

PREDICTED ENERGY ASSESSMENT

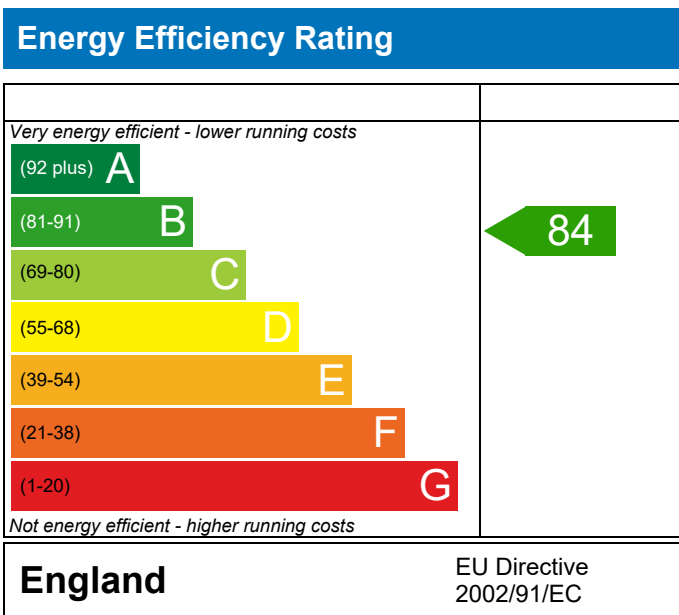


135 - PRJ011855

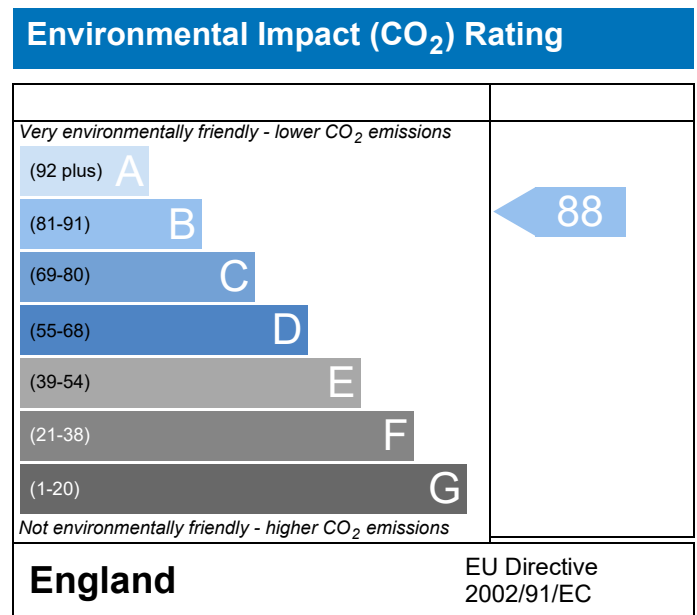
Dwelling type: House, Mid-Terrace
 Date of assessment: 02/08/2021
 Produced by: Michael Juckes
 Total floor area: 68.06 m²

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.



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.



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.

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Designed)



Property Reference	135 - PRJ011855		Issued on Date	02/08/2021	
Assessment Reference	135 M	Prop Type Ref	BLO-0283 SIN BR-MT 4.1		
Property	135 - PRJ011855				
SAP Rating	84 B	DER	16.54	TER	17.95
Environmental	88 B	% DER<TER	7.85		
CO ₂ Emissions (t/year)	0.96	DFEE	35.65	TFEE	43.65
General Requirements Compliance	Pass	% DFEE<TFEE	18.34		
Assessor Details	Mr. Michael Juckes, Michael Juckes, Tel: 02033971373, michael@briaryenergy.co.uk			Assessor ID	T850-0001
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)	17.95	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.54	kgCO ₂ /m ²	Pass
	-1.41 (-7.9%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	43.65	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	35.65	kWh/m ² /yr	
	-8.1 (-18.5%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.18 (max. 0.25)	0.18 (max. 0.70)	Pass
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	Pass
Openings	1.26 (max. 2.00)	1.30 (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)	m ³ /(h.m ²) @ 50 Pa	
Maximum	10.0	m ³ /(h.m ²) @ 50 Pa	Pass

Limiting System Efficiencies

4 Heating efficiency

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BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Designed)



Main heating system

Boiler system with radiators or underfloor - Mains gas
Data from database
Ideal LOGIC COMBI ESP1 30
Combi boiler
Efficiency: 89.6% SEDBUK2009
Minimum: 88.0%

Pass

Secondary heating system

None

5 Cylinder insulation

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

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (East Anglia)

Slight

Pass

Based on:

Overshading

Average

Windows facing North East

3.44 m², No overhang

Windows facing South West

3.36 m², No overhang

Air change rate

4.21 ach

Blinds/curtains

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

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00 W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

5.01 (design value) m³/(h.m²) @ 50 Pa

Maximum

10.0 m³/(h.m²) @ 50 Pa

Pass

10 Key features

Party wall U-value

0.00 W/m²K

Roof U-value

0.10 W/m²K

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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	135 - PRJ011855	Issued on Date	02/08/2021
Assessment Reference	135 M	Prop Type Ref	BLO-0283 SIN BR-MT 4.1
Property	135 - PRJ011855		

SAP Rating	84 B	DER	16.54	TER	17.95
Environmental	88 B	% DER<TER	7.85		
CO ₂ Emissions (t/year)	0.96	DFEE	35.65	TTEE	43.65
General Requirements Compliance	Pass	% DFEE<TTEE	18.34		

Assessor Details	Mr. Michael Juckes, Michael Juckes, Tel: 02033971373, michael@briaryenergy.co.uk	Assessor ID	T850-0001
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Client	
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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	34.0300 (1b)	x 2.3300 (2b)	= 79.2899 (1b) - (3b)
First floor	34.0300 (1c)	x 2.5300 (2c)	= 86.0959 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.0600		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 165.3858 (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)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)				30.0000 / (5) =	0.1814 (8)							
Pressure test				Yes								
Measured/design AP50				5.0100								
Infiltration rate				0.4319	(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) =		0.3671 (21)							
Wind speed	Jan 4.9000	Feb 4.8000	Mar 4.7000	Apr 4.2000	May 4.2000	Jun 3.7000	Jul 3.8000	Aug 3.8000	Sep 4.0000	Oct 4.2000	Nov 4.3000	Dec 4.5000 (22)
Wind factor	1.2250	1.2000	1.1750	1.0500	1.0500	0.9250	0.9500	0.9500	1.0000	1.0500	1.0750	1.1250 (22a)
Adj infiltr rate	0.4497	0.4405	0.4314	0.3855	0.3855	0.3396	0.3488	0.3488	0.3671	0.3855	0.3946	0.4130 (22b)
Effective ac	0.6011	0.5970	0.5930	0.5743	0.5743	0.5577	0.5608	0.5608	0.5674	0.5743	0.5779	0.5853 (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 = 1.30)			6.8000	1.2357	8.4030		(27)
Solid Door			4.0600	1.2000	4.8720		(26)
Flr - Ground			34.0330	0.1800	6.1259	75.6000	2572.8948 (28a)
Wl - Brick	40.8230	10.8580	29.9650	0.2400	7.1916	38.9400	1166.8371 (29a)
Rf - Ins Joist	34.0330		34.0330	0.1000	3.4033	5.8200	198.0721 (30)
Total net area of external elements Aum(A, m ²)			108.8910				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.9959		(33)
Party Wall			78.7620	0.0000	0.0000	54.0300	4255.5109 (32)
Ground Floor Stud			49.6275			5.8200	288.8323 (32c)
1st Floor Stud			80.0085			5.8200	465.6496 (32c)
Internal Floor			34.0400			18.0000	612.7200 (32d)
Internal Ceiling			34.0400			5.8200	198.1128 (32e)
Heat capacity Cm = Sum (A x k)					(28)...(30) + (32) + (32a)...(32e) =		9758.6294 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							143.3827 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.3287 (36)
Total fabric heat loss						(33) + (36) =	34.3245 (37)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

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	32.8075	32.5845	32.3662	31.3433	31.3433	30.4354	30.6078	30.6078	30.9663	31.3433	31.5387	31.9432 (38)
Average = Sum(39)m / 12 =	67.1320	66.9091	66.6907	65.6678	65.6678	64.7599	64.9323	64.9323	65.2909	65.6678	65.8632	66.2678 (39)
HLP	0.9864	0.9831	0.9799	0.9649	0.9649	0.9515	0.9540	0.9540	0.9593	0.9649	0.9677	0.9737 (40)
HLP (average)												0.9670 (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													2.1981 (42)
Average daily hot water use (litres/day)													86.4053 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	95.0459	91.5897	88.1335	84.6772	81.2210	77.7648	77.7648	81.2210	84.6772	88.1335	91.5897	95.0459 (44)	
Energy content (annual)	140.9503	123.2760	127.2098	110.9046	106.4156	91.8286	85.0927	97.6451	98.8113	115.1550	125.7007	136.5028 (45)	
Distribution loss (46)m = 0.15 x (45)m	21.1425	18.4914	19.0815	16.6357	15.9623	13.7743	12.7639	14.6468	14.8217	17.2733	18.8551	20.4754 (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													
Combi 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)	
Total heat required for water heating calculated for each month	14.6188	13.1798	14.5533	14.0400	14.4762	13.9725	14.4154	14.4548	14.0093	14.5214	14.1037	14.6061 (61)	
Solar input	155.5691	136.4558	141.7631	124.9446	120.8918	105.8011	99.5081	112.0999	112.8206	129.6764	139.8044	151.1090 (62)	
Output from w/h	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)	
RHI water heating demand													
Heat gains from water heating, kWh/month	155.5691	136.4558	141.7631	124.9446	120.8918	105.8011	99.5081	112.0999	112.8206	129.6764	139.8044	151.1090 (64)	
Total per year (kWh/year) = Sum(64)m =												1530.4439 (64)	
												1530 (64)	
	50.5207	44.2842	45.9356	40.3858	39.0022	34.0261	31.8972	36.0807	36.3571	41.9194	45.3214	49.0387 (65)	

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	131.8872	131.8872	131.8872	131.8872	131.8872	131.8872	131.8872	131.8872	131.8872	131.8872	131.8872	131.8872 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	49.6113	44.0644	35.8355	27.1298	20.2799	17.1211	18.5000	24.0469	32.2758	40.9815	47.8315	50.9902 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	287.6530	290.6380	283.1160	267.1027	246.8887	227.8904	215.1984	212.2135	219.7354	235.7488	255.9627	274.9610 (68)
Pumps, fans	50.3868	50.3868	50.3868	50.3868	50.3868	50.3868	50.3868	50.3868	50.3868	50.3868	50.3868	50.3868 (69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-87.9248	-87.9248	-87.9248	-87.9248	-87.9248	-87.9248	-87.9248	-87.9248	-87.9248	-87.9248	-87.9248	-87.9248 (71)
Total internal gains	67.9041	65.8992	61.7414	56.0914	52.4224	47.2585	42.8725	48.4956	50.4959	56.3433	62.9464	65.9123 (72)
	502.5177	497.9507	478.0421	447.6731	416.9402	389.6193	373.9202	382.1052	399.8564	430.4228	464.0898	489.2127 (73)

6. Solar gains

[Jan]	Area		Solar flux		g		FF		Access		Gains	
	m2		Table 6a		Specific data		Specific data		factor data		W	
			W/m2		or Table 6b		or Table 6c		Table 6d			
Northeast	3.4380		12.9465		0.4700		0.0000		0.7700		16.1082 (75)	
Southwest	3.3610		40.9830		0.4700		0.0000		0.7700		49.8495 (79)	
Solar gains	65.9578	109.7593	160.8013	232.5337	271.5973	290.2156	273.2498	237.3889	192.4394	130.5479	81.9468	55.2690 (83)
Total gains	568.4755	607.7100	638.8434	680.2068	688.5375	679.8349	647.1699	619.4941	592.2957	560.9707	546.0366	544.4817 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
alpha	40.3791	40.5136	40.6463	41.2794	41.2794	41.8582	41.7470	41.7470	41.5177	41.2794	41.1570	40.9057	
util living area	3.6919	3.7009	3.7098	3.7520	3.7520	3.7905	3.7831	3.7831	3.7678	3.7520	3.7438	3.7270	
MIT	0.9551	0.9408	0.9072	0.8287	0.7000	0.5093	0.3373	0.3517	0.6066	0.8330	0.9282	0.9598 (86)	
Th 2	19.7983	19.9409	20.2267	20.5800	20.8329	20.9638	20.9945	20.9936	20.9287	20.6422	20.1910	19.7802 (87)	
util rest of house	20.0947	20.0974	20.1001	20.1127	20.1127	20.1239	20.1218	20.1218	20.1174	20.1127	20.1103	20.1053 (88)	
MIT 2	0.9473	0.9307	0.8909	0.7990	0.6495	0.4377	0.2520	0.2631	0.5337	0.7973	0.9140	0.9528 (89)	
	19.0158	19.1567	19.4351	19.7763	19.9971	20.1056	20.1203	20.1201	20.0778	19.8388	19.4128	19.0068 (90)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

Living area fraction									FLA = Living area / (4) =	0.2148 (91)		
MIT	19.1839	19.3252	19.6051	19.9489	20.1766	20.2899	20.3081	20.3077	20.2606	20.0114	19.5799	19.1730 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.0339	19.1752	19.4551	19.7989	20.0266	20.1399	20.1581	20.1577	20.1106	19.8614	19.4299	19.0230 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9360	0.9182	0.8771	0.7873	0.6442	0.4391	0.2555	0.2667	0.5331	0.7858	0.9009	0.9421 (94)
Useful gains	532.0698	557.9711	560.3507	535.5166	443.5637	298.5048	165.3826	165.2423	315.7451	440.7966	491.9405	512.9455 (95)
Ext temp.	4.7000	5.2000	7.0000	9.5000	12.5000	15.4000	17.6000	17.6000	15.0000	11.4000	7.7000	4.7000 (96)
Heat loss rate W												
Month fracti	962.2635	935.0650	830.6411	676.3076	494.2584	306.9578	166.1033	166.0792	333.6737	555.6399	772.5707	949.1503 (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	320.0641	253.4071	201.0960	101.3695	37.7169	0.0000	0.0000	0.0000	0.0000	85.4434	202.0537	324.5363 (98)
RHI space heating demand												1525.6872 (98)
												1526 (98)

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	34.0300 (1b)	x 2.3300 (2b)	= 79.2899 (1b) - (3b)
First floor	34.0300 (1c)	x 2.5300 (2c)	= 86.0959 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.0600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 165.3858 (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				3 * 10 =	30.0000 (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)				30.0000 / (5) =	0.1814 (8)							
Pressure test				Yes								
Measured/design AP50					5.0100							
Infiltration rate					0.4319 (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) =		0.3671 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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	0.4681	0.4589	0.4497	0.4038	0.3946	0.3488	0.3488	0.3396	0.3671	0.3946	0.4130	0.4314 (22b)
	0.6095	0.6053	0.6011	0.5815	0.5779	0.5608	0.5608	0.5577	0.5674	0.5779	0.5853	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					
Windows (Uw = 1.30)			6.8000	1.2357	8.4030		(27)					
Solid Door			4.0600	1.2000	4.8720		(26)					
Flr - Ground			34.0330	0.1800	6.1259	75.6000	2572.8948 (28a)					
Wl - Brick	40.8230	10.8580	29.9650	0.2400	7.1916	38.9400	1166.8371 (29a)					
RF - Ins Joist	34.0330		34.0330	0.1000	3.4033	5.8200	198.0721 (30)					
Total net area of external elements Aum(A, m2)			108.8910				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.9959		(33)					
Party Wall			78.7620	0.0000	0.0000	54.0300	4255.5109 (32)					
Ground Floor Stud			49.6275			5.8200	288.8323 (32c)					
1st Floor Stud			80.0085			5.8200	465.6496 (32c)					
Internal Floor			34.0400			18.0000	612.7200 (32d)					
Internal Ceiling			34.0400			5.8200	198.1128 (32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	9758.6294 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							143.3827 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.3287 (36)					
Total fabric heat loss						(33) + (36) =	34.3245 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 33.2672	Feb 33.0350	Mar 32.8075	Apr 31.7387	May 31.5387	Jun 30.6078	Jul 30.6078	Aug 30.4354	Sep 30.9663	Oct 31.5387	Nov 31.9432	Dec 32.3662 (38)
Heat transfer coeff	67.5917	67.3596	67.1320	66.0632	65.8632	64.9323	64.9323	64.7599	65.2909	65.8632	66.2678	66.6907 (39)
Average = Sum(39)m / 12 =												66.0622 (39)
HLP	Jan 0.9931	Feb 0.9897	Mar 0.9864	Apr 0.9707	May 0.9677	Jun 0.9540	Jul 0.9540	Aug 0.9515	Sep 0.9593	Oct 0.9677	Nov 0.9737	Dec 0.9799 (40)
HLP (average)												0.9706 (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												2.1981 (42)
Average daily hot water use (litres/day)												86.4053 (43)
Daily hot water use	95.0459	91.5897	88.1335	84.6772	81.2210	77.7648	77.7648	81.2210	84.6772	88.1335	91.5897	95.0459 (44)
Energy conte	140.9503	123.2760	127.2098	110.9046	106.4156	91.8286	85.0927	97.6451	98.8113	115.1550	125.7007	136.5028 (45)
Energy content (annual)										Total = Sum(45)m =		1359.4925 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	21.1425	18.4914	19.0815	16.6357	15.9623	13.7743	12.7639	14.6468	14.8217	17.2733	18.8551	20.4754 (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)
Combi loss	14.6188	13.1798	14.5533	14.0400	14.4762	13.9725	14.4154	14.4548	14.0093	14.5214	14.1037	14.6061 (61)
Total heat required for water heating calculated for each month	155.5691	136.4558	141.7631	124.9446	120.8918	105.8011	99.5081	112.0999	112.8206	129.6764	139.8044	151.1090 (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	155.5691	136.4558	141.7631	124.9446	120.8918	105.8011	99.5081	112.0999	112.8206	129.6764	139.8044	151.1090 (64)
Heat gains from water heating, kWh/month	50.5207	44.2842	45.9356	40.3858	39.0022	34.0261	31.8972	36.0807	36.3571	41.9194	45.3214	49.0387 (65)
												Total per year (kWh/year) = Sum(64)m = 1530.4439 (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	131.8872	131.8872	131.8872	131.8872	131.8872	131.8872	131.8872	131.8872	131.8872	131.8872	131.8872	131.8872 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	49.6113	44.0644	35.8355	27.1298	20.2799	17.1211	18.5000	24.0469	32.2758	40.9815	47.8315	50.9902 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	287.6530	290.6380	283.1160	267.1027	246.8887	227.8904	215.1984	212.2135	219.7354	235.7488	255.9627	274.9610 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.3868	50.3868	50.3868	50.3868	50.3868	50.3868	50.3868	50.3868	50.3868	50.3868	50.3868	50.3868 (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)	-87.9248	-87.9248	-87.9248	-87.9248	-87.9248	-87.9248	-87.9248	-87.9248	-87.9248	-87.9248	-87.9248	-87.9248 (71)
Water heating gains (Table 5)	67.9041	65.8992	61.7414	56.0914	52.4224	47.2585	42.8725	48.4956	50.4959	56.3433	62.9464	65.9123 (72)
Total internal gains	502.5177	497.9507	478.0421	447.6731	416.9402	389.6193	373.9202	382.1052	399.8564	430.4228	464.0898	489.2127 (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						
Northeast	3.4380	11.2829	0.4700	0.0000	0.7700	14.0384 (75)						
Southwest	3.3610	36.7938	0.4700	0.0000	0.7700	44.7540 (79)						
Solar gains	58.7924	104.8082	155.7888	213.7903	258.4120	264.8784	251.9023	217.3382	175.6741	119.1749	71.2689	49.7646 (83)
Total gains	561.3101	602.7589	633.8310	661.4634	675.3522	654.4977	625.8225	599.4435	575.5305	549.5976	535.3587	538.9773 (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	40.1045	40.2427	40.3791	41.0324	41.1570	41.7470	41.7470	41.8582	41.5177	41.1570	40.9057	40.6463
alpha	3.6736	3.6828	3.6919	3.7355	3.7438	3.7831	3.7831	3.7905	3.7678	3.7438	3.7270	3.7098
util living area	0.9599	0.9454	0.9174	0.8564	0.7491	0.5880	0.4434	0.4787	0.6847	0.8663	0.9400	0.9645 (86)
MIT	19.7164	19.8794	20.1457	20.4900	20.7663	20.9324	20.9820	20.9759	20.8760	20.5423	20.0857	19.6885 (87)
Th 2	20.0891	20.0919	20.0947	20.1079	20.1103	20.1218	20.1218	20.1239	20.1174	20.1103	20.1053	20.1001 (88)
util rest of house	0.9529	0.9361	0.9029	0.8309	0.7050	0.5209	0.3602	0.3946	0.6213	0.8375	0.9282	0.9583 (89)
MIT 2	18.9310	19.0922	19.3529	19.6900	19.9398	20.0830	20.1147	20.1137	20.0398	19.7463	19.3070	18.9124 (90)
Living area fraction									fLA = Living area / (4) =			0.2148 (91)
MIT	19.0997	19.2613	19.5232	19.8618	20.1173	20.2655	20.3010	20.2989	20.2194	19.9173	19.4743	19.0791 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.9497	19.1113	19.3732	19.7118	19.9673	20.1155	20.1510	20.1489	20.0694	19.7673	19.3243	18.9291 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	528.8068	556.8644	563.6565	541.0815	470.9036	340.5829	227.2128	238.0212	355.4335	453.2062	490.2079	511.0829 (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	990.1992	957.2688	864.2019	714.2645	544.5135	358.1331	230.5730	242.7807	389.7499	603.7863	810.0760	982.2958 (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	343.2760	269.0718	223.6058	124.6918	54.7658	0.0000	0.0000	0.0000	0.0000	112.0316	230.3050	350.5824 (98)
Space heating												1708.3302 (98)
Space heating per m2												(98) / (4) = 25.1004 (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													1887.6577 (211)
Space heating requirement	343.2760	269.0718	223.6058	124.6918	54.7658	0.0000	0.0000	0.0000	0.0000	112.0316	230.3050	350.5824	(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)	379.3105	297.3169	247.0782	137.7810	60.5147	0.0000	0.0000	0.0000	0.0000	123.7918	254.4807	387.3839	(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	155.5691	136.4558	141.7631	124.9446	120.8918	105.8011	99.5081	112.0999	112.8206	129.6764	139.8044	151.1090	(64)
Efficiency of water heater (217)m	89.4772	89.3974	89.2309	88.8696	88.2731	87.3000	87.3000	87.3000	87.3000	88.7546	89.2640	89.5117	(217)
Fuel for water heating, kWh/month	173.8646	152.6397	158.8721	140.5932	136.9520	121.1926	113.9841	128.4077	129.2332	146.1067	156.6189	168.8147	(219)
Water heating fuel used													1727.2794 (219)
Annual totals kWh/year													
Space heating fuel - main system													1887.6577 (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)													350.4607 (232)
Total delivered energy for all uses													4040.3978 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1887.6577	3.4800	65.6905 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1727.2794	3.4800	60.1093 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	350.4607	13.1900	46.2258 (250)
Additional standing charges			120.0000 (251)
Total energy cost			301.9181 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.1216 (257)
SAP value		84.3540
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	1887.6577	0.2160	407.7341 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1727.2794	0.2160	373.0924 (264)
Space and water heating			780.8264 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	350.4607	0.5190	181.8891 (268)
Total kg/year			1001.6405 (272)
CO2 emissions per m2			14.7200 (273)
EI value			88.1284
EI rating			88 (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	$3.48 / 0.8850 = 3.932$, stars = 4
Water heating environmental impact	$0.216 / 0.8850 = 0.2441$, stars = 4

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Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

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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	34.0300 (1b)	x 2.3300 (2b)	= 79.2899 (1b) - (3b)
First floor	34.0300 (1c)	x 2.5300 (2c)	= 86.0959 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.0600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 165.3858 (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				3 * 10 =	30.0000 (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)				30.0000 / (5) =	0.1814 (8)								
Pressure test				Yes									
Measured/design AP50				5.0100									
Infiltration rate				0.4319	(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) =		0.3671 (21)								
Wind speed	Jan 4.9000	Feb 4.8000	Mar 4.7000	Apr 4.2000	May 4.2000	Jun 3.7000	Jul 3.8000	Aug 3.8000	Sep 4.0000	Oct 4.2000	Nov 4.3000	Dec 4.5000	(22)
Wind factor	1.2250	1.2000	1.1750	1.0500	1.0500	0.9250	0.9500	0.9500	1.0000	1.0500	1.0750	1.1250	(22a)
Adj infilt rate	0.4497	0.4405	0.4314	0.3855	0.3855	0.3396	0.3488	0.3488	0.3671	0.3855	0.3946	0.4130	(22b)
Effective ac	0.6011	0.5970	0.5930	0.5743	0.5743	0.5577	0.5608	0.5608	0.5674	0.5743	0.5779	0.5853	(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 = 1.30)			6.8000	1.2357	8.4030		(27)						
Solid Door			4.0600	1.2000	4.8720		(26)						
Flr - Ground			34.0330	0.1800	6.1259	75.6000	2572.8948 (28a)						
Wl - Brick	40.8230	10.8580	29.9650	0.2400	7.1916	38.9400	1166.8371 (29a)						
RF - Ins Joist	34.0330		34.0330	0.1000	3.4033	5.8200	198.0721 (30)						
Total net area of external elements Aum(A, m2)			108.8910				(31)						
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.9959		(33)						
Party Wall			78.7620	0.0000	0.0000	54.0300	4255.5109 (32)						
Ground Floor Stud			49.6275			5.8200	288.8323 (32c)						
1st Floor Stud			80.0085			5.8200	465.6496 (32c)						
Internal Floor			34.0400			18.0000	612.7200 (32d)						
Internal Ceiling			34.0400			5.8200	198.1128 (32e)						
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	9758.6294 (34)						
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							143.3827 (35)						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.3287 (36)						
Total fabric heat loss						(33) + (36) =	34.3245 (37)						
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 32.8075	Feb 32.5845	Mar 32.3662	Apr 31.3433	May 31.3433	Jun 30.4354	Jul 30.6078	Aug 30.6078	Sep 30.9663	Oct 31.3433	Nov 31.5387	Dec 31.9432	(38)
Heat transfer coeff	67.1320	66.9091	66.6907	65.6678	65.6678	64.7599	64.9323	64.9323	65.2909	65.6678	65.8632	66.2678	(39)
Average = Sum(39)m / 12 =													(39)
HLP	Jan 0.9864	Feb 0.9831	Mar 0.9799	Apr 0.9649	May 0.9649	Jun 0.9515	Jul 0.9540	Aug 0.9540	Sep 0.9593	Oct 0.9649	Nov 0.9677	Dec 0.9737	(40)
HLP (average)													0.9670 (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												2.1981 (42)
Average daily hot water use (litres/day)												86.4053 (43)
Daily hot water use	95.0459	91.5897	88.1335	84.6772	81.2210	77.7648	77.7648	81.2210	84.6772	88.1335	91.5897	95.0459 (44)
Energy conte	140.9503	123.2760	127.2098	110.9046	106.4156	91.8286	85.0927	97.6451	98.8113	115.1550	125.7007	136.5028 (45)
Energy content (annual)												Total = Sum(45)m = 1359.4925 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

Distribution loss (46)m = 0.15 x (45)m	21.1425	18.4914	19.0815	16.6357	15.9623	13.7743	12.7639	14.6468	14.8217	17.2733	18.8551	20.4754 (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)
Combi loss	14.6188	13.1798	14.5533	14.0400	14.4762	13.9725	14.4154	14.4548	14.0093	14.5214	14.1037	14.6061 (61)
Total heat required for water heating calculated for each month	155.5691	136.4558	141.7631	124.9446	120.8918	105.8011	99.5081	112.0999	112.8206	129.6764	139.8044	151.1090 (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	155.5691	136.4558	141.7631	124.9446	120.8918	105.8011	99.5081	112.0999	112.8206	129.6764	139.8044	151.1090 (64)
Heat gains from water heating, kWh/month	50.5207	44.2842	45.9356	40.3858	39.0022	34.0261	31.8972	36.0807	36.3571	41.9194	45.3214	49.0387 (65)
												Total per year (kWh/year) = Sum(64)m = 1530.4439 (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	131.8872	131.8872	131.8872	131.8872	131.8872	131.8872	131.8872	131.8872	131.8872	131.8872	131.8872	131.8872 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	49.6113	44.0644	35.8355	27.1298	20.2799	17.1211	18.5000	24.0469	32.2758	40.9815	47.8315	50.9902 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	287.6530	290.6380	283.1160	267.1027	246.8887	227.8904	215.1984	212.2135	219.7354	235.7488	255.9627	274.9610 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.3868	50.3868	50.3868	50.3868	50.3868	50.3868	50.3868	50.3868	50.3868	50.3868	50.3868	50.3868 (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)	-87.9248	-87.9248	-87.9248	-87.9248	-87.9248	-87.9248	-87.9248	-87.9248	-87.9248	-87.9248	-87.9248	-87.9248 (71)
Water heating gains (Table 5)	67.9041	65.8992	61.7414	56.0914	52.4224	47.2585	42.8725	48.4956	50.4959	56.3433	62.9464	65.9123 (72)
Total internal gains	502.5177	497.9507	478.0421	447.6731	416.9402	389.6193	373.9202	382.1052	399.8564	430.4228	464.0898	489.2127 (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						
Northeast	3.4380	12.9465	0.4700	0.0000	0.7700	16.1082 (75)						
Southwest	3.3610	40.9830	0.4700	0.0000	0.7700	49.8495 (79)						
Solar gains	65.9578	109.7593	160.8013	232.5337	271.5973	290.2156	273.2498	237.3889	192.4394	130.5479	81.9468	55.2690 (83)
Total gains	568.4755	607.7100	638.8434	680.2068	688.5375	679.8349	647.1699	619.4941	592.2957	560.9707	546.0366	544.4817 (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	40.3791	40.5136	40.6463	41.2794	41.2794	41.8582	41.7470	41.7470	41.5177	41.2794	41.1570	40.9057
alpha	3.6919	3.7009	3.7098	3.7520	3.7520	3.7905	3.7831	3.7831	3.7678	3.7520	3.7438	3.7270
util living area	0.9551	0.9408	0.9072	0.8287	0.7000	0.5093	0.3373	0.3517	0.6066	0.8330	0.9282	0.9598 (86)
MIT	19.7983	19.9409	20.2267	20.5800	20.8329	20.9638	20.9945	20.9936	20.9287	20.6422	20.1910	19.7802 (87)
Th 2	20.0947	20.0974	20.1001	20.1127	20.1127	20.1239	20.1218	20.1218	20.1174	20.1127	20.1103	20.1053 (88)
util rest of house	0.9473	0.9307	0.8909	0.7990	0.6495	0.4377	0.2520	0.2631	0.5337	0.7973	0.9140	0.9528 (89)
MIT 2	19.0158	19.1567	19.4351	19.7763	19.9971	20.1056	20.1203	20.1201	20.0778	19.8388	19.4128	19.0068 (90)
Living area fraction	19.1839	19.3252	19.6051	19.9489	20.1766	20.2899	20.3081	20.3077	20.2606	20.0114	19.5799	19.1730 (92)
Temperature adjustment	19.0339	19.1752	19.4551	19.7989	20.0266	20.1399	20.1581	20.1577	20.1106	19.8614	19.4299	-0.1500
adjusted MIT												19.0230 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9360	0.9182	0.8771	0.7873	0.6442	0.4391	0.2555	0.2667	0.5331	0.7858	0.9009	0.9421 (94)
Ext temp.	532.0698	557.9711	560.3507	535.5166	443.5637	298.5048	165.3826	165.2423	315.7451	440.7966	491.9405	512.9455 (95)
Heat loss rate W	4.7000	5.2000	7.0000	9.5000	12.5000	15.4000	17.6000	17.6000	15.0000	11.4000	7.7000	4.7000 (96)
Month fracti	962.2635	935.0650	830.6411	676.3076	494.2584	306.9578	166.1033	166.0792	333.6737	555.6399	772.5707	949.1503 (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	320.0641	253.4071	201.0960	101.3695	37.7169	0.0000	0.0000	0.0000	0.0000	85.4434	202.0537	324.5363 (98)
												1525.6872 (98)
												(98) / (4) = 22.4168 (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													1685.8422 (211)
Space heating requirement	320.0641	253.4071	201.0960	101.3695	37.7169	0.0000	0.0000	0.0000	0.0000	85.4434	202.0537	324.5363	(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)	353.6620	280.0078	222.2056	112.0105	41.6761	0.0000	0.0000	0.0000	0.0000	94.4126	223.2638	358.6037	(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	155.5691	136.4558	141.7631	124.9446	120.8918	105.8011	99.5081	112.0999	112.8206	129.6764	139.8044	151.1090	(64)
Efficiency of water heater (217)m	89.4278	89.3536	89.1489	88.7049	88.0403	87.3000	87.3000	87.3000	87.3000	88.5435	89.1634	89.4583	(217)
Fuel for water heating, kWh/month	173.9605	152.7144	159.0184	140.8543	137.3142	121.1926	113.9841	128.4077	129.2332	146.4550	156.7957	168.9156	(219)
Water heating fuel used													1728.8455 (219)
Annual totals kWh/year													
Space heating fuel - main system													1685.8422 (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)													350.4607 (232)
Total delivered energy for all uses													3840.1484 (238)

10a. Fuel costs - using BEDF prices (479)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1685.8422	3.7400	63.0505 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1728.8455	3.7400	64.6588 (247)
Pumps and fans for heating	75.0000	19.1200	14.3400 (249)
Energy for lighting	350.4607	19.1200	67.0081 (250)
Additional standing charges			94.0000 (251)
Total energy cost			303.0574 (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	1685.8422	0.2160	364.1419 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1728.8455	0.2160	373.4306 (264)
Space and water heating			737.5725 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	350.4607	0.5190	181.8891 (268)
Total kg/year			958.3867 (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	1685.8422	1.2200	2056.7274 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1728.8455	1.2200	2109.1916 (264)
Space and water heating			4165.9190 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	350.4607	3.0700	1075.9145 (268)
Primary energy kWh/year			5472.0834 (272)
Primary energy kWh/m2/year			80.4009 (273)

SAP 2012 EPC IMPROVEMENTS

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

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	Recommended
O	Not considered
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U Solar photovoltaic panels	Recommended
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
N Solar water heating	+ 1.3	-£ 25	-175 kg (18.3%)
U Solar photovoltaic panels	+ 11.8	-£ 357	-970 kg (123.9%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£25	2.58 kg/m ²	B 86 B 90
Solar photovoltaic panels	£357	14.25 kg/m ²	A 97 A 101
Total Savings	£383	16.83 kg/m ²	

Potential energy efficiency rating: A 97
 Potential environmental impact rating: A 101

Fuel prices for cost data on this page from database revision number 479 TEST (30 Jun 2021)
 Recommendation texts revision number 4.9c (22 Feb 2014)

Typical heating and lighting costs of this home (per year, East Anglia):

	Current	Potential	Saving
Electricity	£81	£91	-£10
Mains gas	£222	£187	£35
Space heating	£171	£171	£0
Water heating	£65	£39	£25
Lighting	£67	£67	£0
Generated (PV)	-£0	-£357	£357
Total cost of fuels	£303	-£79	£382
Total cost of uses	£303	-£80	£382
Delivered energy	56 kWh/m ²	16 kWh/m ²	40 kWh/m ²
Carbon dioxide emissions	1.0 tonnes	-0.2 tonnes	1.1 tonnes
CO2 emissions per m ²	14 kg/m ²	-3 kg/m ²	17 kg/m ²
Primary energy	80 kWh/m ²	-18 kWh/m ²	99 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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	34.0300 (1b)	x 2.3300 (2b)	= 79.2899 (1b) - (3b)
First floor	34.0300 (1c)	x 2.5300 (2c)	= 86.0959 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.0600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 165.3858 (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				3 * 10 =	30.0000 (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)				30.0000 / (5) =	0.1814 (8)							
Pressure test				Yes								
Measured/design AP50					5.0100							
Infiltration rate					0.4319 (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) =		0.3671 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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	0.4681	0.4589	0.4497	0.4038	0.3946	0.3488	0.3488	0.3396	0.3671	0.3946	0.4130	0.4314 (22b)
	0.6095	0.6053	0.6011	0.5815	0.5779	0.5608	0.5608	0.5577	0.5674	0.5779	0.5853	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					
Windows (Uw = 1.30)			6.8000	1.2357	8.4030		(27)					
Solid Door			4.0600	1.2000	4.8720		(26)					
Flr - Ground			34.0330	0.1800	6.1259	75.6000	2572.8948 (28a)					
Wl - Brick	40.8230	10.8580	29.9650	0.2400	7.1916	38.9400	1166.8371 (29a)					
RF - Ins Joist	34.0330		34.0330	0.1000	3.4033	5.8200	198.0721 (30)					
Total net area of external elements Aum(A, m2)			108.8910				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.9959		(33)					
Party Wall			78.7620	0.0000	0.0000	54.0300	4255.5109 (32)					
Ground Floor Stud			49.6275			5.8200	288.8323 (32c)					
1st Floor Stud			80.0085			5.8200	465.6496 (32c)					
Internal Floor			34.0400			18.0000	612.7200 (32d)					
Internal Ceiling			34.0400			5.8200	198.1128 (32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	9758.6294 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							143.3827 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.3287 (36)					
Total fabric heat loss						(33) + (36) =	34.3245 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 33.2672	Feb 33.0350	Mar 32.8075	Apr 31.7387	May 31.5387	Jun 30.6078	Jul 30.6078	Aug 30.4354	Sep 30.9663	Oct 31.5387	Nov 31.9432	Dec 32.3662 (38)
Heat transfer coeff	67.5917	67.3596	67.1320	66.0632	65.8632	64.9323	64.9323	64.7599	65.2909	65.8632	66.2678	66.6907 (39)
Average = Sum(39)m / 12 =												66.0622 (39)
HLP	Jan 0.9931	Feb 0.9897	Mar 0.9864	Apr 0.9707	May 0.9677	Jun 0.9540	Jul 0.9540	Aug 0.9515	Sep 0.9593	Oct 0.9677	Nov 0.9737	Dec 0.9799 (40)
HLP (average)												0.9706 (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												2.1981 (42)
Average daily hot water use (litres/day)												86.4053 (43)
Daily hot water use	95.0459	91.5897	88.1335	84.6772	81.2210	77.7648	77.7648	81.2210	84.6772	88.1335	91.5897	95.0459 (44)
Energy conte	140.9503	123.2760	127.2098	110.9046	106.4156	91.8286	85.0927	97.6451	98.8113	115.1550	125.7007	136.5028 (45)
Energy content (annual)										Total = Sum(45)m =		1359.4925 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	21.1425	18.4914	19.0815	16.6357	15.9623	13.7743	12.7639	14.6468	14.8217	17.2733	18.8551	20.4754 (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)
Combi loss	14.6188	13.1798	14.5533	14.0400	14.4762	13.9725	14.4154	14.4548	14.0093	14.5214	14.1037	14.6061 (61)
Total heat required for water heating calculated for each month	155.5691	136.4558	141.7631	124.9446	120.8918	105.8011	99.5081	112.0999	112.8206	129.6764	139.8044	151.1090 (62)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.7000 (H2)
Collector heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0050 (H3a)
Collector effective heat loss coefficient												1.8063 (H3b)
Collector performance ratio												2.5804 (H4)
Annual solar radiation per m2												1079.5246 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												1813.6014 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.3340 (H8)
Utilisation factor												0.5274 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												86.4053 (H14)
Volume ratio Veff/V												0.8680 (H15)
Solar storage volume factor												0.9717 (H16)
Solar input												-817.3023 (H17)
Solar input	-23.7001	-39.5487	-67.3560	-90.2703	-111.5214	-109.6433	-108.1943	-94.5299	-74.0359	-50.5578	-28.1118	-19.8330 (63)
Solar input (sum of months) = Sum(63)m =												-817.3023 (63)
Output from w/h												
	131.8690	96.9071	74.4071	34.6743	9.3704	0.0000	0.0000	17.5700	38.7847	79.1186	111.6926	131.2760 (64)
Total per year (kWh/year) = Sum(64)m =												725.6699 (64)
Heat gains from water heating, kWh/month												
	50.5207	44.2842	45.9356	40.3858	39.0022	34.0261	31.8972	36.0807	36.3571	41.9194	45.3214	49.0387 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	131.8872	131.8872	131.8872	131.8872	131.8872	131.8872	131.8872	131.8872	131.8872	131.8872	131.8872	131.8872 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	49.6113	44.0644	35.8355	27.1298	20.2799	17.1211	18.5000	24.0469	32.2758	40.9815	47.8315	50.9902 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	287.6530	290.6380	283.1160	267.1027	246.8887	227.8904	215.1984	212.2135	219.7354	235.7488	255.9627	274.9610 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.3868	50.3868	50.3868	50.3868	50.3868	50.3868	50.3868	50.3868	50.3868	50.3868	50.3868	50.3868 (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)	-87.9248	-87.9248	-87.9248	-87.9248	-87.9248	-87.9248	-87.9248	-87.9248	-87.9248	-87.9248	-87.9248	-87.9248 (71)
Water heating gains (Table 5)	67.9041	65.8992	61.7414	56.0914	52.4224	47.2585	42.8725	48.4956	50.4959	56.3433	62.9464	65.9123 (72)
Total internal gains	502.5177	497.9507	478.0421	447.6731	416.9402	389.6193	373.9202	382.1052	399.8564	430.4228	464.0898	489.2127 (73)

6. Solar gains

[Jan]		Area	Solar flux	g	FF	Access	Gains					
		m2	Table 6a	Specific data	Specific data	factor	W					
			W/m2	or Table 6b	or Table 6c	Table 6d						
Northeast		3.4380	11.2829	0.4700	0.0000	0.7700	14.0384 (75)					
Southwest		3.3610	36.7938	0.4700	0.0000	0.7700	44.7540 (79)					
Solar gains	58.7924	104.8082	155.7888	213.7903	258.4120	264.8784	251.9023	217.3382	175.6741	119.1749	71.2689	49.7646 (83)
Total gains	561.3101	602.7589	633.8310	661.4634	675.3522	654.4977	625.8225	599.4435	575.5305	549.5976	535.3587	538.9773 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, T _{hl} (C)												21.0000 (85)
Utilisation factor for gains for living area, n _{il,m} (see Table 9a)												
tau	40.1045	40.2427	40.3791	41.0324	41.1570	41.7470	41.7470	41.8582	41.5177	41.1570	40.9057	40.6463
alpha	3.6736	3.6828	3.6919	3.7355	3.7438	3.7831	3.7831	3.7905	3.7678	3.7438	3.7270	3.7098
util living area	0.9599	0.9454	0.9174	0.8564	0.7491	0.5880	0.4434	0.4787	0.6847	0.8663	0.9400	0.9645 (86)
MIT	19.7164	19.8794	20.1457	20.4900	20.7663	20.9324	20.9820	20.9759	20.8760	20.5423	20.0857	19.6885 (87)
Th 2	20.0891	20.0919	20.0947	20.1079	20.1103	20.1218	20.1218	20.1239	20.1174	20.1103	20.1053	20.1001 (88)
util rest of house	0.9529	0.9361	0.9029	0.8309	0.7050	0.5209	0.3602	0.3946	0.6213	0.8375	0.9282	0.9583 (89)
MIT 2	18.9310	19.0922	19.3529	19.6900	19.9398	20.0830	20.1147	20.1137	20.0398	19.7463	19.3070	18.9124 (90)
Living area fraction									f _{LA} = Living area / (4) =			0.2148 (91)
MIT	19.0997	19.2613	19.5232	19.8618	20.1173	20.2655	20.3010	20.2989	20.2194	19.9173	19.4743	19.0791 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.9497	19.1113	19.3732	19.7118	19.9673	20.1155	20.1510	20.1489	20.0694	19.7673	19.3243	18.9291 (93)

8. Space heating requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Space heating - main system 1	1887.6577	0.2160	407.7341 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	812.0152	0.2160	175.3953 (264)
Space and water heating			583.1293 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	350.4607	0.5190	181.8891 (268)
Energy saving/generation technologies			
PV Unit			
Total kg/year	-1727.2394	0.5190	-896.4372 (269)
CO2 emissions per m2			-66.5438 (272)
EI value			-0.9800 (273)
EI rating			100.7887
EI band			101 (274)
			A

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	34.0300 (1b)	2.3300 (2b)	79.2899 (1b) - (3b)
First floor	34.0300 (1c)	2.5300 (2c)	86.0959 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.0600		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 165.3858 (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				3 * 10 =	30.0000 (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) =				30.0000 / (5) =	0.1814 (8)							
Pressure test				Yes								
Measured/design AP50					5.0100							
Infiltration rate					0.4319 (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) =	0.3671 (21)							
Wind speed	Jan 4.9000	Feb 4.8000	Mar 4.7000	Apr 4.2000	May 4.2000	Jun 3.7000	Jul 3.8000	Aug 3.8000	Sep 4.0000	Oct 4.2000	Nov 4.3000	Dec 4.5000 (22)
Wind factor	1.2250	1.2000	1.1750	1.0500	1.0500	0.9250	0.9500	0.9500	1.0000	1.0500	1.0750	1.1250 (22a)
Adj infilt rate	0.4497	0.4405	0.4314	0.3855	0.3855	0.3396	0.3488	0.3488	0.3671	0.3855	0.3946	0.4130 (22b)
Effective ac	0.6011	0.5970	0.5930	0.5743	0.5743	0.5577	0.5608	0.5608	0.5674	0.5743	0.5779	0.5853 (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 = 1.30)			6.8000	1.2357	8.4030		(27)					
Solid Door			4.0600	1.2000	4.8720		(26)					
Flr - Ground			34.0330	0.1800	6.1259	75.6000	2572.8948 (28a)					
Wl - Brick	40.8230	10.8580	29.9650	0.2400	7.1916	38.9400	1166.8371 (29a)					
RF - Ins Joist	34.0330		34.0330	0.1000	3.4033	5.8200	198.0721 (30)					
Total net area of external elements Aum(A, m2)			108.8910				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.9959		(33)					
Party Wall			78.7620	0.0000	0.0000	54.0300	4255.5109 (32)					
Ground Floor Stud			49.6275			5.8200	288.8323 (32c)					
1st Floor Stud			80.0085			5.8200	465.6496 (32c)					
Internal Floor			34.0400			18.0000	612.7200 (32d)					
Internal Ceiling			34.0400			5.8200	198.1128 (32e)					
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 9758.6294 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							143.3827 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.3287 (36)					
Total fabric heat loss							(33) + (36) = 34.3245 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 32.8075	Feb 32.5845	Mar 32.3662	Apr 31.3433	May 31.3433	Jun 30.4354	Jul 30.6078	Aug 30.6078	Sep 30.9663	Oct 31.3433	Nov 31.5387	Dec 31.9432 (38)
Heat transfer coeff	67.1320	66.9091	66.6907	65.6678	65.6678	64.7599	64.9323	64.9323	65.2909	65.6678	65.8632	66.2678 (39)
Average = Sum(39)m / 12 =												65.8151 (39)
HLP	Jan 0.9864	Feb 0.9831	Mar 0.9799	Apr 0.9649	May 0.9649	Jun 0.9515	Jul 0.9540	Aug 0.9540	Sep 0.9593	Oct 0.9649	Nov 0.9677	Dec 0.9737 (40)
HLP (average)												0.9670 (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												2.1981 (42)
Average daily hot water use (litres/day)												86.4053 (43)
Daily hot water use	95.0459	91.5897	88.1335	84.6772	81.2210	77.7648	77.7648	81.2210	84.6772	88.1335	91.5897	95.0459 (44)
Energy conte	140.9503	123.2760	127.2098	110.9046	106.4156	91.8286	85.0927	97.6451	98.8113	115.1550	125.7007	136.5028 (45)
Energy content (annual)												Total = Sum(45)m = 1359.4925 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

Distribution loss (46)m = 0.15 x (45)m	21.1425	18.4914	19.0815	16.6357	15.9623	13.7743	12.7639	14.6468	14.8217	17.2733	18.8551	20.4754 (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)
Combi loss	14.6188	13.1798	14.5533	14.0400	14.4762	13.9725	14.4154	14.4548	14.0093	14.5214	14.1037	14.6061 (61)
Total heat required for water heating calculated for each month	155.5691	136.4558	141.7631	124.9446	120.8918	105.8011	99.5081	112.0999	112.8206	129.6764	139.8044	151.1090 (62)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.7000 (H2)
Collector heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0050 (H3a)
Collector effective heat loss coefficient												1.8063 (H3b)
Collector performance ratio												2.5804 (H4)
Annual solar radiation per m2												1168.2835 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												1962.7164 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.4437 (H8)
Utilisation factor												0.4998 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												86.4053 (H14)
Volume ratio Veff/V												0.8680 (H15)
Solar storage volume factor												0.9717 (H16)
Solar input	-25.3639	-39.4602	-66.0480	-92.9543	-110.7564	-113.4605	-110.8656	-97.6569	-76.9363	-52.7163	-30.8261	-838.0614 (H17)
Solar input (sum of months) = Sum(63)m =												-838.0614 (63)
Output from w/h	130.2052	96.9956	75.7150	31.9903	10.1354	0.0000	0.0000	14.4430	35.8843	76.9601	108.9783	130.0923 (64)
Total per year (kWh/year) = Sum(64)m =												711.3994 (64)
Heat gains from water heating, kWh/month	50.5207	44.2842	45.9356	40.3858	39.0022	34.0261	31.8972	36.0807	36.3571	41.9194	45.3214	49.0387 (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)
(66)m	131.8872	131.8872	131.8872	131.8872	131.8872	131.8872	131.8872	131.8872	131.8872	131.8872	131.8872	131.8872	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	49.6113	44.0644	35.8355	27.1298	20.2799	17.1211	18.5000	24.0469	32.2758	40.9815	47.8315	50.9902 (67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	287.6530	290.6380	283.1160	267.1027	246.8887	227.8904	215.1984	212.2135	219.7354	235.7488	255.9627	274.9610 (68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.3868	50.3868	50.3868	50.3868	50.3868	50.3868	50.3868	50.3868	50.3868	50.3868	50.3868	50.3868 (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)	-87.9248	-87.9248	-87.9248	-87.9248	-87.9248	-87.9248	-87.9248	-87.9248	-87.9248	-87.9248	-87.9248	-87.9248 (71)	
Water heating gains (Table 5)	67.9041	65.8992	61.7414	56.0914	52.4224	47.2585	42.8725	48.4956	50.4959	56.3433	62.9464	65.9123 (72)	
Total internal gains	502.5177	497.9507	478.0421	447.6731	416.9402	389.6193	373.9202	382.1052	399.8564	430.4228	464.0898	489.2127 (73)	

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	Specific data	Specific data	factor	W						
		W/m2	or Table 6b	or Table 6c	Table 6d							
Northeast	3.4380	12.9465	0.4700	0.0000	0.7700	16.1082 (75)						
Southwest	3.3610	40.9830	0.4700	0.0000	0.7700	49.8495 (79)						
Solar gains	65.9578	109.7593	160.8013	232.5337	271.5973	290.2156	273.2498	237.3889	192.4394	130.5479	81.9468	55.2690 (83)
Total gains	568.4755	607.7100	638.8434	680.2068	688.5375	679.8349	647.1699	619.4941	592.2957	560.9707	546.0366	544.4817 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, T _{hl} (C)													21.0000 (85)
Utilisation factor for gains for living area, n _{l,m} (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	40.3791	40.5136	40.6463	41.2794	41.2794	41.8582	41.7470	41.7470	41.5177	41.2794	41.1570	40.9057	
alpha	3.6919	3.7009	3.7098	3.7520	3.7520	3.7905	3.7831	3.7831	3.7678	3.7520	3.7438	3.7270	
util living area	0.9551	0.9408	0.9072	0.8287	0.7000	0.5093	0.3373	0.3517	0.6066	0.8330	0.9282	0.9598 (86)	
MIT	19.7983	19.9409	20.2267	20.5800	20.8329	20.9638	20.9945	20.9936	20.9287	20.6422	20.1910	19.7802 (87)	
Th 2	20.0947	20.0974	20.1001	20.1127	20.1127	20.1239	20.1218	20.1218	20.1174	20.1127	20.1103	20.1053 (88)	
util rest of house	0.9473	0.9307	0.8909	0.7990	0.6495	0.4377	0.2520	0.2631	0.5337	0.7973	0.9140	0.9528 (89)	
MIT 2	19.0158	19.1567	19.4351	19.7763	19.9971	20.1056	20.1203	20.1201	20.0778	19.8388	19.4128	19.0068 (90)	
Living area fraction									fLA = Living area / (4) =			0.2148 (91)	
MIT	19.1839	19.3252	19.6051	19.9489	20.1766	20.2899	20.3081	20.3077	20.2606	20.0114	19.5799	19.1730 (92)	
Temperature adjustment												-0.1500	
adjusted MIT	19.0339	19.1752	19.4551	19.7989	20.0266	20.1399	20.1581	20.1577	20.1106	19.8614	19.4299	19.0230 (93)	

8. Space heating requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9360	0.9182	0.8771	0.7873	0.6442	0.4391	0.2555	0.2667	0.5331	0.7858	0.9009	0.9421	(94)
Useful gains	532.0698	557.9711	560.3507	535.5166	443.5637	298.5048	165.3826	165.2423	315.7451	440.7966	491.9405	512.9455	(95)
Ext temp.	4.7000	5.2000	7.0000	9.5000	12.5000	15.4000	17.6000	17.6000	15.0000	11.4000	7.7000	4.7000	(96)
Heat loss rate W													
962.2635	935.0650	830.6411	676.3076	494.2584	306.9578	166.1033	166.0792	333.6737	555.6399	772.5707	949.1503		(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													
320.0641	253.4071	201.0960	101.3695	37.7169	0.0000	0.0000	0.0000	0.0000	0.0000	85.4434	202.0537	324.5363	(98)
Space heating													
Space heating per m2													
										(98) / (4) =		22.4168	(99)

8c. Space cooling requirement

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													1685.8422	(211)
Space heating requirement	320.0641	253.4071	201.0960	101.3695	37.7169	0.0000	0.0000	0.0000	0.0000	85.4434	202.0537	324.5363	(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)	353.6620	280.0078	222.2056	112.0105	41.6761	0.0000	0.0000	0.0000	0.0000	94.4126	223.2638	358.6037	(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	130.2052	96.9956	75.7150	31.9903	10.1354	0.0000	0.0000	14.4430	35.8843	76.9601	108.9783	130.0923	(64)	
Efficiency of water heater (217)m	89.5508	89.5910	89.6016	89.7112	89.8028	87.3000	87.3000	87.3000	87.3000	88.9548	89.3524	87.3000	(216)	
Fuel for water heating, kWh/month	145.3981	108.2650	84.5018	35.6592	11.2863	0.0000	0.0000	16.5441	41.1045	86.5159	121.9645	145.2561	(219)	
Water heating fuel used												796.4956	(219)	
Annual totals kWh/year														
Space heating fuel - main system													1685.8422	(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)
pump for solar water heating													50.0000	(230g)
Total electricity for the above, kWh/year													125.0000	(231)
Electricity for lighting (calculated in Appendix L)													350.4607	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 2.50 * 1168 * 0.80) =										-1869.2537			-1869.2537	(233)
Total delivered energy for all uses													1088.5449	(238)

10a. Fuel costs - using BEDF prices (479)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1685.8422	3.7400	63.0505	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	796.4956	3.7400	29.7889	(247)
Pumps and fans for heating	75.0000	19.1200	14.3400	(249)
Pump for solar water heating	50.0000	19.1200	9.5600	(249)
Energy for lighting	350.4607	19.1200	67.0081	(250)
Additional standing charges			94.0000	(251)
Energy saving/generation technologies				
PV Unit	-1869.2537	19.1200	-357.4013	(252)
Total energy cost			-79.6538	(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	1685.8422	0.2160	364.1419	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	796.4956	0.2160	172.0431	(264)
Space and water heating			536.1850	(265)
Pumps and fans	125.0000	0.5190	64.8750	(267)
Energy for lighting	350.4607	0.5190	181.8891	(268)
Energy saving/generation technologies				
PV Unit	-1869.2537	0.5190	-970.1427	(269)
Total kg/year			-187.1936	(272)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

 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	1685.8422	1.2200	2056.7274 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	796.4956	1.2200	971.7247 (264)
Space and water heating			3028.4521 (265)
Pumps and fans	125.0000	3.0700	383.7500 (267)
Energy for lighting	350.4607	3.0700	1075.9145 (268)
Energy saving/generation technologies			
PV Unit	-1869.2537	3.0700	-5738.6088 (269)
Primary energy kWh/year			-1250.4922 (272)
Primary energy kWh/m2/year			-18.3734 (273)

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Designed)



Property Reference	135 - PRJ011855	Issued on Date	02/08/2021	
Assessment Reference	135 M	Prop Type Ref	BLO-0283 SIN BR-MT 4.1	
Property	135 - PRJ011855			
SAP Rating	84 B	DER	16.54	
Environmental	88 B	TER	17.95	
CO₂ Emissions (t/year)	0.96	% DER<TER	7.85	
General Requirements Compliance	Pass	DFEE	35.65	
		TFEE	43.65	
		% DFEE<TFEE	18.34	
Assessor Details	Mr. Michael Juckes, Michael Juckes, Tel: 02033971373, michael@briaryenergy.co.uk		Assessor ID	T850-0001
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)	17.95	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.54	kgCO ₂ /m ²	Pass
	-1.41 (-7.9%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	43.65	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	35.65	kWh/m ² /yr	
	-8.1 (-18.5%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.18 (max. 0.25)	0.18 (max. 0.70)	Pass
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	Pass
Openings	1.26 (max. 2.00)	1.30 (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

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Designed)



Main heating system

Boiler system with radiators or underfloor - Mains gas
Data from database
Ideal LOGIC COMBI ESP1 30
Combi boiler
Efficiency: 89.6% SEDBUK2009
Minimum: 88.0%

Pass

Secondary heating system

None

5 Cylinder insulation

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

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (East Anglia)

Slight

Pass

Based on:

Overshading

Average

Windows facing North East

3.44 m², No overhang

Windows facing South West

3.36 m², No overhang

Air change rate

4.21 ach

Blinds/curtains

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

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

5.01 (design value)

Maximum

10.0

Pass

10 Key features

Party wall U-value

0.00

W/m²K

Roof U-value

0.10

W/m²K

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