

# STEEL CHANNELS

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## i) Rolling Tolerance - EN 10279 : 2000 European Standard

**EN 10279**







This European standard specifies requirements for the tolerances on dimensions, shape and mass on hot rolled steel channels with parallel flanges.

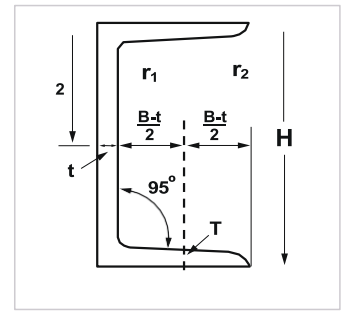
Property	Range mm	Tolerance mm		Designation
Height <b>H</b>	$H \leq 65$	$\pm 1.5$		
	$65 < H \leq 200$	$\pm 2.0$		
	$200 < H \leq 400$	$\pm 3.0$		
	$400 < H$	$\pm 4.0$		
Flange width <b>B</b>	$B \leq 50$	$\pm 1.5$		
	$50 < B \leq 100$	$\pm 2.0$		
	$100 < B \leq 125$	$\pm 2.5$		
	$125 < B$	$\pm 3.0$		
Web thickness <b>t</b>	$t \leq 10$	$\pm 0.5$		
	$10 < t \leq 15$	$\pm 0.7$		
	$15 < t$	$\pm 1.0$		
Flange thickness <b>T</b>	$T \leq 10$	Tolerance limited by weight	-0.5	
	$10 < T \leq 15$		-1	
	$15 < T$		-1.5	
Heel radius <b>r<sub>3</sub></b>	All Sizes	$< 0.3 * t$		
Out of squareness <b>(k, k<sub>1</sub>)</b>	$B \leq 100$	2		
	$100 < B$	2% of B		
Web flatness <b>f</b>	$H \leq 100$	$\pm 0.5$		
	$100 < H \leq 200$	$\pm 1.0$		
	$200 < H \leq 400$	$\pm 1.5$		
	$400 < H$	$\pm 1.5$		
Straightness <b>q<sub>xx</sub></b>	$H \leq 150$	0.30% L		
	$150 < H \leq 300$	0.20% L		
	$300 < H$	0.15% L		
Straightness <b>q<sub>yy</sub></b>	$H \leq 150$	0.50% L		
	$150 < H \leq 300$	0.30% L		
	$300 < H$	0.20% L		
Mass per unit length kg/m	$H \leq 125$	$\pm 6.0\%$		
	$125 < H$	$\pm 4.0\%$		
Standard Length	All	100	0	
Alternative Standard (by agreement) <b>L</b>	All	50	-50	

# 5) Light Gauge Steels for General Structure

## Japanese Industrial Standard (Extracts from JIS G 3350 : 2005)

JIS G 3350

<p><b>General Information</b></p>	<p>This Japanese Industrial Standard specifies the cold formed light gauge steels for buildings and other structures, (hereafter referred to as "light gauge steels").</p> <p>The light gauge steels shall be classified into one class, and its symbol, designation according to sectional shape and mark of sectional shape shall be as given in Table 1.</p> <p>Table 1. Symbol Of Class, Designation According To Sectional Shape And Mark Of Sectional Shape</p> <table border="1"> <thead> <tr> <th>Symbol Of Class</th> <th>Designation According To Sectional Shape</th> <th>Mark Of Sectional Shape</th> </tr> </thead> <tbody> <tr> <td rowspan="2">SSC 400</td> <td>Light channel steel</td> <td></td> </tr> <tr> <td>Lip channel steel</td> <td></td> </tr> </tbody> </table>	Symbol Of Class	Designation According To Sectional Shape	Mark Of Sectional Shape	SSC 400	Light channel steel		Lip channel steel																																											
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<p><b>Chemical Composition</b></p>	<p>The light gauge steel shall be tested in accordance with and its ladle analysis shall be as given in Table 2.</p> <p>Table 2. Chemical Composition <span style="float: right;">Unit : %</span></p> <table border="1"> <thead> <tr> <th>Symbol Of Class</th> <th>C</th> <th>P</th> <th>S</th> </tr> </thead> <tbody> <tr> <td>SSC 400</td> <td>0.25 max.</td> <td>0.050 max.</td> <td>0.050 max.</td> </tr> </tbody> </table>	Symbol Of Class	C	P	S	SSC 400	0.25 max.	0.050 max.	0.050 max.																																										
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<p><b>Mechanical Strength (Tensile Test)</b></p>	<p>The light gauge steel shall be tested in accordance with and its yield point, tensile strength, and elongation shall be as given in Table 3.</p> <p>Table 3. Mechanical Properties</p> <table border="1"> <thead> <tr> <th rowspan="2">Symbol Of Class</th> <th rowspan="2">Yield Point (N/mm<sup>2</sup>)</th> <th rowspan="2">Tensile Strength (N/mm<sup>2</sup>)</th> <th colspan="3">Elongation</th> </tr> <tr> <th>Thickness (mm)</th> <th>Test Piece</th> <th>%</th> </tr> </thead> <tbody> <tr> <td rowspan="2">SSC 400</td> <td rowspan="2">245 min.</td> <td rowspan="2">400 to 540</td> <td>5 or under</td> <td>No. 5</td> <td>21 min.</td> </tr> <tr> <td>Over 5</td> <td>No. 1A</td> <td>17 min.</td> </tr> </tbody> </table> <p>Remark : 1 N/mm<sup>2</sup> = 1 MPa</p>	Symbol Of Class	Yield Point (N/mm <sup>2</sup> )	Tensile Strength (N/mm <sup>2</sup> )	Elongation			Thickness (mm)	Test Piece	%	SSC 400	245 min.	400 to 540	5 or under	No. 5	21 min.	Over 5	No. 1A	17 min.																																
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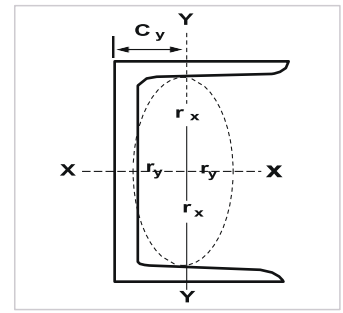


## 5a(i) U Channels ( Imperial Units ) - Part 1

Designation Size	Unit Mass		Depth Of Section		Width Of Section		Thickness				Root Radius		Toe Radius		Area Of Section	
							Web		Flange							
H x B	M		H		B		t		T		r <sub>1</sub>		r <sub>2</sub>		A	
mm (in)	kg/m	lb/ft	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	cm <sup>2</sup>	in <sup>2</sup>
<b>127 x 64</b> (5 x 2 1/2)	14.90	10.0	127.0	5.0	63.5	2.5	6.4	0.252	9.2	0.362	10.7	0.421	2.4	0.094	18.98	2.94
<b>152 x 76</b> (6 x 3)	17.88	12.0	152.4	6.0	76.2	3.0	6.4	0.252	9.0	0.354	12.2	0.480	2.4	0.094	22.77	3.53
<b>152 x 89</b> (6 x 3 1/2)	23.84	16.0	152.4	6.0	88.9	3.5	7.1	0.280	11.6	0.457	13.7	0.539	3.2	0.126	30.36	4.71
<b>178 x 76</b> (7 x 3)	20.84	14.0	177.8	7.0	76.2	3.0	6.6	0.260	10.3	0.406	12.2	0.480	3.2	0.126	26.54	4.11
<b>178 x 89</b> (7 x 3 1/2)	26.81	18.0	177.8	7.0	88.9	3.5	7.6	0.299	12.3	0.484	13.7	0.539	3.2	0.126	34.15	5.29
<b>203 x 76</b> (8 x 3)	23.82	16.0	203.2	8.0	76.2	3.0	7.1	0.280	11.2	0.441	12.2	0.480	3.2	0.126	30.34	4.70
<b>203 x 89</b> (8 x 3 1/2)	29.78	20.0	203.2	8.0	88.9	3.5	8.1	0.319	12.9	0.508	13.7	0.539	3.2	0.126	37.94	5.88
<b>229 x 76</b> (9 x 3)	26.06	17.5	228.6	9.0	76.2	3.0	7.6	0.299	11.2	0.441	12.2	0.480	3.2	0.126	33.20	5.15
<b>229 x 89</b> (9 x 3 1/2)	32.76	22.0	228.6	9.0	88.9	3.5	8.6	0.339	13.3	0.524	13.7	0.539	3.2	0.126	41.73	6.47
<b>254 x 76</b> (10 x 3)	28.29	19.0	254.0	10.0	76.2	3.0	8.1	0.319	10.9	0.429	12.2	0.480	3.2	0.126	36.03	5.58
<b>254 x 89</b> (10 x 3 1/2)	35.74	24.0	254.0	10.0	88.9	3.5	9.1	0.358	13.6	0.535	13.7	0.539	3.2	0.126	45.52	7.06
<b>305 x 89</b> (12 x 3 1/2)	41.69	28.0	304.8	12.0	88.9	3.5	10.2	0.402	13.7	0.539	13.7	0.539	3.2	0.126	53.11	8.23
<b>305 x 102</b> (12 x 4)	46.18	31.0	304.8	12.0	101.6	4.0	10.2	0.402	14.8	0.583	15.2	0.598	4.8	0.189	58.83	9.12
<b>381 x 102</b> (15 x 4)	55.10	37.0	381.0	15.0	101.6	4.0	10.4	0.409	16.3	0.642	15.2	0.598	4.8	0.189	70.19	10.88
<b>432 x 102</b> (17 x 4)	65.54	44.0	431.8	17.0	101.6	4.0	12.2	0.480	16.8	0.661	15.2	0.598	4.8	0.189	83.49	12.94

Note : Calculated based on 1kg= 2.2046 lb and 1m=3.2808 feet and 1in= 2.54cm





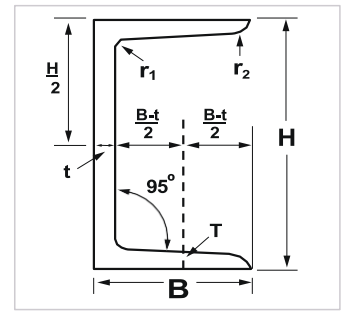
## 5a(i) U Channels ( Imperial Units ) - Part 2

x-x		y-y		x-x		y-y		x-x		y-y		x-x		y-y		Centre of Gravity		Designation Size
Ix		Iy		rx		ry		Zx		Zy		Sx		Sy		Cy		H x B
cm <sup>4</sup>	in <sup>4</sup>	cm <sup>4</sup>	in <sup>4</sup>	cm	in	cm	in	cm <sup>3</sup>	in <sup>3</sup>	cm <sup>3</sup>	in <sup>3</sup>	cm <sup>3</sup>	in <sup>3</sup>	cm <sup>3</sup>	in <sup>3</sup>	cm	in	mm (in)
482.5	11.59	67.23	1.62	5.04	1.984	1.88	0.740	75.99	4.637	15.25	0.931	89.4	5.456	29.31	1.789	1.94	0.764	<b>127 x 64</b> <b>(5 x 2 1/2)</b>
851.5	20.46	113.8	2.73	6.12	2.409	2.24	0.882	111.8	6.822	21.05	1.285	130.0	7.933	41.26	2.518	2.21	0.870	<b>152 x 76</b> <b>(6 x 3)</b>
1166	28.01	215.1	5.17	6.20	2.441	2.66	1.047	153.0	9.337	35.70	2.178	177.7	10.844	68.12	4.157	2.86	1.126	<b>152 x 89</b> <b>(6 x 3 1/2)</b>
1337	32.12	134.0	3.22	7.10	2.795	2.25	0.886	150.4	9.178	24.72	1.509	175.4	10.704	48.07	2.933	2.20	0.866	<b>178 x 76</b> <b>(7 x 3)</b>
1753	42.12	241.0	5.79	7.16	2.819	2.66	1.047	197.2	12.034	39.29	2.398	229.6	14.011	75.44	4.604	2.76	1.087	<b>178 x 89</b> <b>(7 x 3 1/2)</b>
1950	46.85	151.3	3.63	8.02	3.157	2.23	0.878	192.0	11.717	27.59	1.684	225.2	13.743	53.32	3.254	2.13	0.839	<b>203 x 76</b> <b>(8 x 3)</b>
2491	59.85	264.4	6.35	8.10	3.189	2.64	1.039	245.2	14.963	42.34	2.584	286.6	17.489	81.62	4.981	2.65	1.043	<b>203 x 89</b> <b>(8 x 3 1/2)</b>
2610	62.70	158.7	3.81	8.87	3.492	2.19	0.862	228.3	13.932	28.22	1.722	270.3	16.495	54.24	3.310	2.00	0.787	<b>229 x 76</b> <b>(9 x 3)</b>
3387	81.37	285.0	6.85	9.01	3.547	2.61	1.028	296.4	18.087	44.82	2.735	348.4	21.261	86.38	5.271	2.53	0.996	<b>229 x 89</b> <b>(9 x 3 1/2)</b>
3367	80.89	162.6	3.91	9.67	3.807	2.12	0.835	265.1	16.177	28.21	1.721	317.4	19.369	54.14	3.304	1.86	0.732	<b>254 x 76</b> <b>(10 x 3)</b>
4448	106.86	302.4	7.27	9.88	3.890	2.58	1.016	350.2	21.371	46.70	2.850	414.4	25.288	89.56	5.465	2.42	0.953	<b>254 x 89</b> <b>(10 x 3 1/2)</b>
7061	169.64	325.4	7.82	11.5	4.528	2.48	0.976	463.3	28.272	48.49	2.959	557.1	33.996	92.60	5.651	2.18	0.858	<b>305 x 89</b> <b>(12 x 3 1/2)</b>
8214	197.34	499.5	12.00	11.8	4.646	2.91	1.146	539.0	32.892	66.59	4.064	638.3	38.951	128.1	7.817	2.66	1.047	<b>305 x 102</b> <b>(12 x 4)</b>
14894	357.82	579.7	13.93	14.6	5.748	2.87	1.130	781.8	47.708	75.86	4.629	932.7	56.917	144.4	8.812	2.52	0.992	<b>381 x 102</b> <b>(15 x 4)</b>
21399	514.11	628.6	15.10	16.0	6.299	2.74	1.079	991.1	60.480	80.14	4.890	1207	73.656	153.1	9.343	2.32	0.913	<b>432 x 102</b> <b>(17 x 4)</b>

Note : Calculated based on 1kg= 2.2046 lb and 1m=3.2808 feet and 1in= 2.54cm



# Dimensions and Properties



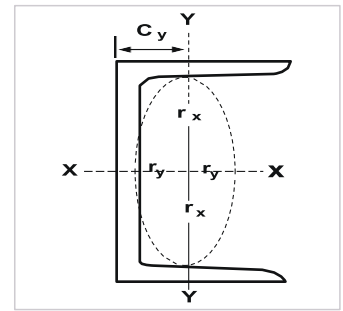
## 5a (ii) U Channels ( Metric Units ) - Part A

Designation Size H x B x t	Dept Of Section H		Width of Flange B		Thickness				Root Radius		Toe Radius		Section Area	
					Web t		Flange T		r <sub>1</sub>		r <sub>2</sub>		A	
					mm	in	mm	in	mm	in	mm	in	mm	in
<b>75 x 40 x 5</b>	75	2.953	40	1.575	5	0.197	7	0.276	8	0.315	4	0.157	8.818	1.367
<b>100 x 50 x 5</b>	100	3.937	50	1.969	5	0.197	7.5	0.295	8	0.315	4	0.157	11.92	1.848
<b>125 x 65 x 6</b>	125	4.921	65	2.559	6	0.236	8	0.315	8	0.315	4	0.157	17.11	2.652
<b>150 x 75 x 6.5 x 9</b>	150	5.906	75	2.953	6.5	0.256	10	0.394	10	0.394	5	0.197	23.71	3.675
	150	5.906	75	2.953	9	0.354	12.5	0.492	15	0.591	7.5	0.295	30.59	4.741
<b>180 x 75 x 7</b>	180	7.087	75	2.953	7	0.276	10.5	0.413	11	0.433	5.5	0.217	27.20	4.316
<b>180 x 90 x 7.5</b>	180	7.087	90	3.543	7.5	0.295	12.5	0.492	13	0.512	6.5	0.256	34.57	5.358
<b>200 x 80 x 7.5</b>	200	7.874	80	3.150	7.5	0.295	11	0.433	12	0.472	6	0.236	31.33	4.856
<b>200 x 90 x 8</b>	200	7.874	90	3.543	8	0.315	13.5	0.531	14	0.551	7	0.276	38.65	5.991
<b>230 x 80 x 8</b>	230	9.055	80	3.150	8	0.315	12	0.472	13	0.512	6.5	0.256	36.12	5.499
<b>230 x 90 x 8.5</b>	230	9.055	90	3.543	8.5	0.335	13.5	0.531	15	0.591	7.5	0.295	42.14	6.531
<b>250 x 80 x 8</b>	250	9.843	80	3.150	8	0.315	12.5	0.492	14	0.551	7	0.276	38.51	5.969
<b>250 x 90 x 9 x 11</b>	250	9.843	90	3.543	9	0.354	13	0.512	14	0.551	7	0.276	44.07	6.831
	250	9.843	90	3.543	11	0.433	14.5	0.571	17	0.669	8.5	0.335	51.17	7.931
<b>280 x 100 x 9 x 11.5</b>	280	11.024	100	3.937	9	0.354	13	0.512	14	0.551	7	0.276	49.37	7.652
	280	11.024	100	3.937	11.5	0.453	16	0.630	18	0.709	9	0.354	61.37	9.512
<b>300 x 90 x 9 x 10</b>	300	11.811	90	3.543	9	0.354	12	0.512	14	0.551	7	0.276	48.57	7.531
	300	11.811	90	3.543	10	0.394	15.5	0.611	19	0.748	9.5	0.374	55.74	8.640
<b>380 x 100 x 10.5 x 13</b>	380	14.961	100	3.937	10.5	0.431	16	0.630	18	0.709	9	0.354	69.39	10.76
	380	14.961	100	3.937	13	0.512	16.5	0.650	18	0.709	9	0.354	78.96	12.54

Note : Calculated based on 1kg= 2.2046 lb and 1m=3.2808 feet and 1in= 2.54cm





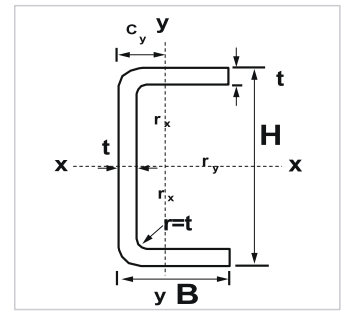


## 5a (ii) U Channels ( Metric Units ) - Part B

Unit Mass			Centre Of Gravity		Moment Of Inertial				Radius Of Gyration				Modulus Of Section				Designation Size
M			C <sub>y</sub>		I <sub>x</sub>		I <sub>y</sub>		r <sub>x</sub>		r <sub>y</sub>		Z <sub>x</sub>		Z <sub>y</sub>		H x B x t
kg/m	kg/ft	lb/ft	cm	in	cm <sup>4</sup>	in <sup>4</sup>	cm <sup>4</sup>	in <sup>4</sup>	cm	in	cm	in	cm <sup>3</sup>	in <sup>3</sup>	cm <sup>3</sup>	in <sup>3</sup>	mm x mm x mm
6.92	2.11	4.65	1.27	0.500	75.9	1.823	12.4	0.298	2.93	1.154	1.19	0.469	20.2	1.233	4.54	0.277	<b>75 x 40 x 5</b>
9.36	2.85	6.29	1.55	0.610	189	4.541	26.9	0.646	3.98	1.567	1.50	0.591	37.8	2.307	7.82	0.477	<b>100 x 50 x 5</b>
13.4	4.08	9.00	1.94	0.764	425	10.21	65.5	1.571	4.99	1.965	1.96	0.772	68.0	4.150	14.4	0.879	<b>125 x 65 x 6</b>
18.6	5.67	12.50	2.31	0.909	864	20.76	122	2.931	6.04	2.378	2.27	0.894	115	7.018	23.6	1.440	<b>150 x 75 x 6.5</b> <b>x 9</b>
24.0	7.32	16.13	2.31	0.909	1060	25.47	151	3.628	5.87	2.311	2.22	0.874	141	8.604	29.1	1.776	
21.4	6.52	14.38	2.15	0.846	1380	33.15	137	3.291	7.13	2.807	2.24	0.882	154	9.398	25.5	1.556	<b>180 x 75 x 7</b> <b>180 x 90 x 7.5</b>
27.1	8.26	18.21	2.85	1.122	1840	44.21	258	6.198	7.29	2.870	2.73	1.075	204	12.45	42.0	2.563	
24.6	7.50	16.53	2.24	0.882	1950	46.85	177	4.525	7.89	3.106	2.38	0.937	195	11.90	30.8	1.880	<b>200 x 80 x 7.5</b> <b>200 x 90 x 8</b>
30.3	9.24	20.36	2.77	1.091	2490	59.82	286	6.871	8.03	3.161	2.72	1.071	249	15.19	45.9	2.801	
28.4	8.66	19.08	2.15	0.846	2900	69.67	200	4.805	8.96	3.528	2.35	0.925	252	15.38	34.2	2.087	<b>230 x 80 x 8</b> <b>230 x 90 x 8.5</b>
33.1	10.09	22.24	2.58	1.016	3490	83.85	303	7.280	9.10	3.583	2.68	1.055	304	18.55	47.3	2.886	
30.2	9.21	20.29	2.11	0.831	3630	87.21	210	5.045	9.71	3.823	2.34	0.921	291	17.76	35.7	2.179	<b>250 x 80 x 8</b> <b>250 x 90 x 9</b> <b>x 11</b>
34.6	10.55	23.25	2.42	0.953	4180	100.4	306	7.352	9.74	3.835	2.64	1.039	335	20.44	46.5	2.838	
40.2	12.25	27.01	2.39	0.941	4690	112.7	342	8.217	9.57	3.768	2.58	1.016	375	22.88	51.7	3.155	
38.8	11.83	26.07	2.64	1.040	5930	142.5	428	10.28	11.0	4.331	2.95	1.161	423	25.81	58.2	3.552	<b>280 x 100 x 9</b> <b>x 11.5</b>
48.2	14.69	32.39	2.68	1.055	7150	171.8	515	12.37	10.8	4.252	2.90	1.142	510	31.12	70.4	4.296	
38.1	11.61	25.60	2.23	0.878	6440	154.7	325	7.808	11.5	4.528	2.59	1.020	429	26.18	48.0	2.929	<b>300 x 90 x 9</b> <b>x 10</b>
43.8	13.35	29.43	2.33	0.917	7400	177.8	373	8.961	11.5	4.528	2.59	1.020	494	30.15	56.0	3.417	
54.5	16.61	36.62	2.41	0.949	14500	348.4	557	13.38	14.5	5.709	2.83	1.114	762	46.50	73.3	4.473	<b>380 x 100 x 10.5</b> <b>x 13</b>
62.0	18.90	41.66	2.29	0.902	15600	374.8	584	14.03	14.1	5.551	2.72	1.071	822	50.16	75.8	4.625	

Note : Calculated based on 1kg= 2.2046 lb and 1m=3.2808 feet and 1in= 2.54cm





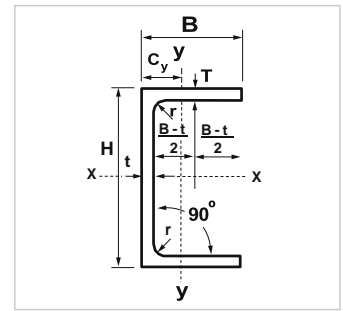
## 5a (iii) Plain Channels JIS G 3350:2005 / Manufacturer's Standard

Designation		Thickness	Area Of Section	Centre Of Gravity	Second Moment Of Area		Radius Of Gyration		Elastic Modulus		Plastic Modulus		Buckling Constant	Torsional Index	Warping Constant	Torsional Constant
Size	Unit Weight				$I_x$	$I_y$	$r_x$	$r_y$	$Z_x$	$Z_y$	$S_x$	$S_y$				
HxB		t	A	$C_y$	$I_x$	$I_y$	$r_x$	$r_y$	$Z_x$	$Z_y$	$S_x$	$S_y$	u	x	H	J
mm	kg/m	mm	cm <sup>2</sup>	cm	cm <sup>4</sup>	cm <sup>4</sup>	cm	cm	cm <sup>3</sup>	cm <sup>3</sup>	cm <sup>3</sup>	mm <sup>3</sup>			dm <sup>6</sup> x 10 <sup>-3</sup>	cm <sup>4</sup>
60 x 30	1.44	1.6	1.84	0.823	10.3	1.63	2.37	0.944	3.45	0.75	4.00	1.37	0.897	29.7	0.0101	0.0165
	2.03	2.3	2.59	0.856	14.2	2.25	2.34	0.932	4.72	1.05	5.54	1.94	0.891	20.4	0.0138	0.0490
75 x 45	2.00	1.6	2.56	1.30	23.9	5.37	3.06	1.45	6.37	1.68	7.22	5.85	0.891	37.7	0.0528	0.0226
	2.84	2.3	3.62	1.34	33.1	7.49	3.02	1.44	8.83	2.37	10.1	7.83	0.885	26.1	0.0739	0.0673
	3.65	3.0	4.65	1.37	41.7	9.46	2.99	1.43	11.1	3.02	12.9	9.51	0.878	19.9	0.0939	0.150
100 x 50	2.44	1.6	3.12	1.32	50.0	7.87	4.01	1.59	10.0	2.14	11.5	3.88	0.901	50.1	0.136	0.0274
	3.47	2.3	4.43	1.36	69.9	11.0	3.97	1.58	14.0	3.03	16.1	5.52	0.898	34.6	0.189	0.0815
	4.47	3.0	5.70	1.39	88.6	14.0	3.94	1.57	17.7	3.88	20.6	7.12	0.895	26.3	0.240	0.181
	5.87	4.0	7.47	1.43	113.3	18.0	3.89	1.55	22.7	5.05	26.6	9.37	0.890	19.5	0.307	0.430
125 x 50	3.92	2.3	5.00	1.21	117	11.8	4.85	1.54	18.8	3.12	22.0	5.72	0.900	43.2	0.315	0.0916
	5.06	3.0	6.45	1.24	149	15.1	4.81	1.53	23.9	4.01	28.2	7.46	0.898	32.7	0.397	0.204
	6.65	4.0	8.47	1.29	192	19.4	4.76	1.51	30.7	5.22	36.6	9.97	0.896	24.2	0.505	0.483
	7.42	4.5	9.46	1.31	212	21.4	4.74	1.51	34.0	5.81	40.6	11.2	0.895	21.3	0.555	0.689
150 x 65	4.91	2.3	6.27	1.61	218	25.8	5.90	2.03	29.1	5.29	33.7	9.56	0.902	52.2	1.00	0.114
	6.36	3.0	8.10	1.64	279	33.1	5.87	2.02	37.2	6.81	43.4	12.4	0.900	39.7	1.27	0.253
	8.38	4.0	10.67	1.69	361	42.9	5.82	2.00	48.2	8.91	56.6	16.5	0.898	29.4	1.63	0.601
	9.36	4.5	11.9	1.71	401	47.6	5.79	2.00	53.4	9.94	63.0	18.5	0.897	26.0	1.81	0.856
175 x 75	5.73	2.3	7.30	1.83	347	40.2	6.89	2.35	39.7	7.09	45.9	12.8	0.902	61.1	2.12	0.132
	7.42	3.0	9.45	1.86	445	51.5	6.86	2.33	50.8	9.14	59.1	16.6	0.901	46.5	2.70	0.294
	9.79	4.0	12.47	1.91	579	67.1	6.81	2.32	66.1	12.0	77.4	22.1	0.899	34.6	3.49	0.697
	10.95	4.5	14.0	1.93	643	74.6	6.79	2.31	73.5	13.4	86.3	24.8	0.898	30.6	3.87	0.992
200 x 75	6.18	2.3	7.88	1.71	473	41.7	7.75	2.30	47.3	7.21	55.4	13.0	0.899	70.0	2.88	0.142
	8.01	3.0	10.2	1.74	608	53.6	7.72	2.29	60.8	9.30	71.4	16.9	0.898	53.3	3.67	0.316
	10.6	4.0	13.5	1.78	792	69.8	7.67	2.28	79.2	12.2	94	22.7	0.897	39.5	4.74	0.75
	11.84	4.5	15.1	1.80	881	77.7	7.64	2.27	88.1	13.6	104	25.6	0.897	35.0	5.24	1.07
225 x 75	6.63	2.3	8.45	1.60	624	43.1	8.60	2.26	55.5	7.30	65.6	13.2	0.894	79.0	3.79	0.152
	8.59	3.0	11.0	1.63	803	55.4	8.56	2.25	71.3	9.43	84.6	17.3	0.894	60.1	4.83	0.339
	11.40	4.0	14.5	1.67	1048	72.2	8.51	2.23	93	12.4	111	23.3	0.893	44.6	6.22	0.80
	12.72	4.5	16.2	1.70	1166	80.4	8.48	2.23	104	13.8	124	26.3	0.893	39.4	6.88	1.14
250 x 75	7.08	2.3	9.03	1.50	802	44.3	9.43	2.22	64.2	7.39	76.5	13.4	0.888	88.2	4.84	0.163
	9.18	3.0	11.7	1.54	1032	56.9	9.39	2.21	82.5	9.54	98.8	17.6	0.888	67.1	6.17	0.361
	12.10	4.0	15.5	1.58	1349	74.3	9.34	2.19	108	12.5	130	23.9	0.888	49.8	7.95	0.86
	13.60	4.5	17.3	1.60	1502	82.7	9.31	2.18	120	14.0	145	27.1	0.888	44.0	8.79	1.22

Note : Calculated based on 1kg= 2.2046 lb and 1m=3.2808 feet and 1in= 2.54cm







## 5a (iv) Parallel Flanges

### Part 1

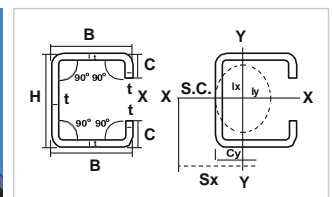
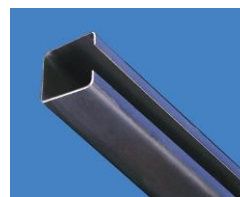
Designation		Unit Weight	Flange		Root Radius	Depth Between Fillets	Area Of Section	Centre Of Gravity	Ratios For Local Buckling		Second Moment Of Area	
Size	t		T	r					d	A	C <sub>y</sub>	Flange
HxB	mm	mm	mm	mm	mm	cm <sup>2</sup>	cm	B/T		cm <sup>4</sup>	cm <sup>4</sup>	
100 x 50		5.0	8.5	9	65.0	13.0	1.73	5.88		208	32.3	
125 x 65	14.8	5.5	9.5	12	82.0	18.8	2.25	6.84	14.9	483	80.0	
150 x 75	17.9	5.5	10.0	12	106	22.8	2.58	7.50	19.3	861	131	
150 x 90	23.9	6.5	12.0	12	102	30.4	3.30	7.50	15.7	1162	253	
180 x 75	20.3	6.0	10.5	12	135	25.9	2.41	7.14	22.5	1370	146	
180 x 90	26.1	6.5	12.5	12	131	33.2	3.17	7.20	20.2	1817	277	
200 x 75	23.4	6.0	12.5	12	151	29.9	2.48	6.00	25.2	1963	170	
200 x 90	29.7	7.0	14.0	12	148	37.9	3.12	6.43	21.1	2523	314	
230 x 75	25.7	6.5	12.5	12	181	32.7	2.30	6.00	27.8	2748	181	
230 x 90	32.2	7.5	14.0	12	178	41.0	2.92	6.43	23.7	3518	334	
250 x 90	35.5	8.0	15.0	12	220	45.2	2.86	6.00	27.5	4510	364	
260 x 75	27.6	7.0	12.0	12	212	35.1	2.10	6.25	30.3	3619	185	
260 x 90	34.8	8.0	14.0	12	208	44.4	2.74	6.43	26.0	4728	353	
300 x 90	41.4	9.0	15.5	12	245	52.7	2.60	5.81	27.2	7218	404	
300 x 100	45.5	9.0	16.5	15	237	58.0	3.05	6.06	26.3	8229	568	
380 x 100	54.0	9.5	17.5	15	315	68.7	2.79	5.71	33.2	15030	643	
430 x 100	64.4	11.0	19.0	15	362	82.1	2.62	5.26	32.9	21940	722	

Note : The flange thickness is measured at the centre of the flange

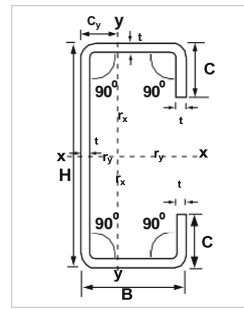
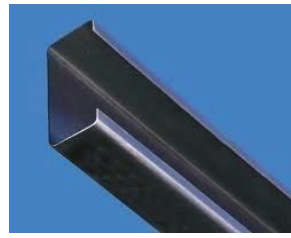
### Part 2

Designation		Radius Of Gyration		Elastic Modulus		Plastic Modulus		Buckling Parameter	Torsional Index	Warping Constant	Torsional Constant
Size	Unit Weight	Axis x-x	Axis y-y	Axis x-x	Axis y-y	Axis x-x	Axis y-y	u	x	H	J
HxB		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>
100 x 50		4.00	1.58	41.5	9.89	48.9	17.5	0.942	10.0	0.000491	2.53
125 x 65	14.8	5.07	2.06	77.3	18.8	89.9	33.2	0.942	11.1	0.00194	4.72
150 x 75	17.9	6.15	2.40	115	26.6	132	47.2	0.946	13.1	0.00467	6.10
150 x 90	23.9	6.18	2.89	155	44.4	179	76.9	0.936	10.8	0.00890	11.8
180 x 75	20.3	7.27	2.38	152	28.8	176	51.8	0.946	15.3	0.00754	7.34
180 x 90	26.1	7.40	2.89	202	47.4	232	83.5	0.949	12.8	0.0141	13.3
200 x 75	23.4	8.11	2.39	196	33.8	227	60.6	0.956	14.8	0.0107	11.1
200 x 90	29.7	8.16	2.89	252	53.4	291	94.5	0.954	12.9	0.0197	18.3
230 x 75	25.7	9.17	2.35	239	34.8	278	63.2	0.947	17.3	0.0153	11.8
230 x 90	32.2	9.27	2.86	306	55.0	355	98.9	0.950	15.1	0.0279	19.3
250 x 90	35.5	9.99	2.84	361	59.3	421	107	0.948	15.5	0.0359	23.8
260 x 75	27.6	10.1	2.30	278	34.4	328	62.0	0.932	20.5	0.0203	11.7
260 x 90	34.8	10.3	2.82	364	56.3	425	102	0.942	17.2	0.0379	20.6
300 x 90	41.4	11.7	2.77	481	63.1	568	114	0.934	18.4	0.0581	28.8
300 x 100	45.5	11.9	3.13	549	81.7	641	148	0.944	17.0	0.0813	36.8
380 x 100	54.0	14.8	3.06	791	89.2	933	161	0.932	21.2	0.150	45.7
430 x 100	64.4	16.3	2.97	1020	97.9	1222	176	0.917	22.5	0.219	63.0

## 5b (i) Trolley Track



Dimension	Thickness	Section Area	Unit Weight	Centre of Gravity		Secondary Moment of Area		Radius of Gyration of Area		Modulus of Section		Centre of Shear	
H x B x C	t	A	M	C <sub>x</sub>	C <sub>y</sub>	I <sub>x</sub>	I <sub>y</sub>	i <sub>x</sub>	i <sub>y</sub>	Z <sub>x</sub>	Z <sub>y</sub>	S <sub>x</sub>	S <sub>y</sub>
mm (in)	mm	cm <sup>2</sup>	Kg/m	cm	cm	cm <sup>4</sup>	cm <sup>4</sup>	cm	cm	cm <sup>3</sup>	cm <sup>3</sup>	cm	cm
50 x 50 x 15	1.5	2.55	2.00	2.50	2.22	11.32	9.45	2.08	1.90	4.53	3.40	4.7	0
(2 x 2 x 5/8)	2.3	3.79	2.98	2.50	2.22	16.53	13.76	2.05	1.87	6.61	4.95	4.7	0



## 5b (ii) Lip Channels

### JIS G 3350:2005 / Manufacturer's Standard

Designation		Thickness t	Inside Outside Radius		Area Of Section A	Centre Of Gravity Cv	Second Moment Of Area		Radius Of Gyration		Elastic Modulus		Plastic Modulus	
Size H x B x C	Unit Weight		r1	r2			Ix	Iy	rx	ry	Zx	Zy	Sx	Sy
		mm	mm	mm	cm <sup>2</sup>	cm	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>
( 2 1/2 x 1 1/4 x 3/8 )	1.99	1.6	4.0	2.4	2.05	1.06	11.4	2.50	2.36	1.10	3.81	1.29	4.48	2.12
	2.25	2.0	5.0	3.0	2.50	1.05	13.7	2.93	2.34	1.08	4.56	1.50	5.41	2.54
		2.3	5.8	3.5	2.83	1.05	15.2	3.20	2.32	1.06	5.06	1.64	6.05	2.57
75 x 45 x 15 ( 3 x 1 3/4 x 1/2 )	2.31	1.6	4.0	2.4	2.93	1.72	26.8	8.59	3.03	1.71	7.15	3.09	8.27	4.62
	2.86	2.0	5.0	3.0	3.60	1.71	32.5	10.3	3.00	1.69	8.66	3.69	10.1	5.61
	3.24	2.3	5.8	3.5	4.09	1.71	36.5	11.5	2.99	1.67	9.73	4.11	11.4	6.31
	4.12	3.0	7.5	4.5	5.18	1.70	44.9	13.8	2.94	1.63	12.0	4.94	14.2	7.79
	4.37	3.2	8.0	4.8	5.48	1.70	47.1	14.4	2.93	1.62	12.6	5.15	14.9	8.18
100 x 50 x 20 ( 4 x 2 x 3/4 )	2.88	1.6	4.0	2.4	3.65	1.86	57.9	13.8	3.98	1.95	11.6	4.41	13.5	6.73
	3.60	2.0	5.0	3.0	4.50	1.86	70.5	16.7	3.96	1.93	14.1	5.32	16.5	8.22
	4.06	2.3	5.8	3.5	5.13	1.86	79.6	18.7	3.94	1.91	15.9	5.95	18.7	9.28
	5.18	3.0	7.5	4.5	6.53	1.85	99	22.9	3.90	1.87	19.8	7.27	23.6	11.6
	5.50	3.2	8.0	4.8	6.92	1.85	104	24.0	3.88	1.86	20.9	7.60	24.9	12.2
	6.71	4.0	10.0	6.0	8.41	1.84	123	27.7	3.83	1.82	24.7	8.79	29.8	14.5
	7.43	4.5	11.3	6.8	9.29	1.84	134	29.7	3.80	1.79	26.8	9.40	32.6	14.4
125 x 50 x 20 ( 5 x 2 x 3/4 )	3.95	2.0	5.0	3.0	5.00	1.68	119	18.1	4.88	1.90	19.1	5.46	22.5	7.90
	4.51	2.3	5.8	3.5	5.70	1.68	135	20.3	4.86	1.89	21.5	6.11	25.5	8.91
	5.77	3.0	7.5	4.5	7.28	1.68	169	24.8	4.81	1.85	27.0	7.47	32.2	11.2
	6.13	3.2	8.0	4.8	7.72	1.68	178	26.0	4.80	1.84	28.4	7.82	34.0	11.8
	7.50	4.0	10.0	6.0	9.41	1.67	212	30.2	4.74	1.79	33.9	9.05	40.9	14.1
150 x 65 x 20 ( 6 x 2 1/2 x 3/4 )	5.50	2.3	5.8	3.5	6.97	2.11	245	40.5	5.93	2.41	32.7	9.23	38.1	13.8
	7.07	3.0	7.5	4.5	8.93	2.10	310	50.2	5.89	2.37	41.3	11.4	48.4	17.4
	7.51	3.2	8.0	4.8	9.48	2.10	327	52.7	5.87	2.36	43.6	12.0	51.2	18.4
	9.22	4.0	10.0	6.0	11.6	2.09	393	62.0	5.82	2.31	52.4	14.1	62.1	22.1
	10.25	4.5	11.3	6.8	12.9	2.09	432	67.1	5.78	2.28	57.5	15.2	68.5	24.2
175 x 75 x 20 ( 7 x 3 x 3/4 )	6.31	2.3	5.8	3.5	8.00	2.34	386	60.3	6.95	2.75	44.1	11.7	51.1	17.8
	8.13	3.0	7.5	4.5	10.3	2.33	489	75.1	6.90	2.70	55.9	14.5	65.2	22.5
	8.63	3.2	8.0	4.8	10.9	2.33	518	79.1	6.88	2.69	59.1	15.3	69.1	23.7
	10.63	4.0	10.0	6.0	13.4	2.32	626	93.6	6.83	2.64	71.5	18.1	84.1	28.7
200 x 75 x 20 ( 10 x 3 x 3/4 )	11.84	4.5	11.3	6.8	14.9	2.31	689	102	6.80	2.61	78.7	19.6	93.0	31.6
	6.76	2.3	5.8	3.5	8.58	2.19	527	63.0	7.84	2.71	52.7	11.9	61.5	18.0
	8.71	3.0	7.5	4.5	11.0	2.18	669	78.5	7.79	2.67	66.9	14.8	78.5	22.9
	9.27	3.2	8.0	4.8	11.7	2.18	708	82.6	7.77	2.65	70.8	15.5	83.2	24.3
	11.40	4.0	10.0	6.0	14.4	2.17	857	98	7.71	2.61	85.7	18.4	101	29.5
200 x 75 x 25 ( 10 x 3 x 1 )	12.73	4.5	11.3	6.8	16.0	2.17	945	106	7.68	2.57	94.5	19.9	112	32.6
	6.95	2.3	5.8	3.5	8.81	2.33	540	69.0	7.83	2.80	54.0	13.3	63.3	19.6
	8.93	3.0	7.5	4.5	11.3	2.32	687	86.3	7.78	2.76	68.7	16.7	80.8	24.9
	9.52	3.2	8.0	4.8	12.0	2.32	727	90.9	7.77	2.75	72.7	17.5	85.7	26.4
	11.70	4.0	10.0	6.0	14.8	2.31	881	108	7.71	2.70	88.1	20.8	105	32.0
225 x 75 x 20 ( 9 x 3 x 3/4 )	13.10	4.5	11.3	6.8	16.5	2.31	972	118	7.68	2.67	97.2	22.7	116	35.4
	7.21	2.3	5.8	3.5	9.15	2.06	694	65.3	8.71	2.67	61.7	12.0	72.6	18.3
	9.30	3.0	7.5	4.5	11.8	2.05	883	81.4	8.66	2.63	78.4	14.9	92.8	23.4
	9.89	3.2	8.0	4.8	12.5	2.05	934	85.7	8.64	2.62	83.1	15.7	98.4	24.8
	12.20	4.0	10.0	6.0	15.4	2.05	1134	101	8.58	2.57	101	18.6	120	30.3
225 x 75 x 25 ( 9 x 3 x 1 )	13.61	4.5	11.3	6.8	17.2	2.04	1252	110	8.54	2.53	111	20.2	133	33.6
	7.40	2.3	5.8	3.5	9.38	2.19	713	71.6	8.72	2.76	63.3	13.5	74.6	19.9
	9.54	3.0	7.5	4.5	12.1	2.19	907	89.6	8.66	2.72	80.6	16.9	95.5	25.3
	10.10	3.2	8.0	4.8	12.8	2.18	960	94.4	8.65	2.71	85.4	17.8	101	26.9
	12.50	4.0	10.0	6.0	15.8	2.18	1166	112	8.59	2.66	104	21.1	124	32.8
250 x 75 x 20 ( 10 x 3 x 3/4 )	14.00	4.5	11.3	6.8	17.6	2.17	1288	122	8.55	2.64	115	23.0	137	36.4
	7.67	2.3	5.8	3.5	9.73	1.94	890	67.3	9.57	2.63	71.2	12.1	84.4	18.6
	9.89	3.0	7.5	4.5	12.5	1.94	1133	83.9	9.51	2.59	90.7	15.1	108	23.8
	10.52	3.2	8.0	4.8	13.3	1.94	1200	88.4	9.49	2.58	96.0	15.9	115	25.3
	12.99	4.0	10.0	6.0	16.4	1.93	1459	105	9.43	2.53	117	18.8	140	31.1
250 x 75 x 25 ( 10 x 3 x 1 )	14.49	4.5	11.3	6.8	18.3	1.93	1612	114	9.39	2.49	129	20.4	155	34.6
	7.85	2.3	5.8	3.5	10.0	2.07	914	74.0	9.58	2.73	73.1	13.6	86.7	20.1
	10.13	3.0	7.5	4.5	12.8	2.07	1165	92.5	9.53	2.69	93.2	17.0	111	25.8
	10.80	3.2	8.0	4.8	13.6	2.07	1234	97.5	9.51	2.67	98.7	17.9	118	27.4
	13.30	4.0	10.0	6.0	16.8	2.06	1501	116	9.45	2.63	120	21.3	144	33.6
14.85	4.5	11.3	6.8	18.7	2.06	1659	126	9.41	2.60	133	23.2	160	37.4	

Note : Calculated based on 1kg= 2.2046 lb and 1m=3.2808 feet and 1in= 2.54cm