6468	19.7996	19.9402	19.9921	20.0091	20.0092	20.0112	20.0082	19.9544	19.7665	19.5492	
Tweekend	20.7531	20.7934	20.8651	20.9364	20.9709	20.9770	20.9772	20.9772	20.9757	20.9418	20.8444	20.7480	
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	20.6190	20.6804	20.7919	20.9008	20.9550	20.9646	20.9648	20.9648	20.9620	20.9102	20.7570	20.6111	(87)
Th 2	20.0383	20.0456	20.0456	20.0503	20.0503	20.0609	20.0609	20.0628	20.0609	20.0525	20.0547	20.0480	(88)
util rest of house													
0.9864	0.9766	0.9390	0.8270	0.6167	0.3764	0.2169	0.2420	0.5008	0.8220	0.9625	0.9887	0.9887	(89)
Tweekday	19.5519	19.6468	19.7996	19.9402	19.9921	20.0091	20.0092	20.0112	20.0082	19.9544	19.7665	19.5492	
Tweekend	19.5519	19.6468	19.7996	19.9402	19.9921	20.0091	20.0092	20.0112	20.0082	19.9544	19.7665	19.5492	
MIT 2	19.5519	19.6468	19.7996	19.9402	19.9921	20.0091	20.0092	20.0112	20.0082	19.9544	19.7665	19.5492	(90)
Living area fraction													
MIT	20.1076	20.1850	20.3163	20.4404	20.4935	20.5066	20.5068	20.5078	20.5048	20.4521	20.2823	20.1021	(92)
Temperature adjustment													
adjusted MIT	20.1076	20.1850	20.3163	20.4404	20.4935	20.5066	20.5068	20.5078	20.5048	20.4521	20.2823	20.1021	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.9868	0.9778	0.9448	0.8465	0.6510	0.4139	0.2562	0.2824	0.5421	0.8459	0.9660	0.9889	0.9889	(94)
Useful gains	441.2486	459.3488	467.9931	442.4910	345.3472	217.8088	129.1143	137.7246	252.3495	372.2754	414.3840	426.8337	(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													
693.4919	663.9873	588.5346	483.0250	350.4951	217.9497	129.1169	137.7301	253.4067	406.0419	558.4882	685.5014	685.5014	(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													
187.6690	137.5171	89.6829	29.1845	3.8300	0.0000	0.0000	0.0000	0.0000	0.0000	25.1223	103.7550	192.4487	(98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Energy Calculations Ltd
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CALCULATION OF HEAT DEMAND 09 Jan 2014

Space heating	769.2095 (98)
RHI space heating demand	769 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	43.2500 (1b)	x 2.4000 (2b)	= 103.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.2500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 103.8000 (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) = 0.1927 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4427 (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) =		0.3763 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
	0.4798	0.4703	0.4609	0.4139	0.4045	0.3575	0.3575	0.3481	0.3763	0.4045	0.4233	0.4421 (22b)
Effective ac	0.6151	0.6106	0.6062	0.5857	0.5818	0.5639	0.5639	0.5606	0.5708	0.5818	0.5896	0.5977 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.40)			5.0100	1.3258	6.6420		(27)
Door to Stairs			1.8900	1.4000	2.6460		(26)
Main Wall	30.7400	5.0100	25.7300	0.2200	5.6606	60.0000	1543.8000 (29a)
Wall to stairs	2.8800	1.8900	0.9900	0.1864	0.1845	190.0000	188.1000 (29a)
Flat roof	43.2500		43.2500	0.1400	6.0550	9.0000	389.2500 (30)
Total net area of external elements Aum, m ²			76.8700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.1882		(33)
Party Wall 1			49.1700	0.0000	0.0000	180.0000	8850.6000 (32)
Party Floor 1			43.2500			40.0000	1730.0000 (32d)
Internal Wall 1			34.3200			100.0000	3432.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	16133.7500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							373.0347 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.3525 (36)
Total fabric heat loss						(33) + (36) =	25.5407 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	21.0690	20.9159	20.7659	20.0611	19.9293	19.3155	19.3155	19.2018	19.5519	19.9293	20.1960	20.4749 (38)
Heat transfer coeff	46.6097	46.4566	46.3065	45.6018	45.4699	44.8561	44.8561	44.7425	45.0926	45.4699	45.7367	46.0155 (39)
Average = Sum(39)m / 12 =												45.6012 (39)
HLP	1.0777	1.0741	1.0707	1.0544	1.0513	1.0371	1.0371	1.0345	1.0426	1.0513	1.0575	1.0639 (40)
HLP (average)												1.0544 (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												1.4951 (42)
Average daily hot water use (litres/day)												69.7097 (43)
Daily hot water use	76.6807	73.8923	71.1039	68.3155	65.5271	62.7387	62.7387	65.5271	68.3155	71.1039	73.8923	76.6807 (44)
Energy conte	113.7152	99.4560	102.6297	89.4751	85.8535	74.0850	68.6507	78.7776	79.7185	92.9042	101.4122	110.1271 (45)
Energy content (annual)										Total = Sum(45)m =		1096.8047 (45)
Distribution loss (46)m = 0.15 x (45)m	17.0573	14.9184	15.3945	13.4213	12.8780	11.1128	10.2976	11.8166	11.9578	13.9356	15.2118	16.5191 (46)
Water storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Energy Calculations Ltd
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CALCULATION OF ENERGY RATINGS 09 Jan 2014

Store volume													210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.8600 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													1.0044 (55)
Total storage loss													
31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	(56)
If cylinder contains dedicated solar storage													
31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
168.1140	148.5904	157.0285	142.1191	140.2523	126.7290	123.0495	133.1764	132.3625	147.3030	154.0562	164.5259	164.5259	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =													
Output from w/h													
168.1140	148.5904	157.0285	142.1191	140.2523	126.7290	123.0495	133.1764	132.3625	147.3030	154.0562	164.5259	164.5259	(64)
Heat gains from water heating, kWh/month													
81.3293	72.3766	77.6434	71.8657	72.0653	66.7485	66.3454	69.7126	68.6216	74.4097	75.8348	80.1363	80.1363	(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		
89.7087	89.7087	89.7087	89.7087	89.7087	89.7087	89.7087	89.7087	89.7087	89.7087	89.7087	89.7087	89.7087	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
32.3582	28.7403	23.3732	17.6950	13.2272	11.1670	12.0663	15.6842	21.0514	26.7295	31.1973	33.2576	33.2576	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
193.7092	195.7193	190.6539	179.8703	166.2580	153.4643	144.9173	142.9072	147.9726	158.7562	172.3685	185.1622	185.1622	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
45.4660	45.4660	45.4660	45.4660	45.4660	45.4660	45.4660	45.4660	45.4660	45.4660	45.4660	45.4660	45.4660	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	(71)
Water heating gains (Table 5)													
109.3136	107.7033	104.3594	99.8134	96.8620	92.7062	89.1739	93.6997	95.3078	100.0130	105.3261	107.7101	107.7101	(72)
Total internal gains													
410.7499	407.5318	393.7554	372.7476	351.7161	332.7064	321.5264	327.6601	339.7006	360.8676	384.2608	401.4987	401.4987	(73)

6. Solar gains

[Jan]													
Area	Solar flux	g	FF	Access	Gains								
m2	Table 6a	or Table 6b	or Table 6c	factor	W								
West	5.0100	19.6403	0.6300	0.7000	0.7700	30.0716	80						
Solar gains	30.0716	58.8265	96.8788	141.2920	173.1586	177.2587	168.7575	144.9602	112.6741	69.8026	37.4958	24.7294	(83)
Total gains	440.8215	466.3583	490.6342	514.0396	524.8747	509.9650	490.2839	472.6203	452.3747	430.6702	421.7566	426.2282	(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	96.1517	96.4685	96.7811	98.2768	98.5617	99.9105	100.1643	99.3866	98.5617	97.9869	97.3931	97.3931	
alpha	7.4101	7.4312	7.4521	7.5518	7.5708	7.6607	7.6607	7.6776	7.6258	7.5708	7.5325	7.4929	
util living area	0.9935	0.9885	0.9720	0.9118	0.7695	0.5599	0.4023	0.4351	0.6749	0.9202	0.9842	0.9948	(86)
Weekday	19.4521	19.5453	19.7016	19.8867	19.9714	19.9996	20.0004	20.0026	19.9921	19.9020	19.6700	19.4466	
Weekend	20.7157	20.7566	20.8274	20.9129	20.9621	20.9758	20.9769	20.9769	20.9724	20.9179	20.8073	20.7089	
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	20.5613	20.6235	20.7336	20.8640	20.9416	20.9628	20.9644	20.9643	20.9569	20.8733	20.6991	20.5507	(87)
Th 2	20.0191	20.0220	20.0249	20.0383	20.0408	20.0525	20.0525	20.0547	20.0480	20.0408	20.0357	20.0304	(88)
util rest of house	0.9906	0.9835	0.9598	0.8777	0.7043	0.4787	0.3158	0.3459	0.5884	0.8819	0.9762	0.9924	(89)
Weekday	19.4521	19.5453	19.7016	19.8867	19.9714	19.9996	20.0004	20.0026	19.9921	19.9020	19.6700	19.4466	
Weekend	19.4521	19.5453	19.7016	19.8867	19.9714	19.9996	20.0004	20.0026	19.9921	19.9020	19.6700	19.4466	
MIT	19.4521	19.5453	19.7016	19.8867	19.9714	19.9996	20.0004	20.0026	19.9921	19.9020	19.6700	19.4466	(90)
Living area fraction									fLA = Living area / (4) =			0.5207	(91)
MIT	20.0297	20.1067	20.2389	20.3956	20.4766	20.5011	20.5023	20.5034	20.4945	20.4078	20.2059	20.0215	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0297	20.1067	20.2389	20.3956	20.4766	20.5011	20.5023	20.5034	20.4945	20.4078	20.2059	20.0215	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.9907	0.9840	0.9629	0.8915	0.7350	0.5174	0.3569	0.3883	0.6298	0.8981	0.9779	0.9924	0.9924	(94)
Useful gains	436.7112	458.8939	472.4132	458.2851	385.7861	263.8615	175.0002	183.5162	284.9001	386.7985	412.4423	422.9947	(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	733.1538	706.4525	636.2031	524.2196	399.0694	264.7024	175.0423	183.5952	288.3423	445.9580	599.4183	728.0359	(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	220.5533	166.3594	121.8597	47.4728	9.8828	0.0000	0.0000	0.0000	0.0000	44.0147	134.6227	226.9507	(98)
Space heating												971.7161	(98)

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Space heating per m2 (98) / (4) = 22.4674 (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 %) 173.6707 (206)
Efficiency of secondary/supplementary heating system, % 100.0000 (208)
Space heating requirement 559.5164 (211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	220.5533	166.3594	121.8597	47.4728	9.8828	0.0000	0.0000	0.0000	0.0000	44.0147	134.6227	226.9507	(98)
Space heating efficiency (main heating system 1)	173.6707	173.6707	173.6707	173.6707	173.6707	0.0000	0.0000	0.0000	0.0000	173.6707	173.6707	173.6707	(210)
Space heating fuel (main heating system)	126.9951	95.7901	70.1671	27.3350	5.6905	0.0000	0.0000	0.0000	0.0000	25.3438	77.5161	130.6787	(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	168.1140	148.5904	157.0285	142.1191	140.2523	126.7290	123.0495	133.1764	132.3625	147.3030	154.0562	164.5259	(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	99.2174	87.6950	92.6750	83.8758	82.7740	74.7929	72.6213	78.5980	78.1176	86.9352	90.9208	97.0998	(219)
Water heating fuel used												1025.3227	(219)
Annual totals kWh/year													
Space heating fuel - main system												559.5164	(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) 228.5825 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
Total delivered energy for all uses 1813.4215 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	559.5164	13.1900	73.8002	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1025.3227	13.1900	135.2401	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	228.5825	13.1900	30.1500	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit	0.0000	13.1900	0.0000	(252)
Total energy cost			239.1903	(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] = 1.1384 (257)
SAP value 84.1199
SAP rating (Section 12) 84 (258)
SAP band B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	559.5164	0.5190	290.3890	(261)
Space heating - secondary	0.0000	0.5190	0.0000	(263)
Water heating (other fuel)	1025.3227	0.5190	532.1425	(264)
Space and water heating			822.5315	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	228.5825	0.5190	118.6343	(268)
Energy saving/generation technologies				
PV Unit	-300.0000	0.5190	-155.7000	(269)
Total kg/year			785.4658	(272)
CO2 emissions per m2			18.1600	(273)
EI value			88.0734	
EI rating			88	(274)
EI band			B	

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Calculation of stars for heating and DHW	

Main heating energy efficiency	$13.19 \times (1 + 0.29 \times 0.25) / 1.7367 = 8.145$, stars = 2
Main heating environmental impact	$0.519 \times (1 + 0.29 \times 0.25) / 1.7367 = 0.3205$, 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	43.2500 (1b)	x 2.4000 (2b)	= 103.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.2500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 103.8000 (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) =	0.1927 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4427 (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) =		0.3763 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.4000	4.1000	4.1000	3.9000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000 (22)
Wind factor	1.1000	1.0250	1.0250	0.9750	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000 (22a)
Adj infilt rate	0.4139	0.3857	0.3857	0.3669	0.3669	0.3198	0.3198	0.3104	0.3198	0.3575	0.3481	0.3763 (22b)
Effective ac	0.5857	0.5744	0.5744	0.5673	0.5673	0.5511	0.5511	0.5482	0.5511	0.5639	0.5606	0.5708 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.40)			5.0100	1.3258	6.6420		(27)
Door to Stairs			1.8900	1.4000	2.6460		(26)
Main Wall	30.7400	5.0100	25.7300	0.2200	5.6606	60.0000	1543.8000 (29a)
Wall to stairs	2.8800	1.8900	0.9900	0.1864	0.1845	190.0000	188.1000 (29a)
Flat roof	43.2500		43.2500	0.1400	6.0550	9.0000	389.2500 (30)
Total net area of external elements Aum, m ²			76.8700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	21.1882			(33)
Party Wall 1			49.1700	0.0000	0.0000	180.0000	8850.6000 (32)
Party Floor 1			43.2500			40.0000	1730.0000 (32d)
Internal Wall 1			34.3200			100.0000	3432.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	16133.7500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							373.0347 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.3525 (36)
Total fabric heat loss						(33) + (36) =	25.5407 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	20.0611	19.6747	19.6747	19.4322	19.4322	18.8790	18.8790	18.7775	18.8790	19.3155	19.2018	19.5519 (38)
Heat transfer coeff	45.6018	45.2153	45.2153	44.9728	44.9728	44.4197	44.4197	44.3181	44.4197	44.8561	44.7425	45.0926 (39)
Average = Sum(39)m / 12 =												44.8539 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0544	1.0454	1.0454	1.0398	1.0398	1.0270	1.0270	1.0247	1.0270	1.0371	1.0345	1.0426 (40)
HLP (average)												1.0371 (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												1.4951 (42)
Average daily hot water use (litres/day)												69.7097 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	76.6807	73.8923	71.1039	68.3155	65.5271	62.7387	62.7387	65.5271	68.3155	71.1039	73.8923	76.6807 (44)
Energy conte	113.7152	99.4560	102.6297	89.4751	85.8535	74.0850	68.6507	78.7776	79.7185	92.9042	101.4122	110.1271 (45)
Energy content (annual)										Total = Sum(45)m =		1096.8047 (45)
Distribution loss (46)m = 0.15 x (45)m												
	17.0573	14.9184	15.3945	13.4213	12.8780	11.1128	10.2976	11.8166	11.9578	13.9356	15.2118	16.5191 (46)
Water storage loss:												

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Store volume													210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.8600 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													1.0044 (55)
Total storage loss													
31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	30.1320	(56)
If cylinder contains dedicated solar storage													
31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	30.1320	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
168.1140	148.5904	157.0285	142.1191	140.2523	126.7290	123.0495	133.1764	132.3625	147.3030	154.0562	164.5259	164.5259	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =													
Output from w/h													
168.1140	148.5904	157.0285	142.1191	140.2523	126.7290	123.0495	133.1764	132.3625	147.3030	154.0562	164.5259	164.5259	(64)
Heat gains from water heating, kWh/month													
81.3293	72.3766	77.6434	71.8657	72.0653	66.7485	66.3454	69.7126	68.6216	74.4097	75.8348	80.1363	80.1363	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
89.7087	89.7087	89.7087	89.7087	89.7087	89.7087	89.7087	89.7087	89.7087	89.7087	89.7087	89.7087	89.7087	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
32.3582	28.7403	23.3732	17.6950	13.2272	11.1670	12.0663	15.6842	21.0514	26.7295	31.1973	33.2576	33.2576	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
193.7092	195.7193	190.6539	179.8703	166.2580	153.4643	144.9173	142.9072	147.9726	158.7562	172.3685	185.1622	185.1622	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
45.4660	45.4660	45.4660	45.4660	45.4660	45.4660	45.4660	45.4660	45.4660	45.4660	45.4660	45.4660	45.4660	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	-59.8058	(71)
Water heating gains (Table 5)													
109.3136	107.7033	104.3594	99.8134	96.8620	92.7062	89.1739	93.6997	95.3078	100.0130	105.3261	107.7101	107.7101	(72)
Total internal gains													
410.7499	407.5318	393.7554	372.7476	351.7161	332.7064	321.5264	327.6601	339.7006	360.8676	384.2608	401.4987	401.4987	(73)

6. Solar gains

[Jan]													
Area													
m2													
Solar flux													
Table 6a													
W/m2													
Specific data													
or Table 6b													
Specific data													
or Table 6c													
Access													
factor													
Table 6d													
Gains													
W													
West													
5.0100													
23.7835													
0.6300													
0.7000													
0.7700													
36.4154													(80)
Solar gains	36.4154	62.2245	101.5577	149.9988	178.7959	193.4901	182.4385	159.9651	125.7876	79.2070	44.7282	30.1184	(83)
Total gains	447.1653	469.7563	495.3131	522.7464	530.5120	526.1965	503.9649	487.6252	465.4883	440.0747	428.9890	431.6172	(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	98.2768	99.1168	99.1168	99.6512	99.6512	100.8922	100.8922	101.1234	100.8922	99.9105	100.1643	99.3866	
alpha	7.5518	7.6078	7.6078	7.6434	7.6434	7.7261	7.7261	7.7416	7.7261	7.6607	7.6776	7.6258	
util living area													
0.9906	0.9838	0.9572	0.8714	0.6887	0.4553	0.2997	0.3271	0.5874	0.8747	0.9749	0.9922	0.9922	(86)
Weekday	19.5519	19.6468	19.7996	19.9402	19.9921	20.0091	20.0092	20.0112	20.0082	19.9544	19.7665	19.5492	
Weekend	20.7531	20.7934	20.8651	20.9364	20.9709	20.9770	20.9772	20.9772	20.9757	20.9418	20.8444	20.7480	
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	20.6190	20.6804	20.7919	20.9008	20.9550	20.9646	20.9648	20.9648	20.9620	20.9102	20.7570	20.6111	(87)
Th 2	20.0383	20.0456	20.0456	20.0503	20.0503	20.0609	20.0609	20.0628	20.0609	20.0525	20.0547	20.0480	(88)
util rest of house													
0.9864	0.9766	0.9390	0.8270	0.6167	0.3764	0.2169	0.2420	0.5008	0.8220	0.9625	0.9887	0.9887	(89)
Weekday	19.5519	19.6468	19.7996	19.9402	19.9921	20.0091	20.0092	20.0112	20.0082	19.9544	19.7665	19.5492	
Weekend	19.5519	19.6468	19.7996	19.9402	19.9921	20.0091	20.0092	20.0112	20.0082	19.9544	19.7665	19.5492	
MIT	19.5519	19.6468	19.7996	19.9402	19.9921	20.0091	20.0092	20.0112	20.0082	19.9544	19.7665	19.5492	(90)
Living area fraction													
fLA = Living area / (4) =													
MIT	20.1076	20.1850	20.3163	20.4404	20.4935	20.5066	20.5068	20.5078	20.5048	20.4521	20.2823	20.1021	(91)
Temperature adjustment													
adjusted MIT	20.1076	20.1850	20.3163	20.4404	20.4935	20.5066	20.5068	20.5078	20.5048	20.4521	20.2823	20.1021	(92)
0.0000													
20.1021													(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.9868	0.9778	0.9448	0.8465	0.6510	0.4139	0.2562	0.2824	0.5421	0.8459	0.9660	0.9889	0.9889	(94)
Useful gains	441.2486	459.3488	467.9931	442.4910	345.3472	217.8088	129.1143	137.7246	252.3495	372.2754	414.3840	426.8337	(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													
693.4919	663.9873	588.5346	483.0250	350.4951	217.9497	129.1169	137.7301	253.4067	406.0419	558.4882	685.5014	685.5014	(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													
187.6690	137.5171	89.6829	29.1845	3.8300	0.0000	0.0000	0.0000	0.0000	25.1223	103.7550	192.4487	192.4487	(98)
Space heating													(98)
769.2095													

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Energy Calculations Ltd
SAP ♦ CODE ♦ SBEM ♦ DESIGN

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

Space heating per m2 (98) / (4) = 17.7852 (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 %)													171.2475 (206)
Efficiency of secondary/supplementary heating system, %													100.0000 (208)
Space heating requirement													449.1800 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	187.6690	137.5171	89.6829	29.1845	3.8300	0.0000	0.0000	0.0000	0.0000	25.1223	103.7550	192.4487	(98)
Space heating efficiency (main heating system 1)	171.2475	171.2475	171.2475	171.2475	171.2475	0.0000	0.0000	0.0000	0.0000	171.2475	171.2475	171.2475	(210)
Space heating fuel (main heating system)	109.5893	80.3031	52.3703	17.0423	2.2365	0.0000	0.0000	0.0000	0.0000	14.6701	60.5877	112.3805	(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	168.1140	148.5904	157.0285	142.1191	140.2523	126.7290	123.0495	133.1764	132.3625	147.3030	154.0562	164.5259	(64)
Efficiency of water heater	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	(216)
(217)m	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	169.4400	(217)
Fuel for water heating, kWh/month	99.2174	87.6950	92.6750	83.8758	82.7740	74.7929	72.6213	78.5980	78.1176	86.9352	90.9208	97.0998	(219)
Water heating fuel used												1025.3227	(219)
Annual totals kWh/year													
Space heating fuel - main system												449.1800	(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)												228.5825	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses												1703.0852	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	449.1800	18.9000	84.8950 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1025.3227	18.9000	193.7860 (247)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	228.5825	18.9000	43.2021 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit	0.0000	18.9000	0.0000 (252)
Total energy cost			321.8831 (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	449.1800	0.5190	233.1244 (261)
Space heating - secondary	0.0000	0.5190	0.0000 (263)
Water heating (other fuel)	1025.3227	0.5190	532.1425 (264)
Space and water heating			765.2669 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	228.5825	0.5190	118.6343 (268)
Energy saving/generation technologies			
PV Unit	-300.0000	0.5190	-155.7000 (269)
Total kg/year			728.2012 (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	449.1800	3.0700	1378.9827 (261)
Space heating - secondary	0.0000	3.0700	0.0000 (263)
Water heating (other fuel)	1025.3227	3.0700	3147.7406 (264)
Space and water heating			4526.7233 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	228.5825	3.0700	701.7483 (268)
Energy saving/generation technologies			
PV Unit	-300.0000	3.0700	-921.0000 (269)
Primary energy kWh/year			4307.4715 (272)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Primary energy kWh/m²/year

99.5947 (273)

SAP 2012 EPC IMPROVEMENTS

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

(For testing purposes):

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

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

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

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

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

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

	Current	Potential	Saving
Electricity	£322	£322	£0
Space heating	£85	£85	£0
Water heating	£194	£194	£0
Lighting	£43	£43	£0
Total cost of fuels	£322	£322	£0
Total cost of uses	£322	£322	£0
Delivered energy	39 kWh/m ²	39 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	0.7 tonnes	0.7 tonnes	0.0 tonnes
CO2 emissions per m ²	17 kg/m ²	17 kg/m ²	0 kg/m ²
Primary energy	100 kWh/m ²	100 kWh/m ²	0 kWh/m ²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Energy Calculations Ltd
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CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Energy Calculations Ltd
SAP ♦ CODE ♦ SBEM ♦ DESIGN

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

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

No improvements selected / applicable

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

Overheating Calculation Input Data

Dwelling type	MidTerrace Flat
Number of storeys	1
Cross ventilation possible	Yes
SAP Region	Thames Valley
Front of dwelling faces	West
Overshading	Average or unknown
Thermal mass parameter	373.0 (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	205.52 (P1)
Transmission heat loss coefficient	25.54 (37)
Summer heat loss coefficient	231.06 (P2)

Overhangs	Ratio	Z_overhangs	Overhang type
Orientation			
West	0.000	1.000	None
Solar shading			
Orientation	Z blinds	Solar access	Z overhangs Z summer
West	1.000	0.90	1.000 0.900 (P8)
[Jul]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b
West	5.0100	117.5071	0.6300
total:			0.7000
			0.9000
			210.2932
			210.2932

	Jun	Jul	Aug	
Solar gains	223	210	185	(P3)
Internal gains	333	322	328	
Total summer gains	556	532	513	(P5)
Summer gain/loss ratio	2.41	2.30	2.22	(P6)
Summer external temperature	16.00	17.90	17.80	
Thermal mass temperature increment (TMP = 373.0)	0.00	0.00	0.00	
Threshold temperature	18.41	20.20	20.02	(P7)
Likelihood of high internal temperature	Not significant	Not significant	Not significant	
Assessment of likelihood of high internal temperature:	Not significant			

BASIC COMPLIANCE REPORT

Energy Calculations Ltd
SAP • CODE • SBEM • DESIGN

Calculation Type: New Build (As Designed)

Property Reference	015732	Issued on Date	01/03/2021
Assessment Reference	003	Prop Type Ref	
Property	Flat 11, 18, Parkside Road, READING, RG30 2DB		
SAP Rating	84 B	DER	21.26
Environmental	88 B	TER	29.47
CO ₂ Emissions (t/year)	0.73	% DER<TER	27.86
General Requirements Compliance	Pass	DFEE	42.47
		TFEE	43.04
		% DFEE<TFEE	1.31
Assessor Details	Mr. Matthew Carter, Energy Calculations Limited, Tel: 01754 761035, mcarter@energycalculations.co.uk		Assessor ID
			7869-0001
Client			

SUMMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFE rate

1a TER and DER

Fuel for main heating	Electricity		
Fuel factor	1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	29.47	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	21.26	kgCO ₂ /m ²	Pass
	-8.21 (-27.9%)	kgCO ₂ /m ²	

1b TFE and DFEE

Target Fabric Energy Efficiency (TFEE)	43.04	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	42.47	kWh/m ² /yr	
	-0.5 (-1.2%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

Limiting System Efficiencies

4 Heating efficiency

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

5 Cylinder insulation

BASIC COMPLIANCE REPORT

Energy Calculations Ltd
SAP • CODE • SBEM • DESIGN

Calculation Type: New Build (As Designed)

Hot water storage

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

Pass

Primary pipework insulated

Yes

Pass

6 Controls

Space heating controls

Time and temperature zone control

Pass

Hot water controls

Cylinderstat

Pass

Independent timer for DHW

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100

%

Minimum

75

%

Pass

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)

Not significant

Pass

Based on:

Overshading

Average

Windows facing West

5.01 m², No overhang

Air change rate

6.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Solid Wall

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

5.00 (design value)

Maximum

10.0

Pass

10 Key features

Party wall U-value

0.00

W/m²K

Photovoltaic array

300.00

kWh/Year

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

SUMMARY FOR INPUT DATA

Energy Calculations Ltd
SAP • CODE • SBEM • DESIGN

Calculation Type: New Build (As Designed)

Property Reference	015732	Issued on Date	01/03/2021
Assessment Reference	003	Prop Type Ref	
Property	Flat 11, 18, Parkside Road, READING, RG30 2DB		
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CO ₂ Emissions (t/year)	0.73	% DER<TER	27.86
General Requirements Compliance	Pass	DFEE	42.47
		TFEE	43.04
		% DFEE<TFEE	1.31
Assessor Details	Mr. Matthew Carter, Energy Calculations Limited, Tel: 01754 761035, mcarter@energycalculations.co.uk		Assessor ID
			7869-0001
Client			

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

Orientation	West						
Property Tenure	Unknown						
Transaction Type	New dwelling						
Terrain Type	Urban						
1.0 Property Type	Flat, Mid-Terrace						
2.0 Number of Storeys	1						
3.0 Date Built	2020						
4.0 Sheltered Sides	2						
5.0 Sunlight/Shade	Average or unknown						
6.0 Measurements							
Ground Floor:		Heat Loss Perimeter		Internal Floor Area		Average Storey Height	
		14.01 m		43.25 m²		2.40 m	
7.0 Living Area	22.52		m²				
8.0 Thermal Mass Parameter	Precise calculation		kJ/m²K				
Thermal Mass	373.03						
9.0 External Walls							
Description	Type	Construction		U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area (m²)	Nett Area (m²)
Main Wall	Cavity Wall	Cavity wall : plasterboard on dabs, AAC block, filled cavity, any outside structure		0.22	60.00	30.74	25.73
Wall to stairs	Cavity Wall	Cavity wall : dense plaster, dense block, filled cavity, any outside structure		0.22	190.00	2.88	0.99
9.1 Party Walls							
Description	Type	Construction		U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	
Party Wall 1	Solid Wall	Dense plaster both sides, dense blocks, cavity or cavity fill		0.00	180.00	49.17	
9.2 Internal Walls							
Description	Construction				Kappa (kJ/m²K)	Area (m²)	
Internal Wall 1	Dense block, dense plaster				100.00	34.32	
10.0 External Roofs							
Description	Type	Construction		U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area (m²)	Nett Area (m²)
Flat roof	External Flat Roof	Plasterboard, insulated flat roof		0.14	9.00	43.25	43.25
11.1 Party Floors							

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Precast concrete planks floor, screed, carpeted	40.00	43.25

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	East							1.89	
Windows	Window	[1] Main Wall	West	None	0.00					5.01	

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)	4.25	0.300	No
Table K1 - Approved	E3 Sill	4.25	0.040	No
Table K1 - Approved	E4 Jamb	11.80	0.050	No
Table K1 - Approved	E7 Party floor between dwellings (in blocks of flats)	14.01	0.070	No
Table K1 - Default	E14 Flat roof	14.01	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)	12.00	-0.090	No
Table K1 - Approved	E18 Party wall between dwellings	14.40	0.060	No
Table K1 - Default	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	20.49	0.000	No

Y-value	0.057	W/m²K
---------	-------	-------

18.0 Pressure Testing

Yes

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

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

SUMMARY FOR INPUT DATA

Energy Calculations Ltd
SAP ♦ CODE ♦ SBEM ♦ DESIGN

Calculation Type: New Build (As Designed)

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 Database

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

25.0 Main Heating 2 None

Community Heating None

28.0 Water Heating HWP From main heating 1

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

29.0 Hot Water Cylinder Hot Water Cylinder

Cylinder Stat Yes

SUMMARY FOR INPUT DATA

Energy Calculations Ltd
SAP ♦ CODE ♦ SBEM ♦ DESIGN

Calculation Type: New Build (As Designed)

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 %			