

**Table 5.2** Universal beams (abstracted from the *Steelwork Design Guide to BS 5950: Part 1*, published by the Steel Construction Institute)

(a) Dimensions

Designation		Depth of section <i>D</i> (mm)	Width of section <i>B</i> (mm)	Thickness		Root radius <i>r</i> (mm)	Depth between fillets <i>d</i> (mm)	Ratios for local buckling		Dimensions for detailing			Surface area	
Serial size (mm)	Mass per metre (kg)			Web <i>t</i> (mm)	Flange <i>T</i> (mm)			Flange <i>b/T</i>	Web <i>d/t</i>	End clearance <i>C</i> (mm)	Notch <i>N</i> (mm)	Notch <i>n</i> (mm)	Per metre (m <sup>2</sup> )	per tonne (m <sup>2</sup> )
914 × 419	388	920.5	420.5	21.5	36.6	24.1	799.1	5.74	37.2	13	210	62	3.44	8.86
	343	911.4	418.5	19.4	32.0	24.1	799.1	6.54	41.2	12	210	58	3.42	9.96
914 × 305	289	926.6	307.8	19.6	32.0	19.1	824.5	4.81	42.1	12	156	52	3.01	10.4
	253	918.5	305.5	17.3	27.9	19.1	824.5	5.47	47.7	11	156	48	2.99	11.8
	224	910.3	304.1	15.9	23.9	19.1	824.5	6.36	51.9	10	156	44	2.97	13.3
	201	903.0	303.4	15.2	20.2	19.1	824.5	7.51	54.2	10	156	40	2.96	14.7
838 × 292	226	850.9	293.8	16.1	26.8	17.8	761.7	5.48	47.3	10	150	46	2.81	12.5
	194	840.7	292.4	14.7	21.7	17.8	761.7	6.74	51.8	9	150	40	2.79	14.4
	176	834.9	291.6	14.0	18.8	17.8	761.7	7.76	54.5	9	150	38	2.78	15.8
762 × 267	197	769.6	268.0	15.6	25.4	16.5	685.8	5.28	44.0	10	138	42	2.55	13.0
	173	762.0	266.7	14.3	21.6	16.5	685.8	6.17	48.0	9	138	40	2.53	14.6
	147	753.9	265.3	12.9	17.5	16.5	685.8	7.58	53.2	8	138	36	2.51	17.1
686 × 254	170	692.9	255.8	14.5	23.7	15.2	615.1	5.40	42.4	9	132	40	2.35	13.8
	152	687.6	254.5	13.2	21.0	15.2	615.1	6.06	46.6	9	132	38	2.34	15.4
	140	683.5	253.7	12.4	19.0	15.2	615.1	6.68	49.6	8	132	36	2.33	16.6
	125	677.9	253.0	11.7	16.2	15.2	615.1	7.81	52.6	8	132	32	2.32	18.5
610 × 305	238	633.0	311.5	18.6	31.4	16.5	537.2	4.96	28.9	11	158	48	2.45	10.3
	179	617.5	307.0	14.1	23.6	16.5	537.2	6.50	38.1	9	158	42	2.41	13.4
	149	609.6	304.8	11.9	19.7	16.5	537.2	7.74	45.1	8	158	38	2.39	16.0
610 × 229	140	617.0	230.1	13.1	22.1	12.7	547.3	5.21	41.8	9	120	36	2.11	15.0
	125	611.9	229.0	11.9	19.6	12.7	547.3	5.84	46.0	8	120	34	2.09	16.8
	113	607.3	228.2	11.2	17.3	12.7	547.3	6.60	48.9	8	120	32	2.08	18.4
	101	602.2	227.6	10.6	14.8	12.7	547.3	7.69	51.6	7	120	28	2.07	20.5
533 × 210	122	544.6	211.9	12.8	21.3	12.7	476.5	4.97	37.2	8	110	36	1.89	15.5
	109	539.5	210.7	11.6	18.8	12.7	476.5	5.60	41.1	8	110	32	1.88	17.2
	101	536.7	210.1	10.9	17.4	12.7	476.5	6.04	43.7	7	110	32	1.87	18.5
	92	533.1	209.3	10.2	15.6	12.7	476.5	6.71	46.7	7	110	30	1.86	20.2
	82	528.3	208.7	9.6	13.2	12.7	476.5	7.91	49.6	7	110	26	1.85	22.6
457 × 191	98	467.4	192.8	11.4	19.6	10.2	407.9	4.92	35.8	8	102	30	1.67	17.0
	89	463.6	192.0	10.6	17.7	10.2	407.9	5.42	38.5	7	102	28	1.66	18.6
	82	460.2	191.3	9.9	16.0	10.2	407.9	5.98	41.2	7	102	28	1.65	20.1
	74	457.2	190.5	9.1	14.5	10.2	407.9	6.57	44.8	7	102	26	1.64	22.2
	67	453.6	189.9	8.5	12.7	10.2	407.9	7.48	48.0	6	102	24	1.63	24.4
457 × 152	82	465.1	153.5	10.7	18.9	10.2	407.0	4.06	38.0	7	82	30	1.51	18.4
	74	461.3	152.7	9.9	17.0	10.2	407.0	4.49	41.1	7	82	28	1.50	20.2
	67	457.3	151.9	9.1	15.0	10.2	407.0	5.06	44.7	7	82	26	1.49	22.2
	60	454.7	152.9	8.0	13.3	10.2	407.0	5.75	51.0	6	84	24	1.49	24.8
	52	449.8	152.4	7.6	10.9	10.2	407.0	6.99	53.6	6	84	22	1.48	28.4

**Table 5.2** Universal beams *continued* (abstracted from the *Steelwork Design Guide to BS 5950: Part 1*, published by the Steel Construction Institute)

## (b) Properties

Designation		Second moment of area		Radius of gyration		Elastic modulus		Plastic modulus		Buckling parameter	Torsional index	Warping constant	Torsional constant	Area of section
Serial size	Mass per metre	Axis x-x	Axis y-y	Axis x-x	Axis y-y	Axis x-x	Axis y-y	Axis x-x	Axis y-y	<i>u</i>	<i>x</i>	<i>H</i>	<i>J</i>	<i>A</i>
(mm)	(kg)	(cm <sup>4</sup> )	(cm <sup>4</sup> )	(cm)	(cm)	(cm <sup>3</sup> )	(cm <sup>3</sup> )	(cm <sup>3</sup> )	(cm <sup>3</sup> )			(dm <sup>6</sup> )	(cm <sup>4</sup> )	(cm <sup>2</sup> )
914 × 419	388	719 000	45 400	38.1	9.58	15 600	2160	17 700	3340	0.884	26.7	88.7	1730	494
	343	625 000	39 200	37.8	9.46	13 700	1870	15 500	2890	0.883	30.1	75.7	1190	437
914 × 305	289	505 000	15 600	37.0	6.51	10 900	1010	12 600	1600	0.867	31.9	31.2	929	369
	253	437 000	13 300	36.8	6.42	9 510	872	10 900	1370	0.866	36.2	26.4	627	323
	224	376 000	11 200	36.3	6.27	8 260	738	9 520	1160	0.861	41.3	22.0	421	285
	201	326 000	9 430	35.6	6.06	7 210	621	8 360	983	0.853	46.8	18.4	293	256
838 × 292	226	340 000	11 400	34.3	6.27	7 990	773	9 160	1210	0.87	35.0	19.3	514	289
	194	279 000	9 070	33.6	6.06	6 650	620	7 650	974	0.862	41.6	15.2	307	247
	176	246 000	7 790	33.1	5.90	5 890	534	6 810	842	0.856	46.5	13.0	222	224
762 × 267	197	240 000	8 170	30.9	5.71	6 230	610	7 170	959	0.869	33.2	11.3	405	251
	173	205 000	6 850	30.5	5.57	5 390	513	6 200	807	0.864	38.1	9.38	267	220
	147	169 000	5 470	30.0	5.39	4 480	412	5 170	649	0.857	45.1	7.41	161	188
686 × 254	170	170 000	6 620	28.0	5.53	4 910	518	5 620	810	0.872	31.8	7.41	307	217
	152	150 000	5 780	27.8	5.46	4 370	454	5 000	710	0.871	35.5	6.42	219	194
	140	136 000	5 180	27.6	5.38	3 990	408	4 560	638	0.868	38.7	5.72	169	179
	125	118 000	4 380	27.2	5.24	3 480	346	4 000	542	0.862	43.9	4.79	116	160
610 × 305	238	208 000	15 800	26.1	7.22	6 560	1020	7 460	1570	0.886	21.1	14.3	788	304
	179	152 000	11 400	25.8	7.08	4 910	743	5 520	1140	0.886	27.5	10.1	341	228
	149	125 000	9 300	25.6	6.99	4 090	610	4 570	937	0.886	32.5	8.09	200	190
610 × 229	140	112 000	4 510	25.0	5.03	3 630	392	4 150	612	0.875	30.5	3.99	217	178
	125	98 600	3 930	24.9	4.96	3 220	344	3 680	536	0.873	34.0	3.45	155	160
	113	87 400	3 440	24.6	4.88	2 880	301	3 290	470	0.87	37.9	2.99	112	144
	101	75 700	2 910	24.2	4.75	2 510	256	2 880	400	0.863	43.0	2.51	77.2	129
533 × 210	122	76 200	3 390	22.1	4.67	2 800	320	3 200	501	0.876	27.6	2.32	180	156
	109	66 700	2 940	21.9	4.60	2 470	279	2 820	435	0.875	30.9	1.99	126	139
	101	61 700	2 690	21.8	4.56	2 300	257	2 620	400	0.874	33.1	1.82	102	129
	92	55 400	2 390	21.7	4.51	2 080	229	2 370	356	0.872	36.4	1.60	76.2	118
	82	47 500	2 010	21.3	4.38	1 800	192	2 060	300	0.865	41.6	1.33	51.3	104
457 × 191	98	45 700	2 340	19.1	4.33	1 960	243	2 230	378	0.88	25.8	1.17	121	125
	89	41 000	2 090	19.0	4.28	1 770	217	2 010	338	0.879	28.3	1.04	90.5	114
	82	37 100	1 870	18.8	4.23	1 610	196	1 830	304	0.877	30.9	0.923	69.2	105
	74	33 400	1 670	18.7	4.19	1 460	175	1 660	272	0.876	33.9	0.819	52.0	95.0
	67	29 400	1 450	18.5	4.12	1 300	153	1 470	237	0.873	37.9	0.706	37.1	85.4
457 × 152	82	36 200	1 140	18.6	3.31	1 560	149	1 800	235	0.872	27.3	0.569	89.3	104
	74	32 400	1 010	18.5	3.26	1 410	133	1 620	209	0.87	30.0	0.499	66.6	95.0
	67	28 600	878	18.3	3.21	1 250	116	1 440	182	0.867	33.6	0.429	47.5	85.4
	60	25 500	794	18.3	3.23	1 120	104	1 280	163	0.869	37.5	0.387	33.6	75.9
	52	21 300	645	17.9	3.11	949	84.6	1 090	133	0.859	43.9	0.311	21.3	66.5