

PREDICTED ENERGY ASSESSMENT

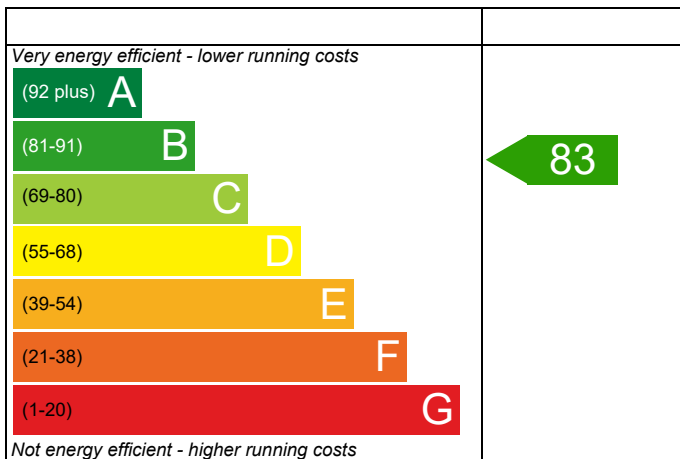
371 - PRJ012318 - GF

Dwelling type: Flat, Detached
Date of assessment: 13/07/2022
Produced by: Scott Binstead
Total floor area: 70.25 m²

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

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

Energy Efficiency Rating

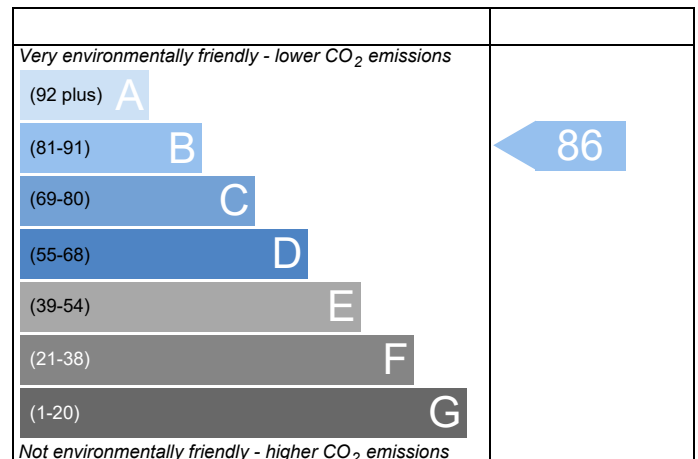


England

EU Directive
2002/91/EC

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

Environmental Impact (CO₂) Rating



England

EU Directive
2002/91/EC

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	371 - PRJ012318 - GF			Issued on Date	13/07/2022
Assessment Reference	371 D	Prop Type Ref	Maryland 2 - GF		
Property	371 - PRJ012318 - GF				
SAP Rating	83 B	DER	19.40	TER	20.55
Environmental	86 B	% DER<TER	5.58		
CO ₂ Emissions (t/year)	1.10	DFEE	52.76	TFEE	59.11
General Requirements Compliance	Pass	% DFEE<TFEE	10.75		
Assessor Details	Chris Nicholls, , Tel: ,			Assessor ID	U903-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

DWELLING AS DESIGNED

Ground-floor flat, total floor area 70 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:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 20.55 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 19.40 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)59.1 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)52.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.22 (max. 0.30)	0.24 (max. 0.70)	OK
Floor	0.15 (max. 0.25)	0.15 (max. 0.70)	OK
Roof (no roof)			
Openings	1.37 (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: 5.01 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from database
Ideal LOGIC COMBI ESP1 35
Combi boiler
Efficiency: 89.6% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls:

No cylinder

Boiler interlock

Yes

OK

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)
Specific fan power: 0.1900 0.1800
Maximum 0.7 OK

9 Summertime temperature

Overheating risk (Thames Valley): Slight OK

Based on:

Overshading: Average
Windows facing North: 1.92 m², No overhang
Windows facing East: 3.24 m², No overhang
Windows facing South: 5.53 m², No overhang
Air change rate: 4.55 ach
Blinds/curtains: Dark-coloured curtain or roller blind, closed 100% of daylight hours

10 Key features

None

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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	70.2500 (1b)	2.7000 (2b)	189.6750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2500		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 189.6750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				0 * 10 =	0.0000 (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) =				0.0000 / (5) =	0.0000 (8)
Pressure test				Yes	
Measured/design AP50				5.0100	
Infiltration rate				0.2505	(18)
Number of sides sheltered				0	(19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.2505 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3194	0.3131	0.3069	0.2756	0.2693	0.2380	0.2380	0.2317	0.2505	0.2693	0.2818	0.2943 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												
Effective ac	0.5694	0.5631	0.5569	0.5256	0.5193	0.5000	0.5000	0.5000	0.5005	0.5193	0.5318	0.5443 (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)			10.6900	1.3258	14.1723		(27)
Solid Door			2.0600	1.2000	2.4720		(26)
Flr - Ground			70.2520	0.1500	10.5378	75.6000	5311.0512 (28a)
Wl - Brick L&G	71.9500	10.6910	61.2590	0.2200	13.4770	58.3400	3573.8501 (29a)
Wl - To Corridor	20.5400	2.0580	18.4820	0.2400	4.4357	51.1800	945.9088 (29a)
Total net area of external elements Aum(A, m ²)			162.7430				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 45.0948		(33)
Party Ceiling			70.2520			70.0000	4917.6400 (32b)
Ground Floor Stud			170.1162			5.8200	990.0763 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	15738.5263 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							224.0360 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.2813 (36)
Total fabric heat loss						(33) + (36) =	55.3761 (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	35.6395	35.2475	34.8556	32.8956	32.5036	31.2964	31.2964	31.2964	31.3277	32.5036	33.2876	34.0716 (38)
Heat transfer coeff	91.0156	90.6236	90.2316	88.2717	87.8797	86.6725	86.6725	86.6725	86.7037	87.8797	88.6637	89.4477 (39)
Average = Sum(39)m / 12 =												88.3945 (39)
HLP	1.2956	1.2900	1.2844	1.2565	1.2510	1.2338	1.2338	1.2338	1.2342	1.2510	1.2621	1.2733 (40)
HLP (average)												1.2583 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.2522 (42)
Average daily hot water use (litres/day)												87.6893 (43)
Daily hot water use	96.4582	92.9506	89.4430	85.9355	82.4279	78.9203	78.9203	82.4279	85.9355	89.4430	92.9506	96.4582 (44)
Energy conte	143.0447	125.1078	129.1000	112.5525	107.9968	93.1931	86.3571	99.0960	100.2795	116.8661	127.5685	138.5311 (45)
Energy content (annual)												Total = Sum(45)m = 1379.6934 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Water storage loss:	21.4567	18.7662	19.3650	16.8829	16.1995	13.9790	12.9536	14.8644	15.0419	17.5299	19.1353	20.7797 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
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)
Combi loss	14.0877	12.7044	14.0337	13.5449	13.9702	13.4893	13.9201	13.9526	13.5196	14.0074	13.5974	14.0773 (61)
Total heat required for water heating calculated for each month	157.1324	137.8122	143.1337	126.0975	121.9671	106.6824	100.2772	113.0486	113.7991	130.8736	141.1659	152.6084 (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	157.1324	137.8122	143.1337	126.0975	121.9671	106.6824	100.2772	113.0486	113.7991	130.8736	141.1659	152.6084 (64)
Heat gains from water heating, kWh/month	51.0843	44.7744	46.4342	40.8100	39.4015	34.3590	32.1938	36.4376	36.7228	42.3598	45.8159	49.5809 (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	112.6090	112.6090	112.6090	112.6090	112.6090	112.6090	112.6090	112.6090	112.6090	112.6090	112.6090	112.6090 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4853	16.4185	13.3524	10.1086	7.5563	6.3794	6.8931	8.9600	12.0260	15.2698	17.8221	18.9991 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.8798	199.9332	194.7588	183.7430	169.8376	156.7685	148.0375	145.9841	151.1586	162.1743	176.0797	189.1489 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2609	34.2609	34.2609	34.2609	34.2609	34.2609	34.2609	34.2609	34.2609	34.2609	34.2609	34.2609 (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)	-90.0872	-90.0872	-90.0872	-90.0872	-90.0872	-90.0872	-90.0872	-90.0872	-90.0872	-90.0872	-90.0872	-90.0872 (71)
Water heating gains (Table 5)	68.6617	66.6286	62.4115	56.6805	52.9590	47.7209	43.2712	48.9752	51.0040	56.9353	63.6332	66.6410 (72)
Total internal gains	344.8095	342.7630	330.3054	310.3149	290.1356	270.6514	257.9845	263.7020	273.9712	294.1621	317.3177	334.5717 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data g or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W						
North	1.9220	10.6334	0.7600	0.7200	0.7700	7.7501 (74)						
East	3.2400	19.6403	0.7600	0.7200	0.7700	24.1308 (76)						
South	5.5290	46.7521	0.7600	0.7200	0.7700	98.0227 (78)						
Solar gains	129.9036	222.5516	307.4012	384.9267	434.2504	432.3168	416.3090	379.4307	334.2921	246.7960	155.8393	111.0055 (83)
Total gains	474.7131	565.3147	637.7067	695.2415	724.3861	702.9682	674.2935	643.1327	608.2633	540.9581	473.1570	445.5771 (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	48.0337	48.2414	48.4510	49.5268	49.7477	50.4406	50.4406	50.4406	50.4224	49.7477	49.3078	48.8757
alpha	4.2022	4.2161	4.2301	4.3018	4.3165	4.3627	4.3627	4.3627	4.3615	4.3165	4.2872	4.2584
util living area	0.9948	0.9887	0.9749	0.9387	0.8574	0.7068	0.5441	0.5882	0.8067	0.9548	0.9898	0.9960 (86)
MIT	19.5169	19.7244	20.0259	20.4074	20.7199	20.9171	20.9793	20.9708	20.8459	20.4325	19.9113	19.4946 (87)
Th 2	19.8443	19.8487	19.8530	19.8750	19.8795	19.8931	19.8931	19.8931	19.8927	19.8795	19.8706	19.8618 (88)
util rest of house	0.9932	0.9852	0.9669	0.9181	0.8088	0.6134	0.4175	0.4613	0.7285	0.9355	0.9860	0.9948 (89)
MIT 2	18.5090	18.7182	19.0185	19.4037	19.6896	19.8536	19.8875	19.8843	19.8080	19.4376	18.9221	18.5003 (90)
Living area fraction	0.9932	0.9852	0.9669	0.9181	0.8088	0.6134	0.4175	0.4613	0.7285	0.9355	0.9860	0.9948 (91)
MIT	18.9284	19.1369	19.4377	19.8213	20.1183	20.2961	20.3418	20.3364	20.2398	19.8516	19.3337	18.9140 (92)
Temperature adjustment	0.9932	0.9852	0.9669	0.9181	0.8088	0.6134	0.4175	0.4613	0.7285	0.9355	0.9860	0.9948 (93)
adjusted MIT	18.7784	18.9869	19.2877	19.6713	19.9683	20.1461	20.1918	20.1864	20.0898	19.7016	19.1837	18.7640 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	470.5319	555.0104	613.3920	635.2194	589.0356	447.4059	305.4617	319.4019	452.6577	503.9624	465.1025	442.5252 (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	1317.7588	1276.6034	1153.8524	950.8028	726.6143	480.6943	311.3066	328.1767	519.3412	799.8448	1071.3861	1302.7175 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	630.3368	484.9105	402.1026	227.2200	102.3586	0.0000	0.0000	0.0000	0.0000	220.1365	436.5242	639.9831 (98)
Space heating												3143.5721 (98)
Space heating per m2												(98) / (4) = 44.7484 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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 %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3473.5604 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	630.3368	484.9105	402.1026	227.2200	102.3586	0.0000	0.0000	0.0000	0.0000	220.1365	436.5242	639.9831	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	696.5047	535.8127	444.3122	251.0718	113.1034	0.0000	0.0000	0.0000	0.0000	243.2448	482.3471	707.1636	(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	157.1324	137.8122	143.1337	126.0975	121.9671	106.6824	100.2772	113.0486	113.7991	130.8736	141.1659	152.6084	(64)
Efficiency of water heater (217)m	89.8429	89.7718	89.6375	89.3314	88.7316	87.3000	87.3000	87.3000	87.3000	89.2798	89.6966	89.8658	(216)
Fuel for water heating, kWh/month	174.8969	153.5139	159.6807	141.1570	137.4561	122.2020	114.8651	129.4944	130.3541	146.5880	157.3816	169.8182	(219)
Water heating fuel used													1737.4082 (219)
Annual totals kWh/year													
Space heating fuel - main system													3473.5604 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans: (MEVDecentralised, Database: total watage = 8.8270, total flow = 37.0000, SFP = 0.2386)													
mechanical ventilation fans (SFP = 0.2386)													55.2054 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													130.2054 (231)
Electricity for lighting (calculated in Appendix L)													326.4568 (232)
Total delivered energy for all uses													5667.6307 (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	3473.5604	0.2160	750.2890	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1737.4082	0.2160	375.2802	(264)
Space and water heating			1125.5692	(265)
Pumps and fans	130.2054	0.5190	67.5766	(267)
Energy for lighting	326.4568	0.5190	169.4311	(268)
Total CO2, kg/year			1362.5769	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			19.4000	(273)

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

DER			19.4000	ZC1
Total Floor Area		TFA	70.2500	
Assumed number of occupants		N	2.2522	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			16.6917	ZC2
CO2 emissions from cooking, equation (L16)			2.4634	ZC3
Total CO2 emissions			38.5551	ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000	ZC5
Additional allowable electricity generation, kWh/m ² /year			0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000	ZC7
Net CO2 emissions			38.5551	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	70.2500 (1b)	2.7000 (2b)	189.6750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	189.6750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				3 * 10 =	30.0000 (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) =				30.0000 / (5) =	0.1582 (8)
Pressure test				Yes	
Measured/design AP50					5.0000
Infiltration rate					0.4082 (18)
Number of sides sheltered					0 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		1.0000 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.4082 (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	0.5204	0.5102	0.5000	0.4490	0.4388	0.3878	0.3878	0.3776	0.4082	0.4388	0.4592	0.4796 (22b)
	0.6354	0.6302	0.6250	0.6008	0.5963	0.5752	0.5752	0.5713	0.5833	0.5963	0.6054	0.6150 (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			2.0600	1.0000	2.0600		(26)
TER Opening Type (Uw = 1.40)			10.6900	1.3258	14.1723		(27)
F1r - Ground			70.2520	0.1300	9.1328		(28a)
W1 - Brick L&G	71.9500	10.6910	61.2590	0.1800	11.0266		(29a)
W1 - To Corridor	20.5400	2.0580	18.4820	0.1800	3.3268		(29a)
Total net area of external elements Aum(A, m ²)			162.7430				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	39.7185	(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)	10.7818 (36)
Total fabric heat loss	(33) + (36) = 50.5003 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	39.7723	39.4432	39.1205	37.6052	37.3217	36.0020	36.0020	35.7576	36.5103	37.3217	37.8953	38.4949 (38)
Average = Sum(39)m / 12 =	90.2726	89.9434	89.6208	88.1055	87.8220	86.5022	86.5022	86.2578	87.0106	87.8220	88.3956	88.9952 (39)
												88.1042 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2850	1.2803	1.2757	1.2542	1.2501	1.2313	1.2313	1.2279	1.2386	1.2501	1.2583	1.2668 (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	2.2522 (42)
Average daily hot water use (litres/day)	87.6893 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	96.4582	92.9506	89.4430	85.9355	82.4279	78.9203	78.9203	82.4279	85.9355	89.4430	92.9506	96.4582 (44)
Energy content (annual)	143.0447	125.1078	129.1000	112.5525	107.9968	93.1931	86.3571	99.0960	100.2795	116.8661	127.5685	138.5311 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	21.4567	18.7662	19.3650	16.8829	16.1995	13.9790	12.9536	14.8644	15.0419	17.5299	19.1353	20.7797 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)

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Combi loss	49.1540	42.7827	45.5792	42.3791	42.0044	38.9196	40.2169	42.0044	42.3791	45.5792	45.8387	49.1540 (61)
Total heat required for water heating calculated for each month	192.1987	167.8905	174.6792	154.9317	150.0012	132.1127	126.5740	141.1004	142.6587	162.4453	173.4072	187.6852 (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	192.1987	167.8905	174.6792	154.9317	150.0012	132.1127	126.5740	141.1004	142.6587	162.4453	173.4072	187.6852 (64)
Heat gains from water heating, kWh/month	59.8509	52.2940	54.3206	48.0185	46.4100	40.7166	38.7680	43.4505	43.9377	50.2528	53.8762	58.3501 (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	112.6090	112.6090	112.6090	112.6090	112.6090	112.6090	112.6090	112.6090	112.6090	112.6090	112.6090	112.6090 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.5923	16.5135	13.4297	10.1671	7.6000	6.4163	6.9330	9.0118	12.0956	15.3581	17.9252	19.1090 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.8798	199.9332	194.7588	183.7430	169.8376	156.7685	148.0375	145.9841	151.1586	162.1743	176.0797	189.1489 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2609	34.2609	34.2609	34.2609	34.2609	34.2609	34.2609	34.2609	34.2609	34.2609	34.2609	34.2609 (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)	-90.0872	-90.0872	-90.0872	-90.0872	-90.0872	-90.0872	-90.0872	-90.0872	-90.0872	-90.0872	-90.0872	-90.0872 (71)
Water heating gains (Table 5)	80.4447	77.8185	73.0115	66.6924	62.3791	56.5508	52.1075	58.4012	61.0246	67.5441	74.8280	78.4276 (72)
Total internal gains	356.6995	354.0479	340.9826	320.3852	299.5994	279.5183	266.8607	273.1798	284.0615	304.8592	328.6157	346.4681 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b g	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	1.9220	10.6334	0.6300	0.7000	0.7700	6.2459 (74)
East	3.2400	19.6403	0.6300	0.7000	0.7700	19.4475 (76)
South	5.5290	46.7521	0.6300	0.7000	0.7700	78.9986 (78)

Solar gains	104.6920	179.3591	247.7411	310.2205	349.9716	348.4132	335.5122	305.7912	269.4130	198.8981	125.5942	89.4616 (83)
Total gains	461.3915	533.4069	588.7238	630.6057	649.5710	627.9315	602.3728	578.9710	553.4745	503.7573	454.2099	435.9297 (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	54.0416	54.2393	54.4346	55.3708	55.5495	56.3971	56.3971	56.5569	56.0676	55.5495	55.1891	54.8173	
alpha	4.6028	4.6160	4.6290	4.6914	4.7033	4.7598	4.7598	4.7705	4.7378	4.7033	4.6793	4.6545	
util living area	0.9970	0.9937	0.9858	0.9634	0.9044	0.7706	0.6037	0.6452	0.8575	0.9717	0.9940	0.9977 (86)	
MIT	19.6332	19.8011	20.0601	20.3984	20.6990	20.9081	20.9777	20.9694	20.8345	20.4435	19.9811	19.6122 (87)	
Th 2	19.8526	19.8563	19.8599	19.8769	19.8801	19.8950	19.8950	19.8978	19.8893	19.8801	19.8736	19.8669 (88)	
util rest of house	0.9960	0.9915	0.9806	0.9487	0.8635	0.6769	0.4660	0.5097	0.7847	0.9575	0.9915	0.9969 (89)	
MIT 2	18.0477	18.2949	18.6731	19.1681	19.5772	19.8314	19.8867	19.8850	19.7555	19.2404	18.5703	18.0269 (90)	
Living area fraction	fLA = Living area / (4) = 0.4161 (91)												
MIT	18.7074	18.9216	19.2502	19.6800	20.0440	20.2794	20.3406	20.3362	20.2045	19.7410	19.1573	18.6865 (92)	
Temperature adjustment	0.0000												
adjusted MIT	18.7074	18.9216	19.2502	19.6800	20.0440	20.2794	20.3406	20.3362	20.2045	19.7410	19.1573	18.6865 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9945	0.9890	0.9769	0.9455	0.8704	0.7124	0.5239	0.5665	0.8083	0.9552	0.9893	0.9957 (94)
Ext temp.	458.8592	527.5628	575.1479	596.2383	565.4047	447.3498	315.5722	327.9907	447.3732	481.2118	449.3551	434.0708 (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	1300.5936	1261.1530	1142.6844	949.7766	732.7832	491.2826	323.5712	339.5297	531.1540	802.7843	1065.8096	1289.2314 (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 per m2	626.2504	492.9726	422.2471	254.5476	124.5296	0.0000	0.0000	0.0000	0.0000	239.2499	443.8473	636.2395 (98)
Space heating per m2												3239.8840 (98)
Space heating per m2												(98) / (4) = 46.1193 (99)

8c. Space cooling requirement

Not applicable

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

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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 %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3468.8265 (211)
Space heating requirement	626.2504	492.9726	422.2471	254.5476	124.5296	0.0000	0.0000	0.0000	0.0000	239.2499	443.8473	636.2395	(98)
Space heating efficiency (main heating system 1)	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000	(210)
Space heating fuel (main heating system)	670.5037	527.8079	452.0847	272.5349	133.3293	0.0000	0.0000	0.0000	0.0000	256.1562	475.2112	681.1986	(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	192.1987	167.8905	174.6792	154.9317	150.0012	132.1127	126.5740	141.1004	142.6587	162.4453	173.4072	187.6852	(64)
Efficiency of water heater (217)m	87.8065	87.6008	87.1908	86.2933	84.5868	80.3000	80.3000	80.3000	80.3000	86.0244	87.3147	87.8820	(216)
Fuel for water heating, kWh/month	218.8890	191.6540	200.3414	179.5408	177.3340	164.5239	157.6264	175.7165	177.6571	188.8363	198.6002	213.5649	(219)
Water heating fuel used													2244.2845 (219)
Annual totals kWh/year													
Space heating fuel - main system													3468.8265 (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)													328.3450 (232)
Total delivered energy for all uses													6116.4560 (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	3468.8265	0.2160	749.2665 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2244.2845	0.2160	484.7654 (264)
Space and water heating			1234.0320 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	328.3450	0.5190	170.4111 (268)
Total CO2, kg/m2/year			1443.3680 (272)
Emissions per m2 for space and water heating			17.5663 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4258 (272b)
Emissions per m2 for pumps and fans			0.5541 (272c)
Target Carbon Dioxide Emission Rate (TER) = (17.5663 * 1.00) + 2.4258 + 0.5541, rounded to 2 d.p.			20.5500 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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	70.2500 (1b)	x 2.7000 (2b)	= 189.6750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 189.6750 (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					3 * 10 = 30.0000 (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) =					30.0000 / (5) = 0.1582 (8)
Pressure test					Yes
Measured/design AP50					5.0100
Infiltration rate					0.4087 (18)
Number of sides sheltered					0 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.4087 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.5210	0.5108	0.5006	0.4495	0.4393	0.3882	0.3882	0.3780	0.4087	0.4393	0.4597	0.4802 (22b)
Effective ac	0.6357	0.6305	0.6253	0.6010	0.5965	0.5754	0.5754	0.5714	0.5835	0.5965	0.6057	0.6153 (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 (U _w = 1.40)			10.6900	1.3258	14.1723		(27)
Solid Door			2.0600	1.2000	2.4720		(26)
F1r - Ground			70.2520	0.1500	10.5378	75.6000	5311.0512 (28a)
W1 - Brick L&G	71.9500	10.6910	61.2590	0.2200	13.4770	58.3400	3573.8501 (29a)
W1 - To Corridor	20.5400	2.0580	18.4820	0.2400	4.4357	51.1800	945.9088 (29a)
Total net area of external elements A _{um} , m ²			162.7430			70.0000	4917.6400 (32b)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.0948	5.8200	990.0763 (32c)
Party Ceiling			70.2520				
Ground Floor Stud			170.1162				
Heat capacity Cm = Sum (A x k)						(28)...(30) + (32) + (32a)...(32e) =	15738.5263 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							224.0360 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.2813 (36)
Total fabric heat loss						(33) + (36) =	55.3761 (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	39.7931	39.4631	39.1397	37.6207	37.3365	36.0135	36.0135	35.7685	36.5231	37.3365	37.9114	38.5125 (38)
Heat transfer coeff	95.1691	94.8392	94.5158	92.9968	92.7126	91.3896	91.3896	91.1446	91.8992	92.7126	93.2875	93.8886 (39)
Average = Sum(39)m / 12 =												92.9954 (39)
HLP	1.3547	1.3500	1.3454	1.3238	1.3198	1.3009	1.3009	1.2974	1.3082	1.3198	1.3279	1.3365 (40)
HLP (average)												1.3238 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.2522 (42)
Average daily hot water use (litres/day)												87.6893 (43)
Daily hot water use	96.4582	92.9506	89.4430	85.9355	82.4279	78.9203	78.9203	82.4279	85.9355	89.4430	92.9506	96.4582 (44)
Energy conte	143.0447	125.1078	129.1000	112.5525	107.9968	93.1931	86.3571	99.0960	100.2795	116.8661	127.5685	138.5311 (45)
Energy content (annual)										Total = Sum(45)m =		1379.6934 (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												

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CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	127.6948	183.3451	155.6871	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction												466.7270 (104)
Intermittency factor (Table 10b)												FC = cooled area / (4) =
	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	1.0000 (105)
Space cooling kWh												0.0000 (106)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	31.9237	45.8363	38.9218	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling per m2												116.6818 (107)
Energy for space heating												1.6610 (108)
Energy for space cooling												51.0953 (99)
Total												1.6610 (108)
Dwelling Fabric Energy Efficiency (DFEE)												52.7563 (109)
												52.8 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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	70.2500 (1b)	2.7000 (2b)	189.6750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	189.6750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				3 * 10 =	30.0000 (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) =				30.0000 / (5) =	0.1582 (8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate				0.4082	(18)
Number of sides sheltered				0	(19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.4082 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.5204	0.5102	0.5000	0.4490	0.4388	0.3878	0.3878	0.3776	0.4082	0.4388	0.4592	0.4796 (22b)
Effective ac	0.6354	0.6302	0.6250	0.6008	0.5963	0.5752	0.5752	0.5713	0.5833	0.5963	0.6054	0.6150 (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			2.0600	1.0000	2.0600		(26)
TER Opening Type (Uw = 1.40)			10.6900	1.3258	14.1723		(27)
F1r - Ground			70.2520	0.1300	9.1328		(28a)
W1 - Brick L&G	71.9500	10.6910	61.2590	0.1800	11.0266		(29a)
W1 - To Corridor	20.5400	2.0580	18.4820	0.1800	3.3268		(29a)
Total net area of external elements Aum, m ²			162.7430				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	39.7185	(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)							10.7818 (36)
Total fabric heat loss							(33) + (36) =
							50.5003 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	39.7723	39.4432	39.1205	37.6052	37.3217	36.0020	36.0020	35.7576	36.5103	37.3217	37.8953	38.4949 (38)
Average = Sum(39)m / 12 =	90.2726	89.9434	89.6208	88.1055	87.8220	86.5022	86.5022	86.2578	87.0106	87.8220	88.3956	88.9952 (39)
												88.1042 (39)
HLP	1.2850	1.2803	1.2757	1.2542	1.2501	1.2313	1.2313	1.2279	1.2386	1.2501	1.2583	1.2668 (40)
HLP (average)												1.2542 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.2522 (42)
Average daily hot water use (litres/day)												87.6893 (43)
Daily hot water use	96.4582	92.9506	89.4430	85.9355	82.4279	78.9203	78.9203	82.4279	85.9355	89.4430	92.9506	96.4582 (44)
Energy conte	143.0447	125.1078	129.1000	112.5525	107.9968	93.1931	86.3571	99.0960	100.2795	116.8661	127.5685	138.5311 (45)
Energy content (annual)												Total = Sum(45)m =
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)

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Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	30.3970	26.5854	27.4338	23.9174	22.9493	19.8035	18.3509	21.0579	21.3094	24.8341	27.1083	29.4379	(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	112.6090	112.6090	112.6090	112.6090	112.6090	112.6090	112.6090	112.6090	112.6090	112.6090	112.6090	112.6090	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.5923	16.5135	13.4297	10.1671	7.6000	6.4163	6.9330	9.0118	12.0956	15.3581	17.9252	19.1090	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.8798	199.9332	194.7588	183.7430	169.8376	156.7685	148.0375	145.9841	151.1586	162.1743	176.0797	189.1489	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2609	34.2609	34.2609	34.2609	34.2609	34.2609	34.2609	34.2609	34.2609	34.2609	34.2609	34.2609	(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)	-90.0872	-90.0872	-90.0872	-90.0872	-90.0872	-90.0872	-90.0872	-90.0872	-90.0872	-90.0872	-90.0872	-90.0872	(71)
Water heating gains (Table 5)	40.8562	39.5616	36.8733	33.2186	30.8459	27.5049	24.6652	28.3036	29.5964	33.3791	37.6504	39.5670	(72)
Total internal gains	314.1110	312.7910	301.8445	283.9115	265.0662	247.4723	236.4183	240.0822	249.6332	267.6942	288.4381	304.6076	(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							
North	1.9220	10.6334	0.6300	0.7000	0.7700	6.2459 (74)							
East	3.2400	19.6403	0.6300	0.7000	0.7700	19.4475 (76)							
South	5.5290	46.7521	0.6300	0.7000	0.7700	78.9986 (78)							
Solar gains	104.6920	179.3591	247.7411	310.2205	349.9716	348.4132	335.5122	305.7912	269.4130	198.8981	125.5942	89.4616	(83)
Total gains	418.8030	492.1500	549.5856	594.1320	615.0378	595.8855	571.9305	545.8734	519.0463	466.5923	414.0322	394.0692	(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	54.0416	54.2393	54.4346	55.3708	55.5495	56.3971	56.3971	56.5569	56.0676	55.5495	55.1891	54.8173	
alpha	4.6028	4.6160	4.6290	4.6914	4.7033	4.7598	4.7598	4.7705	4.7378	4.7033	4.6793	4.6545	
util living area	0.9980	0.9955	0.9892	0.9704	0.9189	0.7946	0.6300	0.6754	0.8800	0.9788	0.9959	0.9985	(86)
MIT	19.5783	19.7487	20.0121	20.3578	20.6696	20.8945	20.9733	20.9629	20.8110	20.4004	19.9297	19.5579	(87)
Th 2	19.8526	19.8563	19.8599	19.8769	19.8801	19.8950	19.8950	19.8978	19.8893	19.8801	19.8736	19.8669	(88)
util rest of house	0.9973	0.9939	0.9851	0.9582	0.8821	0.7035	0.4891	0.5376	0.8131	0.9676	0.9942	0.9980	(89)
MIT 2	18.5657	18.7383	19.0026	19.3549	19.6492	19.8439	19.8880	19.8869	19.7818	19.4028	18.9330	18.5566	(90)
Living area fraction	fLA = Living area / (4) =												0.4161 (91)
MIT	18.9870	19.1587	19.4227	19.7722	20.0738	20.2810	20.3396	20.3346	20.2100	19.8179	19.3477	18.9732	(92)
Temperature adjustment													0.0000
adjusted MIT	18.9870	19.1587	19.4227	19.7722	20.0738	20.2810	20.3396	20.3346	20.2100	19.8179	19.3477	18.9732	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9966	0.9926	0.9831	0.9568	0.8895	0.7385	0.5497	0.5957	0.8355	0.9668	0.9931	0.9974	(94)
Useful gains	417.3766	488.4870	540.2821	568.4362	547.0913	440.0850	313.7929	325.1740	433.6450	451.1186	411.1733	393.0558	(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	1325.8354	1282.4802	1158.1393	957.9007	735.4027	491.4207	323.4835	339.3918	531.6386	809.5365	1082.6434	1314.7453	(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	675.8934	533.5634	459.6858	280.4144	140.1037	0.0000	0.0000	0.0000	0.0000	266.6630	483.4585	685.7369	(98)
Space heating													3525.5190 (98)
Space heating per m2													(98) / (4) = 50.1853 (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	813.1211	640.1166	655.5596	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8091	0.8852	0.8640	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	657.8826	566.6455	566.4235	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	780.5734	750.9151	721.9469	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	88.3374	137.0965	115.7094	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling													341.1433 (104)
Cooled fraction													fC = cooled area / (4) = 1.0000 (105)

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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	22.0843	34.2741	28.9274	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling												85.2858 (107)
Space cooling per m2												1.2140 (108)
Energy for space heating												50.1853 (99)
Energy for space cooling												1.2140 (108)
Total												51.3994 (109)
Target Fabric Energy Efficiency (TFEE)												59.1 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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 (m2)	Storey height (m)	Volume (m3)
Ground floor	70.2500 (1b)	2.7000 (2b)	189.6750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	189.6750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				0 * 10 =	0.0000 (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) =				0.0000 / (5) =	0.0000 (8)
Pressure test				Yes	
Measured/design AP50				5.0100	
Infiltration rate				0.2505	(18)
Number of sides sheltered				0	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		1.0000 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.2505 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.2630	0.2505	0.2505	0.2317	0.2317	0.2067	0.2129	0.2004	0.2067	0.2192	0.2192	0.2380 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5130	0.5005	0.5005	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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
Windows (Uw = 1.40)			10.6900	1.3258	14.1723		(27)
Solid Door			2.0600	1.2000	2.4720		(26)
Flr - Ground			70.2520	0.1500	10.5378	75.6000	5311.0512 (28a)
Wl - Brick L&G	71.9500	10.6910	61.2590	0.2200	13.4770	58.3400	3573.8501 (29a)
Wl - To Corridor	20.5400	2.0580	18.4820	0.2400	4.4357	51.1800	945.9088 (29a)
Total net area of external elements Aum(A, m2)			162.7430				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.0948		(33)
Party Ceiling			70.2520			70.0000	4917.6400 (32b)
Ground Floor Stud			170.1162			5.8200	990.0763 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	15738.5263 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							224.0360 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.2813 (36)
Total fabric heat loss						(33) + (36) =	55.3761 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	32.1116	31.3277	31.3277	31.2964	31.2964	31.2964	31.2964	31.2964	31.2964	31.2964	31.2964	31.2964 (38)
Average = Sum(39)m / 12 =	87.4877	86.7037	86.7037	86.6725	86.6725	86.6725	86.6725	86.6725	86.6725	86.6725	86.6725	86.6725 (39)
												86.7456 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2454	1.2342	1.2342	1.2338	1.2338	1.2338	1.2338	1.2338	1.2338	1.2338	1.2338	1.2338 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.2522 (42)
Average daily hot water use (litres/day)												87.6893 (43)
Daily hot water use	96.4582	92.9506	89.4430	85.9355	82.4279	78.9203	78.9203	82.4279	85.9355	89.4430	92.9506	96.4582 (44)
Energy conte	143.0447	125.1078	129.1000	112.5525	107.9968	93.1931	86.3571	99.0960	100.2795	116.8661	127.5685	138.5311 (45)
Energy content (annual)												Total = Sum(45)m = 1379.6934 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Water storage loss:	21.4567	18.7662	19.3650	16.8829	16.1995	13.9790	12.9536	14.8644	15.0419	17.5299	19.1353	20.7797 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
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)
Combi loss	14.0877	12.7044	14.0337	13.5449	13.9702	13.4893	13.9201	13.9526	13.5196	14.0074	13.5974	14.0773 (61)
Total heat required for water heating calculated for each month	157.1324	137.8122	143.1337	126.0975	121.9671	106.6824	100.2772	113.0486	113.7991	130.8736	141.1659	152.6084 (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	157.1324	137.8122	143.1337	126.0975	121.9671	106.6824	100.2772	113.0486	113.7991	130.8736	141.1659	152.6084 (64)
RHI water heating demand	51.0843	44.7744	46.4342	40.8100	39.4015	34.3590	32.1938	36.4376	36.7228	42.3598	45.8159	49.5809 (65)
Heat gains from water heating, kWh/month	51.0843	44.7744	46.4342	40.8100	39.4015	34.3590	32.1938	36.4376	36.7228	42.3598	45.8159	49.5809 (65)
Total per year (kWh/year) = Sum(64)m =												1545 (64)

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	135.1307	135.1307	135.1307	135.1307	135.1307	135.1307	135.1307	135.1307	135.1307	135.1307	135.1307	135.1307 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	46.2133	41.0463	33.3811	25.2716	18.8908	15.9484	17.2329	22.3999	30.0651	38.1746	44.5554	47.4978 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	295.3431	298.4078	290.6848	274.2433	253.4890	233.9828	220.9515	217.8867	225.6098	242.0512	262.8056	282.3117 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7653	50.7653	50.7653	50.7653	50.7653	50.7653	50.7653	50.7653	50.7653	50.7653	50.7653	50.7653 (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)	-90.0872	-90.0872	-90.0872	-90.0872	-90.0872	-90.0872	-90.0872	-90.0872	-90.0872	-90.0872	-90.0872	-90.0872 (71)
Water heating gains (Table 5)	68.6617	66.6286	62.4115	56.6805	52.9590	47.7209	43.2712	48.9752	51.0040	56.9353	63.6332	66.6410 (72)
Total internal gains	509.0269	504.8915	485.2862	455.0043	424.1476	396.4609	380.2643	388.0707	405.4877	435.9699	469.8029	495.2593 (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						
North	1.9220	11.9814	0.7600	0.7200	0.7700	8.7326 (74)						
East	3.2400	22.3313	0.7600	0.7200	0.7700	27.4371 (76)						
South	5.5290	50.9848	0.7600	0.7200	0.7700	106.8973 (78)						
Solar gains	143.0670	220.5450	301.4657	390.8972	431.7917	461.1348	438.8015	407.2383	355.9286	261.2287	175.8141	121.0929 (83)
Total gains	652.0939	725.4365	786.7519	845.9015	855.9393	857.5958	819.0659	795.3090	761.4163	697.1986	645.6170	616.3522 (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	49.9706	50.4224	50.4224	50.4406	50.4406	50.4406	50.4406	50.4406	50.4406	50.4406	50.4406	50.4406
alpha	4.3314	4.3615	4.3615	4.3627	4.3627	4.3627	4.3627	4.3627	4.3627	4.3627	4.3627	4.3627
util living area	0.9797	0.9668	0.9357	0.8618	0.7194	0.4923	0.3263	0.3464	0.6191	0.8709	0.9604	0.9833 (86)
MIT	19.9248	20.0920	20.3654	20.6661	20.8888	20.9840	20.9980	20.9974	20.9552	20.7027	20.2741	19.8939 (87)
Th 2	19.8839	19.8927	19.8927	19.8931	19.8931	19.8931	19.8931	19.8931	19.8931	19.8931	19.8931	19.8931 (88)
util rest of house	0.9738	0.9575	0.9172	0.8230	0.6466	0.3893	0.2107	0.2278	0.5175	0.8257	0.9472	0.9783 (89)
MIT 2	18.9427	19.1125	19.3748	19.6496	19.8301	19.8880	19.8929	19.8928	19.8748	19.6881	19.2924	18.9201 (90)
Living area fraction									FLA = Living area / (4) =			0.4161 (91)
MIT	19.3514	19.5200	19.7870	20.0726	20.2706	20.3440	20.3527	20.3524	20.3243	20.1102	19.7009	19.3253 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.2014	19.3700	19.6370	19.9226	20.1206	20.1940	20.2027	20.2024	20.1743	19.9602	19.5509	19.1753 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9692	0.9520	0.9122	0.8242	0.6626	0.4180	0.2433	0.2613	0.5447	0.8289	0.9421	0.9742 (94)
Useful gains	631.9968	690.6243	717.6665	697.1685	567.1798	358.5051	199.2607	207.7753	414.7203	577.8813	608.2425	600.4318 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W	1233.6954	1193.9145	1060.9915	868.6807	617.1582	363.5069	199.5798	208.2198	431.1388	724.6022	1001.1408	1219.9383 (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	447.6638	338.2110	255.4338	123.4888	37.1840	0.0000	0.0000	0.0000	0.0000	109.1603	282.8868	460.9129 (98)
Space heating												2054.9414 (98)
RHI space heating demand												2055 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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 (m2)	Storey height (m)	Volume (m3)
Ground floor	70.2500 (1b)	2.7000 (2b)	189.6750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2500		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 189.6750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				0 * 10 =	0.0000 (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) =				0.0000 / (5) =	0.0000 (8)
Pressure test				Yes	
Measured/design AP50				5.0100	
Infiltration rate				0.2505	(18)
Number of sides sheltered				0	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		1.0000 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.2505 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3194	0.3131	0.3069	0.2756	0.2693	0.2380	0.2380	0.2317	0.2505	0.2693	0.2818	0.2943 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												
Effective ac	0.5694	0.5631	0.5569	0.5256	0.5193	0.5000	0.5000	0.5000	0.5005	0.5193	0.5318	0.5443 (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
Windows (Uw = 1.40)			10.6900	1.3258	14.1723		(27)
Solid Door			2.0600	1.2000	2.4720		(26)
Flr - Ground			70.2520	0.1500	10.5378	75.6000	5311.0512 (28a)
Wl - Brick L&G	71.9500	10.6910	61.2590	0.2200	13.4770	58.3400	3573.8501 (29a)
Wl - To Corridor	20.5400	2.0580	18.4820	0.2400	4.4357	51.1800	945.9088 (29a)
Total net area of external elements Aum(A, m2)			162.7430				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.0948		(33)
Party Ceiling			70.2520			70.0000	4917.6400 (32b)
Ground Floor Stud			170.1162			5.8200	990.0763 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	15738.5263 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							224.0360 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.2813 (36)
Total fabric heat loss						(33) + (36) =	55.3761 (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	35.6395	35.2475	34.8556	32.8956	32.5036	31.2964	31.2964	31.2964	31.3277	32.5036	33.2876	34.0716 (38)
Heat transfer coeff	91.0156	90.6236	90.2316	88.2717	87.8797	86.6725	86.6725	86.6725	86.7037	87.8797	88.6637	89.4477 (39)
Average = Sum(39)m / 12 =												88.3945 (39)
HLP	1.2956	1.2900	1.2844	1.2565	1.2510	1.2338	1.2338	1.2338	1.2342	1.2510	1.2621	1.2733 (40)
HLP (average)												1.2583 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.2522 (42)
Average daily hot water use (litres/day)												87.6893 (43)
Daily hot water use	96.4582	92.9506	89.4430	85.9355	82.4279	78.9203	78.9203	82.4279	85.9355	89.4430	92.9506	96.4582 (44)
Energy conte	143.0447	125.1078	129.1000	112.5525	107.9968	93.1931	86.3571	99.0960	100.2795	116.8661	127.5685	138.5311 (45)
Energy content (annual)												Total = Sum(45)m = 1379.6934 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Water storage loss:	21.4567	18.7662	19.3650	16.8829	16.1995	13.9790	12.9536	14.8644	15.0419	17.5299	19.1353	20.7797 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
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)
Combi loss	14.0877	12.7044	14.0337	13.5449	13.9702	13.4893	13.9201	13.9526	13.5196	14.0074	13.5974	14.0773 (61)
Total heat required for water heating calculated for each month	157.1324	137.8122	143.1337	126.0975	121.9671	106.6824	100.2772	113.0486	113.7991	130.8736	141.1659	152.6084 (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	157.1324	137.8122	143.1337	126.0975	121.9671	106.6824	100.2772	113.0486	113.7991	130.8736	141.1659	152.6084 (64)
Heat gains from water heating, kWh/month	51.0843	44.7744	46.4342	40.8100	39.4015	34.3590	32.1938	36.4376	36.7228	42.3598	45.8159	49.5809 (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	135.1307	135.1307	135.1307	135.1307	135.1307	135.1307	135.1307	135.1307	135.1307	135.1307	135.1307	135.1307 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	46.2133	41.0463	33.3811	25.2716	18.8908	15.9484	17.2329	22.3999	30.0651	38.1746	44.5554	47.4978 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	295.3431	298.4078	290.6848	274.2433	253.4890	233.9828	220.9515	217.8867	225.6098	242.0512	262.8056	282.3117 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7653	50.7653	50.7653	50.7653	50.7653	50.7653	50.7653	50.7653	50.7653	50.7653	50.7653	50.7653 (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)	-90.0872	-90.0872	-90.0872	-90.0872	-90.0872	-90.0872	-90.0872	-90.0872	-90.0872	-90.0872	-90.0872	-90.0872 (71)
Water heating gains (Table 5)	68.6617	66.6286	62.4115	56.6805	52.9590	47.7209	43.2712	48.9752	51.0040	56.9353	63.6332	66.6410 (72)
Total internal gains	509.0269	504.8915	485.2862	455.0043	424.1476	396.4609	380.2643	388.0707	405.4877	435.9699	469.8029	495.2593 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data g or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W						
North	1.9220	10.6334	0.7600	0.7200	0.7700	7.7501 (74)						
East	3.2400	19.6403	0.7600	0.7200	0.7700	24.1308 (76)						
South	5.5290	46.7521	0.7600	0.7200	0.7700	98.0227 (78)						
Solar gains	129.9036	222.5516	307.4012	384.9267	434.2504	432.3168	416.3090	379.4307	334.2921	246.7960	155.8393	111.0055 (83)
Total gains	638.9305	727.4432	792.6874	839.9309	858.3981	828.7777	796.5733	767.5014	739.7798	682.7659	625.6422	606.2648 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor for gains for living area, nil,m (see Table 9a)	48.0337	48.2414	48.4510	49.5268	49.7477	50.4406	50.4406	50.4406	50.4224	49.7477	49.3078	48.8757
tau	4.2022	4.2161	4.2301	4.3018	4.3165	4.3627	4.3627	4.3627	4.3615	4.3165	4.2872	4.2584
util living area	0.9846	0.9726	0.9490	0.8945	0.7915	0.6259	0.4685	0.5047	0.7185	0.9088	0.9723	0.9874 (86)
MIT	19.7390	19.9350	20.2111	20.5482	20.8031	20.9484	20.9883	20.9838	20.9045	20.5810	20.1108	19.7147 (87)
Th 2	19.8443	19.8487	19.8530	19.8750	19.8795	19.8931	19.8931	19.8931	19.8927	19.8795	19.8706	19.8618 (88)
util rest of house	0.9803	0.9650	0.9345	0.8644	0.7337	0.5340	0.3557	0.3903	0.6329	0.8763	0.9632	0.9838 (89)
MIT 2	18.7282	18.9237	19.1946	19.5288	19.7524	19.8699	19.8901	19.8885	19.8439	19.5693	19.1160	18.7181 (90)
Living area fraction	19.1487	19.3445	19.6175	19.9530	20.1896	20.3186	20.3470	20.3442	20.2852	19.9903	19.5299	19.1328 (92)
Temperature adjustment	18.9987	19.1945	19.4675	19.8030	20.0396	20.1686	20.1970	20.1942	20.1352	19.8403	19.3799	-0.1500
adjusted MIT												18.9828 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	623.6485	697.9940	736.0593	724.1584	637.6070	462.4815	308.5757	324.1464	483.1858	597.3777	599.4975	594.2043 (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	1337.8154	1295.4182	1170.0829	962.4222	732.8814	482.6478	311.7648	328.8548	523.2747	812.0336	1088.7829	1322.2828 (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	531.3401	401.4690	322.9136	171.5500	70.8841	0.0000	0.0000	0.0000	0.0000	159.7040	352.2855	541.6904 (98)
Space heating per m2												251.8368 (98)
												(98) / (4) = 36.3251 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Not applicable

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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 %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2819.7092 (211)
Space heating requirement	531.3401	401.4690	322.9136	171.5500	70.8841	0.0000	0.0000	0.0000	0.0000	159.7040	352.2855	541.6904	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	587.1161	443.6122	356.8106	189.5580	78.3250	0.0000	0.0000	0.0000	0.0000	176.4685	389.2658	598.5529	(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	157.1324	137.8122	143.1337	126.0975	121.9671	106.6824	100.2772	113.0486	113.7991	130.8736	141.1659	152.6084	(64)
Efficiency of water heater (217)m	89.7492	89.6601	89.4925	89.1161	88.4495	87.3000	87.3000	87.3000	87.3000	89.0302	89.5608	89.7767	(217)
Fuel for water heating, kWh/month	175.0795	153.7051	159.9393	141.4979	137.8945	122.2020	114.8651	129.4944	130.3541	146.9991	157.6201	169.9867	(219)
Water heating fuel used													1739.6378 (219)
Annual totals kWh/year													
Space heating fuel - main system													2819.7092 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans: (MEVDecentralised, Database: total watage = 8.8270, total flow = 37.0000, SFP = 0.2386)													
mechanical ventilation fans (SFP = 0.2386)													55.2054 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													130.2054 (231)
Electricity for lighting (calculated in Appendix L)													326.4568 (232)
Total delivered energy for all uses													5016.0092 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2819.7092	3.4800	98.1259 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1739.6378	3.4800	60.5394 (247)
Mechanical ventilation fans	55.2054	13.1900	7.2816 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	326.4568	13.1900	43.0597 (250)
Additional standing charges			120.0000 (251)
Total energy cost			338.8990 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.2350 (257)
SAP value		82.7713
SAP rating (Section 12)		83 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2819.7092	0.2160	609.0572 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1739.6378	0.2160	375.7618 (264)
Space and water heating			984.8189 (265)
Pumps and fans	130.2054	0.5190	67.5766 (267)
Energy for lighting	326.4568	0.5190	169.4311 (268)
Total kg/year			1221.8266 (272)
CO2 emissions per m2			17.3900 (273)
EI value			85.7939
EI rating			86 (274)
EI band			B

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9050 = 3.845$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9050 = 0.2387$, stars = 4
Water heating energy efficiency	$3.48 / 0.8867 = 3.925$, stars = 4
Water heating environmental impact	$0.216 / 0.8867 = 0.2436$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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 (m2)	Storey height (m)	Volume (m3)
Ground floor	70.2500 (1b)	2.7000 (2b)	189.6750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	189.6750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				0 * 10 =	0.0000 (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) =				0.0000 / (5) =	0.0000 (8)
Pressure test				Yes	
Measured/design AP50				5.0100	
Infiltration rate				0.2505	(18)
Number of sides sheltered				0	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		1.0000 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.2505 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infiltr rate	0.2630	0.2505	0.2505	0.2317	0.2317	0.2067	0.2129	0.2004	0.2067	0.2192	0.2192	0.2380 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5130	0.5005	0.5005	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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
Windows (Uw = 1.40)			10.6900	1.3258	14.1723		(27)
Solid Door			2.0600	1.2000	2.4720		(26)
Flr - Ground			70.2520	0.1500	10.5378	75.6000	5311.0512 (28a)
Wl - Brick L&G	71.9500	10.6910	61.2590	0.2200	13.4770	58.3400	3573.8501 (29a)
Wl - To Corridor	20.5400	2.0580	18.4820	0.2400	4.4357	51.1800	945.9088 (29a)
Total net area of external elements Aum(A, m2)			162.7430				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.0948		(33)
Party Ceiling			70.2520			70.0000	4917.6400 (32b)
Ground Floor Stud			170.1162			5.8200	990.0763 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	15738.5263 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							224.0360 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.2813 (36)
Total fabric heat loss						(33) + (36) =	55.3761 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	32.1116	31.3277	31.3277	31.2964	31.2964	31.2964	31.2964	31.2964	31.2964	31.2964	31.2964	31.2964 (38)
Average = Sum(39)m / 12 =	87.4877	86.7037	86.7037	86.6725	86.6725	86.6725	86.6725	86.6725	86.6725	86.6725	86.6725	86.6725 (39)
												86.7456 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2454	1.2342	1.2342	1.2338	1.2338	1.2338	1.2338	1.2338	1.2338	1.2338	1.2338	1.2338 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.2522 (42)
Average daily hot water use (litres/day)												87.6893 (43)
Daily hot water use	96.4582	92.9506	89.4430	85.9355	82.4279	78.9203	78.9203	82.4279	85.9355	89.4430	92.9506	96.4582 (44)
Energy conte	143.0447	125.1078	129.1000	112.5525	107.9968	93.1931	86.3571	99.0960	100.2795	116.8661	127.5685	138.5311 (45)
Energy content (annual)												Total = Sum(45)m = 1379.6934 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Water storage loss:	21.4567	18.7662	19.3650	16.8829	16.1995	13.9790	12.9536	14.8644	15.0419	17.5299	19.1353	20.7797 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
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)
Combi loss	14.0877	12.7044	14.0337	13.5449	13.9702	13.4893	13.9201	13.9526	13.5196	14.0074	13.5974	14.0773 (61)
Total heat required for water heating calculated for each month	157.1324	137.8122	143.1337	126.0975	121.9671	106.6824	100.2772	113.0486	113.7991	130.8736	141.1659	152.6084 (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	157.1324	137.8122	143.1337	126.0975	121.9671	106.6824	100.2772	113.0486	113.7991	130.8736	141.1659	152.6084 (64)
Heat gains from water heating, kWh/month	51.0843	44.7744	46.4342	40.8100	39.4015	34.3590	32.1938	36.4376	36.7228	42.3598	45.8159	49.5809 (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	135.1307	135.1307	135.1307	135.1307	135.1307	135.1307	135.1307	135.1307	135.1307	135.1307	135.1307	135.1307 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	46.2133	41.0463	33.3811	25.2716	18.8908	15.9484	17.2329	22.3999	30.0651	38.1746	44.5554	47.4978 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	295.3431	298.4078	290.6848	274.2433	253.4890	233.9828	220.9515	217.8867	225.6098	242.0512	262.8056	282.3117 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7653	50.7653	50.7653	50.7653	50.7653	50.7653	50.7653	50.7653	50.7653	50.7653	50.7653	50.7653 (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)	-90.0872	-90.0872	-90.0872	-90.0872	-90.0872	-90.0872	-90.0872	-90.0872	-90.0872	-90.0872	-90.0872	-90.0872 (71)
Water heating gains (Table 5)	68.6617	66.6286	62.4115	56.6805	52.9590	47.7209	43.2712	48.9752	51.0040	56.9353	63.6332	66.6410 (72)
Total internal gains	509.0269	504.8915	485.2862	455.0043	424.1476	396.4609	380.2643	388.0707	405.4877	435.9699	469.8029	495.2593 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data g or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W						
North	1.9220	11.9814	0.7600	0.7200	0.7700	8.7326 (74)						
East	3.2400	22.3313	0.7600	0.7200	0.7700	27.4371 (76)						
South	5.5290	50.9848	0.7600	0.7200	0.7700	106.8973 (78)						
Solar gains	143.0670	220.5450	301.4657	390.8972	431.7917	461.1348	438.8015	407.2383	355.9286	261.2287	175.8141	121.0929 (83)
Total gains	652.0939	725.4365	786.7519	845.9015	855.9393	857.5958	819.0659	795.3090	761.4163	697.1986	645.6170	616.3522 (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	49.9706	50.4224	50.4224	50.4406	50.4406	50.4406	50.4406	50.4406	50.4406	50.4406	50.4406	50.4406
alpha	4.3314	4.3615	4.3615	4.3627	4.3627	4.3627	4.3627	4.3627	4.3627	4.3627	4.3627	4.3627
util living area	0.9797	0.9668	0.9357	0.8618	0.7194	0.4923	0.3263	0.3464	0.6191	0.8709	0.9604	0.9833 (86)
MIT	19.9248	20.0920	20.3654	20.6661	20.8888	20.9840	20.9980	20.9974	20.9552	20.7027	20.2741	19.8939 (87)
Th 2	19.8839	19.8927	19.8927	19.8931	19.8931	19.8931	19.8931	19.8931	19.8931	19.8931	19.8931	19.8931 (88)
util rest of house	0.9738	0.9575	0.9172	0.8230	0.6466	0.3893	0.2107	0.2278	0.5175	0.8257	0.9472	0.9783 (89)
MIT 2	18.9427	19.1125	19.3748	19.6496	19.8301	19.8880	19.8929	19.8928	19.8748	19.6881	19.2924	18.9201 (90)
Living area fraction	19.3514	19.5200	19.7870	20.0726	20.2706	20.3440	20.3527	20.3524	20.3243	20.1102	19.7009	19.3253 (92)
Temperature adjustment	19.2014	19.3700	19.6370	19.9226	20.1206	20.1940	20.2027	20.2024	20.1743	19.9602	19.5509	-0.1500
adjusted MIT	19.2014	19.3700	19.6370	19.9226	20.1206	20.1940	20.2027	20.2024	20.1743	19.9602	19.5509	19.1753 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	631.9968	690.6243	717.6665	697.1685	567.1798	358.5051	199.2607	207.7753	414.7203	577.8813	608.2425	600.4318 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W	1233.6954	1193.9145	1060.9915	868.6807	617.1582	363.5069	199.5798	208.2198	431.1388	724.6022	1001.1408	1219.9383 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	447.6638	338.2110	255.4338	123.4888	37.1840	0.0000	0.0000	0.0000	0.0000	109.1603	282.8868	460.9129 (98)
Space heating per m2												2054.9414 (98)
												(98) / (4) = 29.2518 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Not applicable

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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 %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2270.6535 (211)
Space heating requirement	447.6638	338.2110	255.4338	123.4888	37.1840	0.0000	0.0000	0.0000	0.0000	109.1603	282.8868	460.9129	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	494.6561	373.7138	282.2473	136.4517	41.0872	0.0000	0.0000	0.0000	0.0000	120.6191	312.5821	509.2960	(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	157.1324	137.8122	143.1337	126.0975	121.9671	106.6824	100.2772	113.0486	113.7991	130.8736	141.1659	152.6084	(64)
Efficiency of water heater (217)m	89.6463	89.5497	89.3242	88.8545	88.0272	87.3000	87.3000	87.3000	87.3000	88.7268	89.4090	89.6823	(217)
Fuel for water heating, kWh/month	175.2805	153.8946	160.2408	141.9146	138.5561	122.2020	114.8651	129.4944	130.3541	147.5018	157.8878	170.1656	(219)
Water heating fuel used													1742.3573 (219)
Annual totals kWh/year													
Space heating fuel - main system													2270.6535 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans: (MEVDecentralised, Database: total watage = 8.8270, total flow = 37.0000, SFP = 0.2386)													
mechanical ventilation fans (SFP = 0.2386)													55.2054 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													130.2054 (231)
Electricity for lighting (calculated in Appendix L)													326.4568 (232)
Total delivered energy for all uses													4469.6730 (238)

10a. Fuel costs - using BEDF prices (500)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2270.6535	3.6300	82.4247	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1742.3573	3.6300	63.2476	(247)
Mechanical ventilation fans	55.2054	19.4400	10.7319	(249)
Pumps and fans for heating	75.0000	19.4400	14.5800	(249)
Energy for lighting	326.4568	19.4400	63.4632	(250)
Additional standing charges			95.0000	(251)
Total energy cost			329.4474	(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	2270.6535	0.2160	490.4611	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1742.3573	0.2160	376.3492	(264)
Space and water heating			866.8103	(265)
Pumps and fans	130.2054	0.5190	67.5766	(267)
Energy for lighting	326.4568	0.5190	169.4311	(268)
Total kg/year			1103.8180	(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	2270.6535	1.2200	2770.1972	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1742.3573	1.2200	2125.6759	(264)
Space and water heating			4895.8731	(265)
Pumps and fans	130.2054	3.0700	399.7305	(267)
Energy for lighting	326.4568	3.0700	1002.2224	(268)
Primary energy kWh/year			6297.8260	(272)
Primary energy kWh/m2/year			89.6488	(273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 83
Current environmental impact rating: B 86

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

(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: (none)	SAP change	Cost change	CO2 change
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Recommended measures (none)	Typical annual savings	Energy efficiency	Environmental impact
	Total Savings £0	0.00 kg/m ²	

Potential energy efficiency rating: B 83
 Potential environmental impact rating: B 86

Fuel prices for cost data on this page from database revision number 500 TEST (30 Jun 2022)
 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	£89	£89	£0
Mains gas	£241	£241	£0
Space heating	£203	£203	£0
Water heating	£63	£63	£0
Lighting	£63	£63	£0
Total cost of fuels	£330	£330	£0
Total cost of uses	£329	£329	£0
Delivered energy	64 kWh/m ²	64 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	1.1 tonnes	1.1 tonnes	0.0 tonnes
CO2 emissions per m ²	16 kg/m ²	16 kg/m ²	0 kg/m ²
Primary energy	90 kWh/m ²	90 kWh/m ²	0 kWh/m ²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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)

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	Detached Flat
Number of storeys	1
Cross ventilation possible	Yes
SAP Region	Thames Valley
Front of dwelling faces	South
Overshading	Average or unknown
Thermal mass parameter	224.0 (calculated from construction elements)
Night ventilation	Yes
Ventilation rate during hot weather (ach)	4.55 (Calculated rate)

Overheating Calculation

Summer ventilation heat loss coefficient	284.84 (P1)
Transmission heat loss coefficient	55.38 (37)
Summer heat loss coefficient	340.22 (P2)

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

Solar shading	Z blinds	Solar access	Z overhangs	Z summer
Orientation				
North	0.850	0.90	1.000	0.765 (P8)
East	0.850	0.90	1.000	0.765 (P8)
South	0.850	0.90	1.000	0.765 (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
North	1.9220	81.1852	0.7600	0.7200	0.7650	58.7868
East	3.2400	117.5071	0.7600	0.7200	0.7650	143.4363
South	5.5290	112.2060	0.7600	0.7200	0.7650	233.7291
total:						435.9522

	Jun	Jul	Aug	
Solar gains	458	436	405	(P3)
Internal gains	393	377	385	
Total summer gains	852	813	790	(P5)

	2.50	2.39	2.32	
Summer gain/loss ratio	2.50	2.39	2.32	(P6)
Summer external temperature	16.00	17.90	17.80	
Thermal mass temperature increment (TMP = 224.0)	0.43	0.43	0.43	
Threshold temperature	18.93	20.72	20.55	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	

Assessment of likelihood of high internal temperature: Slight

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Designed)

Property Reference	371 - PRJ012318 - GF		Issued on Date	13/07/2022	
Assessment Reference	371 D	Prop Type Ref	Maryland 2 - GF		
Property	371 - PRJ012318 - GF				
SAP Rating	83 B	DER	19.40	TER	20.55
Environmental	86 B	% DER<TER	5.58		
CO₂ Emissions (t/year)	1.10	DFEE	52.76	TFEE	59.11
General Requirements Compliance	Pass	% DFEE<TFEE	10.75		
Assessor Details	Chris Nicholls, , Tel: ,		Assessor ID	U903-0001	
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	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	20.55	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	19.40	kgCO ₂ /m ²	Pass
	-1.15 (-5.6%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	59.11	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	52.76	kWh/m ² /yr	
	-6.3 (-10.7%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.22 (max. 0.30)	0.24 (max. 0.70)	Pass
Floor	0.15 (max. 0.25)	0.15 (max. 0.70)	Pass
Openings	1.37 (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	5.01 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Boiler system with radiators or underfloor - Mains gas Data from database Ideal LOGIC COMBI ESP1 35 Combi boiler Efficiency: 89.6% SEDBUK2009 Minimum: 88.0%	Pass
Secondary heating system	None	

5 Cylinder insulation

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Designed)

Hot water storage

No cylinder

6 Controls

Space heating controls

Programmer, room thermostat and TRVs

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100

%

Minimum

75

%

Pass

8 Mechanical ventilation

Continuous extract system (decentralised)

Specific fan power

0.1900 0.1800

Maximum

0.7

Pass

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 North

1.92 m², No overhang

Windows facing East

3.24 m², No overhang

Windows facing South

5.53 m², No overhang

Air change rate

4.55 ach

Blinds/curtains

Dark-coloured curtain or roller blind, closed 100% of daylight hours

Criterion 4 – Building performance consistent with DER and DFEE rate

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

5.01 (design value)

Maximum

10.0

Pass

10 Key features

None

N/A