Complete Energy Consultancy Ltd
The Exchange
Brickrow
Stroud
[redacted]

Project Information

Building type Mid-terrace house

Reference
Date
Project HMO
20 Conway Road
Bristol
BS4 3RF

SAP 2012 worksheet for New dwelling created by change of use - calculation of energy ratings

1. Overall dwelling dimensions

	Area (m^2)	Av. Storey height (m)	Volume (m^3)	
Ground floor (1)	62.00	2.70	167.40	(3a)
Ground floor (2)	9.00	0.00	0.00	(3b)
First floor	47.00	2.60	122.20	(3c)
Second floor	33.00	2.45	80.85	(3d)
	151.00			**(4)**
			370.45	**(5)**

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2. Ventilation rate

	main + seondary + other heating		m³ per hour	
Number of chimneys	0 + 0 + 0	x 40	0.00	(6a)
Number of open flues	0 + 0 + 0	x 20	0.00	(6b)
Number of intermittent fans	4	x 10	40.00	(7a)
Number of passive vents	0	x 10	0.00	(7b)
Number of flueless gas fires	0	x 40	0.00	(7c)

		Air changes per hour	
		0.11	**(8)**
Pressure test, assumed q50	15.00		(17)
Air permeability		0.86	(18)
		2.00	**(19)**
		0.85	**(20)**
Infiltration rate incorporating shelter factor		0.73	(21)

Infiltration rate modified for monthly wind speed

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
5.10	5.00	4.90	4.40	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70

52.50 (22)

Wind Factor

1.27	1.25	1.23	1.10	1.07	0.95	0.95	0.93	1.00	1.07	1.13	1.18

13.13 (22a)

Adjusted infiltration rate (allowing for shelter and wind speed)

0.93	0.91	0.89	0.80	0.78	0.69	0.69	0.67	0.73	0.78	0.82	0.86

9.57 (22b)

Ventilation : natural ventilation, intermittent extract fans

Effective air change rate

0.93	0.92	0.90	0.82	0.81	0.74	0.74	0.73	0.77	0.81	0.84	0.87

(25)

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3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²	U-value W/m²K	A x U W/K	kappa-value kJ/m²K	A x K kJ/K	
Window - Double-glazed, air-filled (NorthEast) dg			**1.050**	**1.33 (1.40)**	1.39			(27)
Window - Double-glazed, air-filled (NorthEast) dg			**1.409**	**1.33 (1.40)**	1.87			(27)
Window - Double-glazed, air-filled (NorthEast) dg			**1.350**	**1.33 (1.40)**	1.79			(27)
Window - Double-glazed, air-filled (NorthEast) dg			**3.170**	**1.33 (1.40)**	4.20			(27)
Window - Double-glazed, air-filled (South) dg			**1.350**	**1.33 (1.40)**	1.79			(27)
Window - Double-glazed, air-filled (South) dg			**1.170**	**1.33 (1.40)**	1.55			(27)
Window - Double-glazed, air-filled (West) dg			**1.170**	**1.33 (1.40)**	1.55			(27)
Window - Double-glazed, air-filled (West) dg			**1.350**	**1.33 (1.40)**	1.79			(27)
Window - Double-glazed, air-filled (SouthWest) dg			**2.340**	**1.33 (1.40)**	3.10			(27)
Window - Double-glazed, air-filled (SouthWest) dg			**2.700**	**1.33 (1.40)**	3.58			(27)
Window - Double-glazed, air-filled (SouthWest) dg			**1.400**	**1.33 (1.40)**	1.86			(27)
Window - Double-glazed, air-filled (NorthEast) dg			**1.610**	**2.52 (2.80)**	4.05			(27)
Window - Double-glazed, air-filled (NorthEast) dg			**2.310**	**2.52 (2.80)**	5.82			(27)
Solid door dg			**1.980**	**1.40**	2.77			(26)
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.1, soft coat (n/a) dg			**0.900**	**1.33 (1.40)**	1.19			(27)
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.1, soft coat (n/a) dg			**0.900**	**1.33 (1.40)**	1.19			(27)
Pitched roofs insulated between joists			12.00	0.13	1.56	9.00	108.00	(30)

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3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²	U-value W/m²K	A x U W/K	kappa-value kJ/m²K	A x K kJ/K	
Walls dormer			18.54	0.18	3.34	9.00	166.87	(29)
Walls existing			31.02	0.54	16.75	9.00	279.18	(29)
Walls new			25.08	0.18	4.51	190.00	4765.20	(29)
Ground floors new			15.00	0.18	2.70	110.00	1650.00	(28)
Ground floors existing timber			47.00	1.20	56.40	20.00	940.00	(28)
Flat roofs dormer roof			26.00	0.15	3.90	9.00	234.00	(30)
Flat roofs new			15.00	0.18	2.70	9.00	135.00	(30)
Pitched roofs insulated between rafters slopes			10.20	0.15	1.53	9.00	91.80	(30)
Party wall			106.00	0.00	0.00	70.00	7420.00	

Total area of external elements Sigma A, m²	226.00	(31)
Fabric heat loss, W/K	132.89	(33)
Thermal mass parameter, kJ/m²K (user-specified TMP)	250.00	(35)
Effect of thermal bridges	33.90	(36)
Total fabric heat loss	166.79	(37)

Ventilation heat loss calculated monthly

113.97	111.92	109.91	100.46	98.69	90.46	90.46	88.94	93.63	98.69	102.27	106.01	(38)

Heat transfer coefficient, W/K

280.77	278.71	276.70	267.25	265.49	257.26	257.26	255.73	260.43	265.49	269.06	272.80	
											267.25	(39)

Heat loss parameter (HLP), W/m²K

1.86	1.85	1.83	1.77	1.76	1.70	1.70	1.69	1.72	1.76	1.78	1.81	

HLP (average) 1.77 (40)

Number of days in month (Table 1a)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements **kWh/year**

Assumed occupancy, N 2.94 (42)

Annual average hot water usage in litres per day Vd,average 103.92 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month												
114.32	110.16	106.00	101.85	97.69	93.53	93.53	97.69	101.85	106.00	110.16	114.32	(44)
Energy content of hot water used												
169.53	148.27	153.00	133.39	127.99	110.45	102.34	117.44	118.84	138.50	151.19	164.18	
Energy content (annual)											1635.13	(45)
Distribution loss												
25.43	22.24	22.95	20.01	19.20	16.57	15.35	17.62	17.83	20.78	22.68	24.63	(46)
Cylinder volume, l							300.00					(47)
Hot water cylinder loss factor (kWh/day)											0.0136	(51)
Volume factor											0.7368	(52)
Temperature factor											0.5400	(53)
Energy lost from hot water cylinder (kWh/day)											1.62	(55)
Total storage loss												
50.30	45.43	50.30	48.68	50.30	48.68	50.30	50.30	48.68	50.30	48.68	50.30	(56)
Net storage loss												
50.30	45.43	50.30	48.68	50.30	48.68	50.30	50.30	48.68	50.30	48.68	50.30	(57)
Primary loss												
23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)
Total heat required for water heating calculated for each month												
243.09	214.71	226.56	204.58	201.55	181.64	175.91	191.00	190.03	212.06	222.38	237.74	(62)
Output from water heater for each month, kWh/month												
243.09	214.71	226.56	204.58	201.55	181.64	175.91	191.00	190.03	212.06	222.38	237.74	(64)
											2501.27	(64)
Heat gains from water heating, kWh/month												
115.22	102.45	109.72	101.30	101.41	93.68	92.88	97.90	96.47	104.90	107.22	113.44	(65)

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains, Watts												
176.14	176.14	176.14	176.14	176.14	176.14	176.14	176.14	176.14	176.14	176.14	176.14	(66)
Lighting gains												
74.55	66.21	53.85	40.77	30.47	25.73	27.80	36.13	48.50	61.58	71.87	76.62	(67)
Appliances gains												
480.01	484.99	472.44	445.72	411.99	380.29	359.11	354.12	366.68	393.40	427.13	458.83	(68)
Cooking gains												
55.55	55.55	55.55	55.55	55.55	55.55	55.55	55.55	55.55	55.55	55.55	55.55	(69)
Pumps and fans gains												
3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	(70)
Losses e.g. evaporation (negative values)												
-117.43	-117.43	-117.43	-117.43	-117.43	-117.43	-117.43	-117.43	-117.43	-117.43	-117.43	-117.43	(71)
Water heating gains												
154.86	152.46	147.48	140.70	136.30	130.10	124.84	131.59	133.98	141.00	148.92	152.47	(72)
Total internal gains												
826.69	820.93	791.03	744.45	696.03	653.38	629.01	639.11	666.42	713.24	765.19	805.19	(73)

6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, air-filled (NorthEast) dg	0.9 x 1.050 11.28	0.76 x 0.70	0.77	4.3677
Window - Double-glazed, air-filled (NorthEast) dg	0.9 x 1.409 11.28	0.76 x 0.70	0.77	5.8611
Window - Double-glazed, air-filled (NorthEast) dg	0.9 x 1.350 11.28	0.76 x 0.70	0.77	5.6157
Window - Double-glazed, air-filled (NorthEast) dg	0.9 x 3.170 11.28	0.76 x 0.70	0.77	13.1864
Window - Double-glazed, air-filled (South) dg	0.9 x 1.350 46.75	0.76 x 0.70	0.77	23.2691
Window - Double-glazed, air-filled (South) dg	0.9 x 1.170 46.75	0.76 x 0.70	0.77	20.1665
Window - Double-glazed, air-filled (West) dg	0.9 x 1.170 19.64	0.76 x 0.70	0.77	8.4718
Window - Double-glazed, air-filled (West) dg	0.9 x 1.350 19.64	0.76 x 0.70	0.77	9.7752
Window - Double-glazed, air-filled (SouthWest) dg	0.9 x 2.340 36.79	0.76 x 0.70	0.77	31.7421
Window - Double-glazed, air-filled (SouthWest) dg	0.9 x 2.700 36.79	0.76 x 0.70	0.77	36.6255
Window - Double-glazed, air-filled (SouthWest) dg	0.9 x 1.400 36.79	0.76 x 0.70	0.77	18.9910

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6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains	
Window - Double-glazed, air-filled (NorthEast) dg	0.9 x 1.610 11.28	0.76 x 0.70	0.77	6.6972	
Window - Double-glazed, air-filled (NorthEast) dg	0.9 x 2.310 11.28	0.76 x 0.70	0.77	9.6090	
Solid door dg	0.9 x 1.980 0.00	0.00 x 0.70	0.77	0.0000	
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.1, soft coat (n/a) dg	0.9 x 0.900 26.00	0.63 x 0.70	1.00	9.2875	
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.1, soft coat (n/a) dg	0.9 x 0.900 26.00	0.63 x 0.70	1.00	9.2875	
Total solar gains, January				212.95	(83-1)

Solar gains

212.95	386.50	587.85	820.64	998.57	1024.98	974.29	837.26	668.24	443.47	259.50	179.33	(83)

Total gains

1039.64	1207.43	1378.88	1565.09	1694.60	1678.36	1603.30	1476.37	1334.67	1156.72	1024.68	984.52	(84)

Lighting calculations

	Area	g	FF x Shading	
Window - Double-glazed, air-filled (NorthEast) dg	0.9 x 1.05	0.80	0.70 x 0.83	0.44
Window - Double-glazed, air-filled (NorthEast) dg	0.9 x 1.41	0.80	0.70 x 0.83	0.59
Window - Double-glazed, air-filled (NorthEast) dg	0.9 x 1.35	0.80	0.70 x 0.83	0.56
Window - Double-glazed, air-filled (NorthEast) dg	0.9 x 3.17	0.80	0.70 x 0.83	1.33
Window - Double-glazed, air-filled (South) dg	0.9 x 1.35	0.80	0.70 x 0.83	0.56
Window - Double-glazed, air-filled (South) dg	0.9 x 1.17	0.80	0.70 x 0.83	0.49
Window - Double-glazed, air-filled (West) dg	0.9 x 1.17	0.80	0.70 x 0.83	0.49
Window - Double-glazed, air-filled (West) dg	0.9 x 1.35	0.80	0.70 x 0.83	0.56
Window - Double-glazed, air-filled (SouthWest) dg	0.9 x 2.34	0.80	0.70 x 0.83	0.98
Window - Double-glazed, air-filled (SouthWest) dg	0.9 x 2.70	0.80	0.70 x 0.83	1.13
Window - Double-glazed, air-filled (SouthWest) dg	0.9 x 1.40	0.80	0.70 x 0.83	0.59

Lighting calculations

	Area	g	FF x Shading	
Window - Double-glazed, air-filled (NorthEast) dg	0.9 x 1.61	0.80	0.70 x 0.83	0.67
Window - Double-glazed, air-filled (NorthEast) dg	0.9 x 2.31	0.80	0.70 x 0.83	0.97
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.1, soft coat (n/a) dg	0.9 x 0.90	0.80	0.70 x 1.00	0.45
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.1, soft coat (n/a) dg	0.9 x 0.90	0.80	0.70 x 1.00	0.45

GL = 10.27 / 151.00 = 0.068
C1 = 0.500
C2 = 0.998
EI = 527

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)
Heating system responsiveness 1.00

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau												
37.35	37.62	37.90	39.24	39.50	40.76	40.76	41.00	40.27	39.50	38.97	38.44	
alpha												
3.49	3.51	3.53	3.62	3.63	3.72	3.72	3.73	3.68	3.63	3.60	3.56	
Utilisation factor for gains for living area												
1.00	0.99	0.98	0.96	0.90	0.78	0.64	0.69	0.89	0.97	0.99	1.00	(86)
Mean internal temperature in living area T1												
18.99	19.18	19.53	20.03	20.47	20.81	20.94	20.91	20.65	20.09	19.48	19.00	(87)
Temperature during heating periods in rest of dwelling Th2												
19.43	19.44	19.45	19.49	19.50	19.54	19.54	19.55	19.52	19.50	19.48	19.47	(88)
Utilisation factor for gains for rest of dwelling												
0.99	0.99	0.98	0.94	0.86	0.67	0.46	0.52	0.81	0.96	0.99	1.00	(89)
Mean internal temperature in the rest of dwelling T2												
16.84	17.13	17.64	18.38	18.99	19.41	19.52	19.51	19.25	18.47	17.59	16.87	(90)

Living area fraction (27.26 / 151.00) 0.18 (91)
Mean internal temperature (for the whole dwelling)

17.22	17.50	17.98	18.68	19.26	19.67	19.77	19.76	19.50	18.76	17.93	17.26	(92)
Apply adjustment to the mean internal temperature, where appropriate												
17.22	17.50	17.98	18.68	19.26	19.67	19.77	19.76	19.50	18.76	17.93	17.26	(93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains												
0.99	0.98	0.97	0.93	0.84	0.68	0.49	0.55	0.81	0.95	0.98	0.99	(94)
Useful gains												
1030.15	1188.56	1336.78	1456.65	1431.93	1140.03	782.40	808.64	1076.69	1098.45	1009.10	977.20	(95)
Monthly average external temperature												
4.30	4.90	6.50	8.90	11.70	14.60	16.60	16.40	14.10	10.60	7.10	4.20	(96)
Heat loss rate for mean internal temperature												
3628.8	3511.7	3176.5	2614.1	2006.4	1303.28	816.41	860.50	1406.77	2167.4	2914.3	3562.2	(97)
Fraction of month for heating												
1.00	1.00	1.00	1.00	1.00	-	-	-	-	1.00	1.00	1.00	
Space heating requirement for each month, kWh/month												
1933.37	1561.15	1368.72	833.36	427.44	-	-	-	-	795.32	1371.72	1923.27	

Total space heating requirement per year (kWh/year) (October to May)	10214.35	(98)
Space heating requirement per m² (kWh/m²/year)	67.64	(99)

8c. Space cooling requirement - not applicable

9a. Energy requirements

kWh/year

No secondary heating system selected

Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main heating system	90.50%	(206)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement												
1933.37	1561.15	1368.72	833.36	427.44	-	-	-	-	795.32	1371.72	1923.27	(98)
Appendix Q - monthly energy saved (main heating system 1)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(210)
Space heating fuel (main heating system 1)												
2136.3	1725.03	1512.39	920.84	472.31	-	-	-	-	878.81	1515.71	2125.2	(211)
Appendix Q - monthly energy saved (main heating system 2)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(212)
Space heating fuel (main heating system 2)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(213)
Appendix Q - monthly energy saved (secondary heating system)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(214)
Space heating fuel (secondary)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(215)
Water heating												
Water heating requirement												
243.09	214.71	226.56	204.58	201.55	181.64	175.91	191.00	190.03	212.06	222.38	237.74	(64)
Efficiency of water heater												79.80 (216)
89.16	89.06	88.81	88.17	86.77	79.80	79.80	79.80	79.80	88.02	88.84	89.18	(217)
Water heating fuel												
272.63	241.10	255.11	232.03	232.28	227.61	220.44	239.35	238.14	240.94	250.32	266.57	(219)

Annual totals	kWh/year	
Space heating fuel used, main system 1	11286.57	(211)
Space heating fuel (secondary)	0.00	(215)
Water heating fuel	2916.52	(219)
Electricity for pumps, fans and electric keep-hot		
central heating pump	30.00	(230c)
boiler with a fan-assisted flue	45.00	(230e)
Total electricity for the above, kWh/year	75.00	(231)
Electricity for lighting (100.00% fixed LEL)	526.62	(232)
Energy saving/generation technologies		
PVs 0.80 x 2.000 x 1079.525 x 1.000	1727.239	
PVs 0.80 x 0.000 x 0.000 x 0.500	0.000	
PVs 0.80 x 0.000 x 0.000 x 0.500	0.000	
	1727.239	(233)
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	13077.48	(238)

10a. Fuel costs using Table 12 prices

	kWh/year	Fuel price p/kWh	£/year	
Space heating - main system 1	11286.571	3.480	392.77	(240)
Space heating - main system 2	0.000	0.000	0.00	(241)
Water heating cost	2916.52	3.480	101.49	(247)
Mech vent fans cost	0.000	13.190	0.00	(249)
Pump/fan energy cost	75.000	13.190	9.89	(249)
Energy for lighting	526.624	13.190	69.46	(250)
Additional standing charges			120.00	(251)
Electricity generated - PVs	1727.239	13.190	-227.82	(252)
Appendix Q -				
Energy saved or generated ():	0.000	0.000	0.00	(253)
Energy used ():	0.000	0.000	0.00	(254)
Total energy cost			465.80	(255)

11a. SAP rating

	0.42	**(256)**
	1.00	**(257)**
SAP value	86.08	
	86	(258)
SAP band	**B**	

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating, main system 1	11286.57	0.216	2437.90	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	0.519	0.00	(263)
Water heating	2916.52	0.216	629.97	(264)
Space and water heating			3067.87	(265)
Electricity for pumps and fans	75.00	0.519	38.93	(267)
Electricity for lighting	526.62	0.519	273.32	(268)
Electricity generated - PVs	-1727.24	0.519	-896.44	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Appendix Q -				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			2483.67	(272)

	kg/m²/year	
CO2 emissions per m²	**16.45**	(273)
EI value	83.02	(273a)
EI rating	**83**	(274)
EI band	**B**	

Calculation of stars for heating and DHW

Main heating energy efficiency	(3.48 / 0.9050) x (1 + (0.29 x 0.00)) = 3.8453, stars = 4
Main heating environmental impact	(0.2160 / 0.9050) x (1 + (0.29 x 0.00)) = 0.2387, stars = 4
Water heating energy efficiency	3.48 / 0.8560 = 4.0654, stars = 4
Water heating environmental impact	0.2160 / 0.8560 = 0.2523, stars = 4

Project Information

Building type Mid-terrace house

Reference

Date

Project HMO
20 Conway Road
Bristol
BS4 3RF

SAP 2012 worksheet for New dwelling created by change of use - calculation of dwelling emissions

1. Overall dwelling dimensions

	Area (m^2)	**Av. Storey height (m)**	**Volume (m^3)**	
Ground floor (1)	62.00	2.70	167.40	(3a)
Ground floor (2)	9.00	0.00	0.00	(3b)
First floor	47.00	2.60	122.20	(3c)
Second floor	33.00	2.45	80.85	(3d)
	151.00			**(4)**
			370.45	**(5)**

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2. Ventilation rate

			m³ per hour	
	main + seondary + other heating			
Number of chimneys	0 + 0 + 0	x 40	0.00	(6a)
Number of open flues	0 + 0 + 0	x 20	0.00	(6b)
Number of intermittent fans	4	x 10	40.00	(7a)
Number of passive vents	0	x 10	0.00	(7b)
Number of flueless gas fires	0	x 40	0.00	(7c)

		Air changes per hour	
		0.11	**(8)**
Pressure test, assumed q50	15.00		(17)
Air permeability		0.86	(18)
		2.00	**(19)**
		0.85	**(20)**
Infiltration rate incorporating shelter factor		0.73	(21)

Infiltration rate modified for monthly wind speed

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
5.10	5.00	4.90	4.40	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70

52.50 (22)

Wind Factor

1.27	1.25	1.23	1.10	1.07	0.95	0.95	0.93	1.00	1.07	1.13	1.18

13.13 (22a)

Adjusted infiltration rate (allowing for shelter and wind speed)

0.93	0.91	0.89	0.80	0.78	0.69	0.69	0.67	0.73	0.78	0.82	0.86

9.57 (22b)

Ventilation : natural ventilation, intermittent extract fans

Effective air change rate

0.93	0.92	0.90	0.82	0.81	0.74	0.74	0.73	0.77	0.81	0.84	0.87

(25)

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input data.

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²	U-value W/m²K	A x U W/K	kappa-value kJ/m²K	A x K kJ/K	
Window - Double-glazed, air-filled (NorthEast) dg			**1.409**	**1.33 (1.40)**	1.87			(27)
Window - Double-glazed, air-filled (NorthEast) dg			**1.050**	**1.33 (1.40)**	1.39			(27)
Window - Double-glazed, air-filled (SouthWest) dg			**1.400**	**1.33 (1.40)**	1.86			(27)
Window - Double-glazed, air-filled (SouthWest) dg			**2.700**	**1.33 (1.40)**	3.58			(27)
Window - Double-glazed, air-filled (SouthWest) dg			**2.340**	**1.33 (1.40)**	3.10			(27)
Window - Double-glazed, air-filled (West) dg			**1.350**	**1.33 (1.40)**	1.79			(27)
Window - Double-glazed, air-filled (West) dg			**1.170**	**1.33 (1.40)**	1.55			(27)
Window - Double-glazed, air-filled (South) dg			**1.170**	**1.33 (1.40)**	1.55			(27)
Window - Double-glazed, air-filled (South) dg			**1.350**	**1.33 (1.40)**	1.79			(27)
Window - Double-glazed, air-filled (NorthEast) dg			**3.170**	**1.33 (1.40)**	4.20			(27)
Window - Double-glazed, air-filled (NorthEast) dg			**1.350**	**1.33 (1.40)**	1.79			(27)
Window - Double-glazed, air-filled (NorthEast) dg			**2.310**	**2.52 (2.80)**	5.82			(27)
Window - Double-glazed, air-filled (NorthEast) dg			**1.610**	**2.52 (2.80)**	4.05			(27)
Solid door dg			**1.980**	**1.40**	2.77			(26)
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.1, soft coat (n/a) dg			**0.900**	**1.33 (1.40)**	1.19			(27)
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.1, soft coat (n/a) dg			**0.900**	**1.33 (1.40)**	1.19			(27)
Pitched roofs insulated between joists			12.00	0.13	1.56	9.00	108.00	(30)

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input data.

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²	U-value W/m²K	A x U W/K	kappa-value kJ/m²K	A x K kJ/K	
Walls dormer			18.54	0.18	3.34	9.00	166.87	(29)
Walls existing			31.02	0.54	16.75	9.00	279.18	(29)
Walls new			25.08	0.18	4.51	190.00	4765.20	(29)
Ground floors new			15.00	0.18	2.70	110.00	1650.00	(28)
Ground floors existing timber			47.00	1.20	56.40	20.00	940.00	(28)
Flat roofs dormer roof			26.00	0.15	3.90	9.00	234.00	(30)
Flat roofs new			15.00	0.18	2.70	9.00	135.00	(30)
Pitched roofs insulated between rafters slopes			10.20	0.15	1.53	9.00	91.80	(30)
Party wall			106.00	0.00	0.00	70.00	7420.00	

Total area of external elements Sigma A, m²	226.00	(31)
Fabric heat loss, W/K	132.89	(33)
Thermal mass parameter, kJ/m²K (user-specified TMP)	250.00	(35)
Effect of thermal bridges	33.90	(36)
Total fabric heat loss	166.79	(37)

Ventilation heat loss calculated monthly

113.97	111.92	109.91	100.46	98.69	90.46	90.46	88.94	93.63	98.69	102.27	106.01	(38)

Heat transfer coefficient, W/K

280.77	278.71	276.70	267.25	265.49	257.26	257.26	255.73	260.43	265.49	269.06	272.80	
											267.25	(39)

Heat loss parameter (HLP), W/m²K

1.86	1.85	1.83	1.77	1.76	1.70	1.70	1.69	1.72	1.76	1.78	1.81	

HLP (average) 1.77 (40)

Number of days in month (Table 1a)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements **kWh/year**

Assumed occupancy, N 2.94 (42)

Annual average hot water usage in litres per day Vd,average 103.92 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month												
114.32	110.16	106.00	101.85	97.69	93.53	93.53	97.69	101.85	106.00	110.16	114.32	(44)
Energy content of hot water used												
169.53	148.27	153.00	133.39	127.99	110.45	102.34	117.44	118.84	138.50	151.19	164.18	
Energy content (annual)											1635.13	(45)
Distribution loss												
25.43	22.24	22.95	20.01	19.20	16.57	15.35	17.62	17.83	20.78	22.68	24.63	(46)
Cylinder volume, l							300.00					(47)
Hot water cylinder loss factor (kWh/day)											0.0136	(51)
Volume factor											0.7368	(52)
Temperature factor											0.5400	(53)
Energy lost from hot water cylinder (kWh/day)											1.62	(55)
Total storage loss												
50.30	45.43	50.30	48.68	50.30	48.68	50.30	50.30	48.68	50.30	48.68	50.30	(56)
Net storage loss												
50.30	45.43	50.30	48.68	50.30	48.68	50.30	50.30	48.68	50.30	48.68	50.30	(57)
Primary loss												
23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)
Total heat required for water heating calculated for each month												
243.09	214.71	226.56	204.58	201.55	181.64	175.91	191.00	190.03	212.06	222.38	237.74	(62)
Output from water heater for each month, kWh/month												
243.09	214.71	226.56	204.58	201.55	181.64	175.91	191.00	190.03	212.06	222.38	237.74	(64)
											2501.27	(64)
Heat gains from water heating, kWh/month												
115.22	102.45	109.72	101.30	101.41	93.68	92.88	97.90	96.47	104.90	107.22	113.44	(65)

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5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains, Watts												
146.79	146.79	146.79	146.79	146.79	146.79	146.79	146.79	146.79	146.79	146.79	146.79	(66)
Lighting gains												
29.82	26.49	21.54	16.31	12.19	10.29	11.12	14.45	19.40	24.63	28.75	30.65	(67)
Appliances gains												
321.61	324.95	316.54	298.63	276.03	254.79	240.60	237.26	245.67	263.58	286.18	307.42	(68)
Cooking gains												
37.68	37.68	37.68	37.68	37.68	37.68	37.68	37.68	37.68	37.68	37.68	37.68	(69)
Pumps and fans gains												
3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	(70)
Losses e.g. evaporation (negative values)												
-117.43	-117.43	-117.43	-117.43	-117.43	-117.43	-117.43	-117.43	-117.43	-117.43	-117.43	-117.43	(71)
Water heating gains												
154.86	152.46	147.48	140.70	136.30	130.10	124.84	131.59	133.98	141.00	148.92	152.47	(72)
Total internal gains												
576.33	573.93	555.59	525.67	494.56	465.22	446.60	453.34	469.09	499.24	533.88	560.57	(73)

6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, air-filled (NorthEast) dg	0.9 x 1.409 11.28	0.76 x 0.70	0.77	5.8611
Window - Double-glazed, air-filled (NorthEast) dg	0.9 x 1.050 11.28	0.76 x 0.70	0.77	4.3677
Window - Double-glazed, air-filled (SouthWest) dg	0.9 x 1.400 36.79	0.76 x 0.70	0.77	18.9910
Window - Double-glazed, air-filled (SouthWest) dg	0.9 x 2.700 36.79	0.76 x 0.70	0.77	36.6255
Window - Double-glazed, air-filled (SouthWest) dg	0.9 x 2.340 36.79	0.76 x 0.70	0.77	31.7421
Window - Double-glazed, air-filled (West) dg	0.9 x 1.350 19.64	0.76 x 0.70	0.77	9.7752
Window - Double-glazed, air-filled (West) dg	0.9 x 1.170 19.64	0.76 x 0.70	0.77	8.4718
Window - Double-glazed, air-filled (South) dg	0.9 x 1.170 46.75	0.76 x 0.70	0.77	20.1665
Window - Double-glazed, air-filled (South) dg	0.9 x 1.350 46.75	0.76 x 0.70	0.77	23.2691
Window - Double-glazed, air-filled (NorthEast) dg	0.9 x 3.170 11.28	0.76 x 0.70	0.77	13.1864
Window - Double-glazed, air-filled (NorthEast) dg	0.9 x 1.350 11.28	0.76 x 0.70	0.77	5.6157

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6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, air-filled (NorthEast) dg	0.9 x 2.310 11.28	0.76 x 0.70	0.77	9.6090
Window - Double-glazed, air-filled (NorthEast) dg	0.9 x 1.610 11.28	0.76 x 0.70	0.77	6.6972
Solid door dg	0.9 x 1.980 0.00	0.00 x 0.70	0.77	0.0000
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.1, soft coat (n/a) dg	0.9 x 0.900 26.00	0.63 x 0.70	1.00	9.2875
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.1, soft coat (n/a) dg	0.9 x 0.900 26.00	0.63 x 0.70	1.00	9.2875

Lighting calculations

	Area	g	FF x Shading	
Window - Double-glazed, air-filled (NorthEast) dg	0.9 x 1.41	0.80	0.70 x 0.83	0.59
Window - Double-glazed, air-filled (NorthEast) dg	0.9 x 1.05	0.80	0.70 x 0.83	0.44
Window - Double-glazed, air-filled (SouthWest) dg	0.9 x 1.40	0.80	0.70 x 0.83	0.59
Window - Double-glazed, air-filled (SouthWest) dg	0.9 x 2.70	0.80	0.70 x 0.83	1.13
Window - Double-glazed, air-filled (SouthWest) dg	0.9 x 2.34	0.80	0.70 x 0.83	0.98
Window - Double-glazed, air-filled (West) dg	0.9 x 1.35	0.80	0.70 x 0.83	0.56
Window - Double-glazed, air-filled (West) dg	0.9 x 1.17	0.80	0.70 x 0.83	0.49
Window - Double-glazed, air-filled (South) dg	0.9 x 1.17	0.80	0.70 x 0.83	0.49
Window - Double-glazed, air-filled (South) dg	0.9 x 1.35	0.80	0.70 x 0.83	0.56
Window - Double-glazed, air-filled (NorthEast) dg	0.9 x 3.17	0.80	0.70 x 0.83	1.33
Window - Double-glazed, air-filled (NorthEast) dg	0.9 x 1.35	0.80	0.70 x 0.83	0.56
Window - Double-glazed, air-filled (NorthEast) dg	0.9 x 2.31	0.80	0.70 x 0.83	0.97
Window - Double-glazed, air-filled (NorthEast) dg	0.9 x 1.61	0.80	0.70 x 0.83	0.67

Lighting calculations

	Area	g	FF x Shading	
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.1, soft coat (n/a) dg	0.9 x 0.90	0.80	0.70 x 1.00	0.45
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.1, soft coat (n/a) dg	0.9 x 0.90	0.80	0.70 x 1.00	0.45

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)

Heating system responsiveness 1.00

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau												
37.35	37.62	37.90	39.24	39.50	40.76	40.76	41.00	40.27	39.50	38.97	38.44	
alpha												
3.49	3.51	3.53	3.62	3.63	3.72	3.72	3.73	3.68	3.63	3.60	3.56	
Utilisation factor for gains for living area												
1.00	1.00	0.99	0.98	0.93	0.83	0.69	0.75	0.92	0.99	1.00	1.00	(86)
Mean internal temperature in living area T1												
18.85	19.05	19.41	19.93	20.39	20.76	20.92	20.88	20.58	19.97	19.36	18.86	(87)
Temperature during heating periods in rest of dwelling Th2												
19.43	19.44	19.45	19.49	19.50	19.54	19.54	19.55	19.52	19.50	19.48	19.47	(88)
Utilisation factor for gains for rest of dwelling												
1.00	1.00	0.99	0.96	0.89	0.72	0.51	0.58	0.86	0.98	1.00	1.00	(89)
Mean internal temperature in the rest of dwelling T2												
16.64	16.93	17.46	18.24	18.89	19.38	19.51	19.50	19.17	18.32	17.41	16.68	(90)

Living area fraction (27.26 / 151.00) 0.18 (91)

Mean internal temperature (for the whole dwelling)

17.04	17.32	17.81	18.54	19.16	19.63	19.76	19.75	19.42	18.62	17.76	17.07	(92)
Apply adjustment to the mean internal temperature, where appropriate												
17.04	17.32	17.81	18.54	19.16	19.63	19.76	19.75	19.42	18.62	17.76	17.07	(93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains												
1.00	0.99	0.98	0.95	0.88	0.73	0.54	0.61	0.86	0.97	0.99	1.00	(94)
Useful gains												
786.12	952.67	1122.40	1281.59	1312.93	1086.28	766.44	783.40	974.30	914.83	787.73	737.62	(95)
Monthly average external temperature												
4.30	4.90	6.50	8.90	11.70	14.60	16.60	16.40	14.10	10.60	7.10	4.20	(96)
Heat loss rate for mean internal temperature												
3576.1	3460.8	3129.9	2576.6	1981.47	1293.20	813.59	856.04	1386.06	2128.5	2867.7	3511.7	(97)
Fraction of month for heating												
1.00	1.00	1.00	1.00	1.00	-	-	-	-	1.00	1.00	1.00	
Space heating requirement for each month, kWh/month												
2075.8	1685.43	1493.58	932.37	497.40	-	-	-	-	902.94	1497.57	2063.9	

Total space heating requirement per year (kWh/year) (October to May) 11148.96 (98)
Space heating requirement per m² (kWh/m²/year) 73.83 (99)

8c. Space cooling requirement - not applicable

9a. Energy requirements

kWh/year

No secondary heating system selected

Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main heating system	90.50%	(206)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement												
2075.8	1685.43	1493.58	932.37	497.40	-	-	-	-	902.94	1497.57	2063.9	(98)
Appendix Q - monthly energy saved (main heating system 1)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(210)
Space heating fuel (main heating system 1)												
2293.7	1862.36	1650.36	1030.25	549.61	-	-	-	-	997.73	1654.77	2280.6	(211)
Appendix Q - monthly energy saved (main heating system 2)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(212)
Space heating fuel (main heating system 2)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(213)
Appendix Q - monthly energy saved (secondary heating system)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(214)
Space heating fuel (secondary)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(215)
Water heating												
Water heating requirement												
243.09	214.71	226.56	204.58	201.55	181.64	175.91	191.00	190.03	212.06	222.38	237.74	(64)
Efficiency of water heater												79.80 (216)
89.25	89.15	88.93	88.37	87.13	79.80	79.80	79.80	79.80	88.25	88.96	89.26	(217)
Water heating fuel												
272.38	240.85	254.77	231.51	231.32	227.61	220.44	239.35	238.14	240.30	249.98	266.34	(219)

Annual totals	kWh/year	
Space heating fuel used, main system 1	12319.29	(211)
Space heating fuel (secondary)	0.00	(215)
Water heating fuel	2912.99	(219)
Electricity for pumps, fans and electric keep-hot		
central heating pump	30.00	(230c)
boiler with a fan-assisted flue	45.00	(230e)
Total electricity for the above, kWh/year	75.00	(231)
Electricity for lighting (100.00% fixed LEL)	526.62	(232)
Energy saving/generation technologies		
PVs 0.80 x 2.000 x 1079.525 x 1.000	1727.239	
PVs 0.80 x 0.000 x 0.000 x 0.500	0.000	
PVs 0.80 x 0.000 x 0.000 x 0.500	0.000	
	1727.239	(233)
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	14106.67	(238)

10a. Does not apply

11a. Does not apply

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating, main system 1	12319.29	0.216	2660.97	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	0.519	0.00	(263)
Water heating	2912.99	0.216	629.21	(264)
Space and water heating			3290.17	(265)
Electricity for pumps and fans	75.00	0.519	38.93	(267)
Electricity for lighting	526.62	0.519	273.32	(268)
Electricity generated - PVs	-1727.24	0.519	-896.44	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Appendix Q -				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			2705.98	(272)
			kg/m²/year	
Dwelling Carbon Dioxide Emission Rate (DER)			**17.92**	(273)

Project Information

Building type Mid-terrace house

Reference
Date
Project HMO
20 Conway Road
Bristol
BS4 3RF

REGULATION COMPLIANCE REPORT - Approved Document L1A, 2012 Edition, England
assessed by program JPA Designer version 6.05.085, printed on 06/03/2024 at 13:42:37

New dwelling created by change of use

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1 TER and DER

Fuel for main heating system: Gas (mains) (fuel factor = 1.00)

Target Carbon Dioxide Emission Rate	TER = 13.66	
Dwelling Carbon Dioxide Emission Rate	DER = 17.92	Fail
Excess emissions = 4.26kg/m² (31.2%)		

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	TFEE = 44.4	
Dwelling Fabric Energy Efficiency (DFEE)	DFEE = 82.9	Fail

2a Thermal bridging

Thermal bridging calculated using default y-value of 0.15

2b Fabric U-values

Element	Average	Highest	
Wall	0.33 (max. 0.30)	0.54 (max. 0.70)	Fail
Floor	0.95 (max. 0.25)	1.20 (max. 0.70)	Fail
Roof	0.15 (max. 0.20)	0.18 (max. 0.35)	OK
Openings	1.61 (max. 2.00)	2.80 (max. 3.30)	OK

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3 Air permeability

Air permeability at 50 pascals:	15.00	OK
Maximum :	10.00	
(Small development - no pressure testing carried out)		

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4 Heating efficiency

Main heating system:

Boiler and radiators, mains gas
Worcester Greenstar 8000 Life

Source of efficiency: from boiler database
Worcester Greenstar 8000 Life GR8300iW 30 S NG
Efficiency: 89.5% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system:
None -

5 Cylinder insulation

Hot water storage

	Calculated cylinder loss factor (kWh/day)	3.00	
	Permitted by DBSCG	2.86	Fail
Primary pipework insulated	Yes		OK

6 Controls

(Also refer to "Domestic Building Services Compliance Guide" by the DCLG)

Space heating controls	Time and temperature zone control	OK
	Cylinderstat - Yes	OK
	Independent timer for DHW - Yes	OK
Boiler Interlock	Yes	OK

7 Low energy lights

	Percentage of fixed lights with low-energy fittings: 100.0%	
	Minimum: 75.0%	OK

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Severn Valley): OK

Not significant OK

Based on:

Thermal mass parameter :	250.00
Overshading :	Average or unknown (20-60 % sky blocked)

Orientation : SouthWest

Ventilation rate :	8.00
Blinds/curtains :	

None with blinds/shutters closed 0.00% of daylight hours

10 Key features

Photovoltaic array

Predicted Energy Assessment

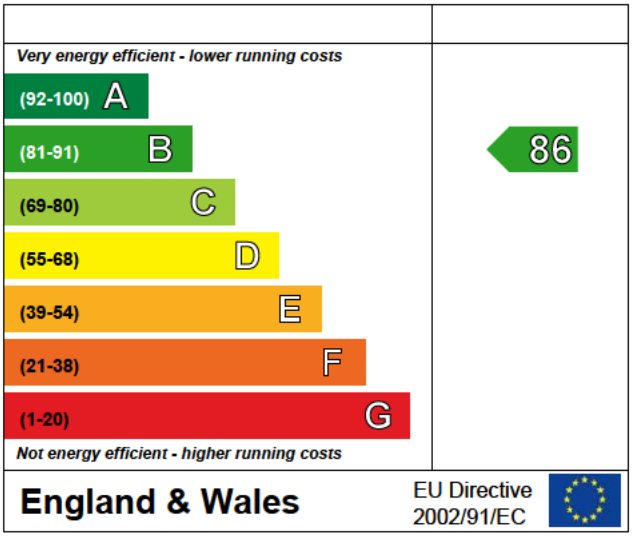
HMO
20 Conway Road
Bristol
BS4 3RF

Dwelling type: Mid-terrace house
Date of assessment: 6 March 2024
Produced by Complete Energy Consultancy Ltd
Total floor area: 151 m²

This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

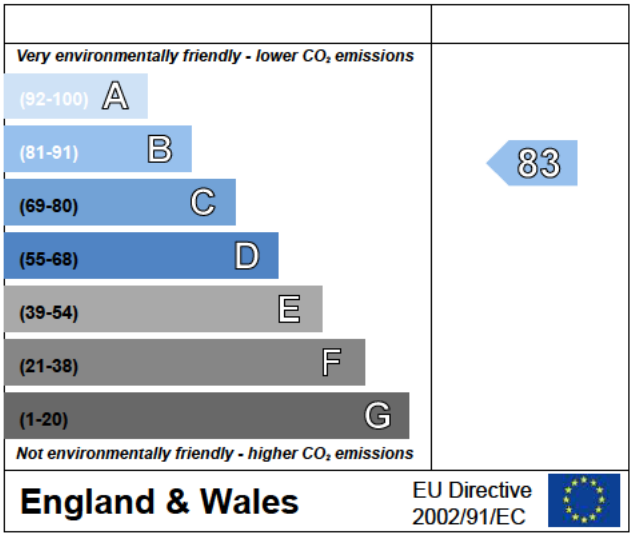
Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO_2) emissions.

Energy Efficiency Rating



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 (CO_2) Rating



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.