



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 (m²)	Av. Storey height (m)	Volume (m³)	
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		370.45	(4)
				(5)

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

2. Ventilation rate

	main + secondary + 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)	

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

3. Heat losses and heat loss parameter

Element	Gross area, m ²	Openings m ²	Net area A, m ²	U-value W/m ² K	A x U W/K	kappa-value kJ/m ² K	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)

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

3. Heat losses and heat loss parameter

Element	Gross area, m ²	Openings m ²	Net area A, m ²	U-value W/m ² K	A x U W/K	kappa-value kJ/m ² K	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, m ²							226.00	(31)					
Fabric heat loss, W/K							132.89	(33)					
Thermal mass parameter, kJ/m ² K (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/m ² K													
1.86	1.85	1.83	1.77	1.76	1.70	1.70	1.69	1.72	1.76	1.78	1.81	1.77	(40)
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		

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

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)	

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

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 1.409 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

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

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
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)
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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)
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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

Lighting calculations

	Area	g	FF x Shading	
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
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
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37.35	37.62	37.90	39.24	39.50	40.76	40.76	41.00	40.27	39.50	38.97	38.44
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3.49	3.51	3.53	3.62	3.63	3.72	3.72	3.73	3.68	3.63	3.60	3.56
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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
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(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
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(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
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(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
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(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
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(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
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(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
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(93)

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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 m ² (kWh/m ² /year)										67.64		(99)

8c. Space cooling requirement - not applicable

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

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														
Appendix Q -														
Energy saved or generated ():												0.000	(236a)	
Energy used ():												0.000	(237a)	
Total delivered energy for all uses												14804.72	(238)	

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

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	0.000	0.000	0.00	(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			693.62	(255)

11a. SAP rating

		0.42	(256)
		1.49	(257)
SAP value		79.27	
		79	(258)
SAP band		C	

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	0.00	0.519	0.00	(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			3380.11	(272)

		22.38	(273)
CO2 emissions per m²		76.89	(273a)
El value		77	(274)
El rating		C	
El band			

Calculation of stars for heating and DHW

Main heating energy efficiency	$(3.48 / 0.9050) \times (1 + (0.29 \times 0.00)) = 3.8453$, stars = 4
Main heating environmental impact	$(0.2160 / 0.9050) \times (1 + (0.29 \times 0.00)) = 0.2387$, 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 (m²)	Av. Storey height (m)	Volume (m³)	
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		370.45	(4) (5)

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

2. Ventilation rate

	main + secondary + 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)	

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

3. Heat losses and heat loss parameter

Element	Gross area, m ²	Openings m ²	Net area A, m ²	U-value W/m ² K	A x U W/K	kappa-value kJ/m ² K	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)

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

3. Heat losses and heat loss parameter

Element	Gross area, m ²	Openings m ²	Net area A, m ²	U-value W/m ² K	A x U W/K	kappa-value kJ/m ² K	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, m ²							226.00	(31)					
Fabric heat loss, W/K							132.89	(33)					
Thermal mass parameter, kJ/m ² K (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/m ² K													
1.86	1.85	1.83	1.77	1.76	1.70	1.70	1.69	1.72	1.76	1.78	1.81	1.77	(40)
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		

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

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
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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
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(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
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(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
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(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
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(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
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(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)

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

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 1.050 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

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

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

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
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

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

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 m ² (kWh/m ² /year)										73.83		(99)

8c. Space cooling requirement - not applicable

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

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													
Appendix Q -													
Energy saved or generated ():												0.000	(236a)
Energy used ():												0.000	(237a)
Total delivered energy for all uses												15833.91	(238)

10a. Does not apply

11a. Does not apply

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

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	0.00	0.519	0.00	(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			3602.42	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			23.86	(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 13:42:21

New dwelling created by change of use

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 = 23.86

Excess emissions = 10.19kg/m² (74.6%)

Fail

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

3 Air permeability

Air permeability at 50 pascals:

15.00

OK

Maximum :

10.00

(Small development - no pressure testing carried out)

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

Primary pipework insulated

Yes

Fail
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):

Not significant

OK

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

None

Predicted Energy Assessment

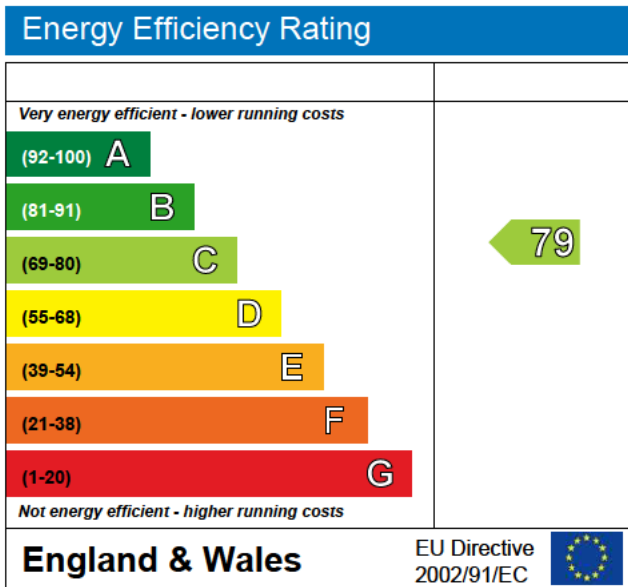
HMO
20 Conway Road
Bristol
BS4 3RF

Dwelling type:
Date of assessment:
Produced by
Total floor area:

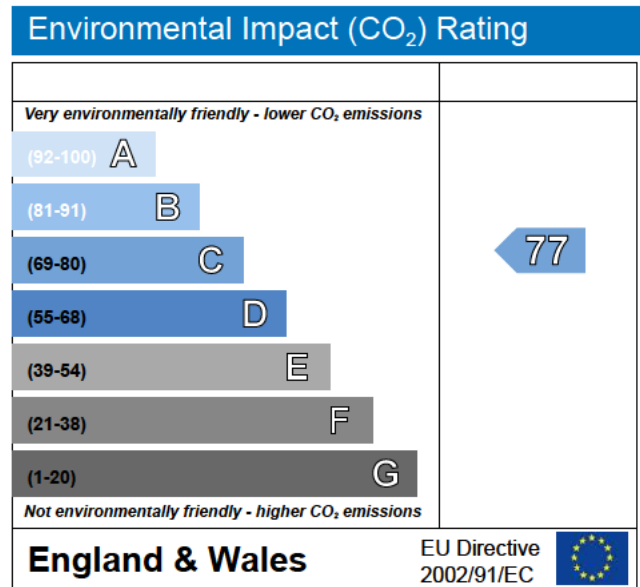
Mid-terrace house
6 March 2024
Complete Energy Consultancy Ltd
151 m²

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 (CO₂) emissions.



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.



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions. The higher the rating the less impact it has on the environment.