COMPLETE ENERGY CONSULTANCY

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08/12/2022

Complete Energy Consultancy – Complete Building Regulation compliance under one roof.

Energy Statement – Formation of a new HMO at 85 Ruby Street, Bedminster, BS3 3DW

The suite of policy BCS13, 14 and 15 do apply in this case

Policy BCS13 sets out that development should contribute to both mitigating and adapting to climate change, and to meeting targets to reduce carbon dioxide emissions.

Policy BCS14 sets out that development in Bristol should include measures to reduce carbon dioxide emissions from energy use by minimising energy requirements, incorporating renewable energy sources and low-energy carbon sources. Development will be expected to provide sufficient renewable energy generation to reduce carbon dioxide emissions from residual energy use in the buildings by at least 20%.

Policy BCS15 sets out that sustainable design and construction should be integral to new development in Bristol. Consideration of energy efficiency, recycling, flood adaption, material consumption and biodiversity should be included as part of a sustainability or energy statement.

The policy aspiration is to achieve a 20% reduction in C02 emissions.

Sustainable Design and Construction

Waste and recycling

- Suitable provision has been made externally for the storage of refuse and recycling containers.

Materials

- The scheme will show consideration of the need to use materials with a reduced energy input e.g. considering the re-use of existing onsite materials, recycled materials, or through reference to BRE Green Guide. BRE Green Guide A rated materials will be specified wherever possible.

Flexibility and adaptability

- The scheme shows consideration of the need to design buildings which will be adaptable in future in terms of their use and the future incorporation of energy saving technologies.

ICT

- The residential unit will be provided with a connection for Internet usage.

Reducing Surface Water Runoff

- Soakaways will be utilised wherever ground conditions allow.

Reducing Water Consumption

- The potable water usage will be restricted to 110l per person per day

Sustainable Energy

Solar water heating systems are one of the more familiar renewable technologies used at the moment.
They use the energy from the sun to heat water, most commonly for hot water needs. Solar heating systems use a heat collector that is usually mounted on a roof in which a fluid is heated by the sun. This fluid is used to heat water that is stored in either a separate hot water cylinder or in a twincoil hot water cylinder (the second coil is used to provide additional heating from a boiler or other heat source). Solar hot water panels could not provide the 20% target.

Wind turbines convert the kinetic energy in wind into mechanical energy that is then converted to electricity. Turbines are available in a range of sizes and designs and can either be free-standing, mounted on a building or integrated into a building structure. For a development in this location only a building mounted turbine could be considered however due to the character, aesthetics and location of the building it would not be feasible. In addition the windspeed in the area is under the advised minimum.

Biomass Heating Biomass is any plant-derived organic material that renews itself over a short period. Biomass energy systems are based on either the direct or indirect combustion of fuels derived from those plant sources. The most common form of biomass is the direct combustion of wood in treated or untreated forms. The use of biomass is becoming increasingly common in some European countries (some countries such as Austria are heavily dependent on biomass). The environmental benefits relate to the significantly lower amounts of energy used in biomass production and processing compared to the energy released when they are burnt. This can range from a four-fold return for biodiesel to an approximate 20-fold energy return for woody biomass. Biomass-fuels can be used to produce energy on a continuous basis (unlike renewables such as wind or solar energy) and it can be an economic alternative to fossil fuels as it is a potential source of both heat and electricity. However Biomass systems have particular design management and maintenance requirements associated with sourcing, transportation and storage and are therefore more commonly used in commercial developments rather than domestic installations. It can be less convenient to operate than mains-supplied fuels such as natural gas and are more management intensive and require expertise in facilities management. Sources of biomass can also fluctuate, so boilers should be specified to operate on a variety of fuels without risk of overheating or tripping out. A communal biomass system would not be feasible for this development due to use, space and maintenance issues. The system would be quite large and there is very little space around the property to locate the boiler, hopper and fuel store that is suitable for deliveries but also appropriate for feeding the boiler.

A heat pump is a device that takes up heat at a certain temperature and releases it at a higher temperature. The essential components of a heat pump are heat exchangers (through which energy is extracted and emitted) and a means of pumping heat between the exchangers. The effectiveness of the heat pump is measured by the ratio of the heating capacity to the effective power input, usually known as the coefficient of performance (COP).

Ground-source heat pumps (GSHP) extract heat from the ground. They are classified as either water to-air or water-to-water units depending on whether the heat distribution system in the building uses air or water. Ground source heat pumps either use long shallow trenches or deep vertical boreholes to take low grade heat from the ground and then compress it to create higher temperatures. Ground source heat pumps would not be suitable due to the lack of land space around the property.

Air Source Heat pumps Air source heat pumps absorb heat from the outside air. This is usually used to heat radiators, under floor heating systems, or warm air convectors and hot water in your home. An air source heat pump extracts heat from the outside air in the same way that a fridge extracts heat from its inside. The system performs down to air temperatures of -20°c which means that they are more than suitable for installations within the UK. Hot water and Heating can be provided 365 days a year. The hot water is produced without the aid of electrical immersions and at 55°c is more than hot enough for baths and showers.

There are two main types of air source heat pump system: An air-to-water system distributes heat via your wet central heating system. Heat pumps work much more efficiently at a lower temperature than a standard boiler system would. So they are more suitable for under-floor heating systems or larger radiators, which give out heat at lower temperatures over longer periods of time. An air-to-air system produces warm air which is circulated by fans to heat your home. They are unlikely to provide you with hot water as well.

Photovoltaic (PV) modules convert sunlight directly to DC electricity. The solar cells consist of a thin piece of semiconductor material, in most cases of silicon. Through a process called doping, a very small amount of impurities are added to the semiconductor, which creates two different layers called n-type and p-type layers. Certain wavelengths of light are able to ionise the silicon atoms, which separates some of the positive charges (holes) from the negative charges (electrons). The holes move into the positive or p-layer and the electrons into the negative or n-layer. These opposite charges are attracted to each other, but most of them can only re-combine by the electrons passing through an external circuit, due to an internal potential energy barrier. This flow of electrons produces a DC current. PV panels could be mounted to roof slopes but would have an obvious visual impact.

The existing property has a mains gas fired system boiler with radiators. A cost benefit analysis has been carried out on the proposal to replace this unit with an air source heat pump. As this would require complete renewal of the entire system (current radiators & associated pipework is not of sufficient size to function with the low temperature output of the heat pump) it has been found not to be cost effective.

In summary only PV panels are suitable for installation on this site, albeit with the obvious visual impact

Required capacity to provide the 20%:

1.75 kW to be located on the south east roof slopes.

Please see table below:

	Energy Demand (kWh pa)	**Energy Saving achieved (%)**	**Regulated CO2 emissions (kg pa)**	**Saving achieved on residual CO2 emissions (%)**
Baseline Part L compliance	13378	-	3076	-
Residual emissions Proposed scheme after energy efficiency measures & CHP.	13310	2%	3014	2%
Proposed scheme after on site renewables	11937	10%	2328	**23%**
Proposed scheme offset for financial contribution or other allowable solution	N/A	N/A	N/A	N/A
Total savings on residual emissions	1441	12%	747	**25%**

Report compiled by:

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Project Information

Building type	Mid-terrace house
Reference	
Date	
Project	85 Ruby Street Bristol BS3 3DW

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)	58.00	2.80	162.40	(3a)
First floor	44.00	2.80	123.20	(3b)
Second floor	20.00	2.50	50.00	(3c)
	122.00			**(4)**
			335.60	**(5)**

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	5	x 10	50.00	(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	
		0.15	**(8)**
Pressure test, assumed q50	15.00		(17)
Air permeability		0.90	(18)
		2.00	**(19)**
		0.85	**(20)**
Infiltration rate incorporating shelter factor		0.76	(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)

0.97	0.96	0.94	0.84	0.82	0.73	0.73	0.71	0.76	0.82	0.86	0.90

10.03 (22b)

Ventilation : natural ventilation, intermittent extract fans

Effective air change rate

0.97	0.96	0.94	0.85	0.84	0.76	0.76	0.75	0.79	0.84	0.87	0.90

(25)

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, argon filled, low-E, En=0.1, soft coat (SouthEast) dg			**1.859**	**1.59 (1.70)**	2.96			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthEast) dg			**1.260**	**1.33 (1.40)**	1.67			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthWest) dg			**1.530**	**1.94 (2.10)**	2.96			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (West) dg			**1.360**	**1.94 (2.10)**	2.63			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (North) dg			**1.360**	**1.94 (2.10)**	2.63			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthWest) dg			**2.124**	**1.94 (2.10)**	4.11			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthEast) dg			**0.840**	**1.94 (2.10)**	1.63			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthEast) dg			**1.700**	**1.94 (2.10)**	3.29			(27)
Solid door dg			**1.890**	**2.10**	3.97			(26)
Full glazed door - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthEast) dg			**2.400**	**1.40**	3.36			(26)
Full glazed door - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) dg			**4.350**	**1.70**	7.39			(26)
Pitched roofs insulated between joists			36.00	0.13	4.68	9.00	324.00	(30)
Walls dormer			8.14	0.28	2.28	9.00	73.27	(29)
Walls new wall			25.34	0.18	4.56	60.00	1520.40	(29)
Walls exisitng wall			84.85	0.30	25.45	9.00	763.61	(29)
Ground floors			58.00	0.25	14.50	75.00	4350.00	(28)

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

Assumed occupancy, N 2.87 (42)
Annual average hot water usage in litres per day Vd,average 102.38 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month												
112.62	108.52	104.43	100.33	96.24	92.14	92.14	96.24	100.33	104.43	108.52	112.62	(44)
Energy content of hot water used												
167.01	146.07	150.73	131.41	126.09	108.81	100.82	115.70	117.08	136.44	148.94	161.74	

Energy content (annual) 1610.83 (45)

Distribution loss

25.05	21.91	22.61	19.71	18.91	16.32	15.12	17.35	17.56	20.47	22.34	24.26	(46)

Cylinder volume, l 210.00 (47)
Manufacturer's declared cylinder loss factor (kWh/day) 1.81 (48)
Temperature Factor 0.5400 (49)
Energy lost from hot water cylinder (kWh/day) 0.98 (55)

Total storage loss												
30.30	27.37	30.30	29.32	30.30	29.32	30.30	30.30	29.32	30.30	29.32	30.30	(56)
Net storage loss												
30.30	27.37	30.30	29.32	30.30	29.32	30.30	30.30	29.32	30.30	29.32	30.30	(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												
220.57	194.45	204.29	183.24	179.65	160.64	154.39	169.26	168.91	190.01	200.77	215.30	(62)
Output from water heater for each month, kWh/month												
220.57	194.45	204.29	183.24	179.65	160.64	154.39	169.26	168.91	190.01	200.77	215.30	(64)

2241.48 (64)

Heat gains from water heating, kWh/month												
98.38	87.27	92.97	85.16	84.77	77.65	76.37	81.32	80.40	88.22	90.99	96.63	(65)

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains, Watts												
172.24	172.24	172.24	172.24	172.24	172.24	172.24	172.24	172.24	172.24	172.24	172.24	(66)
Lighting gains												
74.28	65.98	53.66	40.62	30.36	25.63	27.70	36.00	48.33	61.36	71.62	76.35	(67)
Appliances gains												
429.54	434.00	422.77	398.86	368.67	340.30	321.35	316.89	328.12	352.04	382.22	410.59	(68)
Cooking gains												
55.10	55.10	55.10	55.10	55.10	55.10	55.10	55.10	55.10	55.10	55.10	55.10	(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)												
-114.83	-114.83	-114.83	-114.83	-114.83	-114.83	-114.83	-114.83	-114.83	-114.83	-114.83	-114.83	(71)
Water heating gains												
132.23	129.87	124.95	118.28	113.94	107.84	102.65	109.30	111.66	118.57	126.37	129.88	(72)
Total internal gains												
751.57	745.35	716.89	673.27	628.49	589.29	567.21	577.71	603.62	647.48	695.72	732.32	(73)

6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthEast) dg	0.9 x 1.859 36.79	0.63 x 0.70	0.77	20.9038
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthEast) dg	0.9 x 1.260 36.79	0.63 x 0.70	0.77	14.1683
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthWest) dg	0.9 x 1.530 11.28	0.63 x 0.70	0.77	5.2758
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (West) dg	0.9 x 1.360 19.64	0.63 x 0.70	0.77	8.1632
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (North) dg	0.9 x 1.360 10.63	0.63 x 0.70	0.77	4.4196
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthWest) dg	0.9 x 2.124 11.28	0.63 x 0.70	0.77	7.3240
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthEast) dg	0.9 x 0.840 36.79	0.63 x 0.70	0.77	9.4455
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthEast) dg	0.9 x 1.700 36.79	0.63 x 0.70	0.77	19.1159
Solid door dg	0.9 x 1.890 0.00	0.00 x 0.70	0.77	0.0000
Full glazed door - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthEast) dg	0.9 x 2.400 36.79	0.63 x 0.70	0.77	26.9872

6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains	
Full glazed door - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) dg	0.9 x 4.350 36.79	0.63 x 0.70	0.77	48.9143	
Total solar gains, January				164.72	(83-1)

Solar gains

164.72	287.74	412.06	540.24	631.40	638.18	610.57	540.96	456.27	323.03	198.62	140.10	(83)

Total gains

916.28	1033.10	1128.95	1213.50	1259.89	1227.47	1177.78	1118.67	1059.90	970.51	894.34	872.42	(84)

Lighting calculations

	Area	g	FF x Shading	
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthEast) dg	0.9 x 1.86	0.80	0.70 x 0.83	0.78
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthEast) dg	0.9 x 1.26	0.80	0.70 x 0.83	0.53
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthWest) dg	0.9 x 1.53	0.80	0.70 x 0.83	0.64
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (West) dg	0.9 x 1.36	0.80	0.70 x 0.83	0.57
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (North) dg	0.9 x 1.36	0.80	0.70 x 0.83	0.57
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthWest) dg	0.9 x 2.12	0.80	0.70 x 0.83	0.89
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthEast) dg	0.9 x 0.84	0.80	0.70 x 0.83	0.35
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthEast) dg	0.9 x 1.70	0.80	0.70 x 0.83	0.71

GL = 5.03 / 122.00 = 0.041
C1 = 0.500
C2 = 1.112
El = 525

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	35.80	36.11	36.42	37.95	38.25	39.72	39.72	40.00	39.14	38.25	37.65	37.04	
alpha	3.39	3.41	3.43	3.53	3.55	3.65	3.65	3.67	3.61	3.55	3.51	3.47	
Utilisation factor for gains for living area	0.99	0.99	0.98	0.97	0.92	0.82	0.69	0.73	0.89	0.97	0.99	1.00	(86)
Mean internal temperature in living area T1	18.95	19.14	19.47	19.95	20.39	20.75	20.91	20.89	20.62	20.07	19.47	18.98	(87)
Temperature during heating periods in rest of dwelling Th2	19.37	19.38	19.40	19.45	19.46	19.51	19.51	19.52	19.49	19.46	19.44	19.42	(88)
Utilisation factor for gains for rest of dwelling	0.99	0.99	0.98	0.95	0.88	0.72	0.50	0.55	0.82	0.96	0.99	0.99	(89)
Mean internal temperature in the rest of dwelling T2	16.75	17.03	17.52	18.24	18.85	19.34	19.48	19.47	19.19	18.42	17.54	16.81	(90)

Living area fraction (13.15 / 122.00) 0.11 (91)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Mean internal temperature (for the whole dwelling)	16.99	17.26	17.73	18.43	19.02	19.49	19.63	19.62	19.34	18.60	17.75	17.05	(92)
Apply adjustment to the mean internal temperature, where appropriate	16.99	17.26	17.73	18.43	19.02	19.49	19.63	19.62	19.34	18.60	17.75	17.05	(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	0.94	0.87	0.72	0.52	0.57	0.81	0.94	0.98	0.99	(94)
Useful gains	904.79	1013.14	1091.90	1135.50	1091.57	880.19	611.64	634.52	857.28	915.09	876.51	863.31	(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	3003.7	2900.6	2612.0	2127.1	1620.17	1043.37	646.48	682.90	1134.41	1771.28	2396.9	2939.0	(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	1561.55	1268.36	1130.96	713.99	393.28	-	-	-	-	637.00	1094.68	1544.30	

Total space heating requirement per year (kWh/year) (October to May) 8344.12 (98)
Space heating requirement per m² (kWh/m²/year) 68.39 (99)

8c. Space cooling requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
External temperaturers	-	-	-	-	-	14.60	16.60	16.40	-	-	-	-		
Heat loss rate W	-	-	-	-	-	2005.0	1578.43	1609.57	-	-	-	-		(100)
Utilisation factor for loss	-	-	-	-	-	0.61	0.70	0.66	-	-	-	-		(101)
Useful loss W	-	-	-	-	-	1213.91	1097.81	1064.83	-	-	-	-		(102)
Internal gains W	0.00	0.00	0.00	0.00	0.00	586.29	564.21	574.71	0.00	0.00	0.00	0.00		
Solar gains W	0.00	0.00	0.00	0.00	0.00	745.92	713.65	632.30	0.00	0.00	0.00	0.00		
Gains W	-	-	-	-	-	1332.21	1277.86	1207.00	-	-	-	-		(103)
Fraction of month for cooling	0.00	0.00	0.00	0.00	0.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00		(103a)
Space heating kWh	-	-	-	-	-	40.86	-96.10	-77.95	-	-	-	-		(98)
Space cooling kWh	-	-	-	-	-	85.18	133.95	105.78	-	-	-	-		(104)
Total													324.91	(104)
Cooled fraction													0.70	(105)
Intermittency factor	-	-	-	-	-	0.25	0.25	0.25	-	-	-	-		(106)
Space cooling requirement for month	-	-	-	-	-	14.91	23.44	18.51	-	-	-	-		
Space cooling (June to August)													56.86	(107)
Space cooling requirement per m² (kWh/m²/year)													0.47	(108)

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	90.60%		(206)
Cooling system energy efficiency ratio	4.05%		(209)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1561.55	1268.36	1130.96	713.99	393.28	-	-	-	-	637.00	1094.68	1544.30	(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)	1723.56	1399.96	1248.30	788.06	434.08	-	-	-	-	703.09	1208.26	1704.53	(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)

<u>Water heating</u>

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Water heating requirement	220.57	194.45	204.29	183.24	179.65	160.64	154.39	169.26	168.91	190.01	200.77	215.30	(64)
Efficiency of water heater 79.90													(216)
	89.12	89.02	88.78	88.19	86.95	79.90	79.90	79.90	79.90	87.90	88.76	89.14	(217)
Water heating fuel	247.49	218.44	230.11	207.79	206.62	201.05	193.22	211.84	211.41	216.17	226.20	241.53	(219)

Annual totals	kWh/year	
Space heating fuel used, main system 1	9209.85	(211)
Space heating fuel (secondary)	0.00	(215)
Water heating fuel	2611.87	(219)
Space cooling fuel used	14.04	(221)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
-	-	-	-	-	3.68	5.79	4.57	-	-	-	-	(221)

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)	524.73	(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	12435.49	(238)

10a. Fuel costs using Table 12 prices

	kWh/year	Fuel price p/kWh	£/year	
Space heating - main system 1	9209.847	3.480	320.50	(240)
Space heating - main system 2	0.000	0.000	0.00	(241)
Water heating cost	2611.87	3.480	90.89	(247)
Space cooling	14.039	13.190	1.85	(248)
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	524.734	13.190	69.21	(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			612.35	(255)

11a. SAP rating

	0.42	**(256)**
	1.54	**(257)**
SAP value	78.52	
	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	9209.85	0.216	1989.33	(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	2611.87	0.216	564.16	(264)
Space and water heating			2553.49	(265)
Space cooling	14.04	0.519	7.29	(266)
Electricity for pumps and fans	75.00	0.519	38.93	(267)
Electricity for lighting	524.73	0.519	272.34	(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			2872.04	(272)

	kg/m²/year	
CO2 emissions per m²	**23.54**	(273)
EI value	76.95	(273a)
EI rating	**77**	(274)
EI band	**C**	

Calculation of stars for heating and DHW

Main heating energy efficiency	(3.48 / 0.9060) x (1 + (0.29 x 0.00)) = 3.8411, stars = 4
Main heating environmental impact	(0.2160 / 0.9060) x (1 + (0.29 x 0.00)) = 0.2384, stars = 4
Water heating energy efficiency	3.48 / 0.8562 = 4.0644, stars = 4
Water heating environmental impact	0.2160 / 0.8562 = 0.2523, stars = 4

Project Information

Building type	Mid-terrace house
Reference	
Date	
Project	85 Ruby Street Bristol BS3 3DW

REGULATION COMPLIANCE REPORT - Approved Document L1A, 2012 Edition, England
assessed by program JPA Designer version 6.05.066, printed on 09/12/2022 at 09:53:28

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 = 16.45	
Dwelling Carbon Dioxide Emission Rate	DER = 25.21	Fail

Excess emissions = 8.76kg/m² (53.2%)

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	TFEE = 53.3	
Dwelling Fabric Energy Efficiency (DFEE)	DFEE = 83.9	Fail

2a Thermal bridging

Thermal bridging calculated using default y-value of 0.15

2b Fabric U-values

Element	Average	Highest	
Wall	0.27 (max. 0.30)	0.30 (max. 0.70)	OK
Floor	0.25 (max. 0.25)	0.25 (max. 0.70)	OK
Roof	0.14 (max. 0.20)	0.15 (max. 0.35)	OK
Openings	1.86 (max. 2.00)	2.10 (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)

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4 Heating efficiency

Main heating system:

Boiler and radiators, mains gas
Vaillant ecoTEC exclusive 627

Source of efficiency: from boiler database
Vaillant ecoTEC exclusive 627 VU 256/5-7 (H-GB)
Efficiency: 89.6% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system:
None -

5 Cylinder insulation

Hot water storage			
	Manufacturer's declared cylinder loss factor (kWh/day)	1.81	
	Permitted by DBSCG	2.30	OK
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 : NorthWest		
Ventilation rate :	8.00	
Blinds/curtains :		
None with blinds/shutters closed 0.00%	of daylight hours	

10 Key features

Fixed cooling system

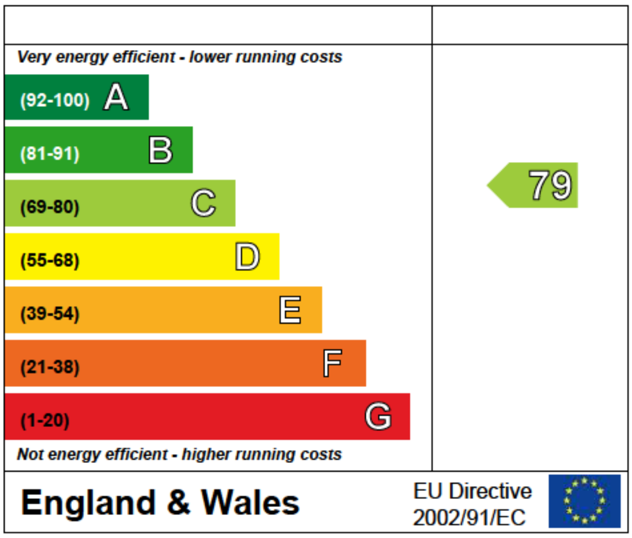
Predicted Energy Assessment

85	Dwelling type:	Mid-terrace house
Ruby Street	Date of assessment:	9 December 2022
Bristol	Produced by	Complete Energy Consultancy Ltd
BS3 3DW	Total floor area:	122 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.

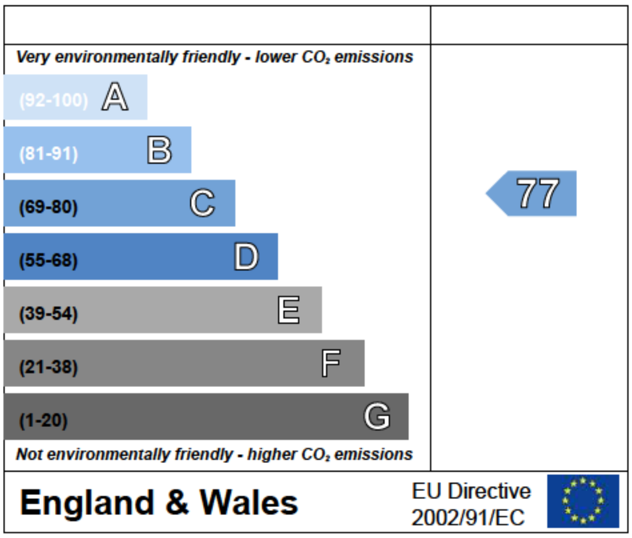
Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO_2) emissions.

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.

Complete Energy Consultancy Ltd
The Exchange
Brickrow
Stroud
[redacted]

Project Information

Building type Mid-terrace house

Reference
Date
Project 85
Ruby Street
Bristol
BS3 3DW

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)	58.00	2.80	162.40	(3a)
First floor	44.00	2.80	123.20	(3b)
Second floor	20.00	2.50	50.00	(3c)
	122.00			**(4)**
			335.60	**(5)**

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	5	x 10	50.00	(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	
		0.15	**(8)**
Pressure test, assumed q50	15.00		(17)
Air permeability		0.90	(18)
		2.00	**(19)**
		0.85	**(20)**
Infiltration rate incorporating shelter factor		0.76	(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)

0.97	0.96	0.94	0.84	0.82	0.73	0.73	0.71	0.76	0.82	0.86	0.90

10.03 (22b)

Ventilation : natural ventilation, intermittent extract fans

Effective air change rate

0.97	0.96	0.94	0.85	0.84	0.76	0.76	0.75	0.79	0.84	0.87	0.90	(25)

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, argon filled, low-E, En=0.1, soft coat (SouthEast) dg			**1.859**	**1.59 (1.70)**	2.96			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthEast) dg			**1.260**	**1.33 (1.40)**	1.67			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthEast) dg			**1.700**	**1.94 (2.10)**	3.29			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthEast) dg			**0.840**	**1.94 (2.10)**	1.63			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthWest) dg			**2.124**	**1.94 (2.10)**	4.11			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (North) dg			**1.360**	**1.94 (2.10)**	2.63			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (West) dg			**1.360**	**1.94 (2.10)**	2.63			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthWest) dg			**1.530**	**1.94 (2.10)**	2.96			(27)
Solid door dg			**1.890**	**2.10**	3.97			(26)
Full glazed door - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthEast) dg			**2.400**	**1.40**	3.36			(26)
Full glazed door - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) dg			**4.350**	**1.70**	7.39			(26)
Pitched roofs insulated between joists			36.00	0.13	4.68	9.00	324.00	(30)
Walls dormer			8.14	0.28	2.28	9.00	73.27	(29)
Walls new wall			25.34	0.18	4.56	60.00	1520.40	(29)
Walls exisitng wall			84.85	0.30	25.45	9.00	763.61	(29)
Ground floors			58.00	0.25	14.50	75.00	4350.00	(28)

4. Water heating energy requirements

	kWh/year	
Assumed occupancy, N	2.87	(42)
Annual average hot water usage in litres per day Vd,average	102.38	(43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month												
112.62	108.52	104.43	100.33	96.24	92.14	92.14	96.24	100.33	104.43	108.52	112.62	(44)
Energy content of hot water used												
167.01	146.07	150.73	131.41	126.09	108.81	100.82	115.70	117.08	136.44	148.94	161.74	

Energy content (annual) 1610.83 (45)

Distribution loss

25.05	21.91	22.61	19.71	18.91	16.32	15.12	17.35	17.56	20.47	22.34	24.26	(46)

Cylinder volume, l	210.00		(47)
Manufacturer's declared cylinder loss factor (kWh/day)	1.81		(48)
Temperature Factor	0.5400		(49)
Energy lost from hot water cylinder (kWh/day)		0.98	(55)

Total storage loss												
30.30	27.37	30.30	29.32	30.30	29.32	30.30	30.30	29.32	30.30	29.32	30.30	(56)
Net storage loss												
30.30	27.37	30.30	29.32	30.30	29.32	30.30	30.30	29.32	30.30	29.32	30.30	(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												
220.57	194.45	204.29	183.24	179.65	160.64	154.39	169.26	168.91	190.01	200.77	215.30	(62)
Output from water heater for each month, kWh/month												
220.57	194.45	204.29	183.24	179.65	160.64	154.39	169.26	168.91	190.01	200.77	215.30	(64)

2241.48 (64)

Heat gains from water heating, kWh/month

98.38	87.27	92.97	85.16	84.77	77.65	76.37	81.32	80.40	88.22	90.99	96.63	(65)

5. Internal gains

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains, Watts	172.24	172.24	172.24	172.24	172.24	172.24	172.24	172.24	172.24	172.24	172.24	172.24	(66)
Lighting gains	74.28	65.98	53.66	40.62	30.36	25.63	27.70	36.00	48.33	61.36	71.62	76.35	(67)
Appliances gains	429.54	434.00	422.77	398.86	368.67	340.30	321.35	316.89	328.12	352.04	382.22	410.59	(68)
Cooking gains	55.10	55.10	55.10	55.10	55.10	55.10	55.10	55.10	55.10	55.10	55.10	55.10	(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)	-114.83	-114.83	-114.83	-114.83	-114.83	-114.83	-114.83	-114.83	-114.83	-114.83	-114.83	-114.83	(71)
Water heating gains	132.23	129.87	124.95	118.28	113.94	107.84	102.65	109.30	111.66	118.57	126.37	129.88	(72)
Total internal gains	751.57	745.35	716.89	673.27	628.49	589.29	567.21	577.71	603.62	647.48	695.72	732.32	(73)

6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthEast) dg	0.9 x 1.859 36.79	0.63 x 0.70	0.77	20.9038
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthEast) dg	0.9 x 1.260 36.79	0.63 x 0.70	0.77	14.1683
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthEast) dg	0.9 x 1.700 36.79	0.63 x 0.70	0.77	19.1159
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthEast) dg	0.9 x 0.840 36.79	0.63 x 0.70	0.77	9.4455
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthWest) dg	0.9 x 2.124 11.28	0.63 x 0.70	0.77	7.3240
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (North) dg	0.9 x 1.360 10.63	0.63 x 0.70	0.77	4.4196
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (West) dg	0.9 x 1.360 19.64	0.63 x 0.70	0.77	8.1632
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthWest) dg	0.9 x 1.530 11.28	0.63 x 0.70	0.77	5.2758
Solid door dg	0.9 x 1.890 0.00	0.00 x 0.70	0.77	0.0000
Full glazed door - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthEast) dg	0.9 x 2.400 36.79	0.63 x 0.70	0.77	26.9872

6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains	
Full glazed door - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) dg	0.9 x 4.350 36.79	0.63 x 0.70	0.77	48.9143	
Total solar gains, January				164.72	(83-1)

Solar gains

164.72	287.74	412.06	540.24	631.40	638.18	610.57	540.96	456.27	323.03	198.62	140.10	(83)

Total gains

916.28	1033.10	1128.95	1213.50	1259.89	1227.47	1177.78	1118.67	1059.90	970.51	894.34	872.42	(84)

Lighting calculations

	Area	g	FF x Shading	
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthEast) dg	0.9 x 1.86	0.80	0.70 x 0.83	0.78
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthEast) dg	0.9 x 1.26	0.80	0.70 x 0.83	0.53
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthEast) dg	0.9 x 1.70	0.80	0.70 x 0.83	0.71
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthEast) dg	0.9 x 0.84	0.80	0.70 x 0.83	0.35
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthWest) dg	0.9 x 2.12	0.80	0.70 x 0.83	0.89
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (North) dg	0.9 x 1.36	0.80	0.70 x 0.83	0.57
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (West) dg	0.9 x 1.36	0.80	0.70 x 0.83	0.57
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthWest) dg	0.9 x 1.53	0.80	0.70 x 0.83	0.64

GL = 5.03 / 122.00 = 0.041
C1 = 0.500
C2 = 1.112
El = 525

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	35.80	36.11	36.42	37.95	38.25	39.72	39.72	40.00	39.14	38.25	37.65	37.04	
alpha	3.39	3.41	3.43	3.53	3.55	3.65	3.65	3.67	3.61	3.55	3.51	3.47	
Utilisation factor for gains for living area	0.99	0.99	0.98	0.97	0.92	0.82	0.69	0.73	0.89	0.97	0.99	1.00	(86)
Mean internal temperature in living area T1	18.95	19.14	19.47	19.95	20.39	20.75	20.91	20.89	20.62	20.07	19.47	18.98	(87)
Temperature during heating periods in rest of dwelling Th2	19.37	19.38	19.40	19.45	19.46	19.51	19.51	19.52	19.49	19.46	19.44	19.42	(88)
Utilisation factor for gains for rest of dwelling	0.99	0.99	0.98	0.95	0.88	0.72	0.50	0.55	0.82	0.96	0.99	0.99	(89)
Mean internal temperature in the rest of dwelling T2	16.75	17.03	17.52	18.24	18.85	19.34	19.48	19.47	19.19	18.42	17.54	16.81	(90)

Living area fraction (13.15 / 122.00) 0.11 (91)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Mean internal temperature (for the whole dwelling)	16.99	17.26	17.73	18.43	19.02	19.49	19.63	19.62	19.34	18.60	17.75	17.05	(92)
Apply adjustment to the mean internal temperature, where appropriate	16.99	17.26	17.73	18.43	19.02	19.49	19.63	19.62	19.34	18.60	17.75	17.05	(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	0.94	0.87	0.72	0.52	0.57	0.81	0.94	0.98	0.99	(94)
Useful gains	904.79	1013.14	1091.90	1135.50	1091.57	880.19	611.64	634.52	857.28	915.09	876.51	863.31	(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	3003.7	2900.6	2612.0	2127.1	1620.17	1043.37	646.48	682.90	1134.41	1771.28	2396.9	2939.0	(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	1561.55	1268.36	1130.96	713.99	393.28	-	-	-	-	637.00	1094.68	1544.30	

Total space heating requirement per year (kWh/year) (October to May) 8344.12 (98)

Space heating requirement per m² (kWh/m²/year) 68.39 (99)

8c. Space cooling requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
External temperaturers	-	-	-	-	-	14.60	16.60	16.40	-	-	-	-	
Heat loss rate W	-	-	-	-	-	2005.0	1578.43	1609.57	-	-	-	-	(100)
Utilisation factor for loss	-	-	-	-	-	0.61	0.70	0.66	-	-	-	-	(101)
Useful loss W	-	-	-	-	-	1213.91	1097.81	1064.83	-	-	-	-	(102)
Internal gains W	0.00	0.00	0.00	0.00	0.00	586.29	564.21	574.71	0.00	0.00	0.00	0.00	
Solar gains W	0.00	0.00	0.00	0.00	0.00	745.92	713.65	632.30	0.00	0.00	0.00	0.00	
Gains W	-	-	-	-	-	1332.21	1277.86	1207.00	-	-	-	-	(103)
Fraction of month for cooling	0.00	0.00	0.00	0.00	0.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	(103a)
Space heating kWh	-	-	-	-	-	40.86	-96.10	-77.95	-	-	-	-	(98)
Space cooling kWh	-	-	-	-	-	85.18	133.95	105.78	-	-	-	-	(104)

Total 324.91 (104)
Cooled fraction 0.70 (105)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Intermittency factor	-	-	-	-	-	0.25	0.25	0.25	-	-	-	-	(106)
Space cooling requirement for month	-	-	-	-	-	14.91	23.44	18.51	-	-	-	-	

Space cooling (June to August) 56.86 (107)
Space cooling requirement per m² (kWh/m²/year) 0.47 (108)

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	90.60%		(206)
Cooling system energy efficiency ratio	4.05%		(209)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1561.55	1268.36	1130.96	713.99	393.28	-	-	-	-	637.00	1094.68	1544.30	(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)	1723.56	1399.96	1248.30	788.06	434.08	-	-	-	-	703.09	1208.26	1704.53	(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)

<u>Water heating</u>

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Water heating requirement	220.57	194.45	204.29	183.24	179.65	160.64	154.39	169.26	168.91	190.01	200.77	215.30	(64)
Efficiency of water heater												79.90	(216)
	89.12	89.02	88.78	88.19	86.95	79.90	79.90	79.90	79.90	87.90	88.76	89.14	(217)
Water heating fuel	247.49	218.44	230.11	207.79	206.62	201.05	193.22	211.84	211.41	216.17	226.20	241.53	(219)

Annual totals	kWh/year	
Space heating fuel used, main system 1	9209.85	(211)
Space heating fuel (secondary)	0.00	(215)
Water heating fuel	2611.87	(219)
Space cooling fuel used	14.04	(221)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
-	-	-	-	-	3.68	5.79	4.57	-	-	-	-	(221)

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)	524.73	(232)
Energy saving/generation technologies		
PVs 0.80 x 1.750 x 1029.187 x 1.000	1440.861	
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	
	1440.861	(233)
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	10994.63	(238)

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10a. Fuel costs using Table 12 prices

	kWh/year	**Fuel price p/kWh**	**£/year**	
Space heating - main system 1	9209.847	3.480	320.50	(240)
Space heating - main system 2	0.000	0.000	0.00	(241)
Water heating cost	2611.87	3.480	90.89	(247)
Space cooling	14.039	13.190	1.85	(248)
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	524.734	13.190	69.21	(250)
Additional standing charges			120.00	(251)
Electricity generated - PVs	1440.861	13.190	-190.05	(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			422.30	(255)

11a. SAP rating

	0.42	**(256)**
	1.06	**(257)**
SAP value	85.18	
	85	(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	9209.85	0.216	1989.33	(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	2611.87	0.216	564.16	(264)
Space and water heating			2553.49	(265)
Space cooling	14.04	0.519	7.29	(266)
Electricity for pumps and fans	75.00	0.519	38.93	(267)
Electricity for lighting	524.73	0.519	272.34	(268)
Electricity generated - PVs	-1440.86	0.519	-747.81	(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			2124.23	(272)

	kg/m²/year	
CO2 emissions per m²	**17.41**	(273)
EI value	82.96	(273a)
EI rating	**83**	(274)
EI band	**B**	

Calculation of stars for heating and DHW

Main heating energy efficiency	(3.48 / 0.9060) x (1 + (0.29 x 0.00)) = 3.8411, stars = 4
Main heating environmental impact	(0.2160 / 0.9060) x (1 + (0.29 x 0.00)) = 0.2384, stars = 4
Water heating energy efficiency	3.48 / 0.8562 = 4.0644, stars = 4
Water heating environmental impact	0.2160 / 0.8562 = 0.2523, stars = 4

Project Information

Building type	Mid-terrace house
Reference	
Date	
Project	85 Ruby Street Bristol BS3 3DW

REGULATION COMPLIANCE REPORT - Approved Document L1A, 2012 Edition, England
assessed by program JPA Designer version 6.05.066, printed on 09/12/2022 at 09:53:44

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 = 16.45	
Dwelling Carbon Dioxide Emission Rate	DER = 19.08	Fail

Excess emissions = 2.63kg/m² (16.0%)

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	TFEE = 53.3	
Dwelling Fabric Energy Efficiency (DFEE)	DFEE = 83.9	Fail

2a Thermal bridging

Thermal bridging calculated using default y-value of 0.15

2b Fabric U-values

Element	Average	Highest	
Wall	0.27 (max. 0.30)	0.30 (max. 0.70)	OK
Floor	0.25 (max. 0.25)	0.25 (max. 0.70)	OK
Roof	0.14 (max. 0.20)	0.15 (max. 0.35)	OK
Openings	1.86 (max. 2.00)	2.10 (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
Vaillant ecoTEC exclusive 627

Source of efficiency: from boiler database
Vaillant ecoTEC exclusive 627 VU 256/5-7 (H-GB)
Efficiency: 89.6% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system:
None -

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5 Cylinder insulation

Hot water storage			
	Manufacturer's declared cylinder loss factor (kWh/day)	1.81	
	Permitted by DBSCG	2.30	OK
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 : NorthWest		
Ventilation rate :	8.00	
Blinds/curtains :		
None with blinds/shutters closed 0.00%	of daylight hours	

10 Key features

Fixed cooling system
Photovoltaic array

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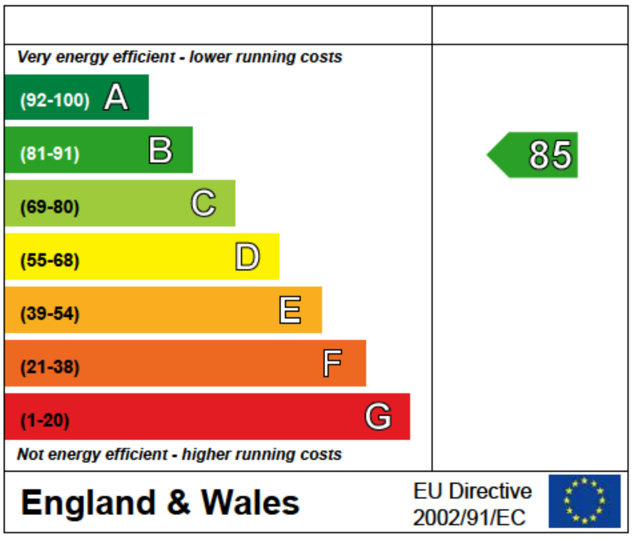
Predicted Energy Assessment

85 Ruby Street Bristol BS3 3DW	Dwelling type: Date of assessment: Produced by Total floor area:	Mid-terrace house 9 December 2022 Complete Energy Consultancy Ltd 122 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.

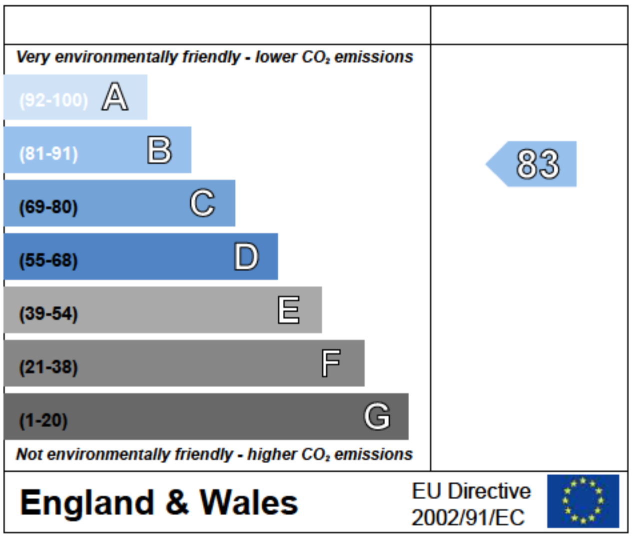
Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO_2) emissions.

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.