

**Project Information**

Building type End-terrace house

Reference

Date

Project 327 Greystoke Avenue  
Bristol  
BS10 6BD

**SAP 2009 worksheet for New extension to existing dwelling - calculation of energy ratings**

**1. Overall dwelling dimensions**

	<b>Area (m<sup>2</sup>)</b>	<b>Av. Storey height (m)</b>	<b>Volume (m<sup>3</sup>)</b>	
Ground floor (1)	41.00	2.40	98.40	(3a)
Ground floor (2)	20.00	2.40	48.00	(3b)
First floor	41.00	2.70	110.70	(3c)
Second floor	24.00	1.80	43.20	(3d)
	<b>126.00</b>		<b>300.30</b>	<b>(4) (5)</b>

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**2. Ventilation rate**

	<b>main + secondary + other heating</b>		<b>m<sup>3</sup> per hour</b>										
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	3	x 10	30.00	(7a)									
Number of passive vents	0	x 10	0.00	(7b)									
Number of flueless gas fires	0	x 40	0.00	(7c)									
			<b>0.10</b>	<b>(8)</b>									
Pressure test, assumed q50		15.00		(17)									
Air permeability			0.85	(18)									
			<b>2.00</b>	<b>(19)</b>									
			<b>0.85</b>	<b>(20)</b>									
Infiltration rate incorporating shelter factor			0.72	(21)									
Infiltration rate modified for monthly wind speed													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly average wind speed from Table 7													
	5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80	5.10	
													54.10
													(22)
Wind Factor													
	1.35	1.27	1.27	1.13	1.02	0.97	0.93	0.93	1.05	1.13	1.20	1.27	
													13.53
													(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)													
	0.98	0.92	0.92	0.81	0.74	0.70	0.67	0.67	0.76	0.81	0.87	0.92	
													9.77
													(22b)
Ventilation : natural ventilation, intermittent extract fans													
Effective air change rate													
	0.98	0.92	0.92	0.83	0.77	0.75	0.72	0.72	0.79	0.83	0.88	0.92	(25)

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**3. Heat losses and heat loss parameter**

Element	Gross area, m <sup>2</sup>	Openings m <sup>2</sup>	Net area A, m <sup>2</sup>	U-value W/m <sup>2</sup> K	A x U W/K	kappa-value kJ/m <sup>2</sup> K	A x K kJ/K	
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (North) dg			<b>1.730</b>	<b>1.50 (1.60)</b>	2.60			(27)
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (South) dg			<b>1.730</b>	<b>1.50 (1.60)</b>	2.60			(27)
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (North) dg			<b>1.260</b>	<b>1.50 (1.60)</b>	1.89			(27)
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (North) dg			<b>1.260</b>	<b>1.50 (1.60)</b>	1.89			(27)
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (East) dg			<b>0.630</b>	<b>1.94 (2.10)</b>	1.22			(27)
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (North) dg			<b>0.660</b>	<b>1.94 (2.10)</b>	1.28			(27)
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (North) dg			<b>1.880</b>	<b>1.94 (2.10)</b>	3.64			(27)
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (North) dg			<b>1.880</b>	<b>1.94 (2.10)</b>	3.64			(27)
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (South) dg			<b>1.250</b>	<b>1.94 (2.10)</b>	2.42			(27)
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (South) dg			<b>1.880</b>	<b>1.94 (2.10)</b>	3.64			(27)
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (South) dg			<b>3.700</b>	<b>1.94 (2.10)</b>	7.17			(27)
Solid door dg			<b>1.890</b>	<b>2.10</b>	3.97			(26)
Full glazed door - Double-glazed, air-filled, low-E, En=0.1, soft coat (North) dg			<b>3.670</b>	<b>2.10</b>	7.71			(26)
Pitched roofs insulated between joists			37.00	0.16	5.92	9.00	333.00	(30)

**SAP 2009 worksheet for New extension to existing dwelling - calculation of energy ratings**

**4. Water heating energy requirements**

												<b>kWh/year</b>		
Assumed occupancy, N												2.88	(42)	
Annual average hot water usage in litres per day Vd,average												108.10	(43)	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Hot water usage in litres per day for each month														
118.90	114.58	110.26	105.93	101.61	97.29	97.29	101.61	105.93	110.26	114.58	118.90		(44)	
Energy content of hot water used														
176.75	154.59	159.52	139.08	133.45	115.15	106.71	122.45	123.91	144.41	157.63	171.18			
Energy content (annual)												1704.83	(45)	
Distribution loss														
26.51	23.19	23.93	20.86	20.02	17.27	16.01	18.37	18.59	21.66	23.64	25.68		(46)	
Cylinder volume, l							210.00						(47)	
Manufacturer's declared cylinder loss factor (kWh/day)							1.91						(47)	
Temperature Factor							0.5400						(48)	
Energy lost from hot water cylinder (kWh/day)												1.03	(55)	
Total storage loss														
31.97	28.88	31.97	30.94	31.97	30.94	31.97	31.97	30.94	31.97	30.94	31.97		(56)	
Net storage loss														
31.97	28.88	31.97	30.94	31.97	30.94	31.97	31.97	30.94	31.97	30.94	31.97		(57)	
Primary circuit loss (annual)												360.00	(58)	
Primary loss														
30.58	27.62	30.58	29.59	30.58	29.59	30.58	30.58	29.59	30.58	29.59	30.58		(59)	
Total heat required for water heating calculated for each month														
239.30	211.09	222.07	199.61	196.00	175.69	169.26	185.00	184.44	206.96	218.16	233.73		(62)	
Output from water heater for each month, kWh/month														
239.30	211.09	222.07	199.61	196.00	175.69	169.26	185.00	184.44	206.96	218.16	233.73		(64)	
												2441.29	(64)	
Heat gains from water heating, kWh/month														
108.81	96.60	103.08	94.67	94.41	86.71	85.52	90.75	89.63	98.05	100.84	106.96		(65)	



**SAP 2009 worksheet for New extension to existing dwelling - calculation of energy ratings**

**6. Solar gains (calculation for January)**

	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (South) dg	0.9 x 1.880 47.32	0.63 x 0.70	0.77	27.1897
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (South) dg	0.9 x 3.700 47.32	0.63 x 0.70	0.77	53.5117
Solid door dg	0.9 x 1.890 0.00	0.00 x 0.70	0.77	0.0000
Full glazed door - Double-glazed, air-filled, low-E, En=0.1, soft coat (North) dg	0.9 x 3.670 10.73	0.63 x 0.70	0.77	12.0307
Total solar gains, January				168.08 (83-1)

Solar gains

168.08	286.11	384.02	498.64	589.04	624.35	600.34	522.81	430.70	325.74	201.29	143.86	(83)
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Total gains

944.08	1056.34	1126.04	1197.01	1242.47	1238.00	1191.17	1123.94	1057.34	996.28	920.44	900.03	(84)
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**Lighting calculations**

	Area	g	FF x Shading	
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (North) dg	0.9 x 1.73	0.80	0.70 x 0.83	0.72
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (South) dg	0.9 x 1.73	0.80	0.70 x 0.83	0.72
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (North) dg	0.9 x 1.26	0.80	0.70 x 0.83	0.53
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (North) dg	0.9 x 1.26	0.80	0.70 x 0.83	0.53
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (East) dg	0.9 x 0.63	0.80	0.70 x 0.83	0.26
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (North) dg	0.9 x 0.66	0.80	0.70 x 0.83	0.28
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (North) dg	0.9 x 1.88	0.80	0.70 x 0.83	0.79
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (North) dg	0.9 x 1.88	0.80	0.70 x 0.83	0.79
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (South) dg	0.9 x 1.25	0.80	0.70 x 0.83	0.52
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (South) dg	0.9 x 1.88	0.80	0.70 x 0.83	0.79

**Lighting calculations**

Window - Double-glazed, air-filled, low-E, Area 0.9 x 3.70 g 0.80 FF x Shading 0.70 x 0.83 1.55  
 En=0.1, soft coat (South)  
 dg  
 GL = 7.47 / 126.00 = 0.059  
 C1 = 0.500  
 C2 = 1.027  
 EI = 493

**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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tau

11.97	12.18	12.18	12.59	12.85	12.97	13.09	13.09	12.79	12.59	12.39	12.18
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alpha

1.80	1.81	1.81	1.84	1.86	1.86	1.87	1.87	1.85	1.84	1.83	1.81
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Utilisation factor for gains for living area

0.96	0.95	0.93	0.90	0.84	0.75	0.62	0.64	0.81	0.90	0.95	0.96	(86)
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Mean internal temperature in living area T1

17.09	17.37	17.94	18.59	19.45	20.17	20.63	20.61	19.98	19.00	17.85	17.20	(87)
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Temperature during heating periods in rest of dwelling Th2

19.14	19.16	19.16	19.21	19.24	19.25	19.26	19.26	19.23	19.21	19.19	19.16	(88)
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Utilisation factor for gains for rest of dwelling

0.95	0.93	0.91	0.88	0.80	0.66	0.44	0.46	0.73	0.87	0.93	0.95	(89)
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Mean internal temperature in the rest of dwelling T2

15.76	16.05	16.61	17.28	18.13	18.78	19.15	19.14	18.62	17.69	16.55	15.89	(90)
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Living area fraction (24.00 / 126.00)

0.19 (91)

Mean internal temperature (for the whole dwelling)

16.01	16.30	16.86	17.53	18.38	19.05	19.43	19.42	18.88	17.94	16.80	16.14	(92)
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Apply adjustment to the mean internal temperature, where appropriate

16.01	16.30	16.86	17.53	18.38	19.05	19.43	19.42	18.88	17.94	16.80	16.14	(93)
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**SAP 2009 worksheet for New extension to existing dwelling - calculation of energy ratings**

**8. Space heating requirement**

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains												
0.92	0.91	0.88	0.84	0.76	0.64	0.46	0.48	0.70	0.84	0.91	0.93	(94)
Useful gains												
872.96	959.06	992.12	1008.77	949.98	793.16	550.19	539.06	743.57	833.67	834.31	834.09	(95)
Monthly average external temperature												
4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90	(96)
Heat loss rate for mean internal temperature												
3365.2	3246.5	2891.2	2453.7	1819.07	1199.74	676.22	673.22	1254.07	1984.89	2767.4	3228.3	(97)
Space heating requirement for each month, kWh/month												
1854.19	1537.19	1412.92	1040.32	646.60	-	-	-	-	856.50	1391.86	1781.28	
Total space heating requirement per year (kWh/year) (October to May)										10520.87		(98)
Space heating requirement per m <sup>2</sup> (kWh/m <sup>2</sup> /year)										83.50		(99)

**8c. Space cooling requirement - not applicable**



**SAP 2009 worksheet for New extension to existing dwelling - 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										89.70%		(206)	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement													
1854.19	1537.19	1412.92	1040.32	646.60	-	-	-	-	856.50	1391.86	1781.28		(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)													
2067.1	1713.70	1575.16	1159.77	720.85	-	-	-	-	954.85	1551.68	1985.82		(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													
239.30	211.09	222.07	199.61	196.00	175.69	169.26	185.00	184.44	206.96	218.16	233.73		(64)
Efficiency of water heater												79.00	(216)
88.33	88.26	88.08	87.79	86.96	79.00	79.00	79.00	79.00	87.40	88.08	88.31		(217)
Water heating fuel													
270.91	239.17	252.13	227.38	225.39	222.39	214.25	234.17	233.47	236.80	247.68	264.66		(219)
Annual totals												kWh/year	
Space heating fuel used, main system 1										11728.95		(211)	
Space heating fuel (secondary)										0.00		(215)	
Water heating fuel										2868.39		(219)	
Electricity for pumps, fans and electric keep-hot													
central heating pump										130.00		(230c)	
boiler with a fan-assisted flue										45.00		(230e)	
Total electricity for the above, kWh/year										175.00		(231)	
Electricity for lighting (100.00% fixed LEL)										493.29		(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										15265.63		(238)	

**SAP 2009 worksheet for New extension to existing dwelling - calculation of energy ratings**

**10a. Fuel costs using Table 12 prices**

	kWh/year	Fuel price p/kWh	£/year	
Space heating - main system 1	11728.950	3.100	363.60	(240)
Space heating - main system 2	0.000	0.000	0.00	(241)
Water heating cost	2868.39	3.100	88.92	(247)
Mech vent fans cost	0.000	11.460	0.00	(249)
Pump/fan energy cost	175.000	11.460	20.05	(249)
Energy for lighting	493.286	11.460	56.53	(250)
Additional standing charges			106.00	(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			635.10	(255)

**11a. SAP rating**

		<b>0.47</b>	<b>(256)</b>
		<b>1.75</b>	<b>(257)</b>
SAP value		75.65	
		<b>76</b>	<b>(258)</b>
<b>SAP band</b>		<b>C</b>	

**12a. Carbon dioxide emissions**

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating, main system 1	11728.95	0.198	2322.33	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	0.517	0.00	(263)
Water heating	2868.39	0.198	567.94	(264)
Space and water heating			2890.27	(265)
Electricity for pumps and fans	175.00	0.517	90.48	(267)
Electricity for lighting	493.29	0.517	255.03	(268)
Electricity generated - PVs	0.00	0.529	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			3235.78	(272)
			<b>kg/m<sup>2</sup>/year</b>	
<b>CO2 emissions per m<sup>2</sup></b>			<b>25.68</b>	<b>(273)</b>
EI value			74.64	(273a)
<b>EI rating</b>			<b>75</b>	<b>(274)</b>
<b>EI band</b>			<b>C</b>	

**SAP 2009 worksheet for New extension to existing dwelling - calculation of energy ratings**

**13a. Primary energy**

	<b>Energy kWh/year</b>	<b>Primary factor</b>	<b>P. Energy (kWh/year)</b>	
Space heating, main	11728.95	1.020	11963.53	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	2.920	0.00	(263)
Water heating	2868.39	1.020	2925.76	(264)
Space and water heating			14889.29	(265)
Electricity for pumps/fans	175.00	2.920	511.00	(267)
Electricity for lighting	493.29	2.920	1440.40	(268)
Electricity generated - PV	0.00	2.920	0.00	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Electricity generated - wind	0.00	2.920	0.00	(269)
New energy-saving technology :				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
<b>Primary energy kWh/year</b>			<b>16840.68</b>	<b>(272)</b>
<b>Primary energy kWh/m<sup>2</sup>/year</b>			<b>133.66</b>	<b>(273)</b>

### Project Information

Building type End-terrace house

Reference

Date

Project 327 Greystoke Avenue  
Bristol  
BS10 6BD

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### REGULATION COMPLIANCE REPORT - Approved Document L1A, 2010 Edition

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#### New extension to existing dwelling

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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 = 16.34

Dwelling Carbon Dioxide Emission Rate

DER = 26.82

Fail

Excess emissions = 10.48kg/m<sup>2</sup> (64.2%)

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##### 2a Thermal bridging

Thermal bridging calculated using default y-value of 0.15

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##### 2b Fabric U-values

<u>Element</u>	<u>Average</u>	<u>Highest</u>	
Wall	0.82 (max. 0.30)	1.20 (max. 0.70)	Fail
Floor	0.32 (max. 0.25)	0.35 (max. 0.70)	Fail
Roof	0.17 (max. 0.20)	0.18 (max. 0.35)	OK
Openings	1.96 (max. 2.00)	2.10 (max. 3.30)	OK

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##### 3 Air permeability

Air permeability at 50 pascals:

15.00

Fail

Maximum :

10.00

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##### 4 Heating efficiency

Main heating system:

Boiler and radiators, mains gas

Worcester GREENSTAR

Source of efficiency: from boiler database

Worcester GREENSTAR 24Ri ErP+

Efficiency: 89.7% 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)	1.91	
	Permitted by DBSCG	2.30	OK
Primary pipework insulated	No		Fail

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## 6 Controls

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

Space heating controls	Programmer + roomstat + TRVs		OK
	Cylinderstat - Yes		OK
	Independent timer for DHW - Yes		OK
Boiler Interlock	Yes		OK

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## 7 Low energy lights

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

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## 8 Mechanical ventilation

Not applicable

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## 9 Summertime temperature

Overheating risk (Severn Valley):		OK
	Not significant	OK

Based on:

Thermal mass parameter :	100.00
Overshading :	Average or unknown (20-60 % sky blocked)
Orientation : South	
Ventilation rate :	8.00
Blinds/curtains :	
None with blinds/shutters closed 0.00% of daylight hours	

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## 10 Key features

Party wall U-value 0.00 W/m<sup>2</sup>K

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# Predicted Energy Assessment

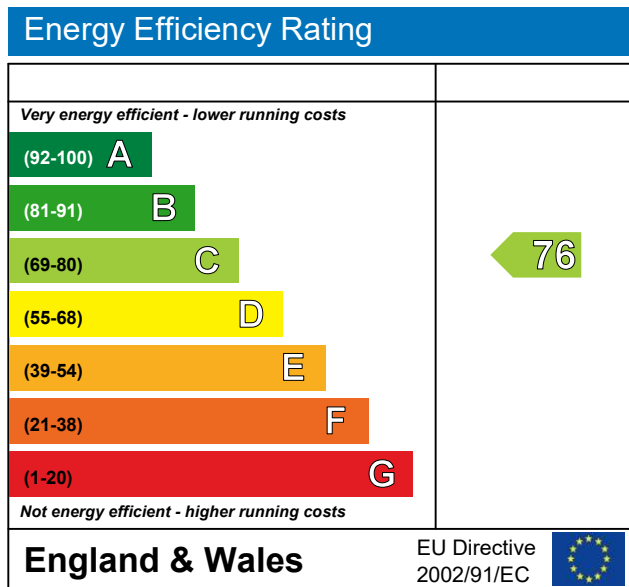
327 Greystoke Avenue  
Bristol  
BS10 6BD

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

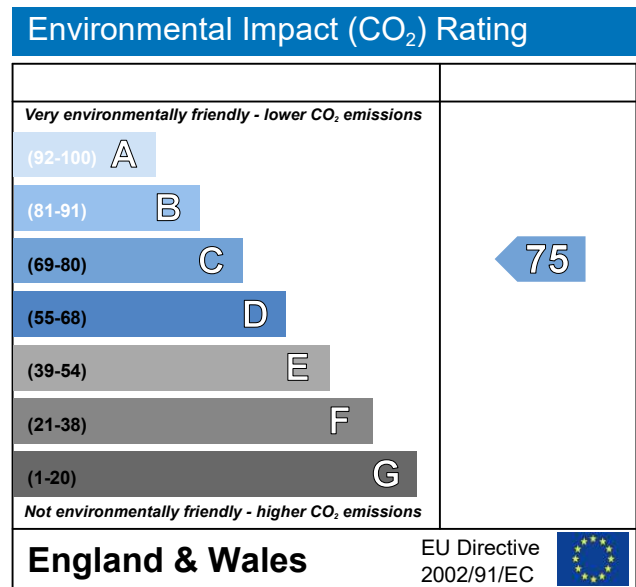
End-terrace house  
11 February 2022  
Complete Energy Consultancy Ltd  
126 m<sup>2</sup>

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 2009 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<sub>2</sub>) 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 (CO<sub>2</sub>) emissions. The higher the rating the less impact it has on the environment.