

Energy Calculations Ltd

SAP ♦ CODE ♦ SBEM ♦ DESIGN

01754-761035



SAP Report Submission for Building Regulations Compliance

Client:

Project: Flat 5, 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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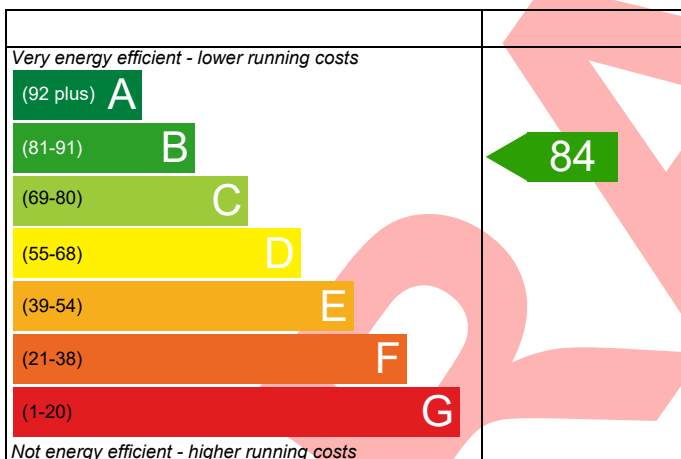
Flat 5, 18, Parkside Road,
READING,
RG30 2DB

Dwelling type: Flat, Mid-Terrace
Date of assessment: 01/03/2021
Produced by: Energy Calculations Limited
Total floor area: 45.84 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

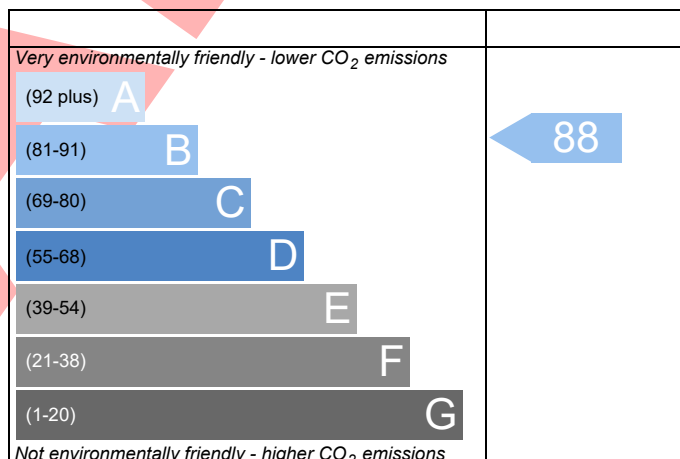


England

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	015726	Issued on Date	01/03/2021
Assessment Reference	003	Prop Type Ref	
Property	Flat 5, 18, Parkside Road, READING, RG30 2DB		

SAP Rating	84 B	DER	19.12	TER	29.28
Environmental	88 B	% DER<TER	34.69		
CO ₂ Emissions (t/year)	0.74	DFEE	46.34	TFEE	45.82
General Requirements Compliance	Fail	% DFEE<TFEE	-1.15		

Assessor Details	Mr. Matthew Carter, Energy Calculations Limited, Tel: 01754 761035, mcarter@energycalculations.co.uk	Assessor ID	7869-0001
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Client	
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	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Table K1 - Approved	0.300	7.33	2.20	
External wall	E3 Sill	Table K1 - Approved	0.040	7.33	0.29	
External wall	E4 Jamb	Table K1 - Approved	0.050	37.44	1.87	
External wall	E7 Party floor between dwellings (in blocks of flats)	Table K1 - Approved	0.070	19.95	1.40	
External wall	E14 Flat roof	Table K1 - Default	0.080	12.42	0.99	
External wall	E16 Corner (normal)	Table K1 - Approved	0.090	7.20	0.65	
External wall	E17 Corner (inverted – internal area greater than external area)	Table K1 - Approved	-0.090	9.60	-0.86	
External wall	E18 Party wall between dwellings	Table K1 - Approved	0.060	7.20	0.43	
Party wall	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	0.000	15.00	0.00	

Total: **6.97** W/mK:
Y-Value: **0.081** 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

Mid-floor flat, total floor area 46 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) 29.28 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 19.12 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)45.8 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)46.3 kWh/m²/yrFail
Excess energy =0.5 kWh/m²/yr (1.1%)

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.22 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.14 (max. 0.25)	0.14 (max. 0.70)	OK
Roof	0.14 (max. 0.20)	0.14 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

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

Secondary heating system:	None
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5 Cylinder insulation

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

6 Controls

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

Cylinderstat	OK
Independent timer for DHW	OK

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames Valley):	Slight	OK
Based on:		
Overshading:	Average	
Windows facing East:	8.00 m ² , No overhang	
Windows facing South:	7.23 m ² , No overhang	
Air change rate:	6.00 ach	
Blinds/curtains:	None	

10 Key features

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

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	45.8400 (1b)	x 2.4000 (2b)	= 110.0160 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	45.8400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 110.0160 (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) = 0.1818 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4318 (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) = 0.3670 (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	0.4680	0.4588	0.4496	0.4037	0.3945	0.3487	0.3487	0.3395	0.3670	0.3945	0.4129	0.4313 (22b)
Effective ac	0.6095	0.6052	0.6011	0.5815	0.5778	0.5608	0.5608	0.5576	0.5674	0.5778	0.5852	0.5930 (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)			15.2300	1.3258	20.1913		(27)
Door to Stairs			1.8900	1.4000	2.6460		(26)
Heat Loss Floor 1			26.5900	0.1400	3.7226		(28b)
Main Wall	35.7200	15.2300	20.4900	0.2200	4.5078	60.0000	1229.4000 (29a)
Wall to stairs	12.1600	1.8900	10.2700	0.1864	1.9141	190.0000	1951.3000 (29a)
Flat roof	11.5200		11.5200	0.1400	1.6128	9.0000	103.6800 (30)
Total net area of external elements Aum(A, m ²)			85.9900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.5946		(33)
Party Wall 1			36.1200	0.0000	0.0000	180.0000	6501.6000 (32)
Party Floor 1			19.2500			40.0000	770.0000 (32d)
Party Ceilings 1			34.3200			40.0000	1372.8000 (32b)
Internal Wall 1			40.6000			9.0000	365.4000 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 12294.1800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							268.1976 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.9703 (36)
Total fabric heat loss							(33) + (36) = 41.5649 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	22.1277	21.9734	21.8221	21.1114	20.9785	20.3595	20.3595	20.2449	20.5979	20.9785	21.2474	21.5286 (38)
Heat transfer coeff	63.6926	63.5383	63.3870	62.6763	62.5433	61.9244	61.9244	61.8098	62.1628	62.5433	62.8123	63.0935 (39)
Average = Sum(39)m / 12 =												62.6757 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3895	1.3861	1.3828	1.3673	1.3644	1.3509	1.3509	1.3484	1.3561	1.3644	1.3703	1.3764 (40)
HLP (average)												1.3673 (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												1.5687 (42)
Average daily hot water use (litres/day)												71.4575 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	78.6032	75.7449	72.8866	70.0283	67.1700	64.3117	64.3117	67.1700	70.0283	72.8866	75.7449	78.6032 (44)
Energy conte	116.5663	101.9496	105.2029	91.7184	88.0060	75.9425	70.3719	80.7528	81.7172	95.2335	103.9549	112.8883 (45)
Energy content (annual)												Total = Sum(45)m = 1124.3044 (45)
Distribution loss (46)m = 0.15 x (45)m												

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	17.4849	15.2924	15.7804	13.7578	13.2009	11.3914	10.5558	12.1129	12.2576	14.2850	15.5932	16.9332 (46)
Water storage loss:												
Store volume												210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8600 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0044 (55)
Total storage loss												
31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(56)
If cylinder contains dedicated solar storage												
31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
170.9651	151.0840	159.6017	144.3624	142.4048	128.5865	124.7707	135.1516	134.3612	149.6323	156.5989	167.2871	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h												
170.9651	151.0840	159.6017	144.3624	142.4048	128.5865	124.7707	135.1516	134.3612	149.6323	156.5989	167.2871	(64)
Heat gains from water heating, kWh/month												
82.2773	73.2058	78.4990	72.6116	72.7810	67.3661	66.9177	70.3693	69.2862	75.1842	76.6802	81.0544	(65)

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

Metabolic gains (Table 5), Watts												
(66)m	78.4368	78.4368	78.4368	78.4368	78.4368	78.4368	78.4368	78.4368	78.4368	78.4368	78.4368	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
12.1645	10.8044	8.7867	6.6521	4.9725	4.1980	4.5361	5.8962	7.9139	10.0485	11.7281	12.5026	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
136.4484	137.8643	134.2962	126.7003	117.1118	108.1000	102.0795	100.6636	104.2316	111.8276	121.4161	130.4279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
30.8437	30.8437	30.8437	30.8437	30.8437	30.8437	30.8437	30.8437	30.8437	30.8437	30.8437	30.8437	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	(71)
Water heating gains (Table 5)												
110.5878	108.9372	105.5094	100.8494	97.8240	93.5640	89.9431	94.5824	96.2308	101.0540	106.5003	108.9441	(72)
Total internal gains												
305.7317	304.1369	295.1234	280.7329	266.4394	252.3930	243.0898	247.6733	254.9073	269.4611	286.1754	298.4056	(73)

6. Solar gains

[Jan]												
			Area		Solar flux		g		FF		Access	Gains
			m2		Table 6a		W/m2		Specific data		factor	W
					or Table 6b				or Table 6c		Table 6d	
East			8.0000		19.6403		0.6300		0.7000		0.7700	48.0186 (76)
South			7.2300		46.7521		0.6300		0.7000		0.7700	103.3025 (78)
Solar gains	151.3211	263.1174	370.2057	469.1879	530.3179	527.3122	508.1342	463.2464	405.0433	293.9408	182.3222	128.7510 (83)
Total gains	457.0528	567.2543	665.3291	749.9208	796.7572	779.7052	751.2240	710.9197	659.9506	563.4019	468.4976	427.1566 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	53.6177	53.7479	53.8762	54.4871	54.6029	55.1487	55.1487	55.2510	54.9372	54.6029	54.3691	54.1268
alpha	4.5745	4.5832	4.5917	4.6325	4.6402	4.6766	4.6766	4.6834	4.6625	4.6402	4.6246	4.6085
util living area												
0.9879	0.9690	0.9251	0.8270	0.6749	0.4975	0.3607	0.3966	0.6165	0.8763	0.9731	0.9909	(86)
Tweekday	18.5897	18.8673	19.1970	19.5053	19.6552	19.7100	19.7157	19.7173	19.6929	19.4862	18.9914	18.5459
Tweekend	20.4095	20.5346	20.6876	20.8371	20.9225	20.9549	20.9611	20.9604	20.9424	20.8202	20.5846	20.3864
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	20.0886	20.2800	20.5179	20.7456	20.8803	20.9307	20.9400	20.9389	20.9101	20.7225	20.3513	20.0529 (87)
Th 2	19.7714	19.7740	19.7766	19.7885	19.7907	19.8012	19.8012	19.8031	19.7972	19.7907	19.7862	19.7815 (88)
util rest of house												
0.9838	0.9591	0.9026	0.7816	0.6045	0.4092	0.2635	0.2952	0.5226	0.8309	0.9628	0.9877	(89)
Tweekday	18.5897	18.8673	19.1970	19.5053	19.6552	19.7100	19.7157	19.7173	19.6929	19.4862	18.9914	18.5459
Tweekend	18.5897	18.8673	19.1970	19.5053	19.6552	19.7100	19.7157	19.7173	19.6929	19.4862	18.9914	18.5459
MIT 2	18.5897	18.8673	19.1970	19.5053	19.6552	19.7100	19.7157	19.7173	19.6929	19.4862	18.9914	18.5459 (90)
Living area fraction												
MIT	19.3509	19.5848	19.8678	20.1352	20.2774	20.3299	20.3375	20.3377	20.3110	20.1141	19.6820	19.3113 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3509	19.5848	19.8678	20.1352	20.2774	20.3299	20.3375	20.3377	20.3110	20.1141	19.6820	19.3113 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	448.8465	543.0203	601.8214	596.6621	505.1332	349.8990	230.7894	242.3306	372.2733	475.7406	450.5553	421.2630 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
958.6326	933.0454	847.3454	704.1785	536.4585	354.8233	231.4406	243.3900	386.0958	595.0412	790.3070	953.4232	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)

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Space heating kWh	379.2808	262.0968	182.6698	77.4119	23.3060	0.0000	0.0000	0.0000	0.0000	88.7597	244.6212	395.9272 (98)
Space heating												1654.0735 (98)
Space heating per m2											(98) / (4) =	36.0836 (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 %)												225.9504 (206)
Efficiency of secondary/supplementary heating system, %												100.0000 (208)
Space heating requirement												732.0514 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	379.2808	262.0968	182.6698	77.4119	23.3060	0.0000	0.0000	0.0000	0.0000	88.7597	244.6212	395.9272 (98)
Space heating efficiency (main heating system 1)	225.9504	225.9504	225.9504	225.9504	225.9504	0.0000	0.0000	0.0000	0.0000	225.9504	225.9504	225.9504 (210)
Space heating fuel (main heating system)	167.8602	115.9975	80.8451	34.2605	10.3146	0.0000	0.0000	0.0000	0.0000	39.2828	108.2632	175.2275 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	170.9651	151.0840	159.6017	144.3624	142.4048	128.5865	124.7707	135.1516	134.3612	149.6323	156.5989	167.2871 (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	100.9001	89.1667	94.1936	85.1997	84.0444	75.8891	73.6371	79.7637	79.2972	88.3099	92.4214	98.7294 (219)
Water heating fuel used												1041.5524 (219)
Annual totals kWh/year												
Space heating fuel - main system												732.0514 (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)												214.8284 (232)
Energy saving/generation technologies (Appendices M,N and Q)												
Total delivered energy for all uses												1988.4322 (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	732.0514	0.5190	379.9347 (261)
Space heating - secondary	0.0000	0.5190	0.0000 (263)
Water heating (other fuel)	1041.5524	0.5190	540.5657 (264)
Space and water heating			920.5004 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	214.8284	0.5190	111.4959 (268)
Energy saving/generation technologies			
PV Unit	-300.0000	0.5190	-155.7000 (269)
Total CO2, kg/year			876.2963 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			19.1200 (273)

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

DER			19.1200 ZC1
Total Floor Area		TFA	45.8400
Assumed number of occupants		N	1.5687
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			17.6388 ZC2
CO2 emissions from cooking, equation (L16)			3.4173 ZC3
Total CO2 emissions			40.1762 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			40.1762 ZC8

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1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	45.8400 (1b)	x 2.4000 (2b)	= 110.0160 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	45.8400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 110.0160 (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)
					Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					20.0000 / (5) = 0.1818 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4318 (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) =		0.3670 (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	0.4680	0.4588	0.4496	0.4037	0.3945	0.3487	0.3487	0.3395	0.3670	0.3945	0.4129	0.4313 (22b)
Effective ac	0.6095	0.6052	0.6011	0.5815	0.5778	0.5608	0.5608	0.5576	0.5674	0.5778	0.5852	0.5930 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900		(26)					
TER Opening Type (Uw = 1.40)			9.5700	1.3258	12.6875		(27)					
Heat Loss Floor 1			26.5900	0.1300	3.4567		(28b)					
Main Wall	35.7200	9.5700	26.1500	0.1800	4.7070		(29a)					
Wall to stairs	12.1600	1.8900	10.2700	0.1800	1.8486		(29a)					
Flat roof	11.5200		11.5200	0.1300	1.4976		(30)					
Total net area of external elements Aum(A, m2)			85.9900				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		26.0874		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)												
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.2111 (36)												
Total fabric heat loss						(33) + (36) =	31.2985 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 22.1277	Feb 21.9734	Mar 21.8221	Apr 21.1114	May 20.9785	Jun 20.3595	Jul 20.3595	Aug 20.2449	Sep 20.5979	Oct 20.9785	Nov 21.2474	Dec 21.5286 (38)
Heat transfer coeff	53.4262	53.2719	53.1206	52.4099	52.2770	51.6580	51.6580	51.5434	51.8964	52.2770	52.5459	52.8271 (39)
Average = Sum(39)m / 12 =												52.4093 (39)
HLP	Jan 1.1655	Feb 1.1621	Mar 1.1588	Apr 1.1433	May 1.1404	Jun 1.1269	Jul 1.1269	Aug 1.1244	Sep 1.1321	Oct 1.1404	Nov 1.1463	Dec 1.1524 (40)
HLP (average)												1.1433 (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													1.5687	(42)
Average daily hot water use (litres/day)													71.4575	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Daily hot water use	78.6032	75.7449	72.8866	70.0283	67.1700	64.3117	64.3117	67.1700	70.0283	72.8866	75.7449	78.6032	(44)	
Energy conte	116.5663	101.9496	105.2029	91.7184	88.0060	75.9425	70.3719	80.7528	81.7172	95.2335	103.9549	112.8883	(45)	
Energy content (annual)											Total = Sum(45)m =	1124.3044	(45)	
Distribution loss (46)m = 0.15 x (45)m														
	17.4849	15.2924	15.7804	13.7578	13.2009	11.3914	10.5558	12.1129	12.2576	14.2850	15.5932	16.9332	(46)	
Water storage loss:														
Store volume													210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):													1.7016	(48)
Temperature factor from Table 2b													0.5400	(49)

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Enter (49) or (54) in (55)													0.9188 (55)
Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)
If cylinder contains dedicated solar storage	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month	168.3129	148.6885	156.9495	141.7958	139.7526	126.0199	122.1185	132.4994	131.7946	146.9801	154.0322	164.6348	(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	168.3129	148.6885	156.9495	141.7958	139.7526	126.0199	122.1185	132.4994	131.7946	146.9801	154.0322	164.6348	(64)
Heat gains from water heating, kWh/month	80.1556	71.2893	76.3772	70.5583	70.6593	65.3128	64.7959	68.2476	67.2329	73.0624	74.6269	78.9326	(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	78.4368	78.4368	78.4368	78.4368	78.4368	78.4368	78.4368	78.4368	78.4368	78.4368	78.4368	78.4368	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	12.2030	10.8386	8.8146	6.6732	4.9883	4.2113	4.5505	5.9149	7.9389	10.0803	11.7652	12.5422	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	136.4484	137.8643	134.2962	126.7003	117.1118	108.1000	102.0795	100.6636	104.2316	111.8276	121.4161	130.4279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.8437	30.8437	30.8437	30.8437	30.8437	30.8437	30.8437	30.8437	30.8437	30.8437	30.8437	30.8437	(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)	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	(71)
Water heating gains (Table 5)	107.7360	106.0853	102.6576	97.9976	94.9721	90.7122	87.0913	91.7306	93.3790	98.2022	103.6484	106.0922	(72)
Total internal gains	305.9184	304.3193	295.2994	280.9021	266.6033	252.5545	243.2523	247.8401	255.0806	269.6411	286.3608	298.5934	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c				Access factor Table 6d	Gains W
East					5.0300	19.6403	0.6300	0.7000				0.7700	30.1917 (76)
South					4.5400	46.7521	0.6300	0.7000				0.7700	64.8677 (78)
Solar gains	95.0594	165.2979	232.5921	294.8044	333.2316	331.3495	319.2959	291.0782	254.4884	184.6673	114.5358		80.8798 (83)
Total gains	400.9778	469.6172	527.8915	575.7065	599.8348	583.9040	562.5482	538.9184	509.5690	454.3084	400.8966		379.4732 (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	59.5837	59.7564	59.9266	60.7391	60.8936	61.6232	61.6232	61.7603	61.3401	60.8936	60.5819	60.2594	
alpha	4.9722	4.9838	4.9951	5.0493	5.0596	5.1082	5.1082	5.1174	5.0893	5.0596	5.0388	5.0173	
util living area	0.9896	0.9769	0.9468	0.8723	0.7368	0.5523	0.4017	0.4362	0.6635	0.9001	0.9774	0.9919	(86)
MIT	19.9879	20.1845	20.4468	20.7293	20.9093	20.9833	20.9973	20.9959	20.9589	20.7234	20.3059	19.9533	(87)
Th 2	19.9477	19.9504	19.9531	19.9656	19.9680	19.9789	19.9789	19.9809	19.9747	19.9680	19.9632	19.9582	(88)
util rest of house	0.9863	0.9700	0.9313	0.8377	0.6761	0.4702	0.3097	0.3416	0.5799	0.8647	0.9694	0.9893	(89)
MIT 2	18.6296	18.9137	19.2849	19.6722	19.8878	19.9689	19.9780	19.9794	19.9465	19.6767	19.1006	18.5874	(90)
Living area fraction	19.3194	19.5591	19.8750	20.2090	20.4066	20.4841	20.4956	20.4956	20.4606	20.2083	19.7127	19.2811	(92)
Temperature adjustment	19.3194	19.5591	19.8750	20.2090	20.4066	20.4841	20.4956	20.4956	20.4606	20.2083	19.7127	19.2811	(93)
adjusted MIT	19.3194	19.5591	19.8750	20.2090	20.4066	20.4841	20.4956	20.4956	20.4606	20.2083	19.7127	19.2811	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	394.5031	454.0280	490.8931	487.3892	421.7067	298.6716	200.5619	210.0383	316.3594	397.0151	387.6814	374.6072	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	802.4303	780.9169	710.4869	592.7059	455.1526	303.9606	201.2406	211.1027	330.0929	502.2904	662.7483	796.6913	(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	303.4979	219.6694	163.3778	75.8280	24.8838	0.0000	0.0000	0.0000	0.0000	78.3249	198.0481	314.0306	(98)
Space heating												1377.6604	(98)
Space heating per m2												30.0537	(99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1473.4335 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	303.4979	219.6694	163.3778	75.8280	24.8838	0.0000	0.0000	0.0000	0.0000	78.3249	198.0481	314.0306	(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)	324.5966	234.9405	174.7356	81.0995	26.6136	0.0000	0.0000	0.0000	0.0000	83.7699	211.8162	335.8616	(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	168.3129	148.6885	156.9495	141.7958	139.7526	126.0199	122.1185	132.4994	131.7946	146.9801	154.0322	164.6348	(64)
Efficiency of water heater (217)m	86.3687	85.8533	84.9209	83.2287	81.2520	79.8000	79.8000	79.8000	79.8000	83.2205	85.4853	86.5103	(216)
Fuel for water heating, kWh/month	194.8772	173.1890	184.8184	170.3688	171.9990	157.9196	153.0307	166.0393	165.1561	176.6152	180.1855	190.3066	(219)
Water heating fuel used												2084.5055	(219)
Annual totals kWh/year													
Space heating fuel - main system												1473.4335	(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)												215.5092	(232)
Total delivered energy for all uses												3848.4483	(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	1473.4335	0.2160	318.2616 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2084.5055	0.2160	450.2532 (264)
Space and water heating			768.5148 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	215.5092	0.5190	111.8493 (268)
Total CO2, kg/m2/year			919.2891 (272)
Emissions per m2 for space and water heating			16.7652 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.4400 (272b)
Emissions per m2 for pumps and fans			0.8491 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.7652 * 1.55) + 2.4400 + 0.8491, rounded to 2 d.p.			29.2800 (273)

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CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	45.8400 (1b)	x 2.4000 (2b)	= 110.0160 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	45.8400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 110.0160 (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) = 0.1818 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4318 (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) =				0.3670 (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	0.4680	0.4588	0.4496	0.4037	0.3945	0.3487	0.3487	0.3395	0.3670	0.3945	0.4129	0.4313 (22b)
Effective ac	0.6095	0.6052	0.6011	0.5815	0.5778	0.5608	0.5608	0.5576	0.5674	0.5778	0.5852	0.5930 (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)			15.2300	1.3258	20.1913		(27)
Door to Stairs			1.8900	1.4000	2.6460		(26)
Heat Loss Floor 1			26.5900	0.1400	3.7226		(28b)
Main Wall	35.7200	15.2300	20.4900	0.2200	4.5078	60.0000	1229.4000 (29a)
Wall to stairs	12.1600	1.8900	10.2700	0.1864	1.9141	190.0000	1951.3000 (29a)
Flat roof	11.5200		11.5200	0.1400	1.6128	9.0000	103.6800 (30)
Total net area of external elements Aum(A, m ²)			85.9900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.5946		(33)
Party Wall 1			36.1200	0.0000	0.0000	180.0000	6501.6000 (32)
Party Floor 1			19.2500			40.0000	770.0000 (32d)
Party Ceilings 1			34.3200			30.0000	1029.6000 (32b)
Internal Wall 1			40.6000			9.0000	365.4000 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		11950.9800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							260.7107 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.9703 (36)
Total fabric heat loss						(33) + (36) =	41.5649 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	22.1277	21.9734	21.8221	21.1114	20.9785	20.3595	20.3595	20.2449	20.5979	20.9785	21.2474	21.5286 (38)
Heat transfer coeff	63.6926	63.5383	63.3870	62.6763	62.5433	61.9244	61.9244	61.8098	62.1628	62.5433	62.8123	63.0935 (39)
Average = Sum(39)m / 12 =												62.6757 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3895	1.3861	1.3828	1.3673	1.3644	1.3509	1.3509	1.3484	1.3561	1.3644	1.3703	1.3764 (40)
HLP (average)												1.3673 (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												1.5687 (42)
Average daily hot water use (litres/day)												71.4575 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	78.6032	75.7449	72.8866	70.0283	67.1700	64.3117	64.3117	67.1700	70.0283	72.8866	75.7449	78.6032 (44)
Energy content (annual)	116.5663	101.9496	105.2029	91.7184	88.0060	75.9425	70.3719	80.7528	81.7172	95.2335	103.9549	112.8883 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1124.3044 (45)

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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	24.7703	21.6643	22.3556	19.4902	18.7013	16.1378	14.9540	17.1600	17.3649	20.2371	22.0904	23.9888 (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	78.4368	78.4368	78.4368	78.4368	78.4368	78.4368	78.4368	78.4368	78.4368	78.4368	78.4368	78.4368	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	12.1645	10.8044	8.7867	6.6521	4.9725	4.1980	4.5361	5.8962	7.9139	10.0485	11.7281	12.5026	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	136.4484	137.8643	134.2962	126.7003	117.1118	108.1000	102.0795	100.6636	104.2316	111.8276	121.4161	130.4279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.8437	30.8437	30.8437	30.8437	30.8437	30.8437	30.8437	30.8437	30.8437	30.8437	30.8437	30.8437	(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)	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	(71)
Water heating gains (Table 5)	33.2935	32.2385	30.0479	27.0697	25.1361	22.4136	20.0995	23.0645	24.1179	27.2004	30.6811	32.2429	(72)
Total internal gains	228.4374	227.4382	219.6619	206.9531	193.7515	181.2426	173.2461	176.1553	182.7945	195.6075	210.3563	221.7045	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
East					8.0000	19.6403	0.6300	0.7000	0.7700		48.0186 (76)	
South					7.2300	46.7521	0.6300	0.7000	0.7700		103.3025 (78)	
Solar gains	151.3211	263.1174	370.2057	469.1879	530.3179	527.3122	508.1342	463.2464	405.0433	293.9408	182.3222	128.7510 (83)
Total gains	379.7584	490.5556	589.8676	676.1410	724.0694	708.5548	681.3803	639.4017	587.8378	489.5483	392.6785	350.4555 (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	52.1209	52.2475	52.3722	52.9661	53.0787	53.6092	53.6092	53.7086	53.4036	53.0787	52.8514	52.6158	
alpha	4.4747	4.4832	4.4915	4.5311	4.5386	4.5739	4.5739	4.5806	4.5602	4.5386	4.5234	4.5077	
util living area	0.9936	0.9804	0.9464	0.8628	0.7201	0.5413	0.3962	0.4386	0.6730	0.9141	0.9850	0.9954	(86)
MIT	19.6949	19.9687	20.3131	20.6660	20.8849	20.9756	20.9952	20.9925	20.9363	20.6124	20.0723	19.6449	(87)
Th 2	19.7714	19.7740	19.7766	19.7885	19.7907	19.8012	19.8012	19.8031	19.7972	19.7907	19.7862	19.7815	(88)
util rest of house	0.9913	0.9738	0.9293	0.8230	0.6509	0.4477	0.2902	0.3276	0.5772	0.8785	0.9789	0.9938	(89)
MIT 2	18.6135	18.8849	19.2181	19.5480	19.7244	19.7919	19.8002	19.8015	19.7688	19.5143	18.9994	18.5718	(90)
Living area fraction									fLA = Living area / (4) =			0.5079	(91)
MIT	19.1627	19.4353	19.7742	20.1158	20.3138	20.3931	20.4071	20.4064	20.3617	20.0720	19.5443	19.1167	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1627	19.4353	19.7742	20.1158	20.3138	20.3931	20.4071	20.4064	20.3617	20.0720	19.5443	19.1167	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9899	0.9716	0.9293	0.8348	0.6822	0.4949	0.3442	0.3842	0.6242	0.8880	0.9774	0.9927	(94)
Useful gains	375.9150	476.6368	548.1664	564.4193	493.9960	350.6775	234.5491	245.6539	366.9213	434.7093	383.7999	347.8833	(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	946.6464	923.5490	841.4114	702.9655	538.7348	358.7324	235.7540	247.6318	389.2441	592.4110	781.6544	941.1497	(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	424.6241	300.3250	218.1743	99.7533	33.2857	0.0000	0.0000	0.0000	0.0000	117.3301	286.4553	441.3902	(98)
Space heating												1921.3379	(98)
Space heating per m2											(98) / (4) =	41.9140	(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	582.0892	458.2404	469.7541	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9448	0.9724	0.9631	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	549.9802	445.5873	452.4365	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	887.9466	855.0762	806.8619	0.0000	0.0000	0.0000	0.0000	(103)

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Month fraction	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	243.3358	304.6597	263.6924	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												811.6880 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	60.8340	76.1649	65.9231	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												202.9220 (107)
Space cooling per m2												4.4267 (108)
Energy for space heating												41.9140 (99)
Energy for space cooling												4.4267 (108)
Total												46.3407 (109)
Dwelling Fabric Energy Efficiency (DFEE)												46.3 (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	45.8400 (1b)	x 2.4000 (2b)	= 110.0160 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	45.8400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 110.0160 (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)
					Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					20.0000 / (5) = 0.1818 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4318 (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) =		0.3670 (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	0.4680	0.4588	0.4496	0.4037	0.3945	0.3487	0.3487	0.3395	0.3670	0.3945	0.4129	0.4313 (22b)
Effective ac	0.6095	0.6052	0.6011	0.5815	0.5778	0.5608	0.5608	0.5576	0.5674	0.5778	0.5852	0.5930 (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)			9.5700	1.3258	12.6875		(27)
Heat Loss Floor 1			26.5900	0.1300	3.4567		(28b)
Main Wall	35.7200	9.5700	26.1500	0.1800	4.7070		(29a)
Wall to stairs	12.1600	1.8900	10.2700	0.1800	1.8486		(29a)
Flat roof	11.5200		11.5200	0.1300	1.4976		(30)
Total net area of external elements Aum(A, m ²)			85.9900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.0874		(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)							5.2111 (36)
Total fabric heat loss						(33) + (36) =	31.2985 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	22.1277	21.9734	21.8221	21.1114	20.9785	20.3595	20.3595	20.2449	20.5979	20.9785	21.2474	21.5286 (38)
Heat transfer coeff	53.4262	53.2719	53.1206	52.4099	52.2770	51.6580	51.6580	51.5434	51.8964	52.2770	52.5459	52.8271 (39)
Average = Sum(39)m / 12 =												52.4093 (39)
HLP	1.1655	1.1621	1.1588	1.1433	1.1404	1.1269	1.1269	1.1244	1.1321	1.1404	1.1463	1.1524 (40)
HLP (average)												1.1433 (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												1.5687 (42)
Average daily hot water use (litres/day)												71.4575 (43)
Daily hot water use	78.6032	75.7449	72.8866	70.0283	67.1700	64.3117	64.3117	67.1700	70.0283	72.8866	75.7449	78.6032 (44)
Energy conte	116.5663	101.9496	105.2029	91.7184	88.0060	75.9425	70.3719	80.7528	81.7172	95.2335	103.9549	112.8883 (45)
Energy content (annual)										Total = Sum(45)m =		1124.3044 (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	(56)
If cylinder contains dedicated solar storage												

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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 (57)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
	24.7703	21.6643	22.3556	19.4902	18.7013	16.1378	14.9540	17.1600	17.3649	20.2371	22.0904	23.9888 (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	78.4368	78.4368	78.4368	78.4368	78.4368	78.4368	78.4368	78.4368	78.4368	78.4368	78.4368	78.4368	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	12.2030	10.8386	8.8146	6.6732	4.9883	4.2113	4.5505	5.9149	7.9389	10.0803	11.7652	12.5422	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	136.4484	137.8643	134.2962	126.7003	117.1118	108.1000	102.0795	100.6636	104.2316	111.8276	121.4161	130.4279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.8437	30.8437	30.8437	30.8437	30.8437	30.8437	30.8437	30.8437	30.8437	30.8437	30.8437	30.8437	(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)	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	(71)
Water heating gains (Table 5)	33.2935	32.2385	30.0479	27.0697	25.1361	22.4136	20.0995	23.0645	24.1179	27.2004	30.6811	32.2429	(72)
Total internal gains	228.4759	227.4725	219.6897	206.9742	193.7673	181.2559	173.2605	176.1740	182.8195	195.6394	210.3935	221.7441	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c	Access factor Table 6d		Gains W
East					5.0300	19.6403	0.6300		0.7000	0.7700		30.1917
South					4.5400	46.7521	0.6300		0.7000	0.7700		(76) 64.8677
Solar gains	95.0594	165.2979	232.5921	294.8044	333.2316	331.3495	319.2959	291.0782	254.4884	184.6673	114.5358	80.8798
Total gains	323.5353	392.7704	452.2818	501.7786	526.9988	512.6054	492.5564	467.2522	437.3080	380.3067	324.9293	(83) 302.6239 (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	59.5837	59.7564	59.9266	60.7391	60.8936	61.6232	61.6232	61.7603	61.3401	60.8936	60.5819	60.2594	
alpha	4.9722	4.9838	4.9951	5.0493	5.0596	5.1082	5.1082	5.1174	5.0893	5.0596	5.0388	5.0173	
util living area	0.9959	0.9888	0.9699	0.9155	0.7996	0.6188	0.4566	0.4995	0.7426	0.9444	0.9906	0.9970	(86)
MIT	19.8355	20.0406	20.3217	20.6415	20.8670	20.9724	20.9951	20.9924	20.9315	20.6213	20.1625	19.8004	(87)
Th 2	19.9477	19.9504	19.9531	19.9656	19.9680	19.9789	19.9789	19.9809	19.9747	19.9680	19.9632	19.9582	(88)
util rest of house	0.9945	0.9852	0.9601	0.8888	0.7428	0.5309	0.3532	0.3930	0.6593	0.9207	0.9869	0.9960	(89)
MIT 2	18.8971	19.1025	19.3795	19.6908	19.8843	19.9672	19.9777	19.9790	19.9406	19.6815	19.2349	18.8707	(90)
Living area fraction	19.3737	19.5789	19.8580	20.1736	20.3834	20.4777	20.4944	20.4936	fLA = Living area / (4) =	20.4439	20.1588	19.7060	0.5079 (91)
MIT	19.3737	19.5789	19.8580	20.1736	20.3834	20.4777	20.4944	20.4936	20.4439	20.1588	19.7060	19.3429	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3737	19.5789	19.8580	20.1736	20.3834	20.4777	20.4944	20.4936	20.4439	20.1588	19.7060	19.3429	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9936	0.9836	0.9590	0.8948	0.7671	0.5750	0.4059	0.4473	0.6995	0.9258	0.9857	0.9952	(94)
Ext temp.	321.4488	386.3461	433.7447	448.9834	404.2460	294.7383	199.9449	209.0052	305.8976	352.0831	320.2927	301.1863	(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	805.3283	781.9739	709.5852	590.8485	453.9397	303.6291	201.1779	211.0000	329.2231	499.7030	662.3920	799.9546	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating	360.0064	265.8619	205.2254	102.1429	36.9721	0.0000	0.0000	0.0000	0.0000	109.8292	246.3115	371.0836	(98)
Space heating per m2												1697.4329	(98)
												37.0295	(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	485.5851	382.2692	391.7296	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9345	0.9687	0.9592	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	453.7991	370.3013	375.7383	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	658.9326	634.3920	605.6730	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	147.6961	196.4835	171.0715	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												515.2510	(104)
Cooled fraction												1.0000	(105)

fC = cooled area / (4) =

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

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	36.9240	49.1209	42.7679	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling												128.8128 (107)
Space cooling per m2												2.8101 (108)
Energy for space heating												37.0295 (99)
Energy for space cooling												2.8101 (108)
Total												39.8396 (109)
Target Fabric Energy Efficiency (TFEE)												45.8 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	45.8400 (1b)	x 2.4000 (2b)	= 110.0160 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	45.8400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 110.0160 (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) = 0.1818 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4318 (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) =				0.3670 (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	0.4037	0.3762	0.3762	0.3578	0.3578	0.3120	0.3120	0.3028	0.3120	0.3487	0.3395	0.3670 (22b)
Effective ac	0.5815	0.5708	0.5708	0.5640	0.5640	0.5487	0.5487	0.5458	0.5487	0.5608	0.5576	0.5674 (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)			15.2300	1.3258	20.1913		(27)
Door to Stairs			1.8900	1.4000	2.6460		(26)
Heat Loss Floor 1			26.5900	0.1400	3.7226		(28b)
Main Wall	35.7200	15.2300	20.4900	0.2200	4.5078	60.0000	1229.4000 (29a)
Wall to stairs	12.1600	1.8900	10.2700	0.1864	1.9141	190.0000	1951.3000 (29a)
Flat roof	11.5200		11.5200	0.1400	1.6128	9.0000	103.6800 (30)
Total net area of external elements Aum(A, m ²)			85.9900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.5946		(33)
Party Wall 1			36.1200	0.0000	0.0000	180.0000	6501.6000 (32)
Party Floor 1			19.2500			40.0000	770.0000 (32d)
Party Ceilings 1			34.3200			40.0000	1372.8000 (32b)
Internal Wall 1			40.6000			9.0000	365.4000 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12294.1800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							268.1976 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.9703 (36)
Total fabric heat loss						(33) + (36) =	41.5649 (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	21.1114	20.7217	20.7217	20.4772	20.4772	19.9193	19.9193	19.8169	19.9193	20.3595	20.2449	20.5979 (38)
Heat transfer coeff	62.6763	62.2866	62.2866	62.0421	62.0421	61.4842	61.4842	61.3818	61.4842	61.9244	61.8098	62.1628 (39)

Average = Sum(39)m / 12 =

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3673	1.3588	1.3588	1.3534	1.3534	1.3413	1.3413	1.3390	1.3413	1.3509	1.3484	1.3561 (40)
HLP (average)												1.3508 (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												1.5687 (42)
Average daily hot water use (litres/day)												71.4575 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	78.6032	75.7449	72.8866	70.0283	67.1700	64.3117	64.3117	67.1700	70.0283	72.8866	75.7449	78.6032 (44)
Energy conte	116.5663	101.9496	105.2029	91.7184	88.0060	75.9425	70.3719	80.7528	81.7172	95.2335	103.9549	112.8883 (45)
Energy content (annual)										Total = Sum(45)m =		1124.3044 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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CALCULATION OF HEAT DEMAND 09 Jan 2014

Water storage loss:	17.4849	15.2924	15.7804	13.7578	13.2009	11.3914	10.5558	12.1129	12.2576	14.2850	15.5932	16.9332 (46)
Store volume												210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8600 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0044 (55)
Total storage loss												
31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(56)
If cylinder contains dedicated solar storage												
31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
170.9651	151.0840	159.6017	144.3624	142.4048	128.5865	124.7707	135.1516	134.3612	149.6323	156.5989	167.2871	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h												
170.9651	151.0840	159.6017	144.3624	142.4048	128.5865	124.7707	135.1516	134.3612	149.6323	156.5989	167.2871	(64)
RHI water heating demand												
Heat gains from water heating, kWh/month												
82.2773	73.2058	78.4990	72.6116	72.7810	67.3661	66.9177	70.3693	69.2862	75.1842	76.6802	81.0544	(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	94.1242	94.1242	94.1242	94.1242	94.1242	94.1242	94.1242	94.1242	94.1242	94.1242	94.1242	94.1242 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
30.4112	27.0109	21.9668	16.6303	12.4313	10.4950	11.3403	14.7405	19.7847	25.1212	29.3201	31.2564	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
203.6543	205.7676	200.4422	189.1049	174.7937	161.3432	152.3575	150.2442	155.5696	166.9068	181.2180	194.6685	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
45.9812	45.9812	45.9812	45.9812	45.9812	45.9812	45.9812	45.9812	45.9812	45.9812	45.9812	45.9812	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	(71)
Water heating gains (Table 5)												
110.5878	108.9372	105.5094	100.8494	97.8240	93.5640	89.9431	94.5824	96.2308	101.0540	106.5003	108.9441	(72)
Total internal gains	422.0092	419.0716	405.2742	383.9405	362.4049	342.7581	330.9967	336.9230	348.9409	370.4379	394.3943	412.2249 (73)

6. Solar gains

[Jan]												Gains				
			Area m2			Solar flux Table 6a W/m2			Specific data or Table 6b			Specific data or Table 6c			Access factor Table 6d	W
East			8.0000			23.7835			0.6300			0.7000			0.7700	58.1483 (76)
South			7.2300			54.0600			0.6300			0.7000			0.7700	119.4500 (78)
Solar gains	177.5984	269.8086	377.4024	487.6130	539.4480	568.7142	542.0671	501.7887	440.7685	323.5963	210.7722	152.0078 (83)				
Total gains	599.6075	688.8802	782.6766	871.5535	901.8529	911.4723	873.0638	838.7117	789.7094	694.0342	605.1665	564.2327 (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	54.4871	54.8280	54.8280	55.0441	55.0441	55.5435	55.5435	55.6362	55.5435	55.1487	55.2510	54.9372
alpha	4.6325	4.6552	4.6552	4.6696	4.6696	4.7029	4.7029	4.7091	4.7029	4.6766	4.6834	4.6625
util living area	0.9616	0.9301	0.8568	0.7241	0.5523	0.3623	0.2392	0.2631	0.4745	0.7547	0.9220	0.9686 (86)
Tweekday	18.9568	19.1691	19.4308	19.6225	19.6976	19.7232	19.7242	19.7260	19.7196	19.6298	19.3081	18.9205
Tweekend	20.5705	20.6679	20.7967	20.8989	20.9472	20.9611	20.9626	20.9625	20.9568	20.8983	20.7283	20.5503
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	20.3372	20.4863	20.6862	20.8422	20.9185	20.9402	20.9422	20.9421	20.9325	20.8431	20.5758	20.3060 (87)
Th 2	19.7885	19.7951	19.7951	19.7992	19.7992	19.8086	19.8086	19.8104	19.8086	19.8012	19.8031	19.7972 (88)
util rest of house												
	0.9498	0.9105	0.8208	0.6678	0.4794	0.2834	0.1555	0.1764	0.3871	0.6890	0.8965	0.9587 (89)
Tweekday	18.9568	19.1691	19.4308	19.6225	19.6976	19.7232	19.7242	19.7260	19.7196	19.6298	19.3081	18.9205
Tweekend	18.9568	19.1691	19.4308	19.6225	19.6976	19.7232	19.7242	19.7260	19.7196	19.6298	19.3081	18.9205
MIT 2	18.9568	19.1691	19.4308	19.6225	19.6976	19.7232	19.7242	19.7260	19.7196	19.6298	19.3081	18.9205 (90)
Living area fraction									fLA = Living area / (4) =			0.5079 (91)
MIT	19.6578	19.8381	20.0683	20.2419	20.3176	20.3412	20.3427	20.3436	20.3356	20.2460	19.9519	19.6242 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6578	19.8381	20.0683	20.2419	20.3176	20.3412	20.3427	20.3436	20.3356	20.2460	19.9519	19.6242 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9483	0.9113	0.8297	0.6895	0.5115	0.3188	0.1931	0.2153	0.4263	0.7149	0.9001	0.9570 (94)
Useful gains	568.5949	627.7617	649.3788	600.8940	461.3167	290.5790	168.5760	180.5804	336.6220	496.1358	544.7082	539.9839 (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	924.9669	893.0708	795.2955	654.0425	472.6125	291.5113	168.6356	180.6832	340.3505	547.7830	751.1034	915.2943 (97)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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CALCULATION OF HEAT DEMAND 09 Jan 2014

Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	265.1408	178.2877	108.5620	38.2669	8.4041	0.0000	0.0000	0.0000	0.0000	38.4255	148.6045	279.2309	(98)
Space heating												1064.9224	(98)
RHI space heating demand												1065	(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	45.8400 (1b)	x 2.4000 (2b)	= 110.0160 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	45.8400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 110.0160 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					20.0000 / (5) = 0.1818 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4318 (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) =				0.3670 (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	0.4680	0.4588	0.4496	0.4037	0.3945	0.3487	0.3487	0.3395	0.3670	0.3945	0.4129	0.4313 (22b)
Effective ac	0.6095	0.6052	0.6011	0.5815	0.5778	0.5608	0.5608	0.5576	0.5674	0.5778	0.5852	0.5930 (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)			15.2300	1.3258	20.1913		(27)
Door to Stairs			1.8900	1.4000	2.6460		(26)
Heat Loss Floor 1			26.5900	0.1400	3.7226		(28b)
Main Wall	35.7200	15.2300	20.4900	0.2200	4.5078	60.0000	1229.4000 (29a)
Wall to stairs	12.1600	1.8900	10.2700	0.1864	1.9141	190.0000	1951.3000 (29a)
Flat roof	11.5200		11.5200	0.1400	1.6128	9.0000	103.6800 (30)
Total net area of external elements Aum(A, m ²)			85.9900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.5946		(33)
Party Wall 1			36.1200	0.0000	0.0000	180.0000	6501.6000 (32)
Party Floor 1			19.2500			40.0000	770.0000 (32d)
Party Ceilings 1			34.3200			40.0000	1372.8000 (32b)
Internal Wall 1			40.6000			9.0000	365.4000 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12294.1800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							268.1976 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.9703 (36)
Total fabric heat loss						(33) + (36) =	41.5649 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	22.1277	21.9734	21.8221	21.1114	20.9785	20.3595	20.3595	20.2449	20.5979	20.9785	21.2474	21.5286 (38)
Heat transfer coeff	63.6926	63.5383	63.3870	62.6763	62.5433	61.9244	61.9244	61.8098	62.1628	62.5433	62.8123	63.0935 (39)
Average = Sum(39)m / 12 =												62.6757 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3895	1.3861	1.3828	1.3673	1.3644	1.3509	1.3509	1.3484	1.3561	1.3644	1.3703	1.3764 (40)
HLP (average)												1.3673 (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												1.5687 (42)
Average daily hot water use (litres/day)												71.4575 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
78.6032	75.7449	72.8866	70.0283	67.1700	64.3117	64.3117	67.1700	70.0283	72.8866	75.7449	78.6032 (44)	
Energy conte	116.5663	101.9496	105.2029	91.7184	88.0060	75.9425	70.3719	80.7528	81.7172	95.2335	103.9549	112.8883 (45)
Energy content (annual)												Total = Sum(45)m = 1124.3044 (45)
Distribution loss (46)m = 0.15 x (45)m												

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	17.4849	15.2924	15.7804	13.7578	13.2009	11.3914	10.5558	12.1129	12.2576	14.2850	15.5932	16.9332 (46)
Water storage loss:												
Store volume												210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8600 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0044 (55)
Total storage loss												
31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(56)
If cylinder contains dedicated solar storage												
31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
170.9651	151.0840	159.6017	144.3624	142.4048	128.5865	124.7707	135.1516	134.3612	149.6323	156.5989	167.2871	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h												
170.9651	151.0840	159.6017	144.3624	142.4048	128.5865	124.7707	135.1516	134.3612	149.6323	156.5989	167.2871	(64)
Heat gains from water heating, kWh/month												
82.2773	73.2058	78.4990	72.6116	72.7810	67.3661	66.9177	70.3693	69.2862	75.1842	76.6802	81.0544	(65)

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

Metabolic gains (Table 5), Watts												
(66)m	94.1242	94.1242	94.1242	94.1242	94.1242	94.1242	94.1242	94.1242	94.1242	94.1242	94.1242	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.4112	27.0109	21.9668	16.6303	12.4313	10.4950	11.3403	14.7405	19.7847	25.1212	29.3201	31.2564 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.6543	205.7676	200.4422	189.1049	174.7937	161.3432	152.3575	150.2442	155.5696	166.9068	181.2180	194.6685 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.9812	45.9812	45.9812	45.9812	45.9812	45.9812	45.9812	45.9812	45.9812	45.9812	45.9812	45.9812 (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)	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494 (71)
Water heating gains (Table 5)	110.5878	108.9372	105.5094	100.8494	97.8240	93.5640	89.9431	94.5824	96.2308	101.0540	106.5003	108.9441 (72)
Total internal gains	422.0092	419.0716	405.2742	383.9405	362.4049	342.7581	330.9967	336.9230	348.9409	370.4379	394.3943	412.2249 (73)

6. Solar gains

[Jan]												
			Area		Solar flux		Specific data		FF		Access	Gains
			m2		Table 6a		g				factor	W
					W/m2		or Table 6b		Specific data		Table 6c	
East			8.0000		19.6403		0.6300		0.7000		0.7700	48.0186 (76)
South			7.2300		46.7521		0.6300		0.7000		0.7700	103.3025 (78)
Solar gains	151.3211	263.1174	370.2057	469.1879	530.3179	527.3122	508.1342	463.2464	405.0433	293.9408	182.3222	128.7510 (83)
Total gains	573.3302	682.1890	775.4800	853.1284	892.7228	870.0703	839.1309	800.1694	753.9842	664.3787	576.7165	540.9759 (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	53.6177	53.7479	53.8762	54.4871	54.6029	55.1487	55.1487	55.2510	54.9372	54.6029	54.3691	54.1268
alpha	4.5745	4.5832	4.5917	4.6325	4.6402	4.6766	4.6766	4.6834	4.6625	4.6402	4.6246	4.6085
util living area	0.9718	0.9419	0.8832	0.7709	0.6174	0.4492	0.3236	0.3535	0.5504	0.8139	0.9448	0.9774 (86)
Tweekday	18.7992	19.0459	19.3217	19.5636	19.6715	19.7123	19.7159	19.7177	19.7004	19.5596	19.1616	18.7569
Tweekend	20.5048	20.6184	20.7503	20.8710	20.9346	20.9575	20.9617	20.9613	20.9498	20.8628	20.6651	20.4817
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	20.2357	20.4098	20.6147	20.7985	20.8991	20.9347	20.9408	20.9402	20.9216	20.7883	20.4770	20.2001 (87)
Th 2	19.7714	19.7740	19.7766	19.7885	19.7907	19.8012	19.8012	19.8031	19.7972	19.7907	19.7862	19.7815 (88)
util rest of house	0.9631	0.9255	0.8530	0.7204	0.5485	0.3679	0.2360	0.2625	0.4623	0.7585	0.9261	0.9703 (89)
Tweekday	18.7992	19.0459	19.3217	19.5636	19.6715	19.7123	19.7159	19.7177	19.7004	19.5596	19.1616	18.7569
Tweekend	18.7992	19.0459	19.3217	19.5636	19.6715	19.7123	19.7159	19.7177	19.7004	19.5596	19.1616	18.7569
MIT 2	18.7992	19.0459	19.3217	19.5636	19.6715	19.7123	19.7159	19.7177	19.7004	19.5596	19.1616	18.7569 (90)
Living area fraction									fLA = Living area / (4) =			0.5079 (91)
MIT	19.5287	19.7385	19.9783	20.1908	20.2949	20.3331	20.3380	20.3386	20.3206	20.1836	19.8296	19.4898 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5287	19.7385	19.9783	20.1908	20.2949	20.3331	20.3380	20.3386	20.3206	20.1836	19.8296	19.4898 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	550.9811	630.9772	665.7515	629.7115	516.0025	351.8225	231.0659	242.7978	378.1225	516.8248	534.5267	523.7788 (94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	969.9575	942.8136	854.3512	707.6644	537.5564	355.0186	231.4722	243.4420	386.6913	599.3916	799.5777	964.6891 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)

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Space heating kWh	311.7185	209.5541	140.3182	56.1260	16.0361	0.0000	0.0000	0.0000	0.0000	61.4297	190.8367	328.0373 (98)
Space heating												1314.0565 (98)
Space heating per m2											(98) / (4) =	28.6662 (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 %)												225.9504 (206)
Efficiency of secondary/supplementary heating system, %												100.0000 (208)
Space heating requirement												581.5685 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	311.7185	209.5541	140.3182	56.1260	16.0361	0.0000	0.0000	0.0000	0.0000	61.4297	190.8367	328.0373 (98)
Space heating efficiency (main heating system 1)	225.9504	225.9504	225.9504	225.9504	225.9504	0.0000	0.0000	0.0000	0.0000	225.9504	225.9504	225.9504 (210)
Space heating fuel (main heating system)	137.9588	92.7434	62.1013	24.8400	7.0972	0.0000	0.0000	0.0000	0.0000	27.1872	84.4595	145.1811 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	170.9651	151.0840	159.6017	144.3624	142.4048	128.5865	124.7707	135.1516	134.3612	149.6323	156.5989	167.2871 (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	100.9001	89.1667	94.1936	85.1997	84.0444	75.8891	73.6371	79.7637	79.2972	88.3099	92.4214	98.7294 (219)
Water heating fuel used												1041.5524 (219)
Annual totals kWh/year												
Space heating fuel - main system												581.5685 (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)												214.8284 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
Total delivered energy for all uses												1837.9492 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	581.5685	13.1900	76.7089 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1041.5524	13.1900	137.3808 (247)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	214.8284	13.1900	28.3359 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit	0.0000	13.1900	0.0000 (252)
Total energy cost			242.4255 (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] =	1.1209 (257)
SAP value		84.3640
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	581.5685	0.5190	301.8340 (261)
Space heating - secondary	0.0000	0.5190	0.0000 (263)
Water heating (other fuel)	1041.5524	0.5190	540.5657 (264)
Space and water heating			842.3997 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	214.8284	0.5190	111.4959 (268)
Energy saving/generation technologies			
PV Unit	-300.0000	0.5190	-155.7000 (269)
Total kg/year			798.1956 (272)
CO2 emissions per m2			17.4100 (273)
EI value			88.2256
EI rating			88 (274)
EI band			B

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Calculation of stars for heating and DHW

Main heating energy efficiency	$13.19 \times (1 + 0.29 \times 0.25) / 2.2595 = 6.261$, stars = 3
Main heating environmental impact	$0.519 \times (1 + 0.29 \times 0.25) / 2.2595 = 0.2463$, 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	45.8400 (1b)	x 2.4000 (2b)	= 110.0160 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	45.8400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 110.0160 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					20.0000 / (5) = 0.1818 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4318 (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) =				0.3670 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.4000	4.1000	4.1000	3.9000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000 (22)
Wind factor	1.1000	1.0250	1.0250	0.9750	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000 (22a)
Adj infilt rate												
Effective ac	0.4037	0.3762	0.3762	0.3578	0.3578	0.3120	0.3120	0.3028	0.3120	0.3487	0.3395	0.3670 (22b)
	0.5815	0.5708	0.5708	0.5640	0.5640	0.5487	0.5487	0.5458	0.5487	0.5608	0.5576	0.5674 (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)			15.2300	1.3258	20.1913		(27)
Door to Stairs			1.8900	1.4000	2.6460		(26)
Heat Loss Floor 1			26.5900	0.1400	3.7226		(28b)
Main Wall	35.7200	15.2300	20.4900	0.2200	4.5078	60.0000	1229.4000 (29a)
Wall to stairs	12.1600	1.8900	10.2700	0.1864	1.9141	190.0000	1951.3000 (29a)
Flat roof	11.5200		11.5200	0.1400	1.6128	9.0000	103.6800 (30)
Total net area of external elements Aum(A, m ²)			85.9900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.5946		(33)
Party Wall 1			36.1200	0.0000	0.0000	180.0000	6501.6000 (32)
Party Floor 1			19.2500			40.0000	770.0000 (32d)
Party Ceilings 1			34.3200			40.0000	1372.8000 (32b)
Internal Wall 1			40.6000			9.0000	365.4000 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12294.1800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							268.1976 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.9703 (36)
Total fabric heat loss					(33) + (36) =		41.5649 (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	21.1114	20.7217	20.7217	20.4772	20.4772	19.9193	19.9193	19.8169	19.9193	20.3595	20.2449	20.5979 (38)
Heat transfer coeff	62.6763	62.2866	62.2866	62.0421	62.0421	61.4842	61.4842	61.3818	61.4842	61.9244	61.8098	62.1628 (39)
Average = Sum(39)m / 12 =												61.9221 (39)
HLP	1.3673	1.3588	1.3588	1.3534	1.3534	1.3413	1.3413	1.3390	1.3413	1.3509	1.3484	1.3561 (40)
HLP (average)												1.3508 (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												1.5687 (42)
Average daily hot water use (litres/day)												71.4575 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	78.6032	75.7449	72.8866	70.0283	67.1700	64.3117	64.3117	67.1700	70.0283	72.8866	75.7449	78.6032 (44)
Energy conte	116.5663	101.9496	105.2029	91.7184	88.0060	75.9425	70.3719	80.7528	81.7172	95.2335	103.9549	112.8883 (45)
Energy content (annual)										Total = Sum(45)m =		1124.3044 (45)
Distribution loss (46)m = 0.15 x (45)m												

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	17.4849	15.2924	15.7804	13.7578	13.2009	11.3914	10.5558	12.1129	12.2576	14.2850	15.5932	16.9332 (46)
Water storage loss:												
Store volume												210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8600 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0044 (55)
Total storage loss												
31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(56)
If cylinder contains dedicated solar storage												
31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
170.9651	151.0840	159.6017	144.3624	142.4048	128.5865	124.7707	135.1516	134.3612	149.6323	156.5989	167.2871	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h												
170.9651	151.0840	159.6017	144.3624	142.4048	128.5865	124.7707	135.1516	134.3612	149.6323	156.5989	167.2871	(64)
Heat gains from water heating, kWh/month												
82.2773	73.2058	78.4990	72.6116	72.7810	67.3661	66.9177	70.3693	69.2862	75.1842	76.6802	81.0544	(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	94.1242	94.1242	94.1242	94.1242	94.1242	94.1242	94.1242	94.1242	94.1242	94.1242	94.1242	94.1242 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.4112	27.0109	21.9668	16.6303	12.4313	10.4950	11.3403	14.7405	19.7847	25.1212	29.3201	31.2564 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.6543	205.7676	200.4422	189.1049	174.7937	161.3432	152.3575	150.2442	155.5696	166.9068	181.2180	194.6685 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.9812	45.9812	45.9812	45.9812	45.9812	45.9812	45.9812	45.9812	45.9812	45.9812	45.9812	45.9812 (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)	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494	-62.7494 (71)
Water heating gains (Table 5)	110.5878	108.9372	105.5094	100.8494	97.8240	93.5640	89.9431	94.5824	96.2308	101.0540	106.5003	108.9441 (72)
Total internal gains	422.0092	419.0716	405.2742	383.9405	362.4049	342.7581	330.9967	336.9230	348.9409	370.4379	394.3943	412.2249 (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
East		8.0000		23.7835		0.6300		0.7000		0.7700		58.1483 (76)
South		7.2300		54.0600		0.6300		0.7000		0.7700		119.4500 (78)
Solar gains	177.5984	269.8086	377.4024	487.6130	539.4480	568.7142	542.0671	501.7887	440.7685	323.5963	210.7722	152.0078 (83)
Total gains	599.6075	688.8802	782.6766	871.5535	901.8529	911.4723	873.0638	838.7117	789.7094	694.0342	605.1665	564.2327 (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	54.4871	54.8280	54.8280	55.0441	55.0441	55.5435	55.5435	55.6362	55.5435	55.1487	55.2510	54.9372
alpha	4.6325	4.6552	4.6552	4.6696	4.6696	4.7029	4.7029	4.7091	4.7029	4.6766	4.6834	4.6625
util living area	0.9616	0.9301	0.8568	0.7241	0.5523	0.3623	0.2392	0.2631	0.4745	0.7547	0.9220	0.9686 (86)
Tweekday	18.9568	19.1691	19.4308	19.6225	19.6976	19.7232	19.7242	19.7260	19.7196	19.6298	19.3081	18.9205
Tweekend	20.5705	20.6679	20.7967	20.8989	20.9472	20.9611	20.9626	20.9625	20.9568	20.8983	20.7283	20.5503
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	20.3372	20.4863	20.6862	20.8422	20.9185	20.9402	20.9422	20.9421	20.9325	20.8431	20.5758	20.3060 (87)
Th 2	19.7885	19.7951	19.7951	19.7992	19.7992	19.8086	19.8086	19.8104	19.8086	19.8012	19.8031	19.7972 (88)
util rest of house	0.9498	0.9105	0.8208	0.6678	0.4794	0.2834	0.1555	0.1764	0.3871	0.6890	0.8965	0.9587 (89)
Tweekday	18.9568	19.1691	19.4308	19.6225	19.6976	19.7232	19.7242	19.7260	19.7196	19.6298	19.3081	18.9205
Tweekend	18.9568	19.1691	19.4308	19.6225	19.6976	19.7232	19.7242	19.7260	19.7196	19.6298	19.3081	18.9205
MIT 2	18.9568	19.1691	19.4308	19.6225	19.6976	19.7232	19.7242	19.7260	19.7196	19.6298	19.3081	18.9205 (90)
Living area fraction									fLA = Living area / (4) =			0.5079 (91)
MIT	19.6578	19.8381	20.0683	20.2419	20.3176	20.3412	20.3427	20.3436	20.3356	20.2460	19.9519	19.6242 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6578	19.8381	20.0683	20.2419	20.3176	20.3412	20.3427	20.3436	20.3356	20.2460	19.9519	19.6242 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9483	0.9113	0.8297	0.6895	0.5115	0.3188	0.1931	0.2153	0.4263	0.7149	0.9001	0.9570 (94)
Useful gains	568.5949	627.7617	649.3788	600.8940	461.3167	290.5790	168.5760	180.5804	336.6220	496.1358	544.7082	539.9839 (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	924.9669	893.0708	795.2955	654.0425	472.6125	291.5113	168.6356	180.6832	340.3505	547.7830	751.1034	915.2943 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Space heating kWh	265.1408	178.2877	108.5620	38.2669	8.4041	0.0000	0.0000	0.0000	0.0000	38.4255	148.6045	279.2309 (98)
Space heating												1064.9224 (98)
Space heating per m2												(98) / (4) = 23.2313 (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 %)												223.7612 (206)
Efficiency of secondary/supplementary heating system, %												100.0000 (208)
Space heating requirement												475.9192 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	265.1408	178.2877	108.5620	38.2669	8.4041	0.0000	0.0000	0.0000	0.0000	38.4255	148.6045	279.2309 (98)
Space heating efficiency (main heating system 1)	223.7612	223.7612	223.7612	223.7612	223.7612	0.0000	0.0000	0.0000	0.0000	223.7612	223.7612	223.7612 (210)
Space heating fuel (main heating system)	118.4928	79.6777	48.5169	17.1017	3.7558	0.0000	0.0000	0.0000	0.0000	17.1726	66.4121	124.7897 (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	170.9651	151.0840	159.6017	144.3624	142.4048	128.5865	124.7707	135.1516	134.3612	149.6323	156.5989	167.2871 (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	100.9001	89.1667	94.1936	85.1997	84.0444	75.8891	73.6371	79.7637	79.2972	88.3099	92.4214	98.7294 (219)
Water heating fuel used												1041.5524 (219)
Annual totals kWh/year												
Space heating fuel - main system												475.9192 (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)												214.8284 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
Total delivered energy for all uses												1732.3000 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	475.9192	18.9000	89.9487 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1041.5524	18.9000	196.8534 (247)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	214.8284	18.9000	40.6026 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit	0.0000	18.9000	0.0000 (252)
Total energy cost			327.4047 (255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	475.9192	0.5190	247.0021 (261)
Space heating - secondary	0.0000	0.5190	0.0000 (263)
Water heating (other fuel)	1041.5524	0.5190	540.5657 (264)
Space and water heating			787.5678 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	214.8284	0.5190	111.4959 (268)
Energy saving/generation technologies			
PV Unit	-300.0000	0.5190	-155.7000 (269)
Total kg/year			743.3637 (272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	475.9192	3.0700	1461.0720 (261)
Space heating - secondary	0.0000	3.0700	0.0000 (263)
Water heating (other fuel)	1041.5524	3.0700	3197.5659 (264)
Space and water heating			4658.6378 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	214.8284	3.0700	659.5231 (268)

FULL SAP CALCULATION PRINTOUT

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

Energy saving/generation technologies			
PV Unit	-300.0000	3.0700	-921.0000 (269)
Primary energy kWh/year			4397.1610 (272)
Primary energy kWh/m2/year			95.9241 (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 efficiency	Environmental impact
(none)			
	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	£327	£327	£0
Space heating	£90	£90	£0
Water heating	£197	£197	£0
Lighting	£41	£41	£0
Total cost of fuels	£327	£327	£0
Total cost of uses	£328	£328	£0
Delivered energy	38 kWh/m²	38 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.7 tonnes	0.7 tonnes	0.0 tonnes
CO2 emissions per m²	16 kg/m²	16 kg/m²	0 kg/m²
Primary energy	96 kWh/m²	96 kWh/m²	0 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Energy Calculations Ltd
SAP ♦ CODE ♦ SBEM ♦ DESIGN

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

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

No improvements selected / applicable

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

Overheating Calculation Input Data

Dwelling type	MidTerrace Flat
Number of storeys	1
Cross ventilation possible	Yes
SAP Region	Thames Valley
Front of dwelling faces	West
Overshading	Average or unknown
Thermal mass parameter	268.2 (calculated from construction elements)
Night ventilation	No
Ventilation rate during hot weather (ach)	6.00 (Windows fully open)

Overheating Calculation

Summer ventilation heat loss coefficient	217.83 (P1)
Transmission heat loss coefficient	41.56 (37)
Summer heat loss coefficient	259.40 (P2)

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

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

[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Shading	Gains W
East	8.0000	117.5071	0.6300	0.7000	0.9000	335.7976
South	7.2300	112.2060	0.6300	0.7000	0.9000	289.7864
total:						625.5840

Solar gains	Jun	Jul	Aug	
	657	626	581	(P3)
Internal gains	343	331	337	
Total summer gains	1000	957	918	(P5)
Summer gain/loss ratio	3.85	3.69	3.54	(P6)
Summer external temperature	16.00	17.90	17.80	
Thermal mass temperature increment (TMP = 268.2)	0.12	0.12	0.12	
Threshold temperature	19.98	21.71	21.46	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	
Assessment of likelihood of high internal temperature:	Slight			

BASIC COMPLIANCE REPORT

Energy Calculations Ltd
SAP • CODE • SBEM • DESIGN

Calculation Type: New Build (As Designed)

Property Reference	015726	Issued on Date	01/03/2021
Assessment Reference	003	Prop Type Ref	
Property	Flat 5, 18, Parkside Road, READING, RG30 2DB		
SAP Rating	84 B	DER	19.12
Environmental	88 B	TER	29.28
CO ₂ Emissions (t/year)	0.74	% DER<TER	34.69
General Requirements Compliance	Fail	DFEE	46.34
		TFEE	45.82
		% DFEE<TFEE	-1.15
Assessor Details	Mr. Matthew Carter, Energy Calculations Limited, Tel: 01754 761035, mcarter@energycalculations.co.uk		Assessor ID
			7869-0001
Client			

SUMMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Electricity		
Fuel factor	1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	29.28	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	19.12	kgCO ₂ /m ²	Pass
	-10.16 (-34.7%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	45.82	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	46.34	kWh/m ² /yr	
Excess energy	0.5 (1.1%)	kWh/m ² /yr	Fail

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.22 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.14 (max. 0.25)	0.14 (max. 0.70)	Pass
Roof	0.14 (max. 0.20)	0.14 (max. 0.35)	Pass
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

Limiting System Efficiencies

4 Heating efficiency

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

BASIC COMPLIANCE REPORT

Energy Calculations Ltd
SAP • CODE • SBEM • DESIGN

Calculation Type: New Build (As Designed)

5 Cylinder insulation

Hot water storage

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

Pass

Primary pipework insulated

Yes

Pass

6 Controls

Space heating controls

Time and temperature zone control

Pass

Hot water controls

Cylinderstat

Pass

Independent timer for DHW

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100

%

Minimum

75

%

Pass

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)

Slight

Pass

Based on:

Overshading

Average

Windows facing East

8.00 m², No overhang

Windows facing South

7.23 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
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Calculation Type: New Build (As Designed)

Property Reference	015726	Issued on Date	01/03/2021
Assessment Reference	003	Prop Type Ref	
Property	Flat 5, 18, Parkside Road, READING, RG30 2DB		
SAP Rating	84 B	DER	19.12
Environmental	88 B	TER	29.28
CO ₂ Emissions (t/year)	0.74	% DER<TER	34.69
General Requirements Compliance	Fail	DFEE	46.34
		TFEE	45.82
		% DFEE<TFEE	-1.15
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 19.95 m	Internal Floor Area 45.84 m ²
			Average Storey Height 2.40 m

7.0 Living Area	23.28	m ²
-----------------	-------	----------------

8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	268.2	kJ/m ² K

9.0 External Walls						
Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Main Wall	Cavity Wall	Cavity wall : plasterboard on dabs, AAC block, filled cavity, any outside structure	0.22	60.00	35.72	20.49
Wall to stairs	Cavity Wall	Cavity wall : dense plaster, dense block, filled cavity, any outside structure	0.22	190.00	12.16	10.27

9.1 Party Walls					
Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)
Party Wall 1	Solid Wall	Dense plaster both sides, dense blocks, cavity or cavity fill	0.00	180.00	36.12

9.2 Internal Walls					
Description	Construction		Kappa (kJ/m ² K)	Area (m ²)	
Internal Wall 1	Plasterboard on timber frame		9.00	40.60	

10.0 External Roofs						
Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Flat roof	External Flat Roof	Plasterboard, insulated flat roof	0.14	9.00	11.52	11.52

10.1 Party Ceilings

SUMMARY FOR INPUT DATA

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

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceilings 1	Precast concrete planks floor, screed, carpeted	30.00	34.32

11.0 Heat Loss Floors					
Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)
Heat Loss Floor 1	Exposed Floor - Solid	Other	0.14	0.00	26.59

11.1 Party Floors					
Description	Construction	Kappa (kJ/m²K)	Area (m²)		
Party Floor 1	Precast concrete planks floor, screed, carpeted	40.00	19.25		

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	North							1.89	
Windows	Window	[1] Main Wall	East	None	0.00					8.00	
Windows	Window	[1] Main Wall	South	None	0.00					7.23	

14.0 Conservatory	None
15.0 Draught Proofing	100 %
16.0 Draught Lobby	Yes
17.0 Thermal Bridging	Calculate Bridges

17.1 List of Bridges					
Source Type	Bridge Type	Length	Psi	Imported	
Table K1 - Approved	E2 Other lintels (including other steel lintels)	7.33	0.300	No	
Table K1 - Approved	E3 Sill	7.33	0.040	No	
Table K1 - Approved	E4 Jamb	37.44	0.050	No	
Table K1 - Approved	E7 Party floor between dwellings (in blocks of flats)	19.95	0.070	No	
Table K1 - Default	E14 Flat roof	12.42	0.080	No	
Table K1 - Approved	E16 Corner (normal)	7.20	0.090	No	
Table K1 - Approved	E17 Corner (inverted – internal area greater than external area)	9.60	-0.090	No	
Table K1 - Approved	E18 Party wall between dwellings	7.20	0.060	No	
Table K1 - Default	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	15.00	0.000	No	

Y-value	0.081	W/m²K
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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

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Cross ventilation possible	Yes
Night Ventilation	No
Air change rate	6.00

Mechanical Ventilation

Mechanical Ventilation System Present	No
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20.0 Fans, Open Fireplaces, Flues

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

21.0 Fixed Cooling System

No

22.0 Lighting

Internal

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

External

External lights fitted	Yes
Light and motion sensor	Yes

23.0 Electricity Tariff

Standard

24.0 Main Heating 1

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
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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

SUMMARY FOR INPUT DATA

Energy Calculations Ltd
SAP ♦ CODE ♦ SBEM ♦ DESIGN

Calculation Type: New Build (As Designed)

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	
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 %			