

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	024 - PRJ013014	Issued on Date	09/05/2024
Assessment Reference	024	Prop Type Ref	E
Property	10 Deeble Way, Netley Abbey, Southampton, SO31 5JP		

SAP Rating	85 B	DER	15.23	TER	18.26
Environmental	88 B	% DER<TER	16.60		
CO ₂ Emissions (t/year)	1.00	DFEE	44.86	TFEE	49.67
General Requirements Compliance	Pass	% DFEE<TFEE	9.67		

Assessor Details	Mr. Christopher Nicholls, Briary Energy Limited, Tel: 0203 397 1373, chris@briaryenergy.co.uk	Assessor ID	U903-0001
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Client	
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CALCULATION OF HEAT DEMAND 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (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	39.2600 (1b)	x 2.3700 (2b)	= 93.0462 (1b) - (3b)
First floor	39.2600 (1c)	x 2.6200 (2c)	= 102.8612 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 195.9074 (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							4 * 10 = 40.0000 (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) =					40.0000 / (5) =	0.2042 (8)					
Pressure test						Yes						
Measured/design AP50							4.5100					
Infiltration rate							0.4297 (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) =	0.3975 (21)					
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.9000	4.6000	4.5000	4.2000	4.2000	4.1000	4.1000	4.0000	4.0000	4.3000	4.3000	4.4000 (22)
Wind factor	1.2250	1.1500	1.1250	1.0500	1.0500	1.0250	1.0250	1.0000	1.0000	1.0750	1.0750	1.1000 (22a)
Adj infiltr rate	0.4869	0.4571	0.4471	0.4173	0.4173	0.4074	0.4074	0.3975	0.3975	0.4273	0.4273	0.4372 (22b)
Effective ac	0.6185	0.6045	0.6000	0.5871	0.5871	0.5830	0.5830	0.5790	0.5790	0.5913	0.5913	0.5956 (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			2.0900	1.2000	2.5080		(26)
Windows (Uw = 1.40)			9.8000	1.3258	12.9792		(27)
Fir - Ground			39.2630	0.1800	7.0673	75.6000	2968.2828 (28a)
Wl - Brick (Timber Frame)	88.6620	11.8870	76.7750	0.2100	16.1228	7.4000	568.1350 (29a)
Rf - Ins Joist	39.2630		39.2630	0.0800	3.1410	7.4000	290.5462 (30)
Total net area of external elements Aum(A, m ²)			167.1810				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.8183		(33)
Party Wall			41.7100	0.0000	0.0000	7.4000	308.6540 (32)
Stud			74.8825			7.4000	554.1306 (32c)
Internal Floor			39.2630			7.4000	290.5462 (32d)
Internal Ceiling			39.2630			7.4000	290.5462 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 5270.8410 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							67.1274 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.8893 (36)
Total fabric heat loss							(33) + (36) = 56.7076 (37)

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

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(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	39.9873	39.0778	38.7874	37.9544	37.9544	37.6895	37.6895	37.4310	37.4310	38.2257	38.2257	38.5033	(38)
Average = Sum(39)m / 12 =	96.6949	95.7854	95.4950	94.6620	94.6620	94.3971	94.3971	94.1386	94.1386	94.9333	94.9333	95.2109	(39)
												94.9540	(39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.2315	1.2199	1.2162	1.2056	1.2056	1.2022	1.2022	1.1989	1.1989	1.2090	1.2090	1.2126	(40)
Days in month												1.2093	(40)
	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4342	(42)	
Average daily hot water use (litres/day)												92.0118	(43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Daily hot water use														
	101.2129	97.5325	93.8520	90.1715	86.4911	82.8106	82.8106	86.4911	90.1715	93.8520	97.5325	101.2129	(44)	
Energy conte	150.0959	131.2748	135.4638	118.1007	113.3204	97.7869	90.6139	103.9808	105.2227	122.6269	133.8568	145.3598	(45)	
Energy content (annual)												Total = Sum (45)m =	1447.7033	(45)
Distribution loss (46)m = 0.15 x (45)m														
	22.5144	19.6912	20.3196	17.7151	16.9981	14.6680	13.5921	15.5971	15.7834	18.3940	20.0785	21.8040	(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	0.6693	0.5762	0.5721	0.4792	0.4411	0.3644	0.3377	0.4047	0.4270	0.5179	0.5875	0.6482	(61)	
Total heat required for water heating calculated for each month														
	150.7652	131.8510	136.0359	118.5799	113.7614	98.1513	90.9516	104.3855	105.6496	123.1448	134.4443	146.0081	(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														
	150.7652	131.8510	136.0359	118.5799	113.7614	98.1513	90.9516	104.3855	105.6496	123.1448	134.4443	146.0081	(64)	
												Total per year (kWh/year) = Sum (64)m =	1453.7285	(64)
RHI water heating demand												1454	(64)	
Heat gains from water heating, kWh/month														
	50.0742	43.7929	45.1848	39.3883	37.7893	32.6052	30.2135	34.6748	35.0933	40.9029	44.6543	48.4942	(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	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	52.7220	46.8272	38.0825	28.8309	21.5514	18.1946	19.6599	25.5547	34.2995	43.5511	50.8305	54.1873	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	322.8650	326.2153	317.7726	299.7991	277.1107	255.7868	241.5411	238.1908	246.6335	264.6071	287.2955	308.6193	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	(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)	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	(71)
Water heating gains (Table 5)	67.3040	65.1680	60.7322	54.7059	50.7921	45.2851	40.6096	46.6059	48.7407	54.9770	62.0198	65.1804	(72)
Total internal gains	546.6139	541.9334	520.3101	487.0587	453.1770	422.9893	405.5335	414.0743	433.3965	466.8580	503.8686	531.7099	(73)

6. Solar gains

[Jan]													Gains
				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				2.5540	14.6130			0.7300	0.7200			0.7700	13.5941
Southwest				7.2440	45.0642			0.7300	0.7200			0.7700	118.9046 (75)
Solar gains	132.4986	196.0489	284.1429	374.7530	413.2359	461.4132	426.5648	393.3528	331.1684	239.9264	159.0172	110.9438	(83)
Total gains	679.1126	737.9823	804.4530	861.8118	866.4129	884.4025	832.0984	807.4271	764.5650	706.7844	662.8858	642.6537	(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	15.1417	15.2854	15.3319	15.4668	15.4668	15.5102	15.5102	15.5528	15.5528	15.4227	15.4227	15.3777	
alpha	2.0094	2.0190	2.0221	2.0311	2.0311	2.0340	2.0340	2.0369	2.0369	2.0282	2.0282	2.0252	
util living area	0.8748	0.8523	0.8055	0.7282	0.6197	0.4589	0.3409	0.3400	0.5348	0.7203	0.8309	0.8825 (86)	
MIT	18.5756	18.8032	19.2851	19.8807	20.4160	20.7903	20.9228	20.9259	20.6976	20.1240	19.3205	18.5703 (87)	
Th 2	19.8949	19.9041	19.9071	19.9155	19.9155	19.9182	19.9182	19.9209	19.9209	19.9128	19.9128	19.9100 (88)	
util rest of house	0.8603	0.8356	0.7828	0.6949	0.5678	0.3815	0.2401	0.2363	0.4590	0.6772	0.8082	0.8687 (89)	
MIT 2	16.7648	17.0870	17.7633	18.5879	19.2997	19.7494	19.8795	19.8852	19.6578	18.9332	17.8289	16.7641 (90)	
Living area fraction													flA = Living area / (4) = 0.2028 (91)

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MIT	17.1319	17.4350	18.0719	18.8500	19.5260	19.9604	20.0911	20.0962	19.8686	19.1746	18.1313	17.1303 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.9819	17.2850	17.9219	18.7000	19.3760	19.8104	19.9411	19.9462	19.7186	19.0246	17.9813	16.9803 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8083	0.7830	0.7313	0.6508	0.5387	0.3731	0.2424	0.2389	0.4433	0.6352	0.7561	0.8178 (94)	
Useful gains	548.9512	577.8120	588.3018	560.8922	466.7502	330.0036	201.6607	192.8885	338.9045	448.9162	501.1936	525.5647 (95)	
Ext temp.	5.7000	6.1000	7.7000	10.1000	13.1000	15.9000	17.7000	17.8000	15.5000	12.3000	8.8000	5.8000 (96)	
Heat loss rate W													
Month fracti	1090.9065	1071.3550	976.1379	814.0953	594.0995	369.1344	211.5490	202.0372	397.1349	638.3924	871.6126	1064.4911 (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	403.2147	331.6609	288.5501	182.3062	94.7478	0.0000	0.0000	0.0000	0.0000	140.9703	266.7017	400.9613 (98)	
RHI space heating demand												2109.1130 (98)	
												2109 (98)	

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CALCULATION OF ENERGY RATINGS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (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	39.2600 (1b)	x 2.3700 (2b)	= 93.0462 (1b) - (3b)
First floor	39.2600 (1c)	x 2.6200 (2c)	= 102.8612 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 195.9074 (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					4 * 10 = 40.0000 (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) =					40.0000 / (5) = 0.2042 (8)
Pressure test					Yes
Measured/design AP50					4.5100
Infiltration rate					0.4297 (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) =	0.3975 (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	0.5068	0.4968	0.4869	0.4372	0.4273	0.3776	0.3776	0.3676	0.3975	0.4273	0.4471	0.4670 (22b)
Effective ac	0.6284	0.6234	0.6185	0.5956	0.5913	0.5713	0.5713	0.5676	0.5790	0.5913	0.6000	0.6090 (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			2.0900	1.2000	2.5080		(26)
Windows (Uw = 1.40)			9.8000	1.3258	12.9792		(27)
Flr - Ground			39.2630	0.1800	7.0673	75.6000	2968.2828 (28a)
Wl - Brick (Timber Frame)	88.6620	11.8870	76.7750	0.2100	16.1228	7.4000	568.1350 (29a)
Rf - Ins Joist	39.2630		39.2630	0.0800	3.1410	7.4000	290.5462 (30)
Total net area of external elements Aum(A, m ²)			167.1810				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.8183		(33)
Party Wall			41.7100	0.0000	0.0000	7.4000	308.6540 (32)
Stud			74.8825			7.4000	554.1306 (32c)
Internal Floor			39.2630			7.4000	290.5462 (32d)
Internal Ceiling			39.2630			7.4000	290.5462 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 5270.8410 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							67.1274 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.8893 (36)
Total fabric heat loss							(33) + (36) = 56.7076 (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	40.6256	40.3033	39.9873	38.5033	38.2257	36.9331	36.9331	36.6938	37.4310	38.2257	38.7874	39.3746 (38)
Heat transfer coeff	97.3332	97.0109	96.6949	95.2109	94.9333	93.6407	93.6407	93.4014	94.1386	94.9333	95.4950	96.0822 (39)
Average = Sum(39)m / 12 =												95.2096 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2396	1.2355	1.2315	1.2126	1.2090	1.1926	1.1926	1.1895	1.1989	1.2090	1.2162	1.2237 (40)
HLP (average)												1.2126 (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												2.4342 (42)
Average daily hot water use (litres/day)												92.0118 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	101.2129	97.5325	93.8520	90.1715	86.4911	82.8106	82.8106	86.4911	90.1715	93.8520	97.5325	101.2129 (44)
Energy content (annual)	150.0959	131.2748	135.4638	118.1007	113.3204	97.7869	90.6139	103.9808	105.2227	122.6269	133.8568	145.3598 (45)
Distribution loss (46)m = 0.15 x (45)m												1447.7033 (45)

	22.5144	19.6912	20.3196	17.7151	16.9981	14.6680	13.5921	15.5971	15.7834	18.3940	20.0785	21.8040 (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	0.6693	0.5762	0.5721	0.4792	0.4411	0.3644	0.3377	0.4047	0.4270	0.5179	0.5875	0.6482 (61)	
Total heat required for water heating calculated for each month	150.7652	131.8510	136.0359	118.5799	113.7614	98.1513	90.9516	104.3855	105.6496	123.1448	134.4443	146.0081 (62)	
WWHRS	-48.4321	-42.6122	-43.4923	-35.7971	-33.2450	-27.4302	-23.2236	-28.1156	-28.9319	-35.7563	-41.4062	-46.8089 eq. (G10)	
Total of WWHRS savings												-435.2513	
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								Solar input (sum of months) = Sum(63)m =					0.0000 (63)
	102.3331	89.2388	92.5437	82.7828	80.5164	70.7211	67.7280	76.2699	76.7177	87.3884	93.0381	99.1991 (64)	
								Total per year (kWh/year) = Sum(64)m =					1018.4772 (64)
Heat gains from water heating, kWh/month													
	50.0742	43.7929	45.1848	39.3883	37.7893	32.6052	30.2135	34.6748	35.0933	40.9029	44.6543	48.4942 (65)	

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CALCULATION OF ENERGY RATINGS 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												90.2000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												2874.8557 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	471.8772	383.5994	344.7984	230.2031	138.6195	0.0000	0.0000	0.0000	0.0000	205.5663	340.8591	477.5969 (98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000 (210)
Space heating fuel (main heating system)	523.1455	425.2765	382.2598	255.2141	153.6802	0.0000	0.0000	0.0000	0.0000	227.9005	377.8926	529.4866 (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	102.3331	89.2388	92.5437	82.7828	80.5164	70.7211	67.7280	76.2699	76.7177	87.3884	93.0381	99.1991 (64)
Efficiency of water heater (217)m	87.3869	87.2265	86.8793	86.0872	84.5862	76.4000	76.4000	76.4000	76.4000	85.5884	86.8367	76.4000 (216)
Fuel for water heating, kWh/month	117.1034	102.3070	106.5198	96.1616	95.1886	92.5669	88.6492	99.8298	100.4158	102.1032	107.1415	113.3933 (219)
Water heating fuel used												1221.3800 (219)
Annual totals kWh/year												
Space heating fuel - main system												2874.8557 (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)												372.4349 (232)
Total delivered energy for all uses												4543.6707 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2874.8557	3.4800	100.0450 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1221.3800	3.4800	42.5040 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	372.4349	13.1900	49.1242 (250)
Additional standing charges			120.0000 (251)
Total energy cost			321.5657 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.0934 (257)
SAP value		84.7470
SAP rating (Section 12)		85 (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	2874.8557	0.2160	620.9688 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1221.3800	0.2160	263.8181 (264)
Space and water heating			884.7869 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	372.4349	0.5190	193.2937 (268)
Total kg/year			1117.0056 (272)
CO2 emissions per m2			14.2300 (273)
EI value			87.8822
EI rating			88 (274)
EI band			B

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9020 = 3.858$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9020 = 0.2395$, stars = 4
Water heating energy efficiency	$3.48 / 0.8314 = 4.186$, stars = 5
Water heating environmental impact	$0.216 / 0.8314 = 0.2598$, stars = 5

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

SAP 2012 WORKSHEET FOR New Build (As Built) (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	39.2600 (1b)	x 2.3700 (2b)	= 93.0462 (1b) - (3b)
First floor	39.2600 (1c)	x 2.6200 (2c)	= 102.8612 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 195.9074 (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					4 * 10 = 40.0000 (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) =					40.0000 / (5) = 0.2042 (8)
Pressure test					Yes
Measured/design AP50					4.5100
Infiltration rate					0.4297 (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) =	0.3975 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	4.9000	4.6000	4.5000	4.2000	4.2000	4.1000	4.1000	4.0000	4.0000	4.3000	4.3000	4.4000 (22)
Wind factor	1.2250	1.1500	1.1250	1.0500	1.0500	1.0250	1.0250	1.0000	1.0000	1.0750	1.0750	1.1000 (22a)
Adj infilt rate	0.4869	0.4571	0.4471	0.4173	0.4173	0.4074	0.4074	0.3975	0.3975	0.4273	0.4273	0.4372 (22b)
Effective ac	0.6185	0.6045	0.6000	0.5871	0.5871	0.5830	0.5830	0.5790	0.5790	0.5913	0.5913	0.5956 (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			2.0900	1.2000	2.5080		(26)
Windows (Uw = 1.40)			9.8000	1.3258	12.9792		(27)
Flr - Ground			39.2630	0.1800	7.0673	75.6000	2968.2828 (28a)
Wl - Brick (Timber Frame)	88.6620	11.8870	76.7750	0.2100	16.1228	7.4000	568.1350 (29a)
Rf - Ins Joist	39.2630		39.2630	0.0800	3.1410	7.4000	290.5462 (30)
Total net area of external elements Aum(A, m ²)			167.1810				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.8183		(33)
Party Wall			41.7100	0.0000	0.0000	7.4000	308.6540 (32)
Stud			74.8825			7.4000	554.1306 (32c)
Internal Floor			39.2630			7.4000	290.5462 (32d)
Internal Ceiling			39.2630			7.4000	290.5462 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 5270.8410 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							67.1274 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.8893 (36)
Total fabric heat loss							(33) + (36) = 56.7076 (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	39.9873	39.0778	38.7874	37.9544	37.9544	37.6895	37.6895	37.4310	37.4310	38.2257	38.2257	38.5033 (38)
Heat transfer coeff	96.6949	95.7854	95.4950	94.6620	94.6620	94.3971	94.3971	94.1386	94.1386	94.9333	94.9333	95.2109 (39)
Average = Sum(39)m / 12 =												94.9540 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1.2315	1.2199	1.2162	1.2056	1.2056	1.2022	1.2022	1.1989	1.1989	1.2090	1.2090	1.2126 (40)
HLP (average)												1.2093 (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												2.4342 (42)
Average daily hot water use (litres/day)												92.0118 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	101.2129	97.5325	93.8520	90.1715	86.4911	82.8106	82.8106	86.4911	90.1715	93.8520	97.5325	101.2129 (44)
Energy conte	150.0959	131.2748	135.4638	118.1007	113.3204	97.7869	90.6139	103.9808	105.2227	122.6269	133.8568	145.3598 (45)
Energy content (annual)												Total = Sum(45)m = 1447.7033 (45)
Distribution loss (46)m = 0.15 x (45)m												

Water storage loss:	22.5144	19.6912	20.3196	17.7151	16.9981	14.6680	13.5921	15.5971	15.7834	18.3940	20.0785	21.8040 (46)
Total storage loss												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.6693	0.5762	0.5721	0.4792	0.4411	0.3644	0.3377	0.4047	0.4270	0.5179	0.5875	0.6482 (61)
Total heat required for water heating calculated for each month												
	150.7652	131.8510	136.0359	118.5799	113.7614	98.1513	90.9516	104.3855	105.6496	123.1448	134.4443	146.0081 (62)
WWHRS	-48.4321	-42.6122	-43.4923	-35.7971	-33.2450	-27.4302	-23.2236	-28.1156	-28.9319	-35.7563	-41.4062	-46.8089 eq. (G10)
Total of WWHRS savings												-435.2513
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												
	102.3331	89.2388	92.5437	82.7828	80.5164	70.7211	67.7280	76.2699	76.7177	87.3884	93.0381	99.1991 (64)
								Total per year (kWh/year) =	Sum(64)m =			1018.4772 (64)
Heat gains from water heating, kWh/month												
	50.0742	43.7929	45.1848	39.3883	37.7893	32.6052	30.2135	34.6748	35.0933	40.9029	44.6543	48.4942 (65)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2338.2627 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	403.2147	331.6609	288.5501	182.3062	94.7478	0.0000	0.0000	0.0000	0.0000	140.9703	266.7017	400.9613	(98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)
Space heating fuel (main heating system)	447.0230	367.6950	319.9003	202.1133	105.0419	0.0000	0.0000	0.0000	0.0000	156.2863	295.6782	444.5247	(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	102.3331	89.2388	92.5437	82.7828	80.5164	70.7211	67.7280	76.2699	76.7177	87.3884	93.0381	99.1991	(64)
Efficiency of water heater (217)m	87.0184	86.8731	86.4098	85.3837	83.2887	76.4000	76.4000	76.4000	76.4000	84.3682	86.1743	87.4000	(216)
Fuel for water heating, kWh/month	117.5994	102.7232	107.0986	96.9538	96.6716	92.5669	88.6492	99.8298	100.4158	103.5798	107.9650	113.9167	(219)
Water heating fuel used												1227.9698	(219)
Annual totals kWh/year													
Space heating fuel - main system												2338.2627	(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)												372.4349	(232)
Total delivered energy for all uses												4013.6674	(238)

10a. Fuel costs - using BEDF prices (542)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2338.2627	7.6100	177.9418 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1227.9698	7.6100	93.4485 (247)
Pumps and fans for heating	75.0000	31.0800	23.3100 (249)
Energy for lighting	372.4349	31.0800	115.7528 (250)
Additional standing charges			105.0000 (251)
Total energy cost			515.4531 (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	2338.2627	0.2160	505.0647 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1227.9698	0.2160	265.2415 (264)
Space and water heating			770.3062 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	372.4349	0.5190	193.2937 (268)
Total kg/year			1002.5249 (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	2338.2627	1.2200	2852.6805 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1227.9698	1.2200	1498.1232 (264)
Space and water heating			4350.8037 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	372.4349	3.0700	1143.3752 (268)
Primary energy kWh/year			5724.4289 (272)
Primary energy kWh/m2/year			72.9041 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 85
Current environmental impact rating: B 88

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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
F	Already installed
G	Not considered
H	Not considered
I	Not considered
J	Not considered
K	Not considered
M	Not considered
N	Solar water heating
O	SAP increase too small
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U	Solar photovoltaic panels
A2	Recommended
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
L2	Not applicable
Q3	Not considered
O3	Not considered

Recommended measures:	SAP change	Cost change	CO2 change
U Solar photovoltaic panels	+ 10.8	-£ 605	-1010 kg (100.8%)

Measures omitted - SAP change or cost saving too small:

N Solar water heating	+ 0.9	-£ 43	-141 kg (14.1%)
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Recommended measures	Typical annual savings		Energy efficiency	Environmental impact
Solar photovoltaic panels	£605	12.87 kg/m²	A 96	A 98
Total Savings	£605	12.87 kg/m²		
Potential energy efficiency rating:			A 96	
Potential environmental impact rating:				A 98

Fuel prices for cost data on this page from database revision number 542 TEST (30 Apr 2024)
Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£139	£139	£0
Mains gas	£376	£376	£0
Space heating	£306	£306	£0
Water heating	£93	£93	£0
Lighting	£116	£116	£0
Generated (PV)	-£0	-£605	£605
Total cost of fuels	£515	-£90	£605
Total cost of uses	£515	-£90	£605
Delivered energy	51 kWh/m²	26 kWh/m²	25 kWh/m²
Carbon dioxide emissions	1.0 tonnes	0.0 tonnes	1.0 tonnes
CO2 emissions per m²	13 kg/m²	0 kg/m²	13 kg/m²
Primary energy	73 kWh/m²	-3 kWh/m²	76 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (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	39.2600 (1b)	x 2.3700 (2b)	= 93.0462 (1b) - (3b)
First floor	39.2600 (1c)	x 2.6200 (2c)	= 102.8612 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 195.9074 (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					4 * 10 = 40.0000 (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)					40.0000 / (5) = 0.2042 (8)
Pressure test					Yes
Measured/design AP50					4.5100
Infiltration rate					0.4297 (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) =	0.3975 (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	0.5068	0.4968	0.4869	0.4372	0.4273	0.3776	0.3776	0.3676	0.3975	0.4273	0.4471	0.4670 (22b)
Effective ac	0.6284	0.6234	0.6185	0.5956	0.5913	0.5713	0.5713	0.5676	0.5790	0.5913	0.6000	0.6090 (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			2.0900	1.2000	2.5080		(26)
Windows (Uw = 1.40)			9.8000	1.3258	12.9792		(27)
Flr - Ground			39.2630	0.1800	7.0673	75.6000	2968.2828 (28a)
Wl - Brick (Timber Frame)	88.6620	11.8870	76.7750	0.2100	16.1228	7.4000	568.1350 (29a)
Rf - Ins Joist	39.2630		39.2630	0.0800	3.1410	7.4000	290.5462 (30)
Total net area of external elements Aum(A, m ²)			167.1810				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.8183		(33)
Party Wall			41.7100	0.0000	0.0000	7.4000	308.6540 (32)
Stud			74.8825			7.4000	554.1306 (32c)
Internal Floor			39.2630			7.4000	290.5462 (32d)
Internal Ceiling			39.2630			7.4000	290.5462 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 5270.8410 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							67.1274 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.8893 (36)
Total fabric heat loss							(33) + (36) = 56.7076 (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	40.6256	40.3033	39.9873	38.5033	38.2257	36.9331	36.9331	36.6938	37.4310	38.2257	38.7874	39.3746 (38)
Heat transfer coeff	97.3332	97.0109	96.6949	95.2109	94.9333	93.6407	93.6407	93.4014	94.1386	94.9333	95.4950	96.0822 (39)
Average = Sum(39)m / 12 =												95.2096 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2396	1.2355	1.2315	1.2126	1.2090	1.1926	1.1926	1.1895	1.1989	1.2090	1.2162	1.2237 (40)
HLP (average)												1.2126 (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												2.4342 (42)
Average daily hot water use (litres/day)												92.0118 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	101.2129	97.5325	93.8520	90.1715	86.4911	82.8106	82.8106	86.4911	90.1715	93.8520	97.5325	101.2129 (44)
Energy conte	150.0959	131.2748	135.4638	118.1007	113.3204	97.7869	90.6139	103.9808	105.2227	122.6269	133.8568	145.3598 (45)
Energy content (annual)												Total = Sum(45)m = 1447.7033 (45)
Distribution loss (46)m = 0.15 x (45)m												

	22.5144	19.6912	20.3196	17.7151	16.9981	14.6680	13.5921	15.5971	15.7834	18.3940	20.0785	21.8040 (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	0.6693	0.5762	0.5721	0.4792	0.4411	0.3644	0.3377	0.4047	0.4270	0.5179	0.5875	0.6482 (61)	
Total heat required for water heating calculated for each month	150.7652	131.8510	136.0359	118.5799	113.7614	98.1513	90.9516	104.3855	105.6496	123.1448	134.4443	146.0081 (62)	
WWHRS	-48.4321	-42.6122	-43.4923	-35.7971	-33.2450	-27.4302	-23.2236	-28.1156	-28.9319	-35.7563	-41.4062	-46.8089 eq. (G10)	
Total of WWHRS savings												-435.2513	
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								Solar input (sum of months) = Sum(63)m =					0.0000 (63)
	102.3331	89.2388	92.5437	82.7828	80.5164	70.7211	67.7280	76.2699	76.7177	87.3884	93.0381	99.1991 (64)	
								Total per year (kWh/year) = Sum(64)m =					1018.4772 (64)
Heat gains from water heating, kWh/month													
	50.0742	43.7929	45.1848	39.3883	37.7893	32.6052	30.2135	34.6748	35.0933	40.9029	44.6543	48.4942 (65)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												90.2000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												2874.8557	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	471.8772	383.5994	344.7984	230.2031	138.6195	0.0000	0.0000	0.0000	0.0000	205.5663	340.8591	477.5969	(98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)
Space heating fuel (main heating system)	523.1455	425.2765	382.2598	255.2141	153.6802	0.0000	0.0000	0.0000	0.0000	227.9005	377.8926	529.4866	(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	102.3331	89.2388	92.5437	82.7828	80.5164	70.7211	67.7280	76.2699	76.7177	87.3884	93.0381	99.1991	(64)
Efficiency of water heater (217)m	87.3869	87.2265	86.8793	86.0872	84.5862	76.4000	76.4000	76.4000	76.4000	85.5884	86.8367	76.4000	(216)
Fuel for water heating, kWh/month	117.1034	102.3070	106.5198	96.1616	95.1886	92.5669	88.6492	99.8298	100.4158	102.1032	107.1415	113.3933	(219)
Water heating fuel used												1221.3800	(219)
Annual totals kWh/year													
Space heating fuel - main system												2874.8557	(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)												372.4349	(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												2816.4313	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2874.8557	3.4800	100.0450 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1221.3800	3.4800	42.5040 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	372.4349	13.1900	49.1242 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-1727.2394	13.1900	-227.8229 (252)
Total energy cost			93.7428 (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] =	0.3187 (257)
SAP value	95.5534	
SAP rating (Section 12)	96	(258)
SAP band	A	

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	2874.8557	0.2160	620.9688 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1221.3800	0.2160	263.8181 (264)
Space and water heating			884.7869 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	372.4349	0.5190	193.2937 (268)
Energy saving/generation technologies			
PV Unit	-1727.2394	0.5190	-896.4372 (269)
Total kg/year			220.5684 (272)
CO2 emissions per m2			2.8100 (273)
EI value			97.6072
EI rating			98 (274)
EI band			A

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

SAP 2012 WORKSHEET FOR New Build (As Built) (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	39.2600 (1b)	x 2.3700 (2b)	= 93.0462 (1b) - (3b)
First floor	39.2600 (1c)	x 2.6200 (2c)	= 102.8612 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 195.9074 (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					4 * 10 = 40.0000 (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) =					40.0000 / (5) = 0.2042 (8)
Pressure test					Yes
Measured/design AP50					4.5100
Infiltration rate					0.4297 (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) =	0.3975 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.9000	4.6000	4.5000	4.2000	4.2000	4.1000	4.1000	4.0000	4.0000	4.3000	4.3000	4.4000 (22)
Wind factor	1.2250	1.1500	1.1250	1.0500	1.0500	1.0250	1.0250	1.0000	1.0000	1.0750	1.0750	1.1000 (22a)
Adj infilt rate	0.4869	0.4571	0.4471	0.4173	0.4173	0.4074	0.4074	0.3975	0.3975	0.4273	0.4273	0.4372 (22b)
Effective ac	0.6185	0.6045	0.6000	0.5871	0.5871	0.5830	0.5830	0.5790	0.5790	0.5913	0.5913	0.5956 (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			2.0900	1.2000	2.5080		(26)
Windows (Uw = 1.40)			9.8000	1.3258	12.9792		(27)
Flr - Ground			39.2630	0.1800	7.0673	75.6000	2968.2828 (28a)
Wl - Brick (Timber Frame)	88.6620	11.8870	76.7750	0.2100	16.1228	7.4000	568.1350 (29a)
Rf - Ins Joist	39.2630		39.2630	0.0800	3.1410	7.4000	290.5462 (30)
Total net area of external elements Aum(A, m ²)			167.1810				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.8183		(33)
Party Wall			41.7100	0.0000	0.0000	7.4000	308.6540 (32)
Stud			74.8825			7.4000	554.1306 (32c)
Internal Floor			39.2630			7.4000	290.5462 (32d)
Internal Ceiling			39.2630			7.4000	290.5462 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 5270.8410 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							67.1274 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.8893 (36)
Total fabric heat loss							(33) + (36) = 56.7076 (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	39.9873	39.0778	38.7874	37.9544	37.9544	37.6895	37.6895	37.4310	37.4310	38.2257	38.2257	38.5033 (38)
Heat transfer coeff	96.6949	95.7854	95.4950	94.6620	94.6620	94.3971	94.3971	94.1386	94.1386	94.9333	94.9333	95.2109 (39)
Average = Sum(39)m / 12 =												94.9540 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2315	1.2199	1.2162	1.2056	1.2056	1.2022	1.2022	1.1989	1.1989	1.2090	1.2090	1.2126 (40)
HLP (average)												1.2093 (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												2.4342 (42)
Average daily hot water use (litres/day)												92.0118 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	101.2129	97.5325	93.8520	90.1715	86.4911	82.8106	82.8106	86.4911	90.1715	93.8520	97.5325	101.2129 (44)
Energy conte	150.0959	131.2748	135.4638	118.1007	113.3204	97.7869	90.6139	103.9808	105.2227	122.6269	133.8568	145.3598 (45)
Energy content (annual)												Total = Sum(45)m = 1447.7033 (45)
Distribution loss (46)m = 0.15 x (45)m												

[illegible]

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	52.7220	46.8272	38.0825	28.8309	21.5514	18.1946	19.6599	25.5547	34.2995	43.5511	50.8305	54.1873 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	322.8650	326.2153	317.7726	299.7991	277.1107	255.7868	241.5411	238.1908	246.6335	264.6071	287.2955	308.6193 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393 (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)	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672 (71)
Water heating gains (Table 5)	67.3040	65.1680	60.7322	54.7059	50.7921	45.2851	40.6096	46.6059	48.7407	54.9770	62.0198	65.1804 (72)
Total internal gains	546.6139	541.9334	520.3101	487.0587	453.1770	422.9893	405.5335	414.0743	433.3965	466.8580	503.8686	531.7099 (73)

[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				2.5540	14.6130	0.7300		0.7200	0.7700		13.5941 (75)	
Southwest				7.2440	45.0642	0.7300		0.7200	0.7700		118.9046 (79)	
Solar gains	132.4986	196.0489	284.1429	374.7530	413.2359	461.4132	426.5648	393.3528	331.1684	239.9264	159.0172	110.9438 (83)
Total gains	679.1126	737.9823	804.4530	861.8118	866.4129	884.4025	832.0984	807.4271	764.5650	706.7844	662.8858	642.6537 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n11,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	15.1417	15.2854	15.3319	15.4668	15.4668	15.5102	15.5102	15.5528	15.5528	15.4227	15.4227	15.3777
alpha	2.0094	2.0190	2.0221	2.0311	2.0311	2.0340	2.0340	2.0369	2.0369	2.0282	2.0282	2.0252
util living area	0.8748	0.8523	0.8055	0.7282	0.6197	0.4589	0.3409	0.3400	0.5348	0.7203	0.8309	0.8825 (86)
MIT	18.5756	18.8032	19.2851	19.8807	20.4160	20.7903	20.9228	20.9259	20.6976	20.1240	19.3205	18.5703 (87)
Th 2	19.8949	19.9041	19.9071	19.9155	19.9155	19.9182	19.9182	19.9209	19.9209	19.9128	19.9128	19.9100 (88)
util rest of house	0.8603	0.8356	0.7828	0.6949	0.5678	0.3815	0.2401	0.2363	0.4590	0.6772	0.8082	0.8687 (89)
MIT 2	16.7648	17.0870	17.7633	18.5679	19.2997	19.7494	19.8795	19.8852	19.6578	18.9332	17.8289	16.7641 (90)
Living area fraction	17.1319	17.4350	18.0719	18.8500	19.5260	19.9604	20.0911	20.0962	fLA = Living area / (4) =	19.6866	19.1746	18.1313
MIT	17.1319	17.4350	18.0719	18.8500	19.5260	19.9604	20.0911	20.0962	19.6866	19.1746	18.1313	17.1303 (92)
Temperature adjustment	16.9819	17.2850	17.9219	18.7000	19.3760	19.8104	19.9411	19.9462	19.7186	19.0246	17.9813	-0.1500
adjusted MIT	16.9819	17.2850	17.9219	18.7000	19.3760	19.8104	19.9411	19.9462	19.7186	19.0246	17.9813	16.9803 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8083	0.7830	0.7313	0.6508	0.5387	0.3731	0.2424	0.2389	0.4433	0.6352	0.7561	0.8178 (94)
Useful gains	548.9512	577.8120	588.3018	560.8922	466.7502	330.0036	201.6607	192.8885	338.9045	448.9162	501.1936	525.5647 (95)
Ext temp.	5.7000	6.1000	7.7000	10.1000	13.1000	15.9000	17.7000	17.8000	15.5000	12.3000	8.8000	5.8000 (96)
Heat loss rate W	1090.9065	1071.3550	976.1379	814.0953	594.0995	369.1344	211.5490	202.0372	397.1349	638.3924	871.6126	1064.4911 (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	403.2147	331.6609	288.5501	182.3062	94.7478	0.0000	0.0000	0.0000	0.0000	140.9703	266.7017	400.9613 (98)
Space heating												2109.1130 (98)
Space heating per m2												(98) / (4) = 26.8608 (99)

Regs Region: England
Elmhurst Energy Systems
SAP2012 Calculator (Design
System) version 4.14r19

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2338.2627 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	403.2147	331.6609	288.5501	182.3062	94.7478	0.0000	0.0000	0.0000	0.0000	140.9703	266.7017	400.9613	(98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)
Space heating fuel (main heating system)	447.0230	367.6950	319.9003	202.1133	105.0419	0.0000	0.0000	0.0000	0.0000	156.2863	295.6782	444.5247	(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	102.3331	89.2388	92.5437	82.7828	80.5164	70.7211	67.7280	76.2699	76.7177	87.3884	93.0381	99.1991	(64)
Efficiency of water heater (217)m	87.0184	86.8731	86.4098	85.3837	83.2887	76.4000	76.4000	76.4000	76.4000	84.3682	86.1743	87.4000	(216)
Fuel for water heating, kWh/month	117.5994	102.7232	107.0986	96.9538	96.6716	92.5669	88.6492	99.8298	100.4158	103.5798	107.9650	113.9167	(219)
Water heating fuel used												1227.9698	(219)
Annual totals kWh/year													
Space heating fuel - main system												2338.2627	(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)												372.4349	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 2.50 * 1217 * 0.80) =										-1946.4459		-1946.4459	(233)
Total delivered energy for all uses												2067.2215	(238)

10a. Fuel costs - using BEDF prices (542)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2338.2627	7.6100	177.9418	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1227.9698	7.6100	93.4485	(247)
Pumps and fans for heating	75.0000	31.0800	23.3100	(249)
Energy for lighting	372.4349	31.0800	115.7528	(250)
Additional standing charges			105.0000	(251)
Energy saving/generation technologies				
PV Unit	-1946.4459	31.0800	-604.9554	(252)
Total energy cost			-89.5023	(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	2338.2627	0.2160	505.0647	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1227.9698	0.2160	265.2415	(264)
Space and water heating			770.3062	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	372.4349	0.5190	193.2937	(268)
Energy saving/generation technologies				
PV Unit	-1946.4459	0.5190	-1010.2054	(269)
Total kg/year			-7.6805	(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	2338.2627	1.2200	2852.6805	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1227.9698	1.2200	1498.1232	(264)
Space and water heating			4350.8037	(265)
Pumps and fans	75.0000	3.0700	230.2500	(267)
Energy for lighting	372.4349	3.0700	1143.3752	(268)
Energy saving/generation technologies				
PV Unit	-1946.4459	3.0700	-5975.5890	(269)
Primary energy kWh/year			-251.1602	(272)
Primary energy kWh/m2/year			-3.1987	(273)

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Built)

Property Reference	024 - PRJ013014			Issued on Date	09/05/2024
Assessment Reference	024	Prop Type Ref	E		
Property	10 Deeble Way, Netley Abbey, Southampton, SO31 5JP				
SAP Rating	85 B	DER	15.23	TER	18.26
Environmental	88 B	% DER<TER	16.60		
CO ₂ Emissions (t/year)	1.00	DFEE	44.86	TFEE	49.67
General Requirements Compliance	Pass	% DFEE<TFEE	9.67		
Assessor Details	Mr. Christopher Nicholls, Briary Energy Limited, Tel: 0203 397 1373, chris@briaryenergy.co.uk			Assessor ID	U903-0001
Client					

SUMMARY FOR INPUT DATA FOR New Build (As Built)

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)	18.26	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	15.23	kgCO ₂ /m ²	Pass
	-3.03 (-16.6%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	49.67	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	44.86	kWh/m ² /yr	
	-4.8 (-9.7%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.21 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.18 (max. 0.25)	0.18 (max. 0.70)	Pass
Roof	0.08 (max. 0.20)	0.08 (max. 0.35)	Pass
Openings	1.36 (max. 2.00)	1.40 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.51 (measured in this dwelling)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Built)

Main heating system

Boiler system with radiators or underfloor - Mains gas
Data from database
Vaillant ecoFIT sustain 835 VUW 356/6-3 (H-GB)
Combi boiler
Efficiency: 89.3% SEDBUK2009
Minimum: 88.0%

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Time and temperature zone control

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 (Southern England)

Slight

Pass

Based on:

Overshading

Average

Windows facing North East

2.55 m², No overhang

Windows facing South West

7.24 m², No overhang

Air change rate

4.71 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

4.51 (measured in this dwelling)

Maximum

10.0

Pass

10 Key features

Party wall U-value

0.00

W/m²K

Roof U-value

0.08

W/m²K