

PREDICTED ENERGY ASSESSMENT

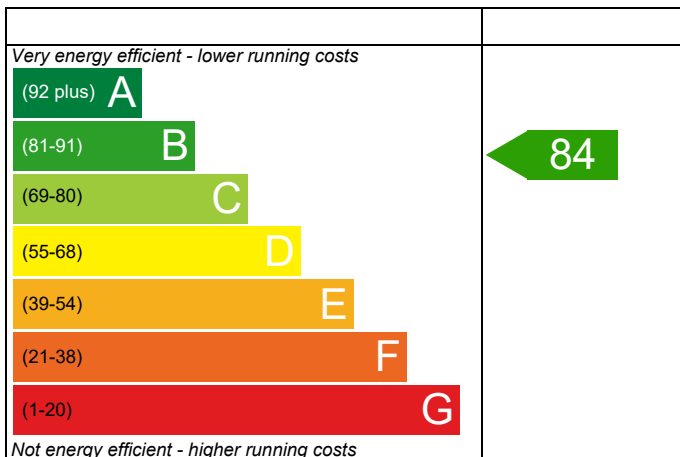
Coggeshall Phase 1 and 2,
0

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

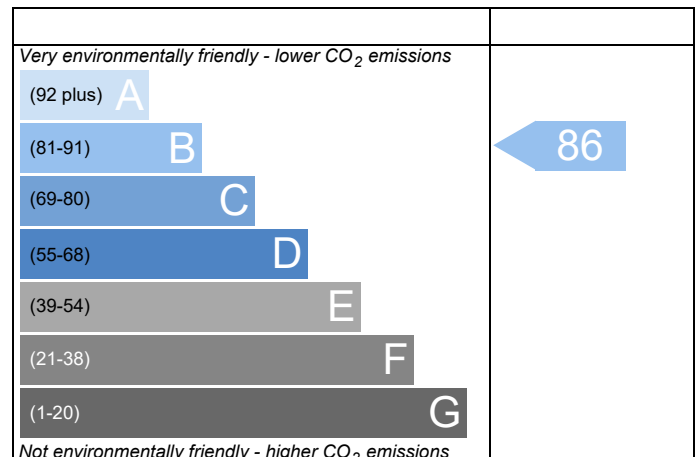


England

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	086 - PRJ013151		Issued on Date	17/04/2023	
Assessment Reference	086	Prop Type Ref	Apple		
Property	Coggeshall Phase 1 and 2, 0				
SAP Rating	84 B	DER	17.05	TER	17.62
Environmental	86 B	% DER<TER	3.23		
CO ₂ Emissions (t/year)	1.41	DFEE	45.45	TTEE	51.45
General Requirements Compliance	Pass	% DFEE<TFEE	11.67		
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	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	5.0100							
Measured/design AP50					0.3809 (18)							
Infiltration rate					1 (19)							
Number of sides sheltered												
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	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)
Effective ac	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)							8.3423 (36)
Total fabric heat loss						(33) + (36) =	64.6976 (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 =	108.6358	108.6358	108.3737	107.1513	106.9245	106.0762	105.8788	105.8788	106.2794	106.9245	107.1513	107.6226 (39)
												107.1277 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1612	1.1612	1.1584	1.1453	1.1429	1.1338	1.1317	1.1317	1.1360	1.1429	1.1453	1.1504 (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 content (annual)	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)	
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	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)	
RHI water heating demand													
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)	
													1708 (64)
													1708 (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 g	Specific data or Table 6c FF	Access factor Table 6d	Gains W						
Northeast	1.4380	12.1063	0.7100	0.7200	0.7700	6.1673 (75)						
Southeast	7.4130	38.7358	0.7100	0.7200	0.7700	101.7257 (77)						
Northwest	4.4920	12.1063	0.7100	0.7200	0.7700	19.2652 (81)						
Solar gains	127.1582	228.5468	336.7836	465.6214	525.5293	579.8050	532.5010	472.4039	390.8381	265.7431	173.1928	119.1797 (83)
Total gains	737.8788	834.3120	918.6359	1010.4950	1032.4871	1053.0289	986.2171	935.1712	875.0849	787.1915	735.8686	713.0990 (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	33.4326	33.4326	33.5135	33.8958	33.9677	34.2393	34.3031	34.3031	34.1738	33.9677	33.8958	33.7473	
alpha	3.2288	3.2288	3.2342	3.2597	3.2645	3.2826	3.2869	3.2869	3.2783	3.2645	3.2597	3.2498	
util living area	0.9668	0.9507	0.9171	0.8479	0.7467	0.5669	0.4503	0.4806	0.7007	0.8798	0.9465	0.9700 (86)	
MIT	19.3088	19.5148	19.8959	20.3379	20.6714	20.9059	20.9663	20.9582	20.7977	20.3358	19.7765	19.2798 (87)	
Th 2	19.9512	19.9512	19.9534	19.9640	19.9659	19.9733	19.9750	19.9750	19.9715	19.9659	19.9640	19.9599 (88)	
util rest of house	0.9606	0.9417	0.9017	0.8193	0.6978	0.4898	0.3540	0.3821	0.6322	0.8512	0.9353	0.9644 (89)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

MIT 2	18.4280	18.6296	19.0019	19.4287	19.7302	19.9223	19.9623	19.9586	19.8455	19.4378	18.8990	18.4060 (90)
Living area fraction									fLA = Living area / (4) =			0.1573 (91)
MIT	18.5666	18.7688	19.1426	19.5717	19.8783	20.0770	20.1202	20.1158	19.9953	19.5790	19.0370	18.5435 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.4166	18.6188	18.9926	19.4217	19.7283	19.9270	19.9702	19.9658	19.8453	19.4290	18.8870	18.3935 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9488	0.9273	0.8843	0.8019	0.6853	0.4861	0.3535	0.3812	0.6228	0.8333	0.9203	0.9533 (94)
Useful gains	700.0942	773.6325	812.3639	810.3609	707.5738	511.9111	348.6716	356.4671	545.0256	655.9966	677.1996	679.8152 (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												
1533.5651	1501.2188	1343.0278	1116.6982	847.7273	543.8526	356.8342	366.9579	621.2363	954.7301	1262.9966	1527.5387 (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												
620.1024	488.9380	394.8140	220.5629	104.2742	0.0000	0.0000	0.0000	0.0000	222.2577	421.7739	630.7063 (98)	
Space heating												3103.4293 (98)
RHI space heating demand												3103 (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)							8.3423 (36)
Total fabric heat loss						(33) + (36) =	64.6976 (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	110.3325	110.0350	109.7434	108.3737	108.1174	106.9245	106.9245	106.7036	107.3840	108.1174	108.6358	109.1778 (39)
Average = Sum(39)m / 12 =												108.3725 (39)
HLP	1.1793	1.1762	1.1730	1.1584	1.1557	1.1429	1.1429	1.1406	1.1478	1.1557	1.1612	1.1670 (40)
HLP (average)												1.1584 (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						
Northeast	1.4380	11.2829	0.7100	0.7200	0.7700	5.7478 (75)						
Southeast	7.4130	36.7938	0.7100	0.7200	0.7700	96.6258 (77)						
Northwest	4.4920	11.2829	0.7100	0.7200	0.7700	17.9550 (81)						
Solar gains	120.3287	212.8374	312.1259	421.7916	504.4360	514.8614	490.5247	426.7167	349.7647	240.8692	145.5598	102.0485 (83)
Total gains	731.0493	818.6025	893.9781	966.6652	1011.3938	988.0853	944.2408	889.4840	834.0115	762.3175	708.2356	695.9678 (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	32.9185	33.0075	33.0952	33.5135	33.5929	33.9677	33.9677	34.0380	33.8223	33.5929	33.4326	33.2666
alpha	3.1946	3.2005	3.2063	3.2342	3.2395	3.2645	3.2645	3.2692	3.2548	3.2395	3.2288	3.2178
util living area	0.9679	0.9527	0.9243	0.8648	0.7619	0.6115	0.4711	0.5134	0.7179	0.8868	0.9520	0.9721 (86)
MIT	19.2651	19.4828	19.8287	20.2692	20.6385	20.8762	20.9605	20.9472	20.7807	20.3100	19.7160	19.2244 (87)
Th 2	19.9366	19.9391	19.9416	19.9534	19.9556	19.9659	19.9659	19.9678	19.9620	19.9556	19.9512	19.9465 (88)
util rest of house	0.9619	0.9440	0.9100	0.8383	0.7144	0.5349	0.3709	0.4123	0.6486	0.8589	0.9416	0.9668 (89)
MIT 2	18.3743	18.5896	18.9285	19.3576	19.6939	19.8961	19.9509	19.9463	19.8255	19.4067	18.8309	18.3417 (90)
Living area fraction									fLA = Living area / (4) =			0.1573 (91)
MIT	18.5144	18.7301	19.0701	19.5010	19.8425	20.0502	20.1097	20.1037	19.9757	19.5488	18.9701	18.4806 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.3644	18.5801	18.9201	19.3510	19.6925	19.9002	19.9597	19.9537	19.8257	19.3988	18.8201	18.3306 (93)

8. Space heating requirement

Utilisation	0.9501	0.9296	0.8928	0.8204	0.7009	0.5296	0.3702	0.4108	0.6384	0.8408	0.9271	0.9561 (94)
Useful gains	694.5772	760.9898	798.1621	793.0552	708.8961	523.3045	349.5900	365.4354	532.4247	640.9586	656.6167	665.4145 (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	1551.7631	1505.2904	1363.0244	1132.6154	864.1319	566.7259	359.2382	379.1944	614.8505	951.3069	1273.2248	1542.7438 (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	637.7463	500.1700	420.2575	244.4833	115.4954	0.0000	0.0000	0.0000	0.0000	230.8991	443.9578	652.7331 (98)
Space heating												3245.7425 (98)
Space heating per m2												(98) / (4) = 34.6938 (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

	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													3586.4558 (211)
Space heating requirement	637.7463	500.1700	420.2575	244.4833	115.4954	0.0000	0.0000	0.0000	0.0000	230.8991	443.9578	652.7331	(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)	704.6921	552.6740	464.3730	270.1473	127.6192	0.0000	0.0000	0.0000	0.0000	255.1371	490.5611	721.2520	(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	89.7945	89.7312	89.6009	89.3110	88.7480	87.3000	87.3000	87.3000	87.3000	89.2396	89.6446	87.3000	(216)
Fuel for water heating, kWh/month	193.7508	170.0287	176.7858	156.1370	151.8959	134.9417	126.7247	143.0309	144.0343	162.1907	174.2818	188.0772	(219)
Water heating fuel used													1921.8794 (219)
Annual totals kWh/year													
Space heating fuel - main system													3586.4558 (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													5993.7953 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3586.4558	3.4800	124.8087 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1921.8794	3.4800	66.8814 (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			375.7222 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.1389 (257)
SAP value		84.1119
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	3586.4558	0.2160	774.6745 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1921.8794	0.2160	415.1260 (264)
Space and water heating			1189.8004 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	410.4600	0.5190	213.0288 (268)
Total kg/year			1441.7542 (272)
CO2 emissions per m2			15.4100 (273)
EI value			86.0563
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	$3.48 / 0.8876 = 3.921$, stars = 4
Water heating environmental impact	$0.216 / 0.8876 = 0.2434$, 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)							8.3423 (36)
Total fabric heat loss						(33) + (36) =	64.6976 (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	108.6358	108.6358	108.3737	107.1513	106.9245	106.0762	105.8788	105.8788	106.2794	106.9245	107.1513	107.6226 (39)
Average = Sum(39)m / 12 =												107.1277 (39)
HLP	1.1612	1.1612	1.1584	1.1453	1.1429	1.1338	1.1317	1.1317	1.1360	1.1429	1.1453	1.1504 (40)
HLP (average)												1.1451 (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												
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 m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W						
Northeast	1.4380	12.1063	0.7100	0.7200	0.7700	6.1673 (75)						
Southeast	7.4130	38.7358	0.7100	0.7200	0.7700	101.7257 (77)						
Northwest	4.4920	12.1063	0.7100	0.7200	0.7700	19.2652 (81)						
Solar gains	127.1582	228.5468	336.7836	465.6214	525.5293	579.8050	532.5010	472.4039	390.8381	265.7431	173.1928	119.1797 (83)
Total gains	737.8788	834.3120	918.6359	1010.4950	1032.4871	1053.0289	986.2171	935.1712	875.0849	787.1915	735.8686	713.0990 (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	33.4326	33.4326	33.5135	33.8958	33.9677	34.2393	34.3031	34.3031	34.1738	33.9677	33.8958	33.7473	
alpha	3.2288	3.2288	3.2342	3.2597	3.2645	3.2826	3.2869	3.2869	3.2783	3.2645	3.2597	3.2498	
util living area	0.9668	0.9507	0.9171	0.8479	0.7467	0.5669	0.4503	0.4806	0.7007	0.8798	0.9465	0.9700 (86)	
MIT	19.3088	19.5148	19.8959	20.3379	20.6714	20.9059	20.9663	20.9582	20.7977	20.3358	19.7765	19.2798 (87)	
Th 2	19.9512	19.9512	19.9534	19.9640	19.9659	19.9733	19.9750	19.9750	19.9715	19.9659	19.9640	19.9599 (88)	
util rest of house	0.9606	0.9417	0.9017	0.8193	0.6978	0.4898	0.3540	0.3821	0.6322	0.8512	0.9353	0.9644 (89)	
MIT 2	18.4280	18.6296	19.0019	19.4287	19.7302	19.9223	19.9623	19.9586	19.8455	19.4378	18.8990	18.4060 (90)	
Living area fraction									fLA = Living area / (4) =			0.1573 (91)	
MIT	18.5666	18.7688	19.1426	19.5717	19.8783	20.0770	20.1202	20.1158	19.9953	19.5790	19.0370	18.5435 (92)	
Temperature adjustment												-0.1500	
adjusted MIT	18.4166	18.6188	18.9926	19.4217	19.7283	19.9270	19.9702	19.9658	19.8453	19.4290	18.8870	18.3935 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9488	0.9273	0.8843	0.8019	0.6853	0.4861	0.3535	0.3812	0.6228	0.8333	0.9203	0.9533 (94)	
Useful gains	700.0942	773.6325	812.3639	810.3609	707.5738	511.9111	348.6716	356.4671	545.0256	655.9966	677.1996	679.8152 (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	1533.5651	1501.2188	1343.0278	1116.6982	847.7273	543.8526	356.8342	366.9579	621.2363	954.7301	1262.9966	1527.5387 (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	620.1024	488.9380	394.8140	220.5629	104.2742	0.0000	0.0000	0.0000	0.0000	222.2577	421.7739	630.7063 (98)	
Space heating												3103.4293 (98)	
Space heating per m ²												(98) / (4) =	33.1726 (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													3429.2037 (211)
Space heating requirement	620.1024	488.9380	394.8140	220.5629	104.2742	0.0000	0.0000	0.0000	0.0000	222.2577	421.7739	630.7063	(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)	685.1960	540.2630	436.2585	243.7159	115.2201	0.0000	0.0000	0.0000	0.0000	245.5887	466.0485	696.9130	(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	89.7790	89.7179	89.5600	89.2331	88.6674	87.3000	87.3000	87.3000	87.3000	89.2103	89.6121	87.3000	(216)
Fuel for water heating, kWh/month	193.7844	170.0540	176.8665	156.2733	152.0339	134.9417	126.7247	143.0309	144.0343	162.2439	174.3451	188.1159	(219)
Water heating fuel used													1922.4485 (219)
Annual totals kWh/year													
Space heating fuel - main system													3429.2037 (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													5837.1123 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3429.2037	9.7400	334.0044 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1922.4485	9.7400	187.2465 (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			804.1429 (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	3429.2037	0.2160	740.7080 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1922.4485	0.2160	415.2489 (264)
Space and water heating			1155.9569 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	410.4600	0.5190	213.0288 (268)
Total kg/year			1407.9106 (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	3429.2037	1.2200	4183.6285 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1922.4485	1.2200	2345.3872 (264)
Space and water heating			6529.0157 (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			8019.3780 (272)
Primary energy kWh/m2/year			85.7192 (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 (13.5%)
U Solar photovoltaic panels	+ 9.6	-£ 699	-985 kg (80.8%)

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/m ²	

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	£625	£528	£97
Space heating	£466	£466	£0
Water heating	£187	£108	£79
Lighting	£151	£151	£0
Generated (PV)	-£0	-£699	£699
Total cost of fuels	£804	£26	£778
Total cost of uses	£804	£26	£778
Delivered energy	62 kWh/m ²	32 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	86 kWh/m ²	12 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 (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	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 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)							8.3423 (36)
Total fabric heat loss						(33) + (36) =	64.6976 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	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)
Average = Sum(39)m / 12 =	110.3325	110.0350	109.7434	108.3737	108.1174	106.9245	106.9245	106.7036	107.3840	108.1174	108.6358	109.1778 (39)
HLP	1.1793	1.1762	1.1730	1.1584	1.1557	1.1429	1.1429	1.1406	1.1478	1.1557	1.1612	1.1670 (40)
HLP (average)												1.1584 (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							
Northeast	1.4380	11.2829	0.7100	0.7200	0.7700	5.7478 (75)						
Southeast	7.4130	36.7938	0.7100	0.7200	0.7700	96.6258 (77)						
Northwest	4.4920	11.2829	0.7100	0.7200	0.7700	17.9550 (81)						
Solar gains	120.3287	212.8374	312.1259	421.7916	504.4360	514.8614	490.5247	426.7167	349.7647	240.8692	145.5598	102.0485 (83)
Total gains	731.0493	818.6025	893.9781	966.6652	1011.3938	988.0853	944.2408	889.4840	834.0115	762.3175	708.2356	695.9678 (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	32.9185	33.0075	33.0952	33.5135	33.5929	33.9677	33.9677	34.0380	33.8223	33.5929	33.4326	33.2666	
alpha	3.1946	3.2005	3.2063	3.2342	3.2395	3.2645	3.2645	3.2692	3.2548	3.2395	3.2288	3.2178	
util living area	0.9679	0.9527	0.9243	0.8648	0.7619	0.6115	0.4711	0.5134	0.7179	0.8868	0.9520	0.9721 (86)	
MIT	19.2651	19.4828	19.8287	20.2692	20.6385	20.8762	20.9605	20.9472	20.7807	20.3100	19.7160	19.2244 (87)	
Th 2	19.9366	19.9391	19.9416	19.9534	19.9556	19.9659	19.9659	19.9678	19.9620	19.9556	19.9512	19.9465 (88)	
util rest of house	0.9619	0.9440	0.9100	0.8383	0.7144	0.5349	0.3709	0.4123	0.6486	0.8589	0.9416	0.9668 (89)	
MIT 2	18.3743	18.5896	18.9285	19.3576	19.6939	19.8961	19.9509	19.9463	19.8255	19.4067	18.8309	18.3417 (90)	
Living area fraction									f _{LA} = Living area / (4) =			0.1573 (91)	
MIT	18.5144	18.7301	19.0701	19.5010	19.8425	20.0502	20.1097	20.1037	19.9757	19.5488	18.9701	18.4806 (92)	
Temperature adjustment												-0.1500	
adjusted MIT	18.3644	18.5801	18.9201	19.3510	19.6925	19.9002	19.9597	19.9537	19.8257	19.3988	18.8201	18.3306 (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	0.9501	0.9296	0.8928	0.8204	0.7009	0.5296	0.3702	0.4108	0.6384	0.8408	0.9271	0.9561	(94)
Useful gains	694.5772	760.9898	798.1621	793.0552	708.8961	523.3045	349.5900	365.4354	532.4247	640.9586	656.6167	665.4145	(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													
	1551.7631	1505.2904	1363.0244	1132.6154	864.1319	566.7259	359.2382	379.1944	614.8505	951.3069	1273.2248	1542.7438	(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													
	637.7463	500.1700	420.2575	244.4833	115.4954	0.0000	0.0000	0.0000	0.0000	230.8991	443.9578	652.7331	(98)
Space heating													
Space heating per m2													(98) / (4) = 34.6938 (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													3586.4558 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	637.7463	500.1700	420.2575	244.4833	115.4954	0.0000	0.0000	0.0000	0.0000	230.8991	443.9578	652.7331	(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)	704.6921	552.6740	464.3730	270.1473	127.6192	0.0000	0.0000	0.0000	0.0000	255.1371	490.5611	721.2520	(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	89.8762	89.9023	89.9331	89.9956	90.0755	87.3000	87.3000	87.3000	87.3000	89.5693	89.7701	87.3000	(216)
(217)m	89.8762	89.9023	89.9331	89.9956	90.0755	87.3000	87.3000	87.3000	87.3000	89.5693	89.7701	87.3000	(217)
Fuel for water heating, kWh/month	165.7292	123.2524	97.0456	49.0303	18.9196	2.3192	0.0000	28.6893	54.4819	101.9893	140.9704	164.6369	(219)
	165.7292	123.2524	97.0456	49.0303	18.9196	2.3192	0.0000	28.6893	54.4819	101.9893	140.9704	164.6369	(219)
Water heating fuel used													
Annual totals kWh/year													
Space heating fuel - main system													3586.4558 (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													3341.7407 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3586.4558	3.4800	124.8087	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	947.0642	3.4800	32.9578	(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			120.5708	(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] =	0.3655	(257)
SAP value		94.9015	
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	3586.4558	0.2160	774.6745 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	947.0642	0.2160	204.5659 (264)
Space and water heating			979.2403 (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			360.7068 (272)
CO2 emissions per m2			3.8600 (273)
EI value			96.5115
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)							8.3423 (36)
Total fabric heat loss						(33) + (36) =	64.6976 (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	108.6358	108.6358	108.3737	107.1513	106.9245	106.0762	105.8788	105.8788	106.2794	106.9245	107.1513	107.6226 (39)
Average = Sum(39)m / 12 =												107.1277 (39)
HLP	1.1612	1.1612	1.1584	1.1453	1.1429	1.1338	1.1317	1.1317	1.1360	1.1429	1.1453	1.1504 (40)
HLP (average)												1.1451 (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												
(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						
Northeast		1.4380	12.1063	0.7100	0.7200	0.7700	6.1673 (75)					
Southeast		7.4130	38.7358	0.7100	0.7200	0.7700	101.7257 (77)					
Northwest		4.4920	12.1063	0.7100	0.7200	0.7700	19.2652 (81)					
Solar gains	127.1582	228.5468	336.7836	465.6214	525.5293	579.8050	532.5010	472.4039	390.8381	265.7431	173.1928	119.1797 (83)
Total gains	737.8788	834.3120	918.6359	1010.4950	1032.4871	1053.0289	986.2171	935.1712	875.0849	787.1915	735.8686	713.0990 (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	33.4326	33.4326	33.5135	33.8958	33.9677	34.2393	34.3031	34.3031	34.1738	33.9677	33.8958	33.7473
alpha	3.2288	3.2288	3.2342	3.2597	3.2645	3.2826	3.2869	3.2869	3.2783	3.2645	3.2597	3.2498
util living area	0.9668	0.9507	0.9171	0.8479	0.7467	0.5669	0.4503	0.4806	0.7007	0.8798	0.9465	0.9700 (86)
MIT	19.3088	19.5148	19.8959	20.3379	20.6714	20.9059	20.9663	20.9582	20.7977	20.3358	19.7765	19.2798 (87)
Th 2	19.9512	19.9512	19.9534	19.9640	19.9659	19.9733	19.9750	19.9750	19.9715	19.9659	19.9640	19.9599 (88)
util rest of house	0.9606	0.9417	0.9017	0.8193	0.6978	0.4898	0.3540	0.3821	0.6322	0.8512	0.9353	0.9644 (89)
MIT 2	18.4280	18.6296	19.0019	19.4287	19.7302	19.9223	19.9623	19.9586	19.8455	19.4378	18.8990	18.4060 (90)
Living area fraction									fLA = Living area / (4) =			0.1573 (91)
MIT	18.5666	18.7688	19.1426	19.5717	19.8783	20.0770	20.1202	20.1158	19.9953	19.5790	19.0370	18.5435 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.4166	18.6188	18.9926	19.4217	19.7283	19.9270	19.9702	19.9658	19.8453	19.4290	18.8870	18.3935 (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	0.9488	0.9273	0.8843	0.8019	0.6853	0.4861	0.3535	0.3812	0.6228	0.8333	0.9203	0.9533	(94)
Useful gains	700.0942	773.6325	812.3639	810.3609	707.5738	511.9111	348.6716	356.4671	545.0256	655.9966	677.1996	679.8152	(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													
	1533.5651	1501.2188	1343.0278	1116.6982	847.7273	543.8526	356.8342	366.9579	621.2363	954.7301	1262.9966	1527.5387	(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													
	620.1024	488.9380	394.8140	220.5629	104.2742	0.0000	0.0000	0.0000	0.0000	222.2577	421.7739	630.7063	(98)
Space heating													
Space heating per m2													(98) / (4) = 33.1726 (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													3429.2037 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	620.1024	488.9380	394.8140	220.5629	104.2742	0.0000	0.0000	0.0000	0.0000	222.2577	421.7739	630.7063	(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)	685.1960	540.2630	436.2585	243.7159	115.2201	0.0000	0.0000	0.0000	0.0000	245.5887	466.0485	696.9130	(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	89.8620	89.8940	89.9106	89.9896	89.9813	87.3000	87.3000	87.3000	87.3000	89.5606	89.7579	89.8814	(216)
(217)m	89.8620	89.8940	89.9106	89.9896	89.9813	87.3000	87.3000	87.3000	87.3000	89.5606	89.7579	89.8814	(217)
Fuel for water heating, kWh/month	165.7705	122.5669	95.6278	44.8632	21.6248	0.0000	0.0000	23.9314	49.6876	99.4767	136.8489	162.2165	(219)
Water heating fuel used													
Annual totals kWh/year													922.6142 (219)
Space heating fuel - main system													3429.2037 (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													2990.2406 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3429.2037	9.7400	334.0044	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	922.6142	9.7400	89.8626	(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			26.1258	(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	3429.2037	0.2160	740.7080	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	922.6142	0.2160	199.2847	(264)
Space and water heating			939.9927	(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			233.3340 (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	3429.2037	1.2200	4183.6285 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	922.6142	1.2200	1125.5894 (264)
Space and water heating			5309.2179 (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			1129.1753 (272)
Primary energy kWh/m2/year			12.0698 (273)

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Designed)

Property Reference	086 - PRJ013151		Issued on Date	17/04/2023	
Assessment Reference	086	Prop Type Ref	Apple		
Property	Coggeshall Phase 1 and 2, 0				
SAP Rating	84 B	DER	17.05	TER	17.62
Environmental	86 B	% DER<TER	3.23		
CO₂ Emissions (t/year)	1.41	DFEE	45.45	TFEE	51.45
General Requirements Compliance	Pass	% DFEE<TFEE	11.67		
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)	17.62	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	17.05	kgCO ₂ /m ²	Pass
	-0.57 (-3.2%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	51.45	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	45.45	kWh/m ² /yr	
	-6.1 (-11.8%)	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 North East

1.44 m², No overhang

Windows facing South East

7.41 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