

PREDICTED ENERGY ASSESSMENT

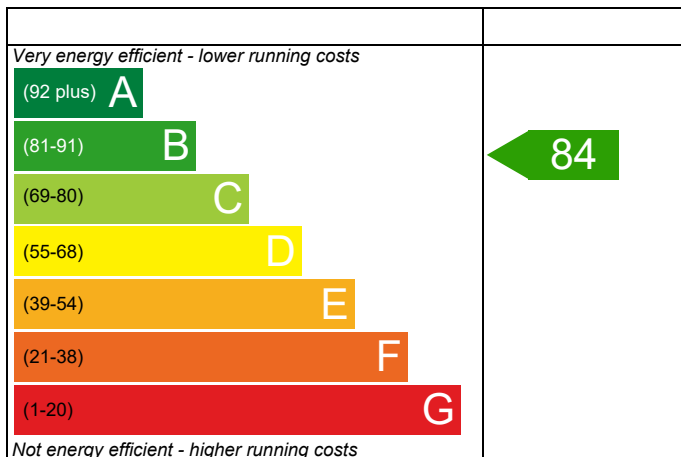
Coggeshall Phase 1 and 2,
0

Dwelling type: House, Semi-Detached
Date of assessment: 17/04/2023
Produced by: Scott Binstead
Total floor area: 93.554 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

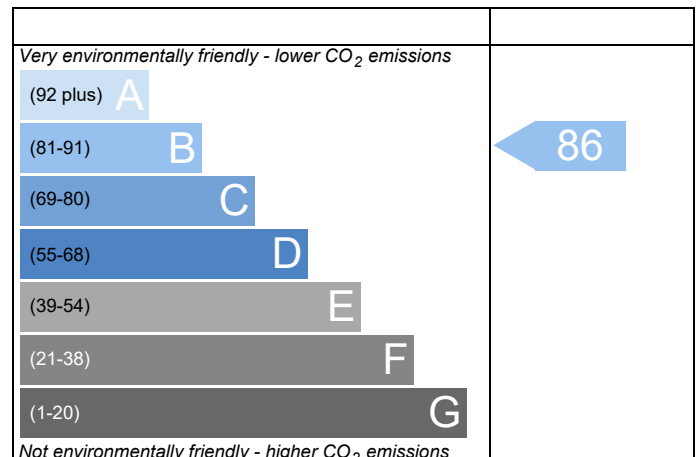


England

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	085 - PRJ013151		Issued on Date	17/04/2023	
Assessment Reference	085	Prop Type Ref	Apple SD		
Property	Coggeshall Phase 1 and 2, 0				
SAP Rating	84 B	DER	16.88	TER	17.47
Environmental	86 B	% DER<TER	3.35		
CO ₂ Emissions (t/year)	1.39	DFEE	44.80	TFEE	50.67
General Requirements Compliance	Pass	% DFEE<TFEE	11.58		
Assessor Details	Chris Nicholls, , Tel: ,			Assessor ID	U903-0001
Client					

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	46.7770 (1b)	x 2.3100 (2b)	= 108.0549 (1b) - (3b)
First floor	46.7770 (1c)	x 2.6100 (2c)	= 122.0880 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.5540		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 230.1428 (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)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					30.0000 / (5) = 0.1304 (8)							
Pressure test					Yes							
Measured/design AP50					5.0100							
Infiltration rate					0.3809 (18)							
Number of sides sheltered					1 (19)							
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.9250 (20)							
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3523 (21)							
Wind speed	Jan 4.5000	Feb 4.5000	Mar 4.4000	Apr 3.9000	May 3.8000	Jun 3.4000	Jul 3.3000	Aug 3.3000	Sep 3.5000	Oct 3.8000	Nov 3.9000	Dec 4.1000 (22)
Wind factor	1.1250	1.1250	1.1000	0.9750	0.9500	0.8500	0.8250	0.8250	0.8750	0.9500	0.9750	1.0250 (22a)
Adj infiltr rate												
Effective ac	0.3963	0.3963	0.3875	0.3435	0.3347	0.2994	0.2906	0.2906	0.3083	0.3347	0.3435	0.3611 (22b)
	0.5785	0.5785	0.5751	0.5590	0.5560	0.5448	0.5422	0.5422	0.5475	0.5560	0.5590	0.5652 (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
Solid Door			2.1500	0.9000	1.9350		(26)
Half Glazed Door			3.0900	1.2000	3.7080		(26a)
Windows (Uw = 1.30)			13.3400	1.2357	16.4848		(27)
Fir - Ground			46.7770	0.1911	8.9385	75.6000	3536.3412 (28a)
Brick	95.4160	18.5840	76.8320	0.2500	19.2080	51.2800	3939.9450 (29a)
Rf - Ins Joist	46.7770		46.7770	0.1300	6.0810	5.6000	261.9512 (30)
Total net area of external elements Aum(A, m ²)			188.9660				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	56.3553		(33)
Party Wall			44.3100	0.0000	0.0000	39.3700	1744.4847 (32)
Stud			47.9833			7.4000	355.0766 (32c)
Stud			114.4746			7.4000	847.1120 (32c)
Block			31.4252			54.0300	1697.9057 (32c)
Internal Floor			46.7770			7.4000	346.1498 (32d)
Internal Ceiling			46.7770			7.4000	346.1498 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13075.1160 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							139.7601 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.3050 (36)
Total fabric heat loss						(33) + (36) =	64.6603 (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	43.9382	43.9382	43.6761	42.4537	42.2269	41.3786	41.1812	41.1812	41.5818	42.2269	42.4537	42.9250 (38)
Average = Sum(39)m / 12 =	108.5985	108.5985	108.3364	107.1140	106.8872	106.0389	105.8415	105.8415	106.2421	106.8872	107.1140	107.5853 (39)
												107.0904 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1608	1.1608	1.1580	1.1449	1.1425	1.1335	1.1313	1.1313	1.1356	1.1425	1.1449	1.1500 (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													2.6713 (42)
Average daily hot water use (litres/day)													97.6436 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	107.4080	103.5022	99.5965	95.6907	91.7850	87.8792	87.8792	91.7850	95.6907	99.5965	103.5022	107.4080 (44)	
Energy content (annual)	159.2829	139.3098	143.7553	125.3293	120.2565	103.7722	96.1602	110.3452	111.6631	130.1326	142.0499	154.2570 (45)	
Distribution loss (46)m = 0.15 x (45)m	23.8924	20.8965	21.5633	18.7994	18.0385	15.5658	14.4240	16.5518	16.7495	19.5199	21.3075	23.1385 (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	14.6948	13.2590	14.6464	14.1181	14.5480	14.0319	14.4704	14.5208	14.0789	14.6057	14.1844	14.6797 (61)	
Solar input	173.9777	152.5689	158.4017	139.4474	134.8045	117.8041	110.6306	124.8660	125.7420	144.7383	156.2343	168.9367 (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	173.9777	152.5689	158.4017	139.4474	134.8045	117.8041	110.6306	124.8660	125.7420	144.7383	156.2343	168.9367 (64)	
Total per year (kWh/year) = Sum(64)m =													1708.1522 (64)
													1708 (64)
56.6353	49.6353	51.4602	45.2015	43.6223	38.0122	35.5909	40.3200	40.6477	46.9205	50.7777	54.9604	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	160.2786	160.2786	160.2786	160.2786	160.2786	160.2786	160.2786	160.2786	160.2786	160.2786	160.2786	160.2786 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	58.1049	51.6082	41.9706	31.7745	23.7518	20.0523	21.6672	28.1638	37.8014	47.9976	56.0203	59.7198 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	366.3678	370.1695	360.5892	340.1939	314.4485	290.2515	274.0864	270.2846	279.8649	300.2602	326.0056	350.2027 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.6992	53.6992	53.6992	53.6992	53.6992	53.6992	53.6992	53.6992	53.6992	53.6992	53.6992	53.6992 (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)	-106.8524	-106.8524	-106.8524	-106.8524	-106.8524	-106.8524	-106.8524	-106.8524	-106.8524	-106.8524	-106.8524	-106.8524 (71)
Water heating gains (Table 5)	76.1227	73.8620	69.1670	62.7799	58.6321	52.7948	47.8372	54.1935	56.4551	63.0652	70.5246	73.8715 (72)
Total internal gains	610.7206	605.7651	581.8522	544.8737	506.9578	473.2238	453.7161	462.7673	484.2468	521.4483	562.6758	593.9193 (73)

6. Solar gains

[Jan]	Area	Solar flux	Specific data	Specific data	Access	Gains							
	m2	Table 6a	g	FF	factor	W							
		W/m2	or Table 6b	or Table 6c	Table 6d								
Southeast	7.4130	38.7358	0.7100	0.7200	0.7700	101.7257 (77)							
Southwest	1.4380	38.7358	0.7100	0.7200	0.7700	19.7331 (79)							
Northwest	4.4920	12.1063	0.7100	0.7200	0.7700	19.2652 (81)							
Solar gains	140.7240	249.8858	360.4971	486.2425	539.3550	590.8971	590.8971	544.3087	489.4458	414.1903	288.4132	191.0538	132.2865 (83)
Total gains	751.4447	855.6510	942.3493	1031.1162	1046.3128	1064.1210	998.0248	952.2131	898.4371	809.8615	753.7296	726.2058 (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	33.4441	33.4441	33.5250	33.9076	33.9795	34.2514	34.3152	34.3152	34.1858	33.9795	33.9076	33.7591	
util living area	3.2296	3.2296	3.2350	3.2605	3.2653	3.2834	3.2877	3.2877	3.2791	3.2653	3.2605	3.2506	
	0.9651	0.9474	0.9121	0.8417	0.7413	0.5622	0.4455	0.4732	0.6895	0.8723	0.9432	0.9685 (86)	
MIT	19.3278	19.5425	19.9228	20.3557	20.6791	20.9083	20.9674	20.9601	20.8077	20.3578	19.7994	19.2984 (87)	
Th 2	19.9515	19.9515	19.9537	19.9643	19.9663	19.9736	19.9753	19.9753	19.9718	19.9663	19.9643	19.9602 (88)	
util rest of house	0.9587	0.9380	0.8959	0.8124	0.6921	0.4854	0.3500	0.3757	0.6205	0.8426	0.9314	0.9627 (89)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

MIT 2	18.4468	18.6565	19.0275	19.4447	19.7366	19.9240	19.9630	19.9597	19.8528	19.4576	18.9212	18.4246 (90)
Living area fraction									fLA = Living area / (4) =			0.1573 (91)
MIT	18.5854	18.7959	19.1683	19.5880	19.8849	20.0788	20.1210	20.1171	20.0030	19.5992	19.0593	18.5620 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.4354	18.6459	19.0183	19.4380	19.7349	19.9288	19.9710	19.9671	19.8530	19.4492	18.9093	18.4120 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9466	0.9232	0.8784	0.7953	0.6799	0.4819	0.3496	0.3749	0.6117	0.8248	0.9160	0.9513 (94)
Useful gains	711.2988	789.8953	827.7566	820.0082	711.3629	512.7513	348.9069	356.9826	549.5946	668.0080	690.4461	690.8130 (95)
Ext temp.	4.3000	4.8000	6.6000	9.0000	11.8000	14.8000	16.6000	16.5000	14.0000	10.5000	7.1000	4.2000 (96)
Heat loss rate W												
	1535.0857	1503.6444	1345.3535	1118.0516	848.1364	543.8529	356.7940	366.9619	621.8358	956.5518	1264.9425	1529.0046 (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												
	612.8975	479.6394	385.0921	214.5912	101.7595	0.0000	0.0000	0.0000	0.0000	214.6766	413.6374	623.6145 (98)
Space heating												3045.9082 (98)
RHI space heating demand												3046 (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	46.7770 (1b)	2.3100 (2b)	108.0549 (1b) - (3b)
First floor	46.7770 (1c)	2.6100 (2c)	122.0880 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.5540		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 230.1428 (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) =	0.1304 (8)
Pressure test					Yes
Measured/design AP50					5.0100
Infiltration rate					0.3809 (18)
Number of sides sheltered					1 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3523 (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	0.4492	0.4404	0.4316	0.3875	0.3787	0.3347	0.3347	0.3259	0.3523	0.3787	0.3963	0.4139 (22b)
	0.6009	0.5970	0.5931	0.5751	0.5717	0.5560	0.5560	0.5531	0.5621	0.5717	0.5785	0.5857 (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
Solid Door			2.1500	0.9000	1.9350		(26)
Half Glazed Door			3.0900	1.2000	3.7080		(26a)
Windows (Uw = 1.30)			13.3400	1.2357	16.4848		(27)
Flr - Ground			46.7770	0.1911	8.9385	75.6000	3536.3412 (28a)
Brick	95.4160	18.5840	76.8320	0.2500	19.2080	51.2800	3939.9450 (29a)
Rf - Ins Joist	46.7770		46.7770	0.1300	6.0810	5.6000	261.9512 (30)
Total net area of external elements Aum(A, m2)			188.9660				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	56.3553		(33)
Party Wall			44.3100	0.0000	0.0000	39.3700	1744.4847 (32)
Stud			47.9833			7.4000	355.0766 (32c)
Stud			114.4746			7.4000	847.1120 (32c)
Block			31.4252			54.0300	1697.9057 (32c)
Internal Floor			46.7770			7.4000	346.1498 (32d)
Internal Ceiling			46.7770			7.4000	346.1498 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13075.1160 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							139.7601 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.3050 (36)
Total fabric heat loss						(33) + (36) =	64.6603 (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
(38)m	45.6349	45.3374	45.0458	43.6761	43.4198	42.2269	42.2269	42.0060	42.6864	43.4198	43.9382	44.4802 (38)
Heat transfer coeff	110.2951	109.9977	109.7060	108.3364	108.0801	106.8872	106.8872	106.6663	107.3467	108.0801	108.5985	109.1405 (39)
Average = Sum(39)m / 12 =												108.3352 (39)
HLP	1.1789	1.1758	1.1726	1.1580	1.1553	1.1425	1.1425	1.1402	1.1474	1.1553	1.1608	1.1666 (40)
HLP (average)												1.1580 (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												2.6713 (42)
Average daily hot water use (litres/day)												97.6436 (43)
Daily hot water use	107.4080	103.5022	99.5965	95.6907	91.7850	87.8792	87.8792	91.7850	95.6907	99.5965	103.5022	107.4080 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Energy content (annual)	159.2829	139.3098	143.7553	125.3293	120.2565	103.7722	96.1602	110.3452	111.6631	130.1326	142.0499	154.2570 (45)
Distribution loss (46)m = 0.15 x (45)m	23.8924	20.8965	21.5633	18.7994	18.0385	15.5658	14.4240	16.5518	16.7495	19.5199	21.3075	23.1385 (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	14.6948	13.2590	14.6464	14.1181	14.5480	14.0319	14.4704	14.5208	14.0789	14.6057	14.1844	14.6797 (61)
Total heat required for water heating calculated for each month	173.9777	152.5689	158.4017	139.4474	134.8045	117.8041	110.6306	124.8660	125.7420	144.7383	156.2343	168.9367 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	173.9777	152.5689	158.4017	139.4474	134.8045	117.8041	110.6306	124.8660	125.7420	144.7383	156.2343	168.9367 (64)
Heat gains from water heating, kWh/month	56.6353	49.6353	51.4602	45.2015	43.6223	38.0122	35.5909	40.3200	40.6477	46.9205	50.7777	54.9604 (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	160.2786	160.2786	160.2786	160.2786	160.2786	160.2786	160.2786	160.2786	160.2786	160.2786	160.2786	160.2786 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	58.1049	51.6082	41.9706	31.7745	23.7518	20.0523	21.6672	28.1638	37.8014	47.9976	56.0203	59.7198 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	366.3678	370.1695	360.5892	340.1939	314.4485	290.2515	274.0864	270.2846	279.8649	300.2602	326.0056	350.2027 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.6992	53.6992	53.6992	53.6992	53.6992	53.6992	53.6992	53.6992	53.6992	53.6992	53.6992	53.6992 (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)	-106.8524	-106.8524	-106.8524	-106.8524	-106.8524	-106.8524	-106.8524	-106.8524	-106.8524	-106.8524	-106.8524	-106.8524 (71)
Water heating gains (Table 5)	76.1227	73.8620	69.1670	62.7799	58.6321	52.7948	47.8372	54.1935	56.4551	63.0652	70.5246	73.8715 (72)
Total internal gains	610.7206	605.7651	581.8522	544.8737	506.9578	473.2238	453.7161	462.7673	484.2468	521.4483	562.6758	593.9193 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W						
Southeast	7.4130	36.7938	0.7100	0.7200	0.7700	96.6258 (77)						
Southwest	1.4380	36.7938	0.7100	0.7200	0.7700	18.7438 (79)						
Northwest	4.4920	11.2829	0.7100	0.7200	0.7700	17.9550 (81)						
Solar gains	133.3246	233.0651	334.7312	441.3005	518.5292	525.4400	502.1438	442.8980	371.3804	261.8578	160.7783	113.3953 (83)
Total gains	744.0453	838.8302	916.5834	986.1742	1025.4870	998.6638	955.8599	905.6652	855.6272	783.3062	723.4541	707.3146 (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	32.9296	33.0187	33.1064	33.5250	33.6045	33.9795	33.9795	34.0499	33.8341	33.6045	33.4441	33.2780
alpha	3.1953	3.2012	3.2071	3.2350	3.2403	3.2653	3.2653	3.2700	3.2556	3.2403	3.2296	3.2185
util living area	0.9663	0.9497	0.9198	0.8592	0.7565	0.6067	0.4661	0.5057	0.7072	0.8800	0.9493	0.9708 (86)
MIT	19.2834	19.5092	19.8550	20.2872	20.6470	20.8792	20.9617	20.9495	20.7909	20.3310	19.7359	19.2407 (87)
Th 2	19.9369	19.9394	19.9419	19.9537	19.9560	19.9663	19.9663	19.9682	19.9623	19.9560	19.9515	19.9468 (88)
util rest of house	0.9601	0.9405	0.9048	0.8320	0.7086	0.5302	0.3666	0.4056	0.6374	0.8510	0.9385	0.9654 (89)
MIT 2	18.3924	18.6154	18.9536	19.3740	19.7010	19.8982	19.9518	19.9476	19.8329	19.4257	18.8503	18.3580 (90)
Living area fraction												0.1573 (91)
MIT	18.5325	18.7560	19.0954	19.5177	19.8498	20.0525	20.1106	20.1052	19.9836	19.5681	18.9896	18.4968 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.3825	18.6060	18.9454	19.3677	19.6998	19.9025	19.9606	19.9552	19.8336	19.4181	18.8396	18.3468 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9480	0.9258	0.8874	0.8142	0.6954	0.5251	0.3660	0.4042	0.6277	0.8330	0.9237	0.9544 (94)
Useful gains	705.3780	776.5666	813.3515	802.9417	713.1015	524.4387	349.8876	366.1112	537.0772	652.4596	668.2214	675.0465 (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	1553.2352	1507.6244	1365.3381	1134.0303	864.6178	566.7708	359.2094	379.2231	615.4776	953.0636	1274.9059	1543.9918 (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	630.8058	491.2708	410.6781	238.3837	112.7281	0.0000	0.0000	0.0000	0.0000	223.6493	436.8128	646.4953 (98)
Space heating												3190.8240 (98)
Space heating per m2												(98) / (4) = 34.1068 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3525.7724 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	630.8058	491.2708	410.6781	238.3837	112.7281	0.0000	0.0000	0.0000	0.0000	223.6493	436.8128	646.4953	(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)	697.0230	542.8407	453.7879	263.4075	124.5615	0.0000	0.0000	0.0000	0.0000	247.1263	482.6661	714.3595	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	173.9777	152.5689	158.4017	139.4474	134.8045	117.8041	110.6306	124.8660	125.7420	144.7383	156.2343	168.9367	(64)
Efficiency of water heater (217)m	89.7885	89.7207	89.5860	89.2920	88.7288	87.3000	87.3000	87.3000	87.3000	89.2151	89.6344	87.3000	(216)
Fuel for water heating, kWh/month	193.7638	170.0487	176.8153	156.1701	151.9287	134.9417	126.7247	143.0309	144.0343	162.2351	174.3017	188.0879	(219)
Water heating fuel used													1922.0830 (219)
Annual totals kWh/year													
Space heating fuel - main system													3525.7724 (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)													410.4600 (232)
Total delivered energy for all uses													5933.3155 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3525.7724	3.4800	122.6969 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1922.0830	3.4800	66.8885 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	410.4600	13.1900	54.1397 (250)
Additional standing charges			120.0000 (251)
Total energy cost			373.6175 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.1326 (257)
SAP value		84.2009
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	3525.7724	0.2160	761.5668 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1922.0830	0.2160	415.1699 (264)
Space and water heating			1176.7368 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	410.4600	0.5190	213.0288 (268)
Total kg/year			1428.6905 (272)
CO2 emissions per m2			15.2700 (273)
EI value			86.1827
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	$3.48 / 0.8875 = 3.921$, stars = 4
Water heating environmental impact	$0.216 / 0.8875 = 0.2434$, 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 (m ²)	Storey height (m)	Volume (m ³)
Ground floor	46.7770 (1b)	2.3100 (2b)	108.0549 (1b) - (3b)
First floor	46.7770 (1c)	2.6100 (2c)	122.0880 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.5540		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 230.1428 (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) =	0.1304 (8)
Pressure test					Yes
Measured/design AP50					5.0100
Infiltration rate					0.3809 (18)
Number of sides sheltered					1 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3523 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.5000	4.5000	4.4000	3.9000	3.8000	3.4000	3.3000	3.3000	3.5000	3.8000	3.9000	4.1000 (22)
Wind factor	1.1250	1.1250	1.1000	0.9750	0.9500	0.8500	0.8250	0.8250	0.8750	0.9500	0.9750	1.0250 (22a)
Adj infilt rate												
Effective ac	0.3963	0.3963	0.3875	0.3435	0.3347	0.2994	0.2906	0.2906	0.3083	0.3347	0.3435	0.3611 (22b)
	0.5785	0.5785	0.5751	0.5590	0.5560	0.5448	0.5422	0.5422	0.5475	0.5560	0.5590	0.5652 (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
Solid Door			2.1500	0.9000	1.9350		(26)
Half Glazed Door			3.0900	1.2000	3.7080		(26a)
Windows (Uw = 1.30)			13.3400	1.2357	16.4848		(27)
Flr - Ground			46.7770	0.1911	8.9385	75.6000	3536.3412 (28a)
Brick	95.4160	18.5840	76.8320	0.2500	19.2080	51.2800	3939.9450 (29a)
Rf - Ins Joist	46.7770		46.7770	0.1300	6.0810	5.6000	261.9512 (30)
Total net area of external elements Aum(A, m ²)			188.9660				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	56.3553		(33)
Party Wall			44.3100	0.0000	0.0000	39.3700	1744.4847 (32)
Stud			47.9833			7.4000	355.0766 (32c)
Stud			114.4746			7.4000	847.1120 (32c)
Block			31.4252			54.0300	1697.9057 (32c)
Internal Floor			46.7770			7.4000	346.1498 (32d)
Internal Ceiling			46.7770			7.4000	346.1498 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13075.1160 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							139.7601 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.3050 (36)
Total fabric heat loss						(33) + (36) =	64.6603 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	43.9382	43.9382	43.6761	42.4537	42.2269	41.3786	41.1812	41.1812	41.5818	42.2269	42.4537	42.9250 (38)
Heat transfer coeff	108.5985	108.5985	108.3364	107.1140	106.8872	106.0389	105.8415	105.8415	106.2421	106.8872	107.1140	107.5853 (39)
Average = Sum(39)m / 12 =												107.0904 (39)
HLP	1.1608	1.1608	1.1580	1.1449	1.1425	1.1335	1.1313	1.1313	1.1356	1.1425	1.1449	1.1500 (40)
HLP (average)												1.1447 (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												2.6713 (42)
Average daily hot water use (litres/day)												97.6436 (43)
Daily hot water use	107.4080	103.5022	99.5965	95.6907	91.7850	87.8792	87.8792	91.7850	95.6907	99.5965	103.5022	107.4080 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Energy conte	159.2829	139.3098	143.7553	125.3293	120.2565	103.7722	96.1602	110.3452	111.6631	130.1326	142.0499	154.2570 (45)
Energy content (annual)												Total = Sum(45)m = 1536.3141 (45)
Distribution loss (46)m = 0.15 x (45)m	23.8924	20.8965	21.5633	18.7994	18.0385	15.5658	14.4240	16.5518	16.7495	19.5199	21.3075	23.1385 (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	14.6948	13.2590	14.6464	14.1181	14.5480	14.0319	14.4704	14.5208	14.0789	14.6057	14.1844	14.6797 (61)
Total heat required for water heating calculated for each month	173.9777	152.5689	158.4017	139.4474	134.8045	117.8041	110.6306	124.8660	125.7420	144.7383	156.2343	168.9367 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	173.9777	152.5689	158.4017	139.4474	134.8045	117.8041	110.6306	124.8660	125.7420	144.7383	156.2343	168.9367 (64)
Heat gains from water heating, kWh/month	56.6353	49.6353	51.4602	45.2015	43.6223	38.0122	35.5909	40.3200	40.6477	46.9205	50.7777	54.9604 (65)
											Total per year (kWh/year) = Sum(64)m = 1708.1522 (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	160.2786	160.2786	160.2786	160.2786	160.2786	160.2786	160.2786	160.2786	160.2786	160.2786	160.2786	160.2786 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	58.1049	51.6082	41.9706	31.7745	23.7518	20.0523	21.6672	28.1638	37.8014	47.9976	56.0203	59.7198 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	366.3678	370.1695	360.5892	340.1939	314.4485	290.2515	274.0864	270.2846	279.8649	300.2602	326.0056	350.2027 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.6992	53.6992	53.6992	53.6992	53.6992	53.6992	53.6992	53.6992	53.6992	53.6992	53.6992	53.6992 (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)	-106.8524	-106.8524	-106.8524	-106.8524	-106.8524	-106.8524	-106.8524	-106.8524	-106.8524	-106.8524	-106.8524	-106.8524 (71)
Water heating gains (Table 5)	76.1227	73.8620	69.1670	62.7799	58.6321	52.7948	47.8372	54.1935	56.4551	63.0652	70.5246	73.8715 (72)
Total internal gains	610.7206	605.7651	581.8522	544.8737	506.9578	473.2238	453.7161	462.7673	484.2468	521.4483	562.6758	593.9193 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W						
Southeast	7.4130	38.7358	0.7100	0.7200	0.7700	101.7257 (77)						
Southwest	1.4380	38.7358	0.7100	0.7200	0.7700	19.7331 (79)						
Northwest	4.4920	12.1063	0.7100	0.7200	0.7700	19.2652 (81)						
Solar gains	140.7240	249.8858	360.4971	486.2425	539.3550	590.8971	544.3087	489.4458	414.1903	288.4132	191.0538	132.2865 (83)
Total gains	751.4447	855.6510	942.3493	1031.1162	1046.3128	1064.1210	998.0248	952.2131	898.4371	809.8615	753.7296	726.2058 (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	33.4441	33.4441	33.5250	33.9076	33.9795	34.2514	34.3152	34.3152	34.1858	33.9795	33.9076	33.7591
alpha	3.2296	3.2296	3.2350	3.2605	3.2653	3.2834	3.2877	3.2877	3.2791	3.2653	3.2605	3.2506
util living area	0.9651	0.9474	0.9121	0.8417	0.7413	0.5622	0.4455	0.4732	0.6895	0.8723	0.9432	0.9685 (86)
MIT	19.3278	19.5425	19.9228	20.3557	20.6791	20.9083	20.9674	20.9601	20.8077	20.3578	19.7994	19.2984 (87)
Th 2	19.9515	19.9515	19.9537	19.9643	19.9663	19.9736	19.9753	19.9753	19.9718	19.9663	19.9643	19.9602 (88)
util rest of house	0.9587	0.9380	0.8959	0.8124	0.6921	0.4854	0.3500	0.3757	0.6205	0.8426	0.9314	0.9627 (89)
MIT 2	18.4468	18.6565	19.0275	19.4447	19.7366	19.9240	19.9630	19.9597	19.8528	19.4576	18.9212	18.4246 (90)
Living area fraction												fLA = Living area / (4) = 0.1573 (91)
MIT	18.5854	18.7959	19.1683	19.5880	19.8849	20.0788	20.1210	20.1171	20.0030	19.5992	19.0593	18.5620 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.4354	18.6459	19.0183	19.4380	19.7349	19.9288	19.9710	19.9671	19.8530	19.4492	18.9093	18.4120 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9466	0.9232	0.8784	0.7953	0.6799	0.4819	0.3496	0.3749	0.6117	0.8248	0.9160	0.9513 (94)
Useful gains	711.2988	789.8953	827.7566	820.0082	711.3629	512.7513	348.9069	356.9826	549.5946	668.0080	690.4461	690.8130 (95)
Ext temp.	4.3000	4.8000	6.6000	9.0000	11.8000	14.8000	16.6000	16.5000	14.0000	10.5000	7.1000	4.2000 (96)
Heat loss rate W	1535.0857	1503.6444	1345.3535	1118.0516	848.1364	543.8529	356.7940	366.9619	621.8358	956.5518	1264.9425	1529.0046 (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	612.8975	479.6394	385.0921	214.5912	101.7595	0.0000	0.0000	0.0000	0.0000	214.6766	413.6374	623.6145 (98)
Space heating												3045.9082 (98)
Space heating per m2												(98) / (4) = 32.5578 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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													3365.6445 (211)
Space heating requirement	612.8975	479.6394	385.0921	214.5912	101.7595	0.0000	0.0000	0.0000	0.0000	214.6766	413.6374	623.6145	(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)	677.2348	529.9883	425.5161	237.1174	112.4415	0.0000	0.0000	0.0000	0.0000	237.2117	457.0579	689.0768	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	173.9777	152.5689	158.4017	139.4474	134.8045	117.8041	110.6306	124.8660	125.7420	144.7383	156.2343	168.9367	(64)
Efficiency of water heater (217)m	89.7724	89.7065	89.5434	89.2120	88.6483	87.3000	87.3000	87.3000	87.3000	89.1835	89.5996	87.3000	(216)
Fuel for water heating, kWh/month	193.7985	170.0756	176.8994	156.3102	152.0666	134.9417	126.7247	143.0309	144.0343	162.2926	174.3695	188.1289	(219)
Water heating fuel used													1922.6729 (219)
Annual totals kWh/year													
Space heating fuel - main system													3365.6445 (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)													410.4600 (232)
Total delivered energy for all uses													5773.7774 (238)

10a. Fuel costs - using BEDF prices (514)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3365.6445	9.7400	327.8138 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1922.6729	9.7400	187.2683 (247)
Pumps and fans for heating	75.0000	36.8500	27.6375 (249)
Energy for lighting	410.4600	36.8500	151.2545 (250)
Additional standing charges			104.0000 (251)
Total energy cost			797.9741 (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	3365.6445	0.2160	726.9792 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1922.6729	0.2160	415.2973 (264)
Space and water heating			1142.2766 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	410.4600	0.5190	213.0288 (268)
Total kg/year			1394.2303 (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	3365.6445	1.2200	4106.0863 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1922.6729	1.2200	2345.6609 (264)
Space and water heating			6451.7472 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	410.4600	3.0700	1260.1123 (268)
Primary energy kWh/year			7942.1095 (272)
Primary energy kWh/m2/year			84.8933 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 84
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	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	+ 1.2	-£ 79	-190 kg (13.6%)
U Solar photovoltaic panels	+ 9.6	-£ 699	-985 kg (81.8%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£79	2.03 kg/m ²	B 85 B 88
Solar photovoltaic panels	£699	10.52 kg/m ²	A 95 A 97
Total Savings	£778	12.56 kg/m²	

Potential energy efficiency rating: A 95
 Potential environmental impact rating: A 97

Fuel prices for cost data on this page from database revision number 514 TEST (30 Mar 2023)
 Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£179	£197	-£18
Mains gas	£619	£522	£97
Space heating	£459	£459	£0
Water heating	£187	£108	£79
Lighting	£151	£151	£0
Generated (PV)	-£0	-£699	£699
Total cost of fuels	£798	£20	£778
Total cost of uses	£797	£19	£778
Delivered energy	62 kWh/m ²	31 kWh/m ²	30 kWh/m ²
Carbon dioxide emissions	1.4 tonnes	0.2 tonnes	1.2 tonnes
CO2 emissions per m ²	15 kg/m ²	2 kg/m ²	13 kg/m ²
Primary energy	85 kWh/m ²	11 kWh/m ²	74 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	46.7770 (1b)	2.3100 (2b)	108.0549 (1b) - (3b)
First floor	46.7770 (1c)	2.6100 (2c)	122.0880 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.5540		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 230.1428 (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) =	0.1304 (8)
Pressure test					Yes
Measured/design AP50					5.0100
Infiltration rate					0.3809 (18)
Number of sides sheltered					1 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3523 (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	0.4492	0.4404	0.4316	0.3875	0.3787	0.3347	0.3347	0.3259	0.3523	0.3787	0.3963	0.4139 (22b)
	0.6009	0.5970	0.5931	0.5751	0.5717	0.5560	0.5560	0.5531	0.5621	0.5717	0.5785	0.5857 (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
Solid Door			2.1500	0.9000	1.9350		(26)
Half Glazed Door			3.0900	1.2000	3.7080		(26a)
Windows (Uw = 1.30)			13.3400	1.2357	16.4848		(27)
Flr - Ground			46.7770	0.1911	8.9385	75.6000	3536.3412 (28a)
Brick	95.4160	18.5840	76.8320	0.2500	19.2080	51.2800	3939.9450 (29a)
Rf - Ins Joist	46.7770		46.7770	0.1300	6.0810	5.6000	261.9512 (30)
Total net area of external elements Aum(A, m2)			188.9660				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	56.3553		(33)
Party Wall			44.3100	0.0000	0.0000	39.3700	1744.4847 (32)
Stud			47.9833			7.4000	355.0766 (32c)
Stud			114.4746			7.4000	847.1120 (32c)
Block			31.4252			54.0300	1697.9057 (32c)
Internal Floor			46.7770			7.4000	346.1498 (32d)
Internal Ceiling			46.7770			7.4000	346.1498 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13075.1160 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							139.7601 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.3050 (36)
Total fabric heat loss						(33) + (36) =	64.6603 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	45.6349	45.3374	45.0458	43.6761	43.4198	42.2269	42.2269	42.0060	42.6864	43.4198	43.9382	44.4802 (38)
Heat transfer coeff	110.2951	109.9977	109.7060	108.3364	108.0801	106.8872	106.8872	106.6663	107.3467	108.0801	108.5985	109.1405 (39)
Average = Sum(39)m / 12 =												108.3352 (39)
HLP	1.1789	1.1758	1.1726	1.1580	1.1553	1.1425	1.1425	1.1402	1.1474	1.1553	1.1608	1.1666 (40)
HLP (average)												1.1580 (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												2.6713 (42)
Average daily hot water use (litres/day)												97.6436 (43)
Daily hot water use	107.4080	103.5022	99.5965	95.6907	91.7850	87.8792	87.8792	91.7850	95.6907	99.5965	103.5022	107.4080 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Energy content (annual)	159.2829	139.3098	143.7553	125.3293	120.2565	103.7722	96.1602	110.3452	111.6631	130.1326	142.0499	154.2570 (45)
Distribution loss (46)m = 0.15 x (45)m	23.8924	20.8965	21.5633	18.7994	18.0385	15.5658	14.4240	16.5518	16.7495	19.5199	21.3075	23.1385 (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	14.6948	13.2590	14.6464	14.1181	14.5480	14.0319	14.4704	14.5208	14.0789	14.6057	14.1844	14.6797 (61)
Total heat required for water heating calculated for each month	173.9777	152.5689	158.4017	139.4474	134.8045	117.8041	110.6306	124.8660	125.7420	144.7383	156.2343	168.9367 (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												1.1805 (H8)
Utilisation factor												0.5713 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												97.6436 (H14)
Volume ratio Veff/V												0.7681 (H15)
Solar storage volume factor												0.9472 (H16)
Solar input												-863.0423 (H17)
Solar input	-25.0265	-41.7620	-71.1255	-95.3223	-117.7626	-115.7794	-114.2493	-99.8202	-78.1792	-53.3872	-29.6850	-20.9429 (63)
Solar input (sum of months) = Sum(63)m =												-863.0423 (63)
Output from w/h	148.9512	110.8068	87.2762	44.1252	17.0419	2.0247	0.0000	25.0458	47.5627	91.3511	126.5493	147.9938 (64)
Total per year (kWh/year) = Sum(64)m =												848.7285 (64)
Heat gains from water heating, kWh/month	56.6353	49.6353	51.4602	45.2015	43.6223	38.0122	35.5909	40.3200	40.6477	46.9205	50.7777	54.9604 (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	160.2786	160.2786	160.2786	160.2786	160.2786	160.2786	160.2786	160.2786	160.2786	160.2786	160.2786	160.2786 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	58.1049	51.6082	41.9706	31.7745	23.7518	20.0523	21.6672	28.1638	37.8014	47.9976	56.0203	59.7198 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	366.3678	370.1695	360.5892	340.1939	314.4485	290.2515	274.0864	270.2846	279.8649	300.2602	326.0056	350.2027 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.6992	53.6992	53.6992	53.6992	53.6992	53.6992	53.6992	53.6992	53.6992	53.6992	53.6992	53.6992 (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)	-106.8524	-106.8524	-106.8524	-106.8524	-106.8524	-106.8524	-106.8524	-106.8524	-106.8524	-106.8524	-106.8524	-106.8524 (71)
Water heating gains (Table 5)	76.1227	73.8620	69.1670	62.7799	58.6321	52.7948	47.8372	54.1935	56.4551	63.0652	70.5246	73.8715 (72)
Total internal gains	610.7206	605.7651	581.8522	544.8737	506.9578	473.2238	453.7161	462.7673	484.2468	521.4483	562.6758	593.9193 (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							
Southeast	7.4130	36.7938	0.7100	0.7200	0.7700	96.6258 (77)						
Southwest	1.4380	36.7938	0.7100	0.7200	0.7700	18.7438 (79)						
Northwest	4.4920	11.2829	0.7100	0.7200	0.7700	17.9550 (81)						
Solar gains	133.3246	233.0651	334.7312	441.3005	518.5292	525.4400	502.1438	442.8980	371.3804	261.8578	160.7783	113.3953 (83)
Total gains	744.0453	838.8302	916.5834	986.1742	1025.4870	998.6638	955.8599	905.6652	855.6272	783.3062	723.4541	707.3146 (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, nil _m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	32.9296	33.0187	33.1064	33.5250	33.6045	33.9795	33.9795	34.0499	33.8341	33.6045	33.4441	33.2780	
alpha	3.1953	3.2012	3.2071	3.2350	3.2403	3.2653	3.2653	3.2700	3.2556	3.2403	3.2296	3.2185	
util living area	0.9663	0.9497	0.9198	0.8592	0.7565	0.6067	0.4661	0.5057	0.7072	0.8800	0.9493	0.9708 (86)	
MIT	19.2834	19.5092	19.8550	20.2872	20.6470	20.8792	20.9617	20.9495	20.7909	20.3310	19.7359	19.2407 (87)	
Th 2	19.9369	19.9394	19.9419	19.9537	19.9560	19.9663	19.9663	19.9682	19.9623	19.9560	19.9515	19.9468 (88)	
util rest of house	0.9601	0.9405	0.9048	0.8320	0.7086	0.5302	0.3666	0.4056	0.6374	0.8510	0.9385	0.9654 (89)	
MIT 2	18.3924	18.6154	18.9536	19.3740	19.7010	19.8982	19.9518	19.9476	19.8329	19.4257	18.8503	18.3580 (90)	
Living area fraction									fLA = Living area / (4) =			0.1573 (91)	
MIT	18.5325	18.7560	19.0954	19.5177	19.8498	20.0525	20.1106	20.1052	19.9836	19.5681	18.9896	18.4968 (92)	
Temperature adjustment												-0.1500	
adjusted MIT	18.3825	18.6060	18.9454	19.3677	19.6998	19.9025	19.9606	19.9552	19.8336	19.4181	18.8396	18.3468 (93)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9480	0.9258	0.8874	0.8142	0.6954	0.5251	0.3660	0.4042	0.6277	0.8330	0.9237	0.9544	(94)
Useful gains	705.3780	776.5666	813.3515	802.9417	713.1015	524.4387	349.8876	366.1112	537.0772	652.4596	668.2214	675.0465	(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													
	1553.2352	1507.6244	1365.3381	1134.0303	864.6178	566.7708	359.2094	379.2231	615.4776	953.0636	1274.9059	1543.9918	(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													
	630.8058	491.2708	410.6781	238.3837	112.7281	0.0000	0.0000	0.0000	0.0000	223.6493	436.8128	646.4953	(98)
Space heating													
Space heating per m2													(98) / (4) = 34.1068 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3525.7724 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	630.8058	491.2708	410.6781	238.3837	112.7281	0.0000	0.0000	0.0000	0.0000	223.6493	436.8128	646.4953	(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)	697.0230	542.8407	453.7879	263.4075	124.5615	0.0000	0.0000	0.0000	0.0000	247.1263	482.6661	714.3595	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	148.9512	110.8068	87.2762	44.1252	17.0419	2.0247	0.0000	25.0458	47.5627	91.3511	126.5493	147.9938	(64)
Efficiency of water heater	89.8707	89.8936	89.9223	89.9848	90.0664	87.3000	87.3000	87.3000	87.3000	89.5481	89.7609	89.8863	(216)
(217)m	89.8707	89.8936	89.9223	89.9848	90.0664	87.3000	87.3000	87.3000	87.3000	89.5481	89.7609	89.8863	(217)
Fuel for water heating, kWh/month	165.7393	123.2644	97.0573	49.0362	18.9215	2.3192	0.0000	28.6893	54.4819	102.0134	140.9849	164.6456	(219)
	165.7393	123.2644	97.0573	49.0362	18.9215	2.3192	0.0000	28.6893	54.4819	102.0134	140.9849	164.6456	(219)
Water heating fuel used													
Annual totals kWh/year													
Space heating fuel - main system													3525.7724 (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)													410.4600 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 2.50 * 1080 * 0.80) =										-1727.2394			-1727.2394 (233)
Total delivered energy for all uses													3281.1462 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3525.7724	3.4800	122.6969	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	947.1532	3.4800	32.9609	(247)
Pumps and fans for heating	75.0000	13.1900	9.8925	(249)
Pump for solar water heating	50.0000	13.1900	6.5950	(249)
Energy for lighting	410.4600	13.1900	54.1397	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	-1727.2394	13.1900	-227.8229	(252)
Total energy cost			118.4621	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.3591 (257)
SAP value		94.9906
SAP rating (Section 12)		95 (258)
SAP band		A

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3525.7724	0.2160	761.5668 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	947.1532	0.2160	204.5851 (264)
Space and water heating			966.1519 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	410.4600	0.5190	213.0288 (268)
Energy saving/generation technologies			
PV Unit	-1727.2394	0.5190	-896.4372 (269)
Total kg/year			347.6184 (272)
CO2 emissions per m2			3.7200 (273)
EI value			96.6381
EI rating			97 (274)
EI band			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 (m ²)	Storey height (m)	Volume (m ³)
Ground floor	46.7770 (1b)	2.3100 (2b)	108.0549 (1b) - (3b)
First floor	46.7770 (1c)	2.6100 (2c)	122.0880 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.5540		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 230.1428 (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) =	0.1304 (8)
Pressure test					Yes
Measured/design AP50					5.0100
Infiltration rate					0.3809 (18)
Number of sides sheltered					1 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3523 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.5000	4.5000	4.4000	3.9000	3.8000	3.4000	3.3000	3.3000	3.5000	3.8000	3.9000	4.1000 (22)
Wind factor	1.1250	1.1250	1.1000	0.9750	0.9500	0.8500	0.8250	0.8250	0.8750	0.9500	0.9750	1.0250 (22a)
Adj infilt rate												
Effective ac	0.3963	0.3963	0.3875	0.3435	0.3347	0.2994	0.2906	0.2906	0.3083	0.3347	0.3435	0.3611 (22b)
	0.5785	0.5785	0.5751	0.5590	0.5560	0.5448	0.5422	0.5422	0.5475	0.5560	0.5590	0.5652 (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
Solid Door			2.1500	0.9000	1.9350		(26)
Half Glazed Door			3.0900	1.2000	3.7080		(26a)
Windows (Uw = 1.30)			13.3400	1.2357	16.4848		(27)
Flr - Ground			46.7770	0.1911	8.9385	75.6000	3536.3412 (28a)
Brick	95.4160	18.5840	76.8320	0.2500	19.2080	51.2800	3939.9450 (29a)
Rf - Ins Joist	46.7770		46.7770	0.1300	6.0810	5.6000	261.9512 (30)
Total net area of external elements Aum(A, m ²)			188.9660				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	56.3553		(33)
Party Wall			44.3100	0.0000	0.0000	39.3700	1744.4847 (32)
Stud			47.9833			7.4000	355.0766 (32c)
Stud			114.4746			7.4000	847.1120 (32c)
Block			31.4252			54.0300	1697.9057 (32c)
Internal Floor			46.7770			7.4000	346.1498 (32d)
Internal Ceiling			46.7770			7.4000	346.1498 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13075.1160 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							139.7601 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.3050 (36)
Total fabric heat loss						(33) + (36) =	64.6603 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	43.9382	43.9382	43.6761	42.4537	42.2269	41.3786	41.1812	41.1812	41.5818	42.2269	42.4537	42.9250 (38)
Heat transfer coeff	108.5985	108.5985	108.3364	107.1140	106.8872	106.0389	105.8415	105.8415	106.2421	106.8872	107.1140	107.5853 (39)
Average = Sum(39)m / 12 =												107.0904 (39)
HLP	1.1608	1.1608	1.1580	1.1449	1.1425	1.1335	1.1313	1.1313	1.1356	1.1425	1.1449	1.1500 (40)
HLP (average)												1.1447 (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												2.6713 (42)
Average daily hot water use (litres/day)												97.6436 (43)
Daily hot water use	107.4080	103.5022	99.5965	95.6907	91.7850	87.8792	87.8792	91.7850	95.6907	99.5965	103.5022	107.4080 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Energy content (annual)	159.2829	139.3098	143.7553	125.3293	120.2565	103.7722	96.1602	110.3452	111.6631	130.1326	142.0499	154.2570 (45)
Distribution loss (46)m = 0.15 x (45)m	23.8924	20.8965	21.5633	18.7994	18.0385	15.5658	14.4240	16.5518	16.7495	19.5199	21.3075	23.1385 (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	14.6948	13.2590	14.6464	14.1181	14.5480	14.0319	14.4704	14.5208	14.0789	14.6057	14.1844	14.6797 (61)
Total heat required for water heating calculated for each month	173.9777	152.5689	158.4017	139.4474	134.8045	117.8041	110.6306	124.8660	125.7420	144.7383	156.2343	168.9367 (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												1185.6484 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												1991.8893 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.2965 (H8)
Utilisation factor												0.5376 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												97.6436 (H14)
Volume ratio Veff/V												0.7681 (H15)
Solar storage volume factor												0.9472 (H16)
Solar input												-891.8669 (H17)
Solar input	-25.0130	-42.3886	-72.4221	-99.0752	-115.3462	-122.5274	-116.5735	-103.9739	-82.3646	-55.6464	-33.4016	-23.1343 (63)
Solar input (sum of months) = Sum(63)m =												-891.8669 (63)
Output from w/h	148.9646	110.1803	85.9796	40.3722	19.4583	0.0000	0.0000	20.8921	43.3773	89.0919	122.8327	145.8024 (64)
Total per year (kWh/year) = Sum(64)m =												826.9515 (64)
Heat gains from water heating, kWh/month	56.6353	49.6353	51.4602	45.2015	43.6223	38.0122	35.5909	40.3200	40.6477	46.9205	50.7777	54.9604 (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	160.2786	160.2786	160.2786	160.2786	160.2786	160.2786	160.2786	160.2786	160.2786	160.2786	160.2786	160.2786 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	58.1049	51.6082	41.9706	31.7745	23.7518	20.0523	21.6672	28.1638	37.8014	47.9976	56.0203	59.7198 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	366.3678	370.1695	360.5892	340.1939	314.4485	290.2515	274.0864	270.2846	279.8649	300.2602	326.0056	350.2027 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.6992	53.6992	53.6992	53.6992	53.6992	53.6992	53.6992	53.6992	53.6992	53.6992	53.6992	53.6992 (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)	-106.8524	-106.8524	-106.8524	-106.8524	-106.8524	-106.8524	-106.8524	-106.8524	-106.8524	-106.8524	-106.8524	-106.8524 (71)
Water heating gains (Table 5)	76.1227	73.8620	69.1670	62.7799	58.6321	52.7948	47.8372	54.1935	56.4551	63.0652	70.5246	73.8715 (72)
Total internal gains	610.7206	605.7651	581.8522	544.8737	506.9578	473.2238	453.7161	462.7673	484.2468	521.4483	562.6758	593.9193 (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							
Southeast	7.4130	38.7358	0.7100	0.7200	0.7700	101.7257 (77)						
Southwest	1.4380	38.7358	0.7100	0.7200	0.7700	19.7331 (79)						
Northwest	4.4920	12.1063	0.7100	0.7200	0.7700	19.2652 (81)						
Solar gains	140.7240	249.8858	360.4971	486.2425	539.3550	590.8971	544.3087	489.4458	414.1903	288.4132	191.0538	132.2865 (83)
Total gains	751.4447	855.6510	942.3493	1031.1162	1046.3128	1064.1210	998.0248	952.2131	898.4371	809.8615	753.7296	726.2058 (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, nil _m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	33.4441	33.4441	33.5250	33.9076	33.9795	34.2514	34.3152	34.3152	34.1858	33.9795	33.9076	33.7591
alpha	3.2296	3.2296	3.2350	3.2605	3.2653	3.2834	3.2877	3.2877	3.2791	3.2653	3.2605	3.2506
util living area	0.9651	0.9474	0.9121	0.8417	0.7413	0.5622	0.4455	0.4732	0.6895	0.8723	0.9432	0.9685 (86)
MIT	19.3278	19.5425	19.9228	20.3557	20.6791	20.9083	20.9674	20.9601	20.8077	20.3578	19.7994	19.2984 (87)
Th 2	19.9515	19.9515	19.9537	19.9643	19.9663	19.9736	19.9753	19.9753	19.9718	19.9663	19.9643	19.9602 (88)
util rest of house	0.9587	0.9380	0.8959	0.8124	0.6921	0.4854	0.3500	0.3757	0.6205	0.8426	0.9314	0.9627 (89)
MIT 2	18.4468	18.6565	19.0275	19.4447	19.7366	19.9240	19.9630	19.9597	19.8528	19.4576	18.9212	18.4246 (90)
Living area fraction									fLA = Living area / (4) =			0.1573 (91)
MIT	18.5854	18.7959	19.1683	19.5880	19.8849	20.0788	20.1210	20.1171	20.0030	19.5992	19.0593	18.5620 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.4354	18.6459	19.0183	19.4380	19.7349	19.9288	19.9710	19.9671	19.8530	19.4492	18.9093	18.4120 (93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9466	0.9232	0.8784	0.7953	0.6799	0.4819	0.3496	0.3749	0.6117	0.8248	0.9160	0.9513	(94)
Useful gains	711.2988	789.8953	827.7566	820.0082	711.3629	512.7513	348.9069	356.9826	549.5946	668.0080	690.4461	690.8130	(95)
Ext temp.	4.3000	4.8000	6.6000	9.0000	11.8000	14.8000	16.6000	16.5000	14.0000	10.5000	7.1000	4.2000	(96)
Heat loss rate W													
	1535.0857	1503.6444	1345.3535	1118.0516	848.1364	543.8529	356.7940	366.9619	621.8358	956.5518	1264.9425	1529.0046	(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	0.0000	(97a)
Space heating kWh													
	612.8975	479.6394	385.0921	214.5912	101.7595	0.0000	0.0000	0.0000	0.0000	214.6766	413.6374	623.6145	(98)
Space heating													
Space heating per m2													3045.9082 (98)
													(98) / (4) = 32.5578 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3365.6445 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	612.8975	479.6394	385.0921	214.5912	101.7595	0.0000	0.0000	0.0000	0.0000	214.6766	413.6374	623.6145	(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)	677.2348	529.9883	425.5161	237.1174	112.4415	0.0000	0.0000	0.0000	0.0000	237.2117	457.0579	689.0768	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	148.9646	110.1803	85.9796	40.3722	19.4583	0.0000	0.0000	20.8921	43.3773	89.0919	122.8327	145.8024	(64)
Efficiency of water heater	89.8560	89.8845	89.8986	89.9778	89.9706	87.3000	87.3000	87.3000	87.3000	89.5374	89.7468	89.8757	(216)
(217)m	89.8560	89.8845	89.8986	89.9778	89.9706	87.3000	87.3000	87.3000	87.3000	89.5374	89.7468	89.8757	(217)
Fuel for water heating, kWh/month	165.7815	122.5798	95.6407	44.8691	21.6274	0.0000	0.0000	23.9314	49.6876	99.5024	136.8659	162.2267	(219)
Water heating fuel used													
Annual totals kWh/year													922.7126 (219)
Space heating fuel - main system													3365.6445 (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)													410.4600 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 2.50 * 1186 * 0.80) =										-1897.0374			-1897.0374 (233)
Total delivered energy for all uses													2926.7797 (238)

10a. Fuel costs - using BEDF prices (514)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3365.6445	9.7400	327.8138	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	922.7126	9.7400	89.8722	(247)
Pumps and fans for heating	75.0000	36.8500	27.6375	(249)
Pump for solar water heating	50.0000	36.8500	18.4250	(249)
Energy for lighting	410.4600	36.8500	151.2545	(250)
Additional standing charges			104.0000	(251)
Energy saving/generation technologies				
PV Unit	-1897.0374	36.8500	-699.0583	(252)
Total energy cost			19.9447	(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	3365.6445	0.2160	726.9792	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	922.7126	0.2160	199.3059	(264)
Space and water heating			926.2851	(265)
Pumps and fans	125.0000	0.5190	64.8750	(267)
Energy for lighting	410.4600	0.5190	213.0288	(268)
Energy saving/generation technologies				

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

PV Unit	-1897.0374	0.5190	-984.5624 (269)
Total kg/year			219.6265 (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	3365.6445	1.2200	4106.0863 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	922.7126	1.2200	1125.7094 (264)
Space and water heating			5231.7956 (265)
Pumps and fans	125.0000	3.0700	383.7500 (267)
Energy for lighting	410.4600	3.0700	1260.1123 (268)
Energy saving/generation technologies			
PV Unit	-1897.0374	3.0700	-5823.9049 (269)
Primary energy kWh/year			1051.7530 (272)
Primary energy kWh/m2/year			11.2422 (273)

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Designed)

Property Reference	085 - PRJ013151		Issued on Date	17/04/2023	
Assessment Reference	085	Prop Type Ref	Apple SD		
Property	Coggeshall Phase 1 and 2, 0				
SAP Rating	84 B	DER	16.88	TER	17.47
Environmental	86 B	% DER<TER	3.35		
CO₂ Emissions (t/year)	1.39	DFEE	44.80	TFEE	50.67
General Requirements Compliance	Pass	% DFEE<TFEE	11.58		
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)	17.47	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.88	kgCO ₂ /m ²	Pass
	-0.59 (-3.4%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	50.67	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	44.80	kWh/m ² /yr	
	-5.9 (-11.6%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.25 (max. 0.30)	0.25 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.19 (max. 0.25)	0.19 (max. 0.70)	Pass
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	Pass
Openings	1.24 (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

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
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BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Designed)

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 (Midlands)

Not significant

Pass

Based on:

Overshading

Average

Windows facing South East

7.41 m², No overhang

Windows facing South West

1.44 m², No overhang

Windows facing North West

4.49 m², No overhang

Air change rate

4.66 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

Door U-value

0.90

W/m²K

Roof window U-value

1.10

W/m²K