

PREDICTED ENERGY ASSESSMENT

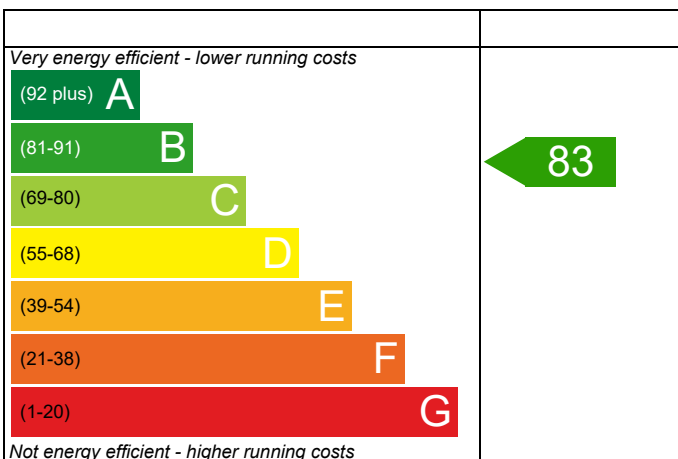
Coggeshall Phase 1 and 2,
0

Dwelling type: House, Semi-Detached
Date of assessment: 17/04/2023
Produced by: Scott Binstead
Total floor area: 78.982 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

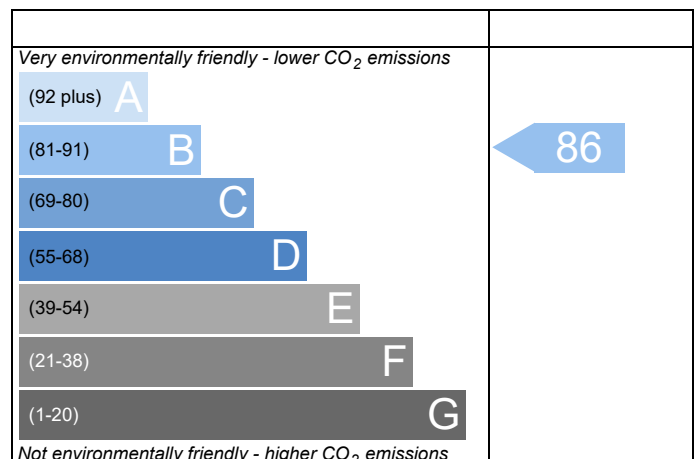


England

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	070 - PRJ013151				Issued on Date	17/04/2023
Assessment Reference	070	Prop Type Ref	Cherry			
Property	Coggeshall Phase 1 and 2, 0					
SAP Rating	83 B	DER	18.20	TER	18.90	
Environmental	86 B	% DER<TER	3.69			
CO ₂ Emissions (t/year)	1.28	DFEE	47.39	TFEE	53.76	
General Requirements Compliance	Pass	% DFEE<TFEE	11.84			
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	39.4910 (1b)	x 2.3100 (2b)	= 91.2242 (1b) - (3b)
First floor	39.4910 (1c)	x 2.6100 (2c)	= 103.0715 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.9820		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 194.2957 (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)				
							Air changes per hour					
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						30.0000 / (5) =	0.1544 (8)				
Pressure test							Yes					
Measured/design AP50							5.0100					
Infiltration rate							0.4049	(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) =	0.3745 (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	0.4214	0.4214	0.4120	0.3652	0.3558	0.3184	0.3090	0.3090	0.3277	0.3558	0.3652	0.3839 (22b)
Effective ac	0.5888	0.5888	0.5849	0.5667	0.5633	0.5507	0.5477	0.5477	0.5537	0.5633	0.5667	0.5737 (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)			11.2500	1.2357	13.9021		(27)
Fir - Ground			39.4910	0.1938	7.6552	75.6000	2985.5196 (28a)
Brick	87.6290	16.4910	71.1380	0.2500	17.7845	51.2800	3647.9566 (29a)
Rf - Ins Joist	39.4910		39.4910	0.1300	5.1338	5.6000	221.1496 (30)
Total net area of external elements Aum(A, m ²)			166.6100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	50.1186			(33)
Party Wall			41.0080	0.0000	0.0000	39.3700	1614.4850 (32)
Stud			68.1080			7.4000	503.9995 (32c)
Stud			83.9898			7.4000	621.5245 (32c)
Internal Floor			39.4910			7.4000	292.2334 (32d)
Internal Ceiling			39.4910			7.4000	292.2334 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	10179.1016 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							128.8788 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.5051 (36)
Total fabric heat loss						(33) + (36) =	57.6237 (37)

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

(38)m	Jan 37.7505	Feb 37.7505	Mar 37.5003	Apr 36.3339	May 36.1174	Jun 35.3080	Jul 35.1196	Aug 35.1196	Sep 35.5019	Oct 36.1174	Nov 36.3339	Dec 36.7836 (38)
Heat transfer coeff	95.3742	95.3742	95.1240	93.9576	93.7411	92.9317	92.7433	92.7433	93.1256	93.7411	93.9576	94.4073 (39)
Average = Sum(39)m / 12 =												93.9351 (39)
HLP	Jan 1.2075	Feb 1.2075	Mar 1.2044	Apr 1.1896	May 1.1869	Jun 1.1766	Jul 1.1742	Aug 1.1742	Sep 1.1791	Oct 1.1869	Nov 1.1896	Dec 1.1953 (40)
HLP (average)												1.1893 (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												2.4433 (42)
Average daily hot water use (litres/day)												92.2275 (43)
Daily hot water use	Jan 101.4502	Feb 97.7611	Mar 94.0720	Apr 90.3829	May 86.6938	Jun 83.0047	Jul 83.0047	Aug 86.6938	Sep 90.3829	Oct 94.0720	Nov 97.7611	Dec 101.4502 (44)
Energy conte	150.4477	131.5825	135.7814	118.3775	113.5860	98.0161	90.8263	104.2246	105.4693	122.9143	134.1706	145.7006 (45)
Energy content (annual)										Total = Sum(45)m =		1451.0971 (45)
Distribution loss (46)m = 0.15 x (45)m	22.5672	19.7374	20.3672	17.7566	17.0379	14.7024	13.6240	15.6337	15.8204	18.4372	20.1256	21.8551 (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	14.6683	13.2270	14.6001	14.0793	14.5123	14.0024	14.4431	14.4880	14.0443	14.5638	14.1518	14.6540 (61)
Total heat required for water heating calculated for each month	165.1160	144.8095	150.3815	132.4568	128.0984	112.0185	105.2694	118.7125	119.5136	137.4781	148.3224	160.3546 (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)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h	165.1160	144.8095	150.3815	132.4568	128.0984	112.0185	105.2694	118.7125	119.5136	137.4781	148.3224	160.3546 (64)
RHI water heating demand										Total per year (kWh/year) = Sum(64)m =		1622.5314 (64)
Heat gains from water heating, kWh/month	53.6909	47.0579	48.7973	42.8803	41.3954	36.0910	33.8105	38.2767	38.5796	44.5100	48.1497	52.1089 (65)

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

Metabolic gains (Table 5), Watts	Jan 146.5957	Feb 146.5957	Mar 146.5957	Apr 146.5957	May 146.5957	Jun 146.5957	Jul 146.5957	Aug 146.5957	Sep 146.5957	Oct 146.5957	Nov 146.5957	Dec 146.5957 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	51.4518	45.6990	37.1649	28.1362	21.0322	17.7562	19.1862	24.9390	33.4731	42.5018	49.6058	52.8818 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	324.3280	327.6935	319.2126	301.1576	278.3664	256.9459	242.6357	239.2701	247.7511	265.8061	288.5973	310.0178 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.1028	52.1028	52.1028	52.1028	52.1028	52.1028	52.1028	52.1028	52.1028	52.1028	52.1028	52.1028 (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)	-97.7305	-97.7305	-97.7305	-97.7305	-97.7305	-97.7305	-97.7305	-97.7305	-97.7305	-97.7305	-97.7305	-97.7305 (71)
Water heating gains (Table 5)	72.1652	70.0267	65.5878	59.5560	55.6390	50.1263	45.4443	51.4471	53.5828	59.8252	66.8746	70.0389 (72)
Total internal gains	551.9131	547.3873	525.9334	492.8179	459.0056	428.7965	411.2342	419.6243	438.7751	472.1012	509.0458	536.9066 (73)

6. Solar gains

[Jan]			Area m2		Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
Northeast			6.1090		12.1063		0.7100		0.7200		0.7700		26.2002 (75)
Southeast			1.5230		38.7358		0.7100		0.7200		0.7700		20.8995 (77)
Southwest			3.6180		38.7358		0.7100		0.7200		0.7700		49.6484 (79)
Solar gains	96.7481	176.2371	265.6642	376.6775	432.4298	480.3002	439.8645	385.1570	311.5182	206.5720	132.2487	90.3753	(83)
Total gains	648.6612	723.6244	791.5975	869.4954	891.4355	909.0967	851.0987	804.7813	750.2933	678.6732	641.2945	627.2818	(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 29.6467	Feb 29.6467	Mar 29.7247	Apr 30.0937	May 30.1632	Jun 30.4259	Jul 30.4877	Aug 30.4877	Sep 30.3625	Oct 30.1632	Nov 30.0937	Dec 29.9503
alpha	2.9764	2.9764	2.9816	3.0062	3.0109	3.0284	3.0325	3.0325	3.0242	3.0109	3.0062	2.9967
util living area	0.9579	0.9415	0.9073	0.8380	0.7381	0.5644	0.4511	0.4819	0.6964	0.8692	0.9363	0.9615 (86)
MIT	19.1592	19.3632	19.7641	20.2403	20.6103	20.8794	20.9539	20.9435	20.7529	20.2481	19.6560	19.1308 (87)
Th 2	19.9140	19.9140	19.9165	19.9283	19.9305	19.9388	19.9407	19.9407	19.9368	19.9305	19.9283	19.9238 (88)
util rest of house	0.9506	0.9316	0.8909	0.8089	0.6892	0.4869	0.3530	0.3817	0.6280	0.8397	0.9237	0.9549 (89)
MIT 2	18.2605	18.4598	18.8515	19.3122	19.6487	19.8721	19.9228	19.9178	19.7807	19.3316	18.7607	18.2398 (90)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Living area fraction									fLA = Living area / (4) =			0.1634 (91)
MIT	18.4073	18.6074	19.0006	19.4638	19.8058	20.0367	20.0912	20.0854	19.9395	19.4813	18.9070	18.3854 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.2573	18.4574	18.8506	19.3138	19.6558	19.8867	19.9412	19.9354	19.7895	19.3313	18.7570	18.2354 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9360	0.9145	0.8711	0.7895	0.6751	0.4829	0.3531	0.3811	0.6174	0.8196	0.9061	0.9410	(94)
Useful gains	607.1421	661.7353	689.5764	686.4491	601.8077	438.9758	300.5150	306.7403	463.2167	556.2707	581.0607	590.2861	(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													
Month fracti	1331.1689	1302.5598	1165.3246	969.0617	736.4150	472.7115	309.8777	318.6122	539.1545	827.8579	1095.2608	1325.0412	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating	538.6759	430.6341	353.9567	203.4811	100.1479	0.0000	0.0000	0.0000	0.0000	202.0609	370.2241	546.6578	(98)
RHI space heating demand												2745.8383	(98)
												2746	(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 (m ²)	Storey height (m)	Volume (m ³)
Ground floor	39.4910 (1b)	x 2.3100 (2b)	= 91.2242 (1b) - (3b)
First floor	39.4910 (1c)	x 2.6100 (2c)	= 103.0715 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.9820		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 194.2957 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 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) = 0.1544 (8)
Pressure test					Yes
Measured/design AP50					5.0100
Infiltration rate					0.4049 (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) =		0.3745 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4775	0.4682	0.4588	0.4120	0.4026	0.3558	0.3558	0.3464	0.3745	0.4026	0.4214	0.4401 (22b)
Effective ac	0.6140	0.6096	0.6053	0.5849	0.5811	0.5633	0.5633	0.5600	0.5701	0.5811	0.5888	0.5968 (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)			11.2500	1.2357	13.9021		(27)
Flr - Ground			39.4910	0.1938	7.6552	75.6000	2985.5196 (28a)
Brick	87.6290	16.4910	71.1380	0.2500	17.7845	51.2800	3647.9566 (29a)
Rf - Ins Joist	39.4910		39.4910	0.1300	5.1338	5.6000	221.1496 (30)
Total net area of external elements Aum(A, m ²)			166.6100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	50.1186		(33)
Party Wall			41.0080	0.0000	0.0000	39.3700	1614.4850 (32)
Stud			68.1080			7.4000	503.9995 (32c)
Stud			83.9898			7.4000	621.5245 (32c)
Internal Floor			39.4910			7.4000	292.2334 (32d)
Internal Ceiling			39.4910			7.4000	292.2334 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 10179.1016 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 128.8788 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.5051 (36)
Total fabric heat loss (33) + (36) = 57.6237 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	39.3694	39.0855	38.8073	37.5003	37.2558	36.1174	36.1174	35.9066	36.5559	37.2558	37.7505	38.2676 (38)
Heat transfer coeff	96.9931	96.7092	96.4310	95.1240	94.8795	93.7411	93.7411	93.5303	94.1796	94.8795	95.3742	95.8913 (39)
Average = Sum(39)m / 12 =												95.1228 (39m)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2280	1.2244	1.2209	1.2044	1.2013	1.1869	1.1869	1.1842	1.1924	1.2013	1.2075	1.2141 (40)
HLP (average)												1.2044 (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 2.4433 (42)
Average daily hot water use (litres/day) 92.2275 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	101.4502	97.7611	94.0720	90.3829	86.6938	83.0047	83.0047	86.6938	90.3829	94.0720	97.7611	101.4502 (44)
Energy conte	150.4477	131.5825	135.7814	118.3775	113.5860	98.0161	90.8263	104.2246	105.4693	122.9143	134.1706	145.7006 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Energy content (annual)	Total = Sum(45)m = 1451.0971 (45)										
Distribution loss (46)m = 0.15 x (45)m											
22.5672	19.7374	20.3672	17.7566	17.0379	14.7024	13.6240	15.6337	15.8204	18.4372	20.1256	21.8551 (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	14.6683	13.2270	14.6001	14.0793	14.5123	14.0024	14.4431	14.4880	14.0443	14.5638	14.1518 (61)
Total heat required for water heating calculated for each month											
165.1160	144.8095	150.3815	132.4568	128.0984	112.0185	105.2694	118.7125	119.5136	137.4781	148.3224	160.3546 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =	0.0000 (63)										
Output from w/h											
165.1160	144.8095	150.3815	132.4568	128.0984	112.0185	105.2694	118.7125	119.5136	137.4781	148.3224	160.3546 (64)
Heat gains from water heating, kWh/month											
53.6909	47.0579	48.7973	42.8803	41.3954	36.0910	33.8105	38.2767	38.5796	44.5100	48.1497	52.1089 (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	146.5957	146.5957	146.5957	146.5957	146.5957	146.5957	146.5957	146.5957	146.5957	146.5957	146.5957	146.5957	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	51.4518	45.6990	37.1649	28.1362	21.0322	17.7562	19.1862	24.9390	33.4731	42.5018	49.6058	52.8818	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	324.3280	327.6935	319.2126	301.1576	278.3664	256.9459	242.6357	239.2701	247.7511	265.8061	288.5973	310.0178	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.1028	52.1028	52.1028	52.1028	52.1028	52.1028	52.1028	52.1028	52.1028	52.1028	52.1028	52.1028	(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)	-97.7305	-97.7305	-97.7305	-97.7305	-97.7305	-97.7305	-97.7305	-97.7305	-97.7305	-97.7305	-97.7305	-97.7305	(71)
Water heating gains (Table 5)	72.1652	70.0267	65.5878	59.5560	55.6390	50.1263	45.4443	51.4471	53.5828	59.8252	66.8746	70.0389	(72)
Total internal gains	551.9131	547.3873	525.9334	492.8179	459.0056	428.7965	411.2342	419.6243	438.7751	472.1012	509.0458	536.9066	(73)

6. Solar gains

[Jan]												
				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d	Gains W

Northeast				6.1090	11.2829		0.7100		0.7200		0.7700	24.4184 (75)
Southeast				1.5230	36.7938		0.7100		0.7200		0.7700	19.8518 (77)
Southwest				3.6180	36.7938		0.7100		0.7200		0.7700	47.1593 (79)

Solar gains	91.4295	163.8490	245.7290	340.5808	414.4389	425.9399	404.6181	347.3001	278.2271	186.8968	110.9885	77.2888 (83)
Total gains	643.3425	711.2363	771.6624	833.3987	873.4445	854.7364	815.8523	766.9245	717.0022	658.9979	620.0342	614.1953 (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	29.1518	29.2374	29.3218	29.7247	29.8013	30.1632	30.1632	30.2311	30.0227	29.8013	29.6467	29.4868
alpha	2.9435	2.9492	2.9548	2.9816	2.9868	3.0109	3.0109	3.0154	3.0015	2.9868	2.9764	2.9658
util living area	0.9591	0.9436	0.9145	0.8544	0.7530	0.6068	0.4713	0.5132	0.7121	0.8757	0.9417	0.9638 (86)
MIT	19.1110	19.3294	19.6926	20.1674	20.5734	20.8451	20.9467	20.9301	20.7349	20.2222	19.5943	19.0726 (87)
Th 2	19.8976	19.9005	19.9033	19.9165	19.9190	19.9305	19.9305	19.9327	19.9261	19.9190	19.9140	19.9087 (88)
util rest of house	0.9520	0.9337	0.8991	0.8272	0.7052	0.5300	0.3693	0.4108	0.6428	0.8466	0.9299	0.9574 (89)
MIT 2	18.2014	18.4172	18.7732	19.2364	19.6080	19.8416	19.9097	19.9033	19.7590	19.2996	18.6906	18.1718 (90)
Living area fraction	18.3500	18.5662	18.9234	19.3885	19.7657	20.0056	20.0791	20.0711	19.9184	19.4503	18.8383	18.3190 (91)
MIT	18.3500	18.5662	18.9234	19.3885	19.7657	20.0056	20.0791	20.0711	19.9184	19.4503	18.8383	18.3190 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.2000	18.4162	18.7734	19.2385	19.6157	19.8556	19.9291	19.9211	19.7684	19.3003	18.6883	18.1690 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation	0.9374	0.9167	0.8795	0.8071	0.6901	0.5242	0.3692	0.4096	0.6313	0.8263	0.9127	0.9438	(94)	
Useful gains	603.0565	652.0079	678.6407	672.6042	602.7891	448.0413	301.1726	314.1330	452.6422	544.5528	565.8789	579.7020	(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	1348.2072	1307.1450	1183.5345	983.4383	751.0386	492.6615	312.0769	329.3299	533.8496	825.4844	1105.2236	1339.5062	(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	554.3922	440.2521	375.6410	223.8006	110.2976	0.0000	0.0000	0.0000	0.0000	209.0132	388.3282	565.2943	(98)	
Space heating												2867.0192	(98)	
Space heating per m2												(98) / (4) =	36.2997	(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													3167.9770 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	554.3922	440.2521	375.6410	223.8006	110.2976	0.0000	0.0000	0.0000	0.0000	209.0132	388.3282	565.2943	(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)	612.5880	486.4665	415.0730	247.2934	121.8758	0.0000	0.0000	0.0000	0.0000	230.9538	429.0919	624.6346	(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	165.1160	144.8095	150.3815	132.4568	128.0984	112.0185	105.2694	118.7125	119.5136	137.4781	148.3224	160.3546	(64)
Efficiency of water heater	89.7451	89.6863	89.5615	89.2832	88.7519	87.3000	87.3000	87.3000	87.3000	89.2027	89.5923	89.7728	(216)
(217)m	89.7451	89.6863	89.5615	89.2832	88.7519	87.3000	87.3000	87.3000	87.3000	89.2027	89.5923	89.7728	(217)
Fuel for water heating, kWh/month	183.9833	161.4622	167.9087	148.3558	144.3330	128.3144	120.5835	135.9823	136.8999	154.1189	165.5525	178.6226	(219)
Water heating fuel used												1826.1173	(219)
Annual totals kWh/year													
Space heating fuel - main system												3167.9770	(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)												363.4617	(232)
Total delivered energy for all uses												5432.5560	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3167.9770	3.4800	110.2456 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1826.1173	3.4800	63.5489 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	363.4617	13.1900	47.9406 (250)
Additional standing charges			120.0000 (251)
Total energy cost			351.6276 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.4200 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] = 1.1912 (257)
SAP value	83.3832
SAP rating (Section 12)	83 (258)
SAP band	B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3167.9770	0.2160	684.2830 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1826.1173	0.2160	394.4413 (264)
Space and water heating			1078.7244 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	363.4617	0.5190	188.6366 (268)
Total kg/year			1306.2860 (272)
CO2 emissions per m2			16.5400 (273)
EI value			85.8816
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	$3.48 / 0.8873 = 3.922$, stars = 4
Water heating environmental impact	$0.216 / 0.8873 = 0.2434$, 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	39.4910 (1b)	x 2.3100 (2b)	= 91.2242 (1b) - (3b)
First floor	39.4910 (1c)	x 2.6100 (2c)	= 103.0715 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.9820		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 194.2957 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 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) = 0.1544 (8)
Pressure test					Yes
Measured/design AP50					5.0100
Infiltration rate					0.4049 (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)	=	0.3745 (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	0.4214	0.4214	0.4120	0.3652	0.3558	0.3184	0.3090	0.3090	0.3277	0.3558	0.3652	0.3839 (22b)
Effective ac	0.5888	0.5888	0.5849	0.5667	0.5633	0.5507	0.5477	0.5477	0.5537	0.5633	0.5667	0.5737 (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)			11.2500	1.2357	13.9021		(27)
Flr - Ground			39.4910	0.1938	7.6552	75.6000	2985.5196 (28a)
Brick	87.6290	16.4910	71.1380	0.2500	17.7845	51.2800	3647.9566 (29a)
Rf - Ins Joist	39.4910		39.4910	0.1300	5.1338	5.6000	221.1496 (30)
Total net area of external elements Aum(A, m ²)			166.6100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	50.1186		(33)
Party Wall			41.0080	0.0000	0.0000	39.3700	1614.4850 (32)
Stud			68.1080			7.4000	503.9995 (32c)
Stud			83.9898			7.4000	621.5245 (32c)
Internal Floor			39.4910			7.4000	292.2334 (32d)
Internal Ceiling			39.4910			7.4000	292.2334 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 10179.1016 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							128.8788 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.5051 (36)
Total fabric heat loss							(33) + (36) = 57.6237 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	37.7505	37.7505	37.5003	36.3339	36.1174	35.3080	35.1196	35.1196	35.5019	36.1174	36.3339	36.7836 (38)
Heat transfer coeff	95.3742	95.3742	95.1240	93.9576	93.7411	92.9317	92.7433	92.7433	93.1256	93.7411	93.9576	94.4073 (39)
Average = Sum(39)m / 12 =												93.9351 (39)
HLP	1.2075	1.2075	1.2044	1.1896	1.1869	1.1766	1.1742	1.1742	1.1791	1.1869	1.1896	1.1953 (40)
HLP (average)												1.1893 (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												2.4433 (42)
Average daily hot water use (litres/day)												92.2275 (43)
Daily hot water use	101.4502	97.7611	94.0720	90.3829	86.6938	83.0047	83.0047	86.6938	90.3829	94.0720	97.7611	101.4502 (44)
Energy conte	150.4477	131.5825	135.7814	118.3775	113.5860	98.0161	90.8263	104.2246	105.4693	122.9143	134.1706	145.7006 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Energy content (annual)	Total = Sum(45)m = 1451.0971 (45)										
Distribution loss (46)m = 0.15 x (45)m											
22.5672	19.7374	20.3672	17.7566	17.0379	14.7024	13.6240	15.6337	15.8204	18.4372	20.1256	21.8551 (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	14.6683	13.2270	14.6001	14.0793	14.5123	14.0024	14.4431	14.4880	14.0443	14.5638	14.1518 (61)
Total heat required for water heating calculated for each month											
165.1160	144.8095	150.3815	132.4568	128.0984	112.0185	105.2694	118.7125	119.5136	137.4781	148.3224	160.3546 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =	0.0000 (63)										
Output from w/h											
165.1160	144.8095	150.3815	132.4568	128.0984	112.0185	105.2694	118.7125	119.5136	137.4781	148.3224	160.3546 (64)
Total per year (kWh/year) = Sum(64)m =	1622.5314 (64)										
Heat gains from water heating, kWh/month											
53.6909	47.0579	48.7973	42.8803	41.3954	36.0910	33.8105	38.2767	38.5796	44.5100	48.1497	52.1089 (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	146.5957	146.5957	146.5957	146.5957	146.5957	146.5957	146.5957	146.5957	146.5957	146.5957	146.5957	146.5957	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	51.4518	45.6990	37.1649	28.1362	21.0322	17.7562	19.1862	24.9390	33.4731	42.5018	49.6058	52.8818	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	324.3280	327.6935	319.2126	301.1576	278.3664	256.9459	242.6357	239.2701	247.7511	265.8061	288.5973	310.0178	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.1028	52.1028	52.1028	52.1028	52.1028	52.1028	52.1028	52.1028	52.1028	52.1028	52.1028	52.1028	(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)	-97.7305	-97.7305	-97.7305	-97.7305	-97.7305	-97.7305	-97.7305	-97.7305	-97.7305	-97.7305	-97.7305	-97.7305	(71)
Water heating gains (Table 5)	72.1652	70.0267	65.5878	59.5560	55.6390	50.1263	45.4443	51.4471	53.5828	59.8252	66.8746	70.0389	(72)
Total internal gains	551.9131	547.3873	525.9334	492.8179	459.0056	428.7965	411.2342	419.6243	438.7751	472.1012	509.0458	536.9066	(73)

6. Solar gains

[Jan]			Area m2		Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
Northeast			6.1090		12.1063		0.7100		0.7200		0.7700		26.2002 (75)
Southeast			1.5230		38.7358		0.7100		0.7200		0.7700		20.8995 (77)
Southwest			3.6180		38.7358		0.7100		0.7200		0.7700		49.6484 (79)
Solar gains	96.7481	176.2371	265.6642	376.6775	432.4298	480.3002	439.8645	385.1570	311.5182	206.5720	132.2487	90.3753	(83)
Total gains	648.6612	723.6244	791.5975	869.4954	891.4355	909.0967	851.0987	804.7813	750.2933	678.6732	641.2945	627.2818	(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	29.6467	29.6467	29.7247	30.0937	30.1632	30.4259	30.4877	30.4877	30.3625	30.1632	30.0937	29.9503
alpha	2.9764	2.9764	2.9816	3.0062	3.0109	3.0284	3.0325	3.0325	3.0242	3.0109	3.0062	2.9967
util living area	0.9579	0.9415	0.9073	0.8380	0.7381	0.5644	0.4511	0.4819	0.6964	0.8692	0.9363	0.9615 (86)
MIT	19.1592	19.3632	19.7641	20.2403	20.6103	20.8794	20.9539	20.9435	20.7529	20.2481	19.6560	19.1308 (87)
Th 2	19.9140	19.9140	19.9165	19.9283	19.9305	19.9388	19.9407	19.9407	19.9368	19.9305	19.9283	19.9238 (88)
util rest of house	0.9506	0.9316	0.8909	0.8089	0.6892	0.4869	0.3530	0.3817	0.6280	0.8397	0.9237	0.9549 (89)
MIT 2	18.2605	18.4598	18.8515	19.3122	19.6487	19.8721	19.9228	19.9178	19.7807	19.3316	18.7607	18.2398 (90)
Living area fraction	18.4073	18.6074	19.0006	19.4638	19.8058	20.0367	20.0912	20.0854	19.9395	19.4813	18.9070	18.3854 (92)
MIT	18.4073	18.6074	19.0006	19.4638	19.8058	20.0367	20.0912	20.0854	19.9395	19.4813	18.9070	18.3854 (92)
Temperature adjustment	18.2573	18.4574	18.8506	19.3138	19.6558	19.8867	19.9412	19.9354	19.7895	19.3313	18.7570	-0.1500
adjusted MIT	18.2573	18.4574	18.8506	19.3138	19.6558	19.8867	19.9412	19.9354	19.7895	19.3313	18.7570	18.2354 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9360	0.9145	0.8711	0.7895	0.6751	0.4829	0.3531	0.3811	0.6174	0.8196	0.9061	0.9410	(94)
Useful gains	607.1421	661.7353	689.5764	686.4491	601.8077	438.9758	300.5150	306.7403	463.2167	556.2707	581.0607	590.2861	(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	1331.1689	1302.5598	1165.3246	969.0617	736.4150	472.7115	309.8777	318.6122	539.1545	827.8579	1095.2608	1325.0412	(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	538.6759	430.6341	353.9567	203.4811	100.1479	0.0000	0.0000	0.0000	0.0000	202.0609	370.2241	546.6578	(98)
Space heating												2745.8383	(98)
Space heating per m2												34.7654	(99)
												(98) / (4) =	

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

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													3034.0755 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	538.6759	430.6341	353.9567	203.4811	100.1479	0.0000	0.0000	0.0000	0.0000	202.0609	370.2241	546.6578	(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)	595.2220	475.8387	391.1123	224.8409	110.6606	0.0000	0.0000	0.0000	0.0000	223.2717	409.0874	604.0417	(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	165.1160	144.8095	150.3815	132.4568	128.0984	112.0185	105.2694	118.7125	119.5136	137.4781	148.3224	160.3546	(64)
Efficiency of water heater (217)m	89.7284	89.6728	89.5216	89.2107	88.6758	87.3000	87.3000	87.3000	87.3000	89.1765	89.5610	89.7538	(216)
Fuel for water heating, kWh/month	184.0176	161.4865	167.9836	148.4764	144.4570	128.3144	120.5835	135.9823	136.8999	154.1641	165.6105	178.6605	(219)
Water heating fuel used												1826.6364	(219)
Annual totals kWh/year													
Space heating fuel - main system												3034.0755	(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)												363.4617	(232)
Total delivered energy for all uses												5299.1736	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3034.0755	9.7400	295.5190 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1826.6364	9.7400	177.9144 (247)
Pumps and fans for heating	75.0000	36.8500	27.6375 (249)
Energy for lighting	363.4617	36.8500	133.9356 (250)
Additional standing charges			104.0000 (251)
Total energy cost			739.0065 (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	3034.0755	0.2160	655.3603 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1826.6364	0.2160	394.5535 (264)
Space and water heating			1049.9138 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	363.4617	0.5190	188.6366 (268)
Total kg/year			1277.4754 (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	3034.0755	1.2200	3701.5721 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1826.6364	1.2200	2228.4964 (264)
Space and water heating			5930.0685 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	363.4617	3.0700	1115.8274 (268)
Primary energy kWh/year			7276.1459 (272)
Primary energy kWh/m2/year			92.1241 (273)

SAP 2012 EPC IMPROVEMENTS

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

(For testing purposes):

A	Not considered
B	Not considered
C	Not considered
D	Not considered
E Low energy lighting	Already installed
F	Not considered
G	Not considered
H	Not considered
I	Not considered
J	Not considered
K	Not considered
M	Not considered
N Solar water heating	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	-£ 76	-183 kg (14.3%)
U Solar photovoltaic panels	+ 10.8	-£ 699	-985 kg (90.0%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£76	2.32 kg/m²	B 85 B 88
Solar photovoltaic panels	£699	12.47 kg/m²	A 95 A 98
Total Savings	£775	14.78 kg/m²	

Potential energy efficiency rating: A 95
Potential environmental impact rating: A 98

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	£162	£180	-£18
Mains gas	£577	£483	£94
Space heating	£427	£427	£0
Water heating	£178	£102	£76
Lighting	£134	£134	£0
Generated (PV)	-£0	-£699	£699
Total cost of fuels	£739	-£36	£775
Total cost of uses	£739	-£36	£775
Delivered energy	67 kWh/m²	31 kWh/m²	36 kWh/m²
Carbon dioxide emissions	1.3 tonnes	0.1 tonnes	1.2 tonnes
CO2 emissions per m²	16 kg/m²	1 kg/m²	15 kg/m²
Primary energy	92 kWh/m²	5 kWh/m²	87 kWh/m²

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	39.4910 (1b)	x 2.3100 (2b)	= 91.2242 (1b) - (3b)
First floor	39.4910 (1c)	x 2.6100 (2c)	= 103.0715 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.9820		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 194.2957 (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) = 0.1544 (8)
Pressure test					Yes
Measured/design AP50					5.0100
Infiltration rate					0.4049 (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) = 0.3745 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4775	0.4682	0.4588	0.4120	0.4026	0.3558	0.3558	0.3464	0.3745	0.4026	0.4214	0.4401 (22b)
Effective ac	0.6140	0.6096	0.6053	0.5849	0.5811	0.5633	0.5633	0.5600	0.5701	0.5811	0.5888	0.5968 (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)			11.2500	1.2357	13.9021		(27)
Flr - Ground			39.4910	0.1938	7.6552	75.6000	2985.5196 (28a)
Brick	87.6290	16.4910	71.1380	0.2500	17.7845	51.2800	3647.9566 (29a)
Rf - Ins Joist	39.4910		39.4910	0.1300	5.1338	5.6000	221.1496 (30)
Total net area of external elements Aum(A, m ²)			166.6100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	50.1186		(33)
Party Wall			41.0080	0.0000	0.0000	39.3700	1614.4850 (32)
Stud			68.1080			7.4000	503.9995 (32c)
Stud			83.9898			7.4000	621.5245 (32c)
Internal Floor			39.4910			7.4000	292.2334 (32d)
Internal Ceiling			39.4910			7.4000	292.2334 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 10179.1016 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							128.8788 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.5051 (36)
Total fabric heat loss							(33) + (36) = 57.6237 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	39.3694	39.0855	38.8073	37.5003	37.2558	36.1174	36.1174	35.9066	36.5559	37.2558	37.7505	38.2676 (38)
Heat transfer coeff	96.9931	96.7092	96.4310	95.1240	94.8795	93.7411	93.7411	93.5303	94.1796	94.8795	95.3742	95.8913 (39)
Average = Sum(39)m / 12 =												95.1228 (39m)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2280	1.2244	1.2209	1.2044	1.2013	1.1869	1.1869	1.1842	1.1924	1.2013	1.2075	1.2141 (40)
HLP (average)												1.2044 (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	2.4433 (42)
Average daily hot water use (litres/day)	92.2275 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	101.4502	97.7611	94.0720	90.3829	86.6938	83.0047	83.0047	86.6938	90.3829	94.0720	97.7611	101.4502 (44)
Energy conte	150.4477	131.5825	135.7814	118.3775	113.5860	98.0161	90.8263	104.2246	105.4693	122.9143	134.1706	145.7006 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Energy content (annual)												Total = Sum(45)m =	1451.0971 (45)
Distribution loss (46)m = 0.15 x (45)m													
	22.5672	19.7374	20.3672	17.7566	17.0379	14.7024	13.6240	15.6337	15.8204	18.4372	20.1256	21.8551 (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	14.6683	13.2270	14.6001	14.0793	14.5123	14.0024	14.4431	14.4880	14.0443	14.5638	14.1518	14.6540 (61)	
Total heat required for water heating calculated for each month	165.1160	144.8095	150.3815	132.4568	128.0984	112.0185	105.2694	118.7125	119.5136	137.4781	148.3224	160.3546 (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												1.2498 (H8)	
Utilisation factor												0.5507 (H9)	
Collector performance factor												0.8793 (H10)	
Dedicated solar storage volume												75.0000 (H11)	
Effective solar volume												75.0000 (H13)	
Daily hot water demand												92.2275 (H14)	
Volume ratio Veff/V												0.8132 (H15)	
Solar storage volume factor												0.9586 (H16)	
Solar input												-841.9153 (H17)	
Solar input	-24.4139	-40.7397	-69.3844	-92.9888	-114.8798	-112.9452	-111.4525	-97.3766	-76.2654	-52.0803	-28.9584	-20.4302 (63)	
	Solar input (sum of months) = Sum(63)m =											-841.9153 (63)	
Output from w/h	140.7021	104.0698	80.9971	39.4680	13.2186	0.0000	0.0000	21.3359	43.2482	85.3978	119.3640	139.9244 (64)	
	Total per year (kWh/year) = Sum(64)m =											787.7259 (64)	
Heat gains from water heating, kWh/month	53.6909	47.0579	48.7973	42.8803	41.3954	36.0910	33.8105	38.2767	38.5796	44.5100	48.1497	52.1089 (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	146.5957	146.5957	146.5957	146.5957	146.5957	146.5957	146.5957	146.5957	146.5957	146.5957	146.5957	146.5957	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	51.4518	45.6990	37.1649	28.1362	21.0322	17.7562	19.1862	24.9390	33.4731	42.5018	49.6058	52.8818	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	324.3280	327.6935	319.2126	301.1576	278.3664	256.9459	242.6357	239.2701	247.7511	265.8061	288.5973	310.0178	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.1028	52.1028	52.1028	52.1028	52.1028	52.1028	52.1028	52.1028	52.1028	52.1028	52.1028	52.1028	(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)	-97.7305	-97.7305	-97.7305	-97.7305	-97.7305	-97.7305	-97.7305	-97.7305	-97.7305	-97.7305	-97.7305	-97.7305	(71)
Water heating gains (Table 5)	72.1652	70.0267	65.5878	59.5560	55.6390	50.1263	45.4443	51.4471	53.5828	59.8252	66.8746	70.0389	(72)
Total internal gains	551.9131	547.3873	525.9334	492.8179	459.0056	428.7965	411.2342	419.6243	438.7751	472.1012	509.0458	536.9066	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	6.1090	11.2829	0.7100	0.7200	0.7700	24.4184 (75)
Southeast	1.5230	36.7938	0.7100	0.7200	0.7700	19.8518 (77)
Southwest	3.6180	36.7938	0.7100	0.7200	0.7700	47.1593 (79)

Solar gains	91.4295	163.8490	245.7290	340.5808	414.4389	425.9399	404.6181	347.3001	278.2271	186.8968	110.9885	77.2888 (83)
Total gains	643.3425	711.2363	771.6624	833.3987	873.4445	854.7364	815.8523	766.9245	717.0022	658.9979	620.0342	614.1953 (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	29.1518	29.2374	29.3218	29.7247	29.8013	30.1632	30.1632	30.2311	30.0227	29.8013	29.6467	29.4868
alpha	2.9435	2.9492	2.9548	2.9816	2.9868	3.0109	3.0109	3.0154	3.0015	2.9868	2.9764	2.9658
util living area	0.9591	0.9436	0.9145	0.8544	0.7530	0.6068	0.4713	0.5132	0.7121	0.8757	0.9417	0.9638 (86)
MIT	19.1110	19.3294	19.6926	20.1674	20.5734	20.8451	20.9467	20.9301	20.7349	20.2222	19.5943	19.0726 (87)
Th 2	19.8976	19.9005	19.9033	19.9165	19.9190	19.9305	19.9305	19.9327	19.9261	19.9190	19.9140	19.9087 (88)
util rest of house	0.9520	0.9337	0.8991	0.8272	0.7052	0.5300	0.3693	0.4108	0.6428	0.8466	0.9299	0.9574 (89)
MIT 2	18.2014	18.4172	18.7732	19.2364	19.6080	19.8416	19.9097	19.9033	19.7590	19.2996	18.6906	18.1718 (90)
Living area fraction	fLA = Living area / (4) =											0.1634 (91)
MIT	18.3500	18.5662	18.9234	19.3885	19.7657	20.0056	20.0791	20.0711	19.9184	19.4503	18.8383	18.3190 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.2000	18.4162	18.7734	19.2385	19.6157	19.8556	19.9291	19.9211	19.7684	19.3003	18.6883	18.1690 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9374	0.9167	0.8795	0.8071	0.6901	0.5242	0.3692	0.4096	0.6313	0.8263	0.9127	0.9438 (94)
Useful gains	603.0565	652.0079	678.6407	672.6042	602.7891	448.0413	301.1726	314.1330	452.6422	544.5528	565.8789	579.7020 (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	1348.2072	1307.1450	1183.5345	983.4383	751.0386	492.6615	312.0769	329.3299	533.8496	825.4844	1105.2236	1339.5062 (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	554.3922	440.2521	375.6410	223.8006	110.2976	0.0000	0.0000	0.0000	0.0000	209.0132	388.3282	565.2943 (98)
Space heating												2867.0192 (98)
Space heating per m2										(98) / (4) =		36.2997 (99)

8c. Space cooling requirement

Not applicable

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

[illegible]

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3167.9770	3.4800	110.2456 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	879.1340	3.4800	30.5939 (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	363.4617	13.1900	47.9406 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-1727.2394	13.1900	-227.8229 (252)
Total energy cost			97.4447 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200	(256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.3301	(257)
SAP value		95.3951	
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	3167.9770	0.2160	684.2830 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	879.1340	0.2160	189.8929 (264)
Space and water heating			874.1760 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	363.4617	0.5190	188.6366 (268)
Energy saving/generation technologies			
PV Unit	-1727.2394	0.5190	-896.4372 (269)
Total kg/year			231.2503 (272)
CO2 emissions per m2			2.9300 (273)
EI value			97.5006
EI rating			98 (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	39.4910 (1b)	x 2.3100 (2b)	= 91.2242 (1b) - (3b)
First floor	39.4910 (1c)	x 2.6100 (2c)	= 103.0715 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.9820		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 194.2957 (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) = 0.1544 (8)
Pressure test					Yes
Measured/design AP50					5.0100
Infiltration rate					0.4049 (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) =		0.3745 (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	0.4214	0.4214	0.4120	0.3652	0.3558	0.3184	0.3090	0.3090	0.3277	0.3558	0.3652	0.3839 (22b)
Effective ac	0.5888	0.5888	0.5849	0.5667	0.5633	0.5507	0.5477	0.5477	0.5537	0.5633	0.5667	0.5737 (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)			11.2500	1.2357	13.9021		(27)
Flr - Ground			39.4910	0.1938	7.6552	75.6000	2985.5196 (28a)
Brick	87.6290	16.4910	71.1380	0.2500	17.7845	51.2800	3647.9566 (29a)
Rf - Ins Joist	39.4910		39.4910	0.1300	5.1338	5.6000	221.1496 (30)
Total net area of external elements Aum(A, m ²)			166.6100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		50.1186		(33)
Party Wall			41.0080	0.0000	0.0000	39.3700	1614.4850 (32)
Stud			68.1080			7.4000	503.9995 (32c)
Stud			83.9898			7.4000	621.5245 (32c)
Internal Floor			39.4910			7.4000	292.2334 (32d)
Internal Ceiling			39.4910			7.4000	292.2334 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 10179.1016 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 128.8788 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.5051 (36)
Total fabric heat loss (33) + (36) = 57.6237 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	37.7505	37.7505	37.5003	36.3339	36.1174	35.3080	35.1196	35.1196	35.5019	36.1174	36.3339	36.7836 (38)
Heat transfer coeff	95.3742	95.3742	95.1240	93.9576	93.7411	92.9317	92.7433	92.7433	93.1256	93.7411	93.9576	94.4073 (39)
Average = Sum(39)m / 12 =												93.9351 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2075	1.2075	1.2044	1.1896	1.1869	1.1766	1.1742	1.1742	1.1791	1.1869	1.1896	1.1953 (40)
HLP (average)												1.1893 (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 2.4433 (42)
Average daily hot water use (litres/day) 92.2275 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	101.4502	97.7611	94.0720	90.3829	86.6938	83.0047	83.0047	86.6938	90.3829	94.0720	97.7611	101.4502 (44)
Energy conte	150.4477	131.5825	135.7814	118.3775	113.5860	98.0161	90.8263	104.2246	105.4693	122.9143	134.1706	145.7006 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Energy content (annual)												Total = Sum(45)m =	1451.0971 (45)
Distribution loss (46)m = 0.15 x (45)m													
	22.5672	19.7374	20.3672	17.7566	17.0379	14.7024	13.6240	15.6337	15.8204	18.4372	20.1256	21.8551 (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	14.6683	13.2270	14.6001	14.0793	14.5123	14.0024	14.4431	14.4880	14.0443	14.5638	14.1518	14.6540 (61)	
Total heat required for water heating calculated for each month	165.1160	144.8095	150.3815	132.4568	128.0984	112.0185	105.2694	118.7125	119.5136	137.4781	148.3224	160.3546 (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												1.3727 (H8)	
Utilisation factor												0.5174 (H9)	
Collector performance factor												0.8793 (H10)	
Dedicated solar storage volume												75.0000 (H11)	
Effective solar volume												75.0000 (H13)	
Daily hot water demand												92.2275 (H14)	
Volume ratio Veff/V												0.8132 (H15)	
Solar storage volume factor												0.9586 (H16)	
Solar input												-868.6758 (H17)	
Solar input	-24.3626	-41.2864	-70.5389	-96.4989	-112.3469	-119.3414	-113.5422	-101.2702	-80.2229	-54.1994	-32.5331	-22.5327 (63)	
	Solar input (sum of months) = Sum(63)m =											-868.6758 (63)	
Output from w/h	140.7534	103.5232	79.8426	35.9578	15.7515	0.0000	0.0000	17.4423	39.2907	83.2787	115.7893	137.8219 (64)	
	Total per year (kWh/year) = Sum(64)m =											769.4513 (64)	
Heat gains from water heating, kWh/month	53.6909	47.0579	48.7973	42.8803	41.3954	36.0910	33.8105	38.2767	38.5796	44.5100	48.1497	52.1089 (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	146.5957	146.5957	146.5957	146.5957	146.5957	146.5957	146.5957	146.5957	146.5957	146.5957	146.5957	146.5957	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	51.4518	45.6990	37.1649	28.1362	21.0322	17.7562	19.1862	24.9390	33.4731	42.5018	49.6058	52.8818	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	324.3280	327.6935	319.2126	301.1576	278.3664	256.9459	242.6357	239.2701	247.7511	265.8061	288.5973	310.0178	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.1028	52.1028	52.1028	52.1028	52.1028	52.1028	52.1028	52.1028	52.1028	52.1028	52.1028	52.1028	(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)	-97.7305	-97.7305	-97.7305	-97.7305	-97.7305	-97.7305	-97.7305	-97.7305	-97.7305	-97.7305	-97.7305	-97.7305	(71)
Water heating gains (Table 5)	72.1652	70.0267	65.5878	59.5560	55.6390	50.1263	45.4443	51.4471	53.5828	59.8252	66.8746	70.0389	(72)
Total internal gains	551.9131	547.3873	525.9334	492.8179	459.0056	428.7965	411.2342	419.6243	438.7751	472.1012	509.0458	536.9066	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			

Northeast				6.1090	12.1063	0.7100	0.7200	0.7700	26.2002 (75)			
Southeast				1.5230	38.7358	0.7100	0.7200	0.7700	20.8995 (77)			
Southwest				3.6180	38.7358	0.7100	0.7200	0.7700	49.6484 (79)			

Solar gains	96.7481	176.2371	265.6642	376.6775	432.4298	480.3002	439.8645	385.1570	311.5182	206.5720	132.2487	90.3753 (83)
Total gains	648.6612	723.6244	791.5975	869.4954	891.4355	909.0967	851.0987	804.7813	750.2933	678.6732	641.2945	627.2818 (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	29.6467	29.6467	29.7247	30.0937	30.1632	30.4259	30.4877	30.4877	30.3625	30.1632	30.0937	29.9503
alpha	2.9764	2.9764	2.9816	3.0062	3.0109	3.0284	3.0325	3.0325	3.0242	3.0109	3.0062	2.9967
util living area	0.9579	0.9415	0.9073	0.8380	0.7381	0.5644	0.4511	0.4819	0.6964	0.8692	0.9363	0.9615 (86)
MIT	19.1592	19.3632	19.7641	20.2403	20.6103	20.8794	20.9539	20.9435	20.7529	20.2481	19.6560	19.1308 (87)
Th 2	19.9140	19.9140	19.9165	19.9283	19.9305	19.9388	19.9407	19.9407	19.9368	19.9305	19.9283	19.9238 (88)
util rest of house	0.9506	0.9316	0.8909	0.8089	0.6892	0.4869	0.3530	0.3817	0.6280	0.8397	0.9237	0.9549 (89)
MIT 2	18.2605	18.4598	18.8515	19.3122	19.6487	19.8721	19.9228	19.9178	19.7807	19.3316	18.7607	18.2398 (90)
Living area fraction	18.4073	18.6074	19.0006	19.4638	19.8058	20.0367	20.0912	20.0854	fLA = Living area / (4) = 19.9395	19.4813	18.9070	0.1634 (91)
MIT	18.4073	18.6074	19.0006	19.4638	19.8058	20.0367	20.0912	20.0854	19.9395	19.4813	18.9070	18.3854 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.2573	18.4574	18.8506	19.3138	19.6558	19.8867	19.9412	19.9354	19.7895	19.3313	18.7570	18.2354 (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	0.9360	0.9145	0.8711	0.7895	0.6751	0.4829	0.3531	0.3811	0.6174	0.8196	0.9061	0.9410	(94)
Useful gains	607.1421	661.7353	689.5764	686.4491	601.8077	438.9758	300.5150	306.7403	463.2167	556.2707	581.0607	590.2861	(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	1331.1689	1302.5598	1165.3246	969.0617	736.4150	472.7115	309.8777	318.6122	539.1545	827.8579	1095.2608	1325.0412	(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	538.6759	430.6341	353.9567	203.4811	100.1479	0.0000	0.0000	0.0000	0.0000	202.0609	370.2241	546.6578	(98)
Space heating												2745.8383	(98)
Space heating per m2												(98) / (4) =	34.7654 (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													3034.0755 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	538.6759	430.6341	353.9567	203.4811	100.1479	0.0000	0.0000	0.0000	0.0000	202.0609	370.2241	546.6578	(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)	595.2220	475.8387	391.1123	224.8409	110.6606	0.0000	0.0000	0.0000	0.0000	223.2717	409.0874	604.0417	(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	140.7534	103.5232	79.8426	35.9578	15.7515	0.0000	0.0000	17.4423	39.2907	83.2787	115.7893	137.8219	(64)
Efficiency of water heater	89.8180	89.8616	89.8935	90.0046	90.0514	87.3000	87.3000	87.3000	87.3000	89.5421	89.7165	89.8369	(216)
(217)m	156.7096	115.2029	88.8190	39.9511	17.4916	0.0000	0.0000	19.9797	45.0065	93.0051	129.0613	153.4134	(219)
Fuel for water heating, kWh/month												858.6403	(219)
Water heating fuel used													
Annual totals kWh/year													
Space heating fuel - main system												3034.0755	(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)													363.4617 (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												2484.1401	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3034.0755	9.7400	295.5190	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	858.6403	9.7400	83.6316	(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	363.4617	36.8500	133.9356	(250)
Additional standing charges			104.0000	(251)
Energy saving/generation technologies				
PV Unit	-1897.0374	36.8500	-699.0583	(252)
Total energy cost			-35.9096	(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	3034.0755	0.2160	655.3603	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	858.6403	0.2160	185.4663	(264)
Space and water heating			840.8266	(265)
Pumps and fans	125.0000	0.5190	64.8750	(267)
Energy for lighting	363.4617	0.5190	188.6366	(268)
Energy saving/generation technologies				
PV Unit	-1897.0374	0.5190	-984.5624	(269)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Total kg/year

109.7758 (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	3034.0755	1.2200	3701.5721 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	858.6403	1.2200	1047.5412 (264)
Space and water heating			4749.1133 (265)
Pumps and fans	125.0000	3.0700	383.7500 (267)
Energy for lighting	363.4617	3.0700	1115.8274 (268)
Energy saving/generation technologies			
PV Unit	-1897.0374	3.0700	-5823.9049 (269)
Primary energy kWh/year			424.7859 (272)
Primary energy kWh/m2/year			5.3783 (273)

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Designed)

Property Reference	070 - PRJ013151	Issued on Date	17/04/2023
Assessment Reference	070	Prop Type Ref	Cherry
Property	Coggeshall Phase 1 and 2, 0		
SAP Rating	83 B	DER	18.20
Environmental	86 B	TER	18.90
CO ₂ Emissions (t/year)	1.28	% DER<TER	3.69
General Requirements Compliance	Pass	DFEE	47.39
		TFEE	53.76
		% DFEE<TFEE	11.84
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)	18.90	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	18.20	kgCO ₂ /m ²	Pass
	-0.70 (-3.7%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	53.76	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	47.39	kWh/m ² /yr	
	-6.4 (-11.9%)	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	1.23 (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
---------------------	---	------

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

6.11 m², No overhang

Windows facing South East

1.52 m², No overhang

Windows facing South West

3.62 m², No overhang

Air change rate

4.68 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