IS : 811 - 1987
(Reaffirmed 1995)
(Reaffirmed 1995)

Indian Standard

SPECIFICATION FOR COLD FORMED LIGHT GAUGE STRUCTURAL STEEL SECTIONS

(Second Revision)

Third Reprint OCTOBER1998

UDC 669·14·018·29-243-131·2

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr 11

May 1989

Indian Standard

SPECIFICATION FOR COLD FORMED LIGHT GAUGE STRUCTURAL STEEL SECTIONS

(Second Revision)

Structural Sections Sectional Committee, SMDC 6

Chairman
SHRI M. DHAR
Flat No. 56, Kailash Apartments
Lala Lajpat Rai Marg
New Delhi

Members	*Representing*
SHRI V. K. AGRAWAL SHRI N. G. SHARMA (*Alternate*)	Hindustan Aluminium Corporation Ltd, Renukoot
SHRI R. N. AGGARWAL SHRI B. K. SRIVASTAVA (*Alternate*)	Steel Authority of India Ltd (Bokaro Steel Plant), Bokaro
SHRI S. BANERJEE	Steel Re-Rolling Mills Association of India, Calcutta
SHRI N. BHATTACHARYA	Garden Reach Shipbuilder & Engineers Ltd, Calcutta
SHRI B. B. CHAKRAVERTI SHRI A. K. SHOME (*Alternate*)	Superintendence Co of India (Pvt) Ltd, Calcutta
SHRI D. S. DESAI	M. N. Dastur & Co Pvt Ltd, Calcutta
SHRI B. K. DUTTA SHRI S. S. SAHA (*Alternate*)	Iron & Steel Control, Calcutta
SHRI S. K. GANGULY	Institution of Engineers (India), Calcutta
SHRI S. C. CHADHA	Directorate General of Supplies & Disposals (Inspection Wing), New Delhi
SHRI M. P. JASUJA	Steel Authority of India Ltd (Research & Development Centre for Iron & Steel), Ranchi
JOINT DIRECTOR STANDARDS (WAGON I), RDSO JOINT DIRECTOR STANDARDS (B&S) SB, RDSO (*Alternate*)	Ministry of Railways
SHRI A. J. JOSHI SHRI A. G. RAMA RAO (*Alternate*)	Steel Authority of India Ltd (Bhilai Steel Plant), Bhilai
LT-COL KULWANT SINGH MAJ S. B. PURI (*Alternate*)	Engineer-in-Chief's Branch, Army Headquarters, New Delhi
SHRI S. K. MITRA SHRI S. DUTTA (*Alternate*)	Indian Iron & Steel Co Ltd, Burnpur
SHRI P. K. MUKHERJEE SHRI AMIT KUMAR BHATTACHARYA (*Alternate*)	Braithwaite & Co Ltd, Calcutta
SHRI A. P. BHATNAGAR SHRI P. K. DEBNATH (*Alternate*)	Steel Authority of India Ltd (Durgapur Steel Plant), Durgapur
SHRI KAMMAL PRAKASH SHRI C. S. KANNAN (*Alternate*)	Metallurgical & Engineering Consultants (India) Ltd, Ranchi
SHRI P. V. NAIK	Richardson & Cruddas Ltd, Bombay
SHRI N. S. R. V. RAJU SHRI D. KRISHNAMURTHY (*Alternate*)	Hindustan Shipyard Ltd, Visakhapatnam
SHRI S. K. SADHU SHRI S. C. CHAKRAVARTI (*Alternate*)	Jessop & Co Ltd, Calcutta
SHRI M. C. SARANGDHAR SHRI M. K. CHATTERJEE (*Alternate*)	Stup & Co Ltd, Bombay
SHRI S. K. SARNA SHRI G. N. RAO (*Alternate*)	Visakhapatnam Steel Project, Vishakhapatnam
SHRI K. R. SENGUPTA SHRI B. P. GHOSH (*Alternate*)	Joint Plant Committee, Calcutta
SHRI S. N. SINGH SHRI C. K. NAG (*Alternate*)	EMC Steelal Ltd, Calcutta
SHRI K. S. SRINIVASAN SHRI A. K. LAL (*Alternate*)	National Buildings Organization, New Delhi

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Members	*Representing*
SHRI K. SURYANARAYANAN	Indian Aluminium Co Ltd, Calcutta
SHRI G. M. MENON (*Alternate*)	
SHRI D. THIRUVENGADAM	Tube Products of India, Madras
SHRI K. V. VIJAYARAGHAVAN (*Alternate*)	
SHRI S. G. TUDEKAR	Steel Authority of India Ltd (Rourkela Steel Plant), Rourkela
SHRI J. N. BHAMBRY (*Alternate*)	
SHRI P. VISHWAKARMA	Tata Iron & Steel Co Ltd, Jamshedpur
SHRI A. HAQUE (*Alternate*)	
SHRI B. MUKHERJI, Director (Struc & Met)	Director General, BIS (*Ex-officio Member*)

Secretary
SHRI S. S. SETHI
Joint Director (Struc & Met), BIS

Panel for Revision of IS : 811-1965, SMDC 6 : P11

Convener	
SHRI D. THIRUVENGADAM	Tube Products of India Ltd, Madras
Members	
SHRI K. V. VIJAYARAGHAVAN (*Alternate* to Shri D. Thiruvengadam)	
SHRI C. S. CHADHA	SRC Roll Forming Pvt Ltd, Bombay
SHRI S. V. KANSARA (*Alternate*)	
SHRI A. B. DATTA	Press Metal Corporation Ltd, Bombay
SHRI S. S. NAIR (*Alternate*)	
SHRI S. K. DATTA	Richardson & Cruddas Ltd, Bombay
SHRI B. P. DE	M. N. Dastur & Co Private Ltd, Calcutta
REPRESENTATIVE	Hindustan Steel Works Construction Ltd, Calcutta

Indian Standard

SPECIFICATION FOR COLD FORMED LIGHT GAUGE STRUCTURAL STEEL SECTIONS

(Second Revision)

0. FOREWORD

0.1 This Indian Standard (Second Revision) was adopted by the Bureau of Indian Standards on 22 July 1987, after the draft finalized by the Structural Sections Sectional Committee had been approved by the Structural and Metals Division Council.

0.2 This standard is one of a series of Indian Standards being published under the Steel Economy Programme. This was first published in 1961 and revised in 1965.

In this revision, the following major modifications have been effected:

a) a series of zed sections with lips has been added,

b) box sections and the strength properties of the various profiles have been deleted, and

c) the sectional properties have been expressed to three significant figures.

0.3 Cold formed light gauge steel sections are produced from steel strips or sheets generally not thicker than 10 mm. For mass production, they are formed most economically by cold-rolling, while smaller quantities of special shapes are most economically produced on press brakes. The later process with its versatility of shape variation makes this type of construction as adoptable to special requirements as reinforced concrete is in its field of use. Members are connected by spot, fillet, plug or slot welds; by screws, bolts; cold rivets or any other special device.

0.3.1 For the load carrying members like 'Z' sections, it is recommended to manufacture these sections by cold roll forming process.

0.3.2 This type of construction is appropriate and economical in one or more of the following conditions:

a) Where moderate loads made the thicker hot rolled shapes uneconomical (for example, joists, purlins, girts, roof trusses, complete framing for one and two storeyed residential, commercial and industrial structures, and stringer beams in conveyors);

b) Where it is desired that load carrying members should also provide useful surface (for example, floor panels and roof decks mostly installed without any shoring and wall panels); and

c) Where sub-assemblies of such members may be pre-fabricated in the plant, reducing site erection to a minimum of simple operations.

0.4 It is not intended that the freedom of designers and/or manufacturers should be limited to the use of sections listed in this standard. The flexibility of the forming process and the great variety of shapes which may be formed of sheet and strip steel are such that substantial economy may often be effected in meeting the end requirements by the use of special sections. However, the designer is advised to seek the advice of manufacturers or fabricators before specifying special sections.

0.5 In the preparation of this standard, assistance has been drawn from BS 2994-1976 'Specification for Cold Rolled Steel Sections', issued by the British Standards Institution.

0.6 Illustrative examples given in Appendix A of IS : 811-1965 have been deleted. The designers are advised to refer IS : 801-1975* and SP 6(5)-1980† which stipulate the design criteria and commentary/illustrative examples respectively on the use of cold formed steel sections for structural purposes.

0.7 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960‡. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

*Code of practice for use of cold formed light gauge steel structural members in general building construction (*first revision*).

†Specification for cold-formed, light-gauge steel structures (*first revision*).

‡Rules for rounding off numerical values (*revised*).

1. SCOPE

1.1 This standard lays down dimensions, mass, sectional properties and requirements for corrosion protection for cold formed light gauge open wall steel sections for structural and other general applications, having minimum thickness of 1.25 mm.

2. DEFINITIONS

2.0 For the purpose of this standard, the following definitions shall apply.

2.1 *Y-Y Axis* — A line parallel to the axis of web of section (in the case of channels) or parallel to the webs (in the case of hat sections and rectangular sections) or parallel to either flange (in the case of angles and square sections), and passing through the centre of gravity of the profile of the section.

2.2 *X-X Axis* — A line passing through the centre of gravity of the profile of the section and at right angles to the Y-Y Axis.

2.3 *U-U Axis* — It is the major principal axis.

2.4 *V-V Axis* — It is the minor principal axis.

3. DESIGNATION

3.1 Cold formed light gauge sections shall be designated by figures denoting depth (mm) × width (mm) × thickness (mm) of the section.

4. SYMBOLS

4.1 Letter symbols used in this standard have been indicated in Tables 1 to 11. More explicit definitions for certain symbols used in the tables are given below:

A = cross-sectional area of the profile,
b = width of the section,
h = height of the section,
R_i = international radius at curve,
t = thickness of the metal,
t_{red} = reduced thickness of the section at curve,
M = calculated mass of the profile per unit length,
I_{xx} = moment of inertia about the X–X axis,
I_{yy} = moment of inertia about the Y–Y axis,
I_{xy} = product moment of inertia,
I_{uu} = moment of inertia about U–U axis,
I_{vv} = moment of inertia about V–V axis,
Z_{xx} = modulus of section about the X–X axis,
Z_{yy} = modulus of section about the Y–Y axis,
r_{xx} = radius of gyration about the X–X axis,
r_{yy} = radius of gyration about the Y–Y axis,
r_{uu} = radius of gyration about the U–U axis,
r_{vv} = radius of gyration about the V–V axis,
C_x = distance of centre of gravity from X–X axis,
C_y = distance of centre of gravity from Y–Y axis,
X_o = shear centre,
J = torsional constant, and
C_w = warping constant.

5. MATERIAL

5.1 Sheet and strip used for making the cold-formed sections shall conform to a grade not lower than St 34-1079 of IS : 1079-1973*.

5.1.1 Sheet and strip conforming to IS : 513-1986† (other than Grade 'O') may also be used for sections where load bearing is not a design criteria, for example, false ceiling, sections for frames of doors and windows.

6. BASIS OF CALCULATION

6.1 Material, when subjected to cold-forming processes, develops slight thinning at the curves. The actual strip width, therefore, required to form the section is slightly less than its theoretical width. Reduction factor assumed for this thinning effect has been taken as 0·925 in accordance with Appendix A by assuming internal radius at curve as $1{\cdot}5t$.

7. DIMENSIONS AND PROPERTIES

7.1 The dimensions of the different profiles of cold formed light gauge steel sections shall be as given in Tables 1 to 10.

7.1.1 Internal radius at curves shall generally be taken as $1{\cdot}5t$.

7.2 Mass and sectional properties of various profiles of cold formed light gauge steel sections are given in Tables 1 to 10.

7.2.1 The properties of the 90° corners are given in Table 11.

7.2.2 The density of steel of 7·85 g/cm^3 has been assumed in calculating the mass.

7.2.3 The sectional properties, as given in Tables 1 to 11, have been calculated assuming R_i as $1{\cdot}5t$.

8. TOLERANCES

8.1 General — Unless otherwise agreed between the manufacturer and the purchaser, tolerances as specified in **8.2** to **8.4** shall apply.

8.2 Straightness — The straightness of any length shall be such that the offset does not exceed $\frac{1}{600}$ of that length, when measured along both the X-X and Y-Y axis.

8.3 Profile — The deviation of the profile dimensions shall not exceed ± 0.5 mm. The deviation from the angle of 90° shall not exceed ± 1°.

8.4 Twist — The section shall be reasonably free from twist.

*Specification for cold-rolled low carbon steel sheets and strips (*third revision*).

†Specification for hot-rolled carbon steel sheet and strip (*third revision*).

8.5 Thickness — The tolerance on thickness for the strip used shall be the same as that specified in IS : 852-1985*.

8.6 Length — The tolerances on the ordered lengths shall be as follows:

Ordered Length m	*Permissible Deviation* mm
Up to and including 3	± 1.0
Over 3 and up to and including 6	± 1.5
Over 6	± 3.0

9. CORROSION PROTECTION

9.1 Corrosion protection of cold formed light gauge steel sections shall be carried out in accordance with IS : 4180-1967†. The performance tests for protective scheme used in the protection of these sections against corrosion shall conform to IS : 4777-1968*.

10. MARKING

10.1 Each bundle/section shall be legibly marked with the followings:

a) Designation,

b) Trade-mark or name of the manufacturer,

c) Specification and grade of the material, and

d) Lot number or any other identification mark relating to production.

10.1.1 The material may also be marked with the Standard Mark.

NOTE — The use of the Standard Mark is governed by the provisions of the Bureau of Indian Standards Act 1986 and the Rules and Regulations made thereunder. The Standard Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well defined system of inspection, testing and quality control which is devised and supervised by BIS and operated by the producer. Standard marked products are also continuously checked by BIS for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

*Specification for rolling and cutting tolerances for hot-rolled steel products (*fourth revision*).

†Code of practice for corrosion protection of light gauge steel sections used in building.

*Performance tests for protection schemes used in protection of light gauge steel against corrosion.

APPENDIX A

(*Clause* 6.1)

BASIS OF CALCULATION FOR REDUCTION IN THICKNESS AT CURVES

A-1. GENERAL

A-1.1 It has been established that slight thinning in the material occurs at the curves when steel strip is subjected to excessive pressure while cold forming a profile. The actual geometrical properties are, therefore, different from the theoretical properties if no allowance were made for the thinning effects.

A-2. REDUCTION FACTORS

A-2.1 In working out the properties as given in Tables 1 to 11, an allowance for the thinning at curves have been taken into account as follows:

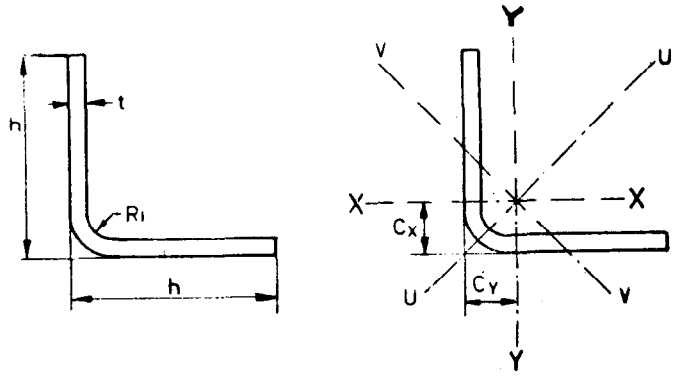
a) $t_{red} = \left(\frac{R_i + 0.3t}{R_i + 0.5t}\right) t$ for $\frac{R_i}{t} \leqslant 1$, and

b) $t_{red} = \left(\frac{R_i + 0.35t}{R_i + 0.5t}\right) t$ for $\frac{R_i}{t} > 1$

where

t_{red} = reduced thickness at curves,
R_i = internal radius of curvature at the curve assumed as 1.5 t, and
t = thickness of the virgin material before cold forming.

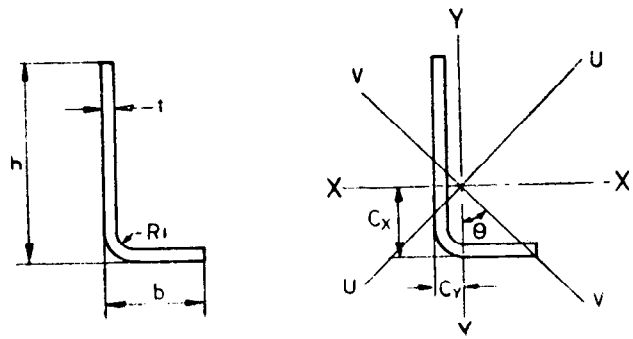
TABLE 1 EQUAL ANGLES



Designation	Dimensions			Mass/ Unit Length	Area of Section	Centre of Gravity		Moment of Inertia			Radius of Gyration			Section Modulus	Product Moment of Inertia
$h \times h \times t$	h	t	R_1	M	A	C_x	C_y	I_{xx}, I_{yy}	I_{uu}	I_{vv}	R_{xx}, R_{yy}	R_{uu}	R_{vv}	Z_{xx}, Z_{yy}	I_{xy}
mm	mm	mm	mm	kg/m	cm^2	cm	cm	cm^4	cm^4	cm^4	cm	cm	cm	cm^3	cm^4
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
20 × 20 × 1.25	20	1.25	1.88	0.366	0.466	0.566	0.566	0.185	0.303	0.067	0.630	0.806	0.380	0.129	0.118
20 × 20 × 1.60	20	1.60	2.40	0.459	0.585	0.584	0.584	0.229	0.377	0.081	0.626	0.803	0.373	0.162	0.148
20 × 20 × 2.00	20	2.00	3.00	0.560	0.714	0.606	0.606	0.275	0.456	0.095	0.621	0.799	0.364	0.197	0.180
30 × 30 × 1.60	30	1.60	2.40	0.710	0.905	0.834	0.834	0.814	1.328	0.301	0.949	1.21	0.577	0.376	0.513
30 × 30 × 2.00	30	2.00	3.00	0.874	1.11	0.855	0.855	0.992	1.62	0.359	0.944	1.21	0.568	0.463	0.633
30 × 30 × 3.15	30	3.15	4.73	1.32	1.68	0.917	0.917	1.45	2.40	0.495	0.929	1.20	0.543	0.695	0.953

40 × 40 × 1.60	40	1.60	2.40	0.962	1.22	1.08	1.08	1.98	3.21	0.747	1.27	1.62	0.781	0.679	1.23
40 × 40 × 2.00	40	2.00	3.00	1.19	1.51	1.11	1.10	2.43	3.95	0.902	1.27	1.62	0.772	0.839	1.53
40 × 40 × 2.55	40	2.55	3.82	1.49	1.90	1.13	1.13	3.02	4.93	1.10	1.26	1.61	0.760	1.05	1.95
40 × 40 × 3.15	40	3.15	4.73	1.81	2.31	1.17	1.17	3.62	5.95	1.28	1.25	1.62	0.746	1.28	2.33
50 × 50 × 2.00	50	2.00	3.00	1.50	1.91	1.36	1.36	4.83	7.84	1.82	1.589	2.02	0.976	1.33	3.01
50 × 50 × 2.55	50	2.55	3.82	1.89	2.41	1.38	1.38	6.04	9.83	2.24	1.58	2.02	0.964	1.67	3.80
50 × 50 × 3.15	50	3.15	4.73	2.30	2.94	1.42	1.42	7.28	11.9	2.65	1.58	2.02	0.950	2.03	4.63
50 × 50 × 4.00	50	4.00	6.00	2.87	3.66	1.46	1.46	8.95	14.7	3.17	1.56	2.01	0.932	2.53	5.78
60 × 60 × 2.00	60	2.00	3.00	1.82	2.31	1.60	1.60	8.46	13.7	3.22	1.91	2.43	1.18	1.92	5.24
60 × 60 × 2.55	60	2.55	3.82	2.29	2.92	1.63	1.63	10.6	17.2	3.98	1.90	2.43	1.17	2.43	6.62
60 × 60 × 3.15	60	3.15	4.73	2.80	3.57	1.66	1.66	12.8	20.9	4.75	1.90	2.42	1.15	2.96	8.09
60 × 60 × 4.00	60	4.00	6.00	3.50	4.46	1.71	1.71	15.9	26.0	5.74	1.90	2.42	1.14	3.70	10.1
70 × 70 × 3.15	70	3.15	4.73	3.29	4.20	1.92	1.92	20.7	33.6	7.74	2.22	2.83	1.36	4.07	12.9
70 × 70 × 4.00	70	4.00	6.00	4.13	5.26	1.96	1.96	25.7	41.9	9.43	2.21	2.82	1.34	5.09	16.2
70 × 70 × 5.00	70	5.00	7.50	5.07	6.46	2.01	2.01	31.2	51.2	11.2	2.20	2.82	1.32	6.26	20.0
80 × 80 × 3.15	80	3.15	4.73	3.79	4.83	2.16	2.16	31.2	50.6	11.8	2.54	3.24	1.56	5.35	19.4
80 × 80 × 4.00	80	4.00	6.00	4.75	6.06	2.21	2.21	38.8	63.3	14.4	2.53	3.23	1.54	6.71	24.4
80 × 80 × 5.00	80	5.00	7.50	5.86	7.46	2.26	2.26	47.4	77.5	17.3	2.52	3.22	1.52	8.26	30.1
80 × 80 × 6.00	80	6.00	9.00	6.93	8.83	2.32	2.32	55.5	91.2	19.8	2.50	3.22	1.50	9.77	35.7
100 × 100 × 3.15	100	3.15	4.73	4.78	6.09	2.66	2.66	61.9	100.0	23.6	3.19	4.06	1.97	8.14	38.2
100 × 100 × 4.00	100	4.00	6.00	6.01	7.66	2.71	2.71	77.3	125.0	29.2	3.18	4.05	1.95	10.6	48.2
100 × 100 × 5.00	100	5.00	7.50	7.43	9.46	2.76	2.76	94.8	154.0	35.2	3.17	4.04	1.93	13.1	59.6
100 × 100 × 6.00	100	6.00	9.00	8.81	11.2	2.82	2.82	111.0	182.0	40.8	3.15	4.03	1.91	15.5	70.8

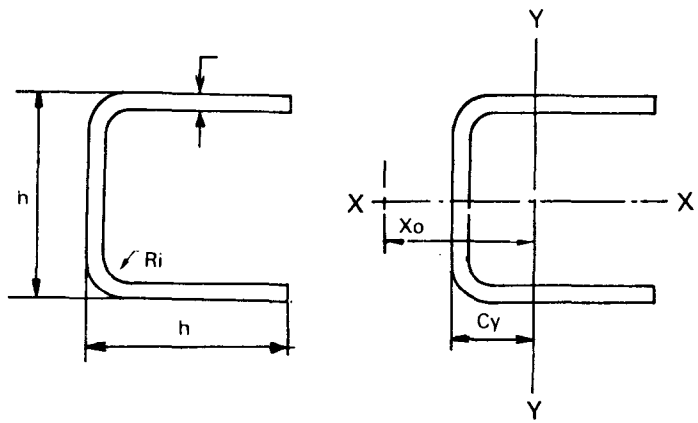
TABLE 2 UNEQUAL ANGLES



Designation	Dimensions				Mass/ Unit Length	Area of Section	Centre of Gravity		Moment of Inertia				Radius of Gyration			Angle	Section Modulus		Product Moment of Inertia
$h \times b \times t$ mm	h mm	b mm	R_1 mm	t mm	M kg/m	A cm^2	C_x cm	C_y cm	I_{xx} cm^4	I_{yy} cm^4	I_{vv} cm^4	I_{uu} cm^4	R_{xx} cm	R_{yy} cm	R_{vv} cm	$\tan\theta$	Z_{xx} cm^3	Z_{yy} cm^3	I_{xy} cm^4
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
20 × 15 × 1.25	20	15	1.88	1.25	0.317	0.404	0.644	0.382	0.167	0.083	0.211	0.039	0.643	0.452	0.311	0.584	0.123	0.074	0.075
20 × 15 × 1.60	20	15	2.40	1.60	0.396	0.505	0.664	0.400	0.205	0.102	0.260	0.047	0.638	0.448	0.304	0.588	0.154	0.092	0.093
20 × 15 × 2.00	20	15	3.00	2.00	0.482	0.614	0.688	0.420	0.245	0.121	0.312	0.054	0.632	0.444	0.296	0.592	0.187	0.112	0.113
30 × 15 × 1.25	30	15	1.88	1.25	0.415	0.529	1.082	0.307	0.506	0.093	0.544	0.054	0.978	0.418	0.321	0.291	0.264	0.078	0.131
30 × 15 × 1.60	30	15	2.40	1.60	0.522	0.665	1.106	0.323	0.628	0.114	0.676	0.066	0.972	0.415	0.315	0.293	0.332	0.097	0.165
30 × 15 × 2.00	30	15	3.00	2.00	0.639	0.814	1.133	0.341	0.757	0.137	0.816	0.078	0.964	0.410	0.309	0.295	0.406	0.118	0.200
30 × 20 × 1.60	30	20	2.40	1.60	0.585	0.745	0.996	0.476	0.703	0.261	0.831	0.134	0.972	0.592	0 424	0.473	0.351	0.172	0.269
30 × 20 × 2.00	30	20	3.00	2.00	0.717	0.914	1.02	0.495	0.852	0.316	1.01	0.159	0.966	0.588	0.417	0.476	0.431	0.210	0.330

40 × 20 × 1.60	40	20	2.40	1.60	0.710	0.905	1.44	0.406	1.54	0.282	1.66	0.166	1.31	0.559	0.429	0.291	0.602	0.177	0.400
40 × 20 × 2.00	40	20	3.00	2.00	0.874	1.11	1.47	0.424	1.88	0.342	2.02	0.199	1.30	0.554	0.422	0.292	0.741	0.217	0.491
40 × 20 × 2.55	40	20	3.82	2.55	1.09	1.39	1.50	0.449	2.31	0.418	2.49	0.238	1.29	0.548	0.414	0.295	0.924	0.269	0.610
40 × 25 × 2.00	40	25	3.00	2.00	0.953	1.21	1.35	0.575	2.05	0.650	2.35	0.346	1.30	0.732	0.534	0.423	0.774	0.338	0.720
40 × 25 × 2.55	40	25	3.82	2.55	1.19	1.52	1.39	0.601	2.53	0.799	2.91	0.416	1.29	0.726	0.524	0.426	0.968	0.421	0.899
50 × 25 × 1.60	50	25	2.40	1.60	0.899	1.14	1.77	0.489	3.08	0.566	3.31	0.337	1.64	0.703	0.542	0.289	0.953	0.281	0.792
50 × 25 × 2.00	50	25	3.00	2.00	1.11	1.41	1.80	0.508	3.72	0.689	4.05	0.406	1.63	0.698	0.536	0.291	1.18	0.346	0.976
50 × 25 × 2.55	50	25	3.82	2.55	1.39	1.77	1.84	0.533	4.66	0.849	5.02	0.492	1.62	0.692	0.527	0.293	1.47	0.432	1.22
60 × 30 × 2.00	60	30	3.00	2.00	1.34	1.71	2.13	0.591	6.62	1.22	7.12	0.723	1.97	0.842	0.649	0.289	1.71	0.505	1.71
60 × 30 × 3.15	60	30	4.73	3.15	2.06	2.62	2.21	0.643	9.92	1.81	10.7	1.044	1.94	0.830	0.631	0.293	2.62	0.766	2.60
80 × 30 × 2.00	80	30	3.00	2.00	1.66	2.11	3.05	0.498	14.4	1.30	14.9	0.843	2.61	0.783	0.632	0.182	2.92	0.518	2.48
80 × 30 × 2.55	80	30	3.82	2.55	2.09	2.66	3.09	0.522	18.0	1.61	18.64	1.04	2.60	0.777	0.624	0.183	3.68	0.649	3.12
80 × 30 × 3.15	80	30	4.73	3.15	2.55	3.25	3.14	0.549	21.8	1.93	22.5	1.24	2.60	0.770	0.616	0.184	4.48	0.787	3.78
80 × 50 × 3.15	80	50	4.73	3.15	3.05	3.88	2.65	1.11	26.5	8.40	30.3	4.56	2.61	1.47	1.08	0.420	4.95	2.16	9.21
80 × 50 × 4.00	80	50	6.00	4.00	3.81	4.86	2.71	1.15	32.8	10.4	37.7	5.54	2.60	1.46	1.07	0.423	6.19	2.70	11.5
80 × 50 × 5.00	80	50	7.50	5.00	4.68	5.96	2.77	1.20	39.8	12.6	45.8	6.57	2.58	1.45	1.05	0.425	7.60	3.31	14.1
100 × 30 × 3.15	100	30	4.73	3.15	3.05	3.88	4.09	0.486	40.1	2.02	40.8	1.37	3.22	0.721	0.595	0.129	6.79	0.802	4.99
100 × 30 × 4.00	100	30	6.00	4.00	3.81	4.86	4.16	0.523	49.5	2.46	50.3	1.67	3.19	0.712	0.586	0.129	8.47	0.994	6.17
100 × 30 × 5.00	100	30	7.50	5.00	4.68	5.96	4.24	0.568	59.7	2.94	60.7	1.98	3.16	0.703	0.576	0.129	10.4	1.21	7.46
100 × 50 × 3.15	100	50	4.73	3.15	3.54	4.51	3.54	0.976	48.5	8.92	52.1	5.32	3.28	1.41	1.08	0.289	7.51	2.22	12.5
100 × 50 × 4.00	100	50	6.00	4.00	4.44	5.66	3.60	1.02	60.3	11.0	64.8	6.49	3.26	1.40	1.07	0.291	9.41	2.72	15.6
100 × 50 × 5.00	100	50	7.50	5.00	5.46	6.96	3.66	1.06	73.4	13.4	79.0	7.76	3.25	1.39	1.06	0.292	11.6	3.39	19.2
100 × 50 × 6.00	100	50	9.00	6.00	6.46	8.23	3.73	1.11	85.7	15.5	92.3	8.90	3.23	1.38	1.04	0.294	13.7	4.00	22.6

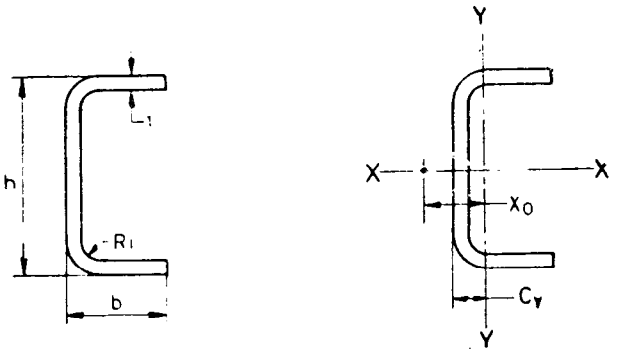
TABLE 3 CHANNELS WITHOUT LIPS — SQUARE



Designation	Dimensions			Mass/ Unit Length	Area of Section	Centre of Gravity	Moment of Inertia		Radius of Gyration		Section Modulus		Shear Centre	Torsion Constant	Warping Constant
$h \times h \times t$ mm	h mm	t mm	R_i mm	M kg/m	A cm^2	C_y cm	I_{xx} cm^4	I_{yy} cm^4	R_{xx} cm	R_{yy} cm	Z_{xx} cm^3	Z_{yy} cm^3	X_o cm	J cm^4	C_w cm^6
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
20 × 20 × 1.25	20	1.25	1.88	0.536	0.683	0.750	0.463	0.284	0.823	0.644	0.463	0.227	1.49	0.004	0.189
20 × 20 × 1.60	20	1.60	2.40	0.667	0.850	0.774	0.554	0.345	0.807	0.638	0.554	0.282	1.48	0.007	0.226
20 × 20 × 2.00	20	2.00	3.00	0.807	1.03	0.803	0.639	0.407	0.788	0.629	0.639	0.340	1.46	0.013	0.261
25 × 25 × 1.25	25	1.25	1.88	0.683	0.870	0.916	0.949	0.573	1.04	0.811	0.759	0.362	1.87	0.004	0.604
25 × 25 × 1.60	25	1.60	2.40	0.856	1.09	0.940	1.15	0.706	1.03	0.805	0.921	0.453	1.86	0.009	0.733
25 × 25 × 2.00	25	2.00	3.00	1.04	1.32	0.968	1.35	0.843	1.01	0.797	1.08	0.550	1.85	0.017	0.861
25 × 25 × 2.55	25	2.55	3.82	1.28	1.63	1.01	1.58	1.01	0.983	0.785	1.26	0.675	1.83	0.034	1.01

30 × 30 × 1.69	30	1.60	2.40	1.04	1.33	1.12	2.07	1.26	1.25	0.972	1.38	0.663	2.24	0.011	1.90
30 × 30 × 2.00	30	2.00	3.00	1.28	1.63	1.13	2.46	1.51	1.23	0.964	1.64	0.811	2.23	0.021	2.26
30 × 30 × 3.15	30	3.15	4.73	1.89	2.41	1.22	3.33	2.13	1.18	0.940	2.22	1.19	2.19	0.077	3.06
40 × 40 × 1.60	40	1.60	2.40	1.42	1.81	1.44	5.16	3.09	1.69	1.31	2.58	1.20	3.00	0.015	8.42
40 × 40 × 2.00	40	2.00	3.00	1.75	2.23	1.47	6.22	3.76	1.67	1.30	3.11	1.48	2.99	0.029	10.1
40 × 40 × 2.55	40	2.55	3.82	2.18	2.78	1.50	7.52	4.61	1.64	1.29	3.76	1.85	2.97	0.059	12.3
40 × 40 × 3.15	40	3.15	4.73	2.63	3.35	1.54	8.76	5.46	1.62	1.28	4.38	2.22	2.96	0.108	14.3
50 × 50 × 2.00	50	2.00	3.00	2.22	2.83	1.80	12.67	7.53	2.11	1.63	5.04	2.35	3.75	0.037	32.1
50 × 50 × 2.55	50	2.55	3.82	2.78	3.54	1.84	15.4	9.33	2.09	1.62	6.17	2.95	3.74	0.076	39.3
50 × 50 × 3.15	50	3.15	4.73	3.37	4.30	1.88	18.2	11.2	2.06	1.61	7.28	3.570	3.72	0.140	46.3
50 × 50 × 4.00	50	4.00	6.00	4.17	5.31	1.94	21.6	13.5	2.02	1.594	8.65	4.40	3.69	0.276	55.1
60 × 60 × 2.00	60	2.00	3.00	2.69	3.43	2.13	22.3	13.2	2.55	1.97	7.44	3.42	4.51	0.045	81.9
60 × 60 × 3.15	60	3.15	4.73	4.12	5.24	2.21	32.7	19.8	2.50	1.94	10.91	5.23	4.48	0.171	121
60 × 60 × 4.00	60	4.00	6.00	5.11	6.51	2.27	39.4	24.2	2.46	1.93	13.1	6.49	4.45	0.340	144
80 × 80 × 2.00	80	2.00	3.00	3.63	4.63	2.80	54.6	32.1	3.43	2.63	13.6	6.16	6.04	0.061	356
80 × 80 × 3.15	80	3.15	4.73	5.60	7.13	2.87	81.5	48.7	3.38	2.61	20.4	9.50	6.00	0.233	531
80 × 80 × 5.00	80	5.00	7.50	8.58	10.9	3.00	119	72.6	3.29	2.58	29.6	14.5	5.95	0.893	773
80 × 80 × 6.00	80	6.00	9.00	10.2	12.9	3.07	136	84.1	3.25	2.56	33.9	17.1	5.92	1.51	884
100 × 100 × 2.00	100	2.00	3.00	4.58	5.83	3.46	109	63.4	4.32	3.30	21.7	9.71	7.56	0.077	1 110
100 × 100 × 3.15	100	3.15	4.73	7.08	9.02	3.54	164	97.0	4.26	3.28	32.8	15.0	7.53	0.296	1 670
100 × 100 × 5.00	100	5.00	7.50	10.9	13.9	3.66	243	147	4.18	3.25	48.6	23.2	7.47	1.14	2 470
100 × 100 × 6.00	100	6.00	9.00	12.9	16.5	3.73	280	171	4.13	3.23	56.1	27.3	7.44	1.94	2 860

TABLE 4 CHANNELS WITHOUT LIPS — RECTANGULAR



Designation	Dimensions				Mass/ Unit Length	Area of Section	Centre of Gravity	Moment of Inertia		Radius of Gyration		Section Modulus		Shear Centre	Torsion Constant	Warping Constant
$h \times b \times t$	h	b	t	R_1	M	A	C_y	I_{xx}	I_{yy}	R_{xx}	R_{yy}	Z_{xx}	Z_{yy}	X_o	J	C_w
mm	mm	mm	mm	mm	kg/m	cm^2	cm	cm^4	cm^4	cm	cm	cm^3	cm^3	cm	cm^4	cm^6
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
30 × 15 × 1.25	30	15	1.25	1.88	0.536	0.683	0.441	0.916	0.150	1.16	0.469	0.611	0.142	0.898	0.004	0.224
30 × 15 × 1.60	30	15	1.60	2.40	0.667	0.850	0.460	1.10	0.183	1.14	0.464	0.735	0.176	0.887	0.007	0.269
30 × 20 × 1.25	30	20	1.25	1.88	0.634	0.808	0.644	1.17	0.334	1.21	0.643	0.783	0.246	1.33	0.004	0.499
30 × 20 × 2.00	30	20	2.00	3.00	0.964	1.23	0.688	1.68	0.490	1.17	0.632	1.117	0.374	1.31	0.016	0.713
40 × 15 × 1.25	40	15	1.25	1.88	0.634	0.808	0.382	1.82	0.165	1.50	0.452	0.910	0.148	0.802	0.004	0.448
40 × 15 × 2.00	40	15	2.00	3.00	0.964	1.23	0.420	2.60	0.242	1.46	0.444	1.30	0.224	0.779	0.016	0.639
40 × 20 × 2.00	40	20	2.00	3.00	1.12	1.43	0.606	3.32	0.550	1.53	0.621	1.66	0.395	1.19	0.019	1.44
40 × 20 × 3.15	40	20	3.15	4.73	1.64	2.09	0.669	4.48	0.768	1.46	0.606	2.24	0.577	1.15	0.066	1.95
40 × 25 × 1.60	40	25	1.60	2.40	1.04	1.33	0.785	3.39	0.852	1.60	0.800	1.70	0.497	1.63	0.011	2.27
40 × 25 × 2.00	40	25	2.00	3.00	1.28	1.63	0.808	4.05	1.03	1.58	0.795	2.02	0.608	1.62	0.021	2.70
40 × 25 × 2.55	40	25	2.55	3.82	1.58	2.02	0.840	4.83	1.25	1.55	0.787	2.42	0.752	1.60	0.042	3.23
50 × 25 × 1.60	50	25	1.60	2.40	1.17	1.49	0.709	5.70	0.923	1.96	0.787	2.28	0.516	1.51	0.012	3.87
50 × 25 × 2.00	50	25	2.00	3.00	1.44	1.83	0.730	6.84	1.12	1.94	0.782	2.74	0.632	1.50	0.024	4.64

50 × 25 × 2.55	50	25	2.55	3.82	1.78	2.27	0.760	8.24	1.36	1.90	0.775	3.30	0.785	1.48	0.048	5.59
50 × 25 × 3.15	50	25	3.15	4.73	2.14	2.72	0.793	9.54	1.60	1.87	0.768	3.82	0.940	1.46	0.087	6.48
50 × 40 × 1.60	50	40	1.60	2.40	1.55	1.97	1.33	8.54	3.36	2.08	1.30	3.41	1.26	2.84	0.017	14.2
50 × 40 × 2.00	50	40	2.00	3.00	1.91	2.43	1.35	10.3	4.10	2.06	1.30	4.12	1.55	2.82	0.032	17.2
50 × 40 × 2.55	50	40	2.55	3.82	2.38	3.04	1.39	12.5	5.06	2.03	1.29	5.02	1.94	2.81	0.065	21.0
50 × 40 × 3.15	50	40	3.15	4.73	2.88	3.67	1.43	14.7	6.02	2.00	1.28	5.89	2.34	2.79	0.119	24.6
60 × 30 × 1.60	60	30	1.60	2.40	1.42	1.81	0.834	10.1	1.63	2.36	0.949	3.37	0.752	1.82	0.015	9.91
60 × 30 × 2.00	60	30	2.00	3.00	1.75	2.23	0.855	12.2	1.96	2.34	0.944	4.08	0.925	1.81	0.029	12.0
60 × 30 × 3.15	60	30	3.15	4.73	2.63	3.35	0.917	17.4	2.90	2.28	0.929	5.82	1.39	1.78	0.108	17.0
60 × 30 × 4.00	60	30	4.00	6.00	3.23	4.11	0.964	20.5	3.47	2.23	0.918	6.84	1.70	1.75	0.212	20.1
60 × 40 × 2.00	60	40	2.00	3.00	2.06	2.63	1.26	15.6	4.39	2.44	1.29	5.20	1.60	2.68	0.035	26.5
60 × 40 × 3.15	60	40	3.15	4.73	3.13	3.98	1.33	22.5	6.49	2.38	1.28	7.51	2.43	2.65	0.129	38.3
60 × 40 × 4.00	60	40	4.00	6.00	3.86	4.91	1.38	26.8	7.84	2.34	1.26	8.93	2.99	2.62	0.255	45.6
60 × 50 × 2.00	60	50	2.00	3.00	2.38	3.03	1.69	19.0	8.07	2.50	1.63	6.32	2.44	3.58	0.040	49.3
60 × 50 × 3.15	60	50	3.15	4.73	3.62	4.61	1.76	27.6	12.0	2.45	1.61	9.21	3.71	3.55	0.150	71.8
70 × 30 × 1.60	70	30	1.60	2.40	1.55	1.97	0.773	14.5	1.71	2.71	0.932	4.14	0.769	1.72	0.017	14.3
70 × 30 × 2.00	70	30	2.00	3.00	1.91	2.43	0.793	17.6	2.09	2.69	0.928	5.02	0.947	1.71	0.032	17.3
70 × 30 × 3.15	70	30	3.15	4.73	2.88	3.67	0.852	25.3	3.06	2.63	0.914	7.23	1.43	1.67	0.119	24.8
70 × 40 × 2.00	70	40	2.00	3.00	2.22	2.83	1.18	22.2	4.64	2.80	1.28	6.35	1.64	2.55	0.037	38.3
70 × 40 × 3.15	70	40	3.15	4.73	3.37	4.30	1.24	32.3	6.89	2.74	1.27	9.24	2.50	2.52	0.140	55.7
70 × 40 × 4.00	70	40	4.00	6.00	4.17	5.31	1.29	38.7	8.36	2.70	1.26	11.1	3.08	2.49	0.276	66.7
80 × 25 × 1.60	80	25	1.60	2.40	1.55	1.97	0.556	17.4	1.07	2.97	0.736	4.36	0.549	1.25	0.017	11.9
80 × 25 × 2.00	80	25	2.00	3.00	1.91	2.43	0.575	21.1	1.30	2.95	0.732	5.28	0.675	1.24	0.032	14.4
80 × 25 × 3.15	80	25	3.15	4.73	2.88	3.67	0.629	30.3	1.90	2.88	0.719	7.58	1.01	1.20	0.119	20.5
80 × 25 × 4.00	80	25	4.00	6.00	3.54	4.51	0.670	35.9	2.27	2.82	0.710	8.97	1.24	1.18	0.234	24.2
80 × 40 × 1.60	80	40	1.60	2.40	1.92	2.45	1.08	24.8	3.96	3.18	1.27	6.28	1.34	2.45	0.021	43.2
80 × 40 × 2.00	80	40	2.00	3.00	2.38	3.03	1.10	30.2	4.86	3.16	1.27	7.56	1.68	2.44	0.040	52.6
80 × 40 × 3.15	80	40	3.15	4.73	3.62	4.61	1.17	44.3	7.24	3.10	1.25	11.1	2.55	2.40	0.150	77.0
80 × 40 × 4.00	80	40	4.00	6.00	4.48	5.71	1.21	53.2	8.81	3.05	1.24	13.3	3.16	2.38	0.298	92.4
80 × 50 × 2.00	80	50	2.00	3.00	2.69	3.43	1.50	36.3	8.96	3.26	1.62	9.08	2.56	3.30	0.045	97.2
80 × 50 × 3.15	80	50	3.15	4.73	4.12	5.24	1.57	53.6	13.4	3.20	1.60	13.4	3.92	3.26	0.171	143
80 × 50 × 4.00	80	50	4.00	6.00	5.11	6.51	1.62	64.8	16.5	3.15	1.59	16.2	4.86	3.24	0.340	173
80 × 50 × 5.00	80	50	5.00	7.50	6.22	7.92	1.67	76.3	19.7	3.10	1.58	19.1	5.92	3.21	0.643	204
80 × 60 × 2.00	80	60	2.00	3.00	3.00	3.83	1.92	42.4	14.7	3.33	1.96	10.6	3.61	4.19	0.051	161
80 × 60 × 3.15	80	60	3.15	4.73	4.61	5.87	1.99	62.9	22.2	3.27	1.94	15.7	5.54	4.16	0.192	238
80 × 60 × 4.00	80	60	4.00	6.00	5.74	7.31	2.04	76.3	27.3	3.23	1.93	19.1	6.89	4.13	0.383	289
90 × 40 × 1.60	90	40	1.60	2.40	2.05	2.61	1.02	32.6	4.11	3.53	1.26	7.24	1.38	2.35	0.022	57.1
90 × 40 × 2.00	90	40	2.00	3.00	2.53	3.23	1.04	39.8	5.05	3.51	1.25	8.84	1.71	2.33	0.043	69.7
90 × 40 × 3.15	90	40	3.15	4.73	3.87	4.93	1.10	58.5	7.54	3.45	1.24	13.0	2.60	2.30	0.160	102
90 × 50 × 1.60	90	50	1.60	2.40	2.30	2.93	1.40	38.8	7.59	3.64	1.61	8.63	2.11	3.14	0.025	105

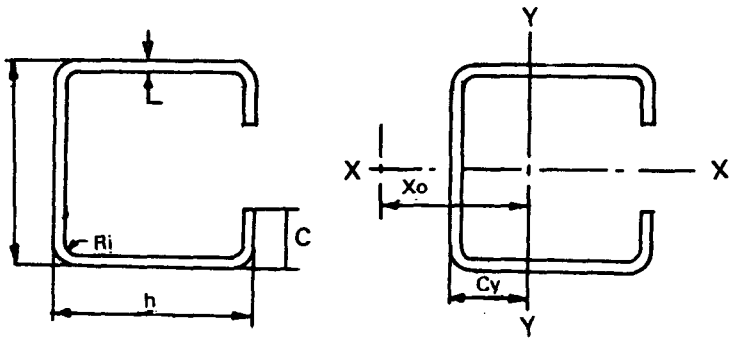
(*Continued*)

TABLE 4 CHANNELS WITHOUT LIPS — RECTANGULAR — *Contd*

Designation	Dimensions				Mass/ Unit Length	Area of Section	Centre of Gravity	Moment of Inertia		Radius of Gyration		Section Modulus		Shear Centre	Torsion Constant	Warping Constant
$h \times b \times$	h	b	t	R_1	M	A	C_y	I_{xx}	I_{yy}	R_{xx}	R_{yy}	Z_{xx}	Z_{yy}	X_o	J	C_w
mm	mm	mm	mm	mm	kg/m	cm^2	cm	cm^4	cm^4	cm	cm	cm^3	cm^3	cm	cm^4	cm^6
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
90 × 50 × 2.00	90	50	2.00	3.00	2.85	3.63	1.42	47.5	9.33	3.62	1.60	10.6	2.61	3.18	0.048	128
90 × 50 × 3.15	90	50	3.15	4.73	4.36	5.56	1.49	70.4	14.0	3.56	1.59	15.6	4.00	3.14	0.181	190
100 × 40 × 1.60	100	40	1.60	2.40	2.17	2.77	0.968	41.6	4.24	3.88	1.24	8.33	1.40	2.25	0.024	73.3
100 × 40 × 2.00	100	40	2.00	3.00	2.69	3.43	0.988	50.9	5.21	3.86	1.23	10.2	1.73	2.24	0.045	89.5
100 × 40 × 3.15	100	40	3.15	4.73	4.12	5.24	1.04	75.3	7.80	3.79	1.22	15.1	2.64	2.20	0.171	132
100 × 40 × 4.00	100	40	4.00	6.00	5.11	6.51	1.09	91.0	9.54	3.74	1.21	18.2	3.27	2.18	0.340	159
100 × 50 × 2.00	100	50	2.00	3.00	3.00	3.83	1.36	60.5	9.67	3.98	1.54	12.1	2.65	3.06	0.051	165
100 × 50 × 3.15	100	50	3.15	4.73	4.61	5.87	1.42	90.0	14.6	3.92	1.58	18.0	4.06	3.03	0.192	245
100 × 50 × 4.00	100	50	4.00	6.00	5.74	7.31	1.46	109	17.9	3.87	1.56	21.9	5.06	3.00	0.383	297
100 × 50 × 5.00	100	50	5.00	7.50	7.01	8.92	1.52	130	21.5	3.82	1.55	26.0	6.17	2.97	0.727	35.3
100 × 60 × 2.00	100	60	2.00	3.00	3.32	4.23	1.75	70.1	15.9	4.07	1.94	14.0	3.74	3.92	0.056	271
100 × 60 × 3.15	100	60	3.15	4.73	5.10	6.50	1.81	105	24.1	4.02	1.93	21.0	5.76	3.89	0.212	405
100 × 60 × 4.00	100	60	4.00	6.00	6.37	8.11	1.86	128	29.7	3.97	1.91	25.6	7.18	3.86	0.426	494
100 × 60 × 5.00	100	60	5.00	7.50	7.79	9.92	1.92	152	35.9	3.92	1.90	30.8	8.78	3.83	0.810	589

120 × 50 × 3.15	120	50	3.15	4.73	5.10	6.50	1.29	138	15.5	4.61	1.54	23.0	4.18	2.82	0.212	379
120 × 50 × 4.00	120	50	4.00	6.00	6.37	8.11	1.34	169	19.1	4.56	1.53	28.1	5.20	2.80	0.426	462
120 × 50 × 5.00	120	50	5.00	7.50	7.79	9.92	1.39	201	23.0	4.50	1.52	33.6	6.36	2.77	0.810	550
120 × 60 × 4.00	120	60	4.00	6.00	7.00	8.91	1.71	196	31.7	4.69	1.89	32.6	7.40	3.62	0.468	766
120 × 60 × 5.00	120	60	5.00	7.50	8.58	10.9	1.76	234	38.4	4.63	1.88	39.1	9.07	3.59	0.893	917
120 × 60 × 6.00	120	60	6.00	9.00	10.1	12.9	1.82	269	44.6	4.58	1.86	44.9	10.7	3.56	1.507	1050
140 × 60 × 4.00	140	60	4.00	6.00	7.62	9.71	1.59	281	33.4	5.38	1.86	40.2	7.57	3.42	0.511	1110
140 × 60 × 6.00	140	60	6.00	9.00	11.0	14.1	1.69	390	47.1	5.27	1.83	55.7	10.9	3.36	1.651	1530
150 × 50 × 3.15	150	50	3.15	4.73	5.85	7.45	1.15	235	16.5	5.62	1.49	31.4	4.30	2.57	0.244	650
150 × 50 × 4.00	150	50	4.00	6.00	7.31	9.31	1.19	289	20.4	5.57	1.48	38.5	5.36	2.54	0.490	790
150 × 50 × 5.00	150	50	5.00	7.50	8.97	11.4	1.24	346	24.7	5.51	1.47	46.2	6.56	2.51	0.935	940
180 × 50 × 3.15	180	50	3.15	4.73	6.59	8.39	1.04	366	17.4	6.60	1.44	40.7	4.39	2.36	0.275	1000
180 × 50 × 5.00	180	50	5.00	7.50	10.2	12.9	1.12	543	26.0	6.48	1.42	60.3	6.71	2.31	1.06	1460
200 × 50 × 4.00	200	50	4.00	6.00	8.88	11.3	1.02	584	22.1	7.19	1.40	58.4	5.54	2.22	0.596	1570
200 × 50 × 5.00	200	50	5.00	7.50	10.9	13.9	1.06	706	26.7	7.12	1.39	70.6	6.79	2.19	1.14	1880
200 × 50 × 6.00	200	50	6.00	9.00	12.9	16.5	1.11	818	31.1	7.05	1.38	81.8	7.98	2.16	1.94	2170
200 × 80 × 4.00	200	80	4.00	6.00	10.8	13.7	1.98	815	83.4	7.71	2.47	81.5	13.8	4.48	0.724	5730
200 × 80 × 5.00	200	80	5.00	7.50	13.3	16.9	2.02	991	102.0	7.65	2.46	99.1	17.1	4.44	1.39	6960
200 × 80 × 6.00	200	80	6.00	9.00	15.7	20.1	2.08	1160	119.7	7.59	2.44	116	20.2	4.42	2.37	8110
250 × 50 × 4.00	250	50	4.00	6.00	10.4	13.3	0.893	1020	23.2	8.76	1.32	81.7	5.65	1.97	0.703	2660
250 × 50 × 5.00	250	50	5.00	7.50	12.9	16.4	0.937	1240	28.2	8.69	1.31	99.1	6.94	1.94	1.35	3200
250 × 50 × 6.00	250	50	6.00	9.00	15.3	19.5	0.982	1440	32.8	8.61	1.30	115	8.17	1.91	2.30	3700
250 × 80 × 4.00	250	80	4.00	6.00	12.3	15.7	1.75	1380	89.0	9.39	2.38	110	13.2	4.07	0.831	9730
250 × 80 × 5.00	250	80	5.00	7.50	15.2	19.4	1.80	1690	109	9.33	2.37	135	17.6	4.04	1.60	11800

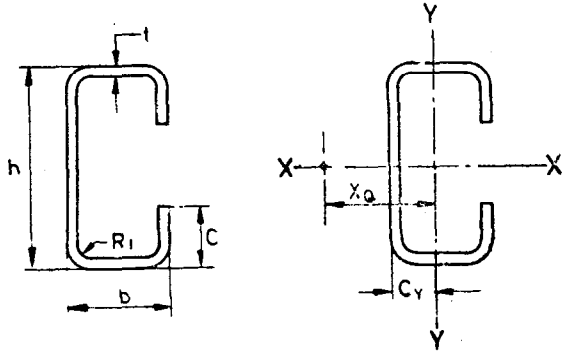
TABLE 5 CHANNELS WITH LIPS—SQUARE



Designation	Dimensions				Mass/ Unit Length	Area of Section	Centre of Gravity	Moment of Inertia		Radius of Gyration		Section Modulus		Shear Centre	Torsion Constant	Warping Constant
$h \times h \times c \times t$	h	c	t	R_i	M	A	C_y	I_{xx}	I_{yy}	R_{xx}	R_{yy}	Z_{xx}	Z_{yy}	X_o	J	C_w
mm	mm	mm	mm	mm	kg/m	cm^2	cm	cm^4	cm^4	cm	cm	cm^3	cm^3	cm	cm^4	cm^6
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
25 × 25 × 8 × 1.25	25	8	1.25	1.88	0.787	1.00	1.12	1.01	0.838	1.002	0.914	0.806	0.606	2.66	0.005	1.87
25 × 25 × 8 × 1.60	25	8	1.60	2.40	0.970	1.24	1.11	1.20	0.985	0.983	0.893	0.956	0.710	2.69	0.010	2.14
30 × 30 × 10 × 1.25	30	10	1.25	1.88	0.974	1.24	1.36	1.82	1.55	1.21	1.12	1.21	0.941	3.20	0.006	5.32
30 × 30 × 10 × 1.60	30	10	1.60	2.40	1.21	1.54	1.35	2.19	1.85	1.19	1.10	1.46	1.12	3.23	0.013	6.23
35 × 35 × 10 × 1.25	35	10	1.25	1.88	1.12	1.43	1.53	2.96	2.40	1.44	1.30	1.69	1.22	3.60	0.007	9.49
35 × 35 × 10 × 1.60	35	10	1.60	2.40	1.40	1.78	1.52	3.60	2.88	1.42	1.27	2.06	1.46	3.62	0.015	11.2
40 × 40 × 10 × 1.25	40	10	1.25	1.88	1.27	1.62	1.70	4.50	3.50	1.67	1.47	2.25	1.52	3.99	0.008	16.1
40 × 40 × 10 × 1.60	40	10	1.60	2.40	1.59	2.02	1.70	5.50	4.24	1.65	1.45	2.75	1.84	4.01	0.017	19.1
40 × 40 × 15 × 2.00	40	15	2.00	3.00	2.08	2.66	1.86	6.63	5.87	1.58	1.49	3.32	2.74	4.41	0.034	41.6

50 × 50 × 10 × 1.60	50	10	1.60	2.40	1.96	2.50	2.04	11.0	8.05	2.10	1.80	4.42	2.72	4.78	0.021	48.7
50 × 50 × 15 × 2.00	50	15	2.00	3.00	2.56	3.26	2.20	13.6	11.1	2.04	1.85	5.42	3.97	5.21	0.042	93.8
60 × 60 × 15 × 2.00	60	15	2.00	3.00	3.03	3.86	2.55	24.0	18.6	2.50	2.20	8.01	5.40	5.99	0.050	192
60 × 60 × 15 × 2.55	60	15	2.55	3.82	3.76	4.80	2.54	29.2	22.4	2.47	2.16	9.73	6.49	6.02	0.102	226
60 × 60 × 20 × 3.15	60	20	3.15	4.73	4.77	6.08	2.70	34.7	29.3	2.39	2.20	11.6	8.88	6.46	0.196	395
80 × 80 × 15 × 2.00	80	15	2.00	3.00	3.97	5.06	3.23	58.4	42.3	3.40	2.89	14.6	8.86	7.53	0.066	641
80 × 80 × 20 × 3.15	80	20	3.15	4.73	6.25	7.97	3.39	86.9	67.0	3.30	2.90	21.7	14.54	8.02	0.258	1210
80 × 80 × 25 × 4.00	80	25	4.00	6.00	8.02	10.2	3.55	106	87.0	3.21	2.92	26.4	19.6	8.47	0.531	1940
80 × 80 × 25 × 5.00	80	25	5.00	7.50	9.69	12.3	3.54	123	101	3.16	2.86	30.8	22.6	8.55	0.995	2190
100 × 100 × 15 × 2.00	100	15	2.00	3.00	4.91	6.26	3.90	115	79.9	4.29	3.58	23.1	13.1	9.06	0.082	1720
100 × 100 × 20 × 3.15	100	20	3.15	4.73	7.74	9.86	4.07	174	127	4.21	3.59	34.9	21.5	9.55	0.321	3080
100 × 100 × 25 × 4.00	100	25	4.00	6.00	9.91	12.6	4.24	215	166	4.12	3.62	43.0	28.7	10.0	0.659	4660
100 × 100 × 25 × 5.00	100	25	5.00	7.50	12.0	15.3	4.27	255	194.9	4.07	3.56	50.9	33.6	10.1	1.24	5340

TABLE 6 CHANNELS WITH LIPS—RECTANGULAR



Designation	Dimensions					Mass/ Unit Length	Area of Section	Centre of Gravity	Moment of Inertia		Radius of Gyration		Section Modulus		Shear Centre	Torsion Constant	Warping Constant
$h \times b \times c \times t$ mm	h mm	b mm	c mm	t mm	R_i mm	M kg/m	A cm^2	C_y cm	I_{xx} cm^4	I_{yy} cm^4	R_{xx} cm	R_{yy} cm	Z_{xx} cm^3	Z_{yy} cm^3	X_o cm	J cm^4	C_w cm^6
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
30 × 15 × 10 × 1.15	30	15	10	1.25	1.88	0.679	0.866	0.651	1.05	0.292	1.10	0.581	0.697	0.344	1.66	0.004	1.03
30 × 15 × 10 × 1.60	30	15	10	1.60	2.40	0.832	1.06	0.649	1.22	0.337	1.07	0.564	0.815	0.395	1.68	0.009	1.14
40 × 20 × 10 × 1.25	40	20	10	1.25	1.88	0.876	1.12	0.790	2.62	0.657	1.53	0.767	1.31	0.543	2.00	0.006	3.06
40 × 20 × 10 × 1.60	40	20	10	1.60	2.40	1.08	1.38	0.787	3.14	0.773	1.51	0.748	1.57	0.637	2.01	0.011	3.47
50 × 25 × 10 × 1.25	50	25	10	1.25	1.88	1.07	1.37	0.924	5.23	1.22	1.96	0.946	2.09	0.776	2.33	0.007	7.59
50 × 25 × 10 × 1.60	50	25	10	1.60	2.40	1.33	1.70	0.920	6.36	1.46	1.93	0.926	2.54	0.923	2.33	0.014	8.78
50 × 25 × 15 × 2.00	50	25	15	2.00	3.00	1.77	2.26	1.05	7.79	2.08	1.86	0.960	3.12	1.43	2.67	0.029	17.8
50 × 40 × 10 × 1.25	50	40	10	1.25	1.88	1.37	1.74	1.58	7.46	3.81	2.07	1.48	2.98	1.57	3.78	0.009	23.5
50 × 40 × 10 × 1.60	50	40	10	1.60	2.40	1.71	2.18	1.58	9.17	4.62	2.05	1.46	3.67	1.91	3.80	0.018	28.0
50 × 40 × 15 × 2.00	50	40	15	2.00	3.00	2.24	2.86	1.73	11.2	6.45	1.98	1.50	4.50	2.85	4.20	0.037	55.1
50 × 40 × 15 × 3.15	50	40	15	3.15	4.73	3.29	4.19	1.72	15.4	8.63	1.92	1.44	6.16	3.79	4.28	0.133	69.7
60 × 30 × 10 × 1.60	60	30	10	1.60	2.40	1.59	2.02	1.05	11.2	2.44	2.36	1.10	3.73	1.25	2.65	0.017	19.4
60 × 30 × 15 × 2.00	60	30	15	2.00	3.00	2.08	2.66	1.18	13.9	3.48	2.29	1.14	4.64	1.92	3.00	0.034	36.1
60 × 30 × 20 × 3.15	60	30	20	3.15	4.73	3.29	4.19	1.30	19.4	5.34	2.15	1.13	6.46	3.14	3.35	0.133	72.6
60 × 30 × 20 × 4.00	60	30	20	4.00	6.00	3.94	5.02	1.29	21.9	5.92	2.09	1.09	7.31	3.47	3.40	0.254	76.4
60 × 40 × 15 × 2.00	60	40	15	2.00	3.00	2.40	3.06	1.63	17.3	6.95	2.38	1.51	5.76	2.93	4.00	0.040	72.2
60 × 40 × 20 × 3.15	60	40	20	3.15	4.73	3.78	4.82	1.76	24.5	10.8	2.26	1.50	8.16	4.83	4.40	0.154	148
60 × 40 × 20 × 4.00	60	40	20	4.00	6.00	4.57	5.82	1.75	28.20	12.3	2.20	1.45	9.40	5.46	4.46	0.296	162

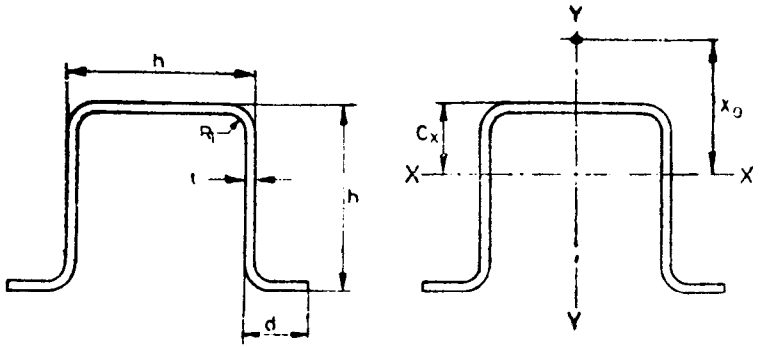
70 × 25 × 10 × 1.60	70	25	10	1.60	2.40	1.59	2.02	0.787	14.2	1.65	2.66	1.903	4.07	0.962	2.05	0.017	16.9
70 × 25 × 15 × 2.00	70	25	15	2.00	3.00	2.08	2.66	0.904	17.9	2.38	2.60	1.948	5.12	1.49	2.35	0.034	30.0
70 × 25 × 20 × 3.15	70	25	20	3.15	4.73	3.29	4.19	1.00	25.2	3.65	2.46	0.934	7.21	2.44	2.64	0.133	55.4
70 × 30 × 15 × 2.00	70	30	15	2.00	3.00	2.24	2.86	1.11	20.2	3.70	2.66	1.14	5.78	1.95	2.84	0.037	46.6
70 × 30 × 20 × 3.15	70	30	20	3.15	4.73	3.53	4.50	1.22	28.7	5.73	2.53	1.13	8.21	3.21	3.17	0.144	88.3
70 × 40 × 15 × 2.00	70	40	15	2.00	3.00	2.56	3.26	1.53	24.9	7.39	2.76	1.51	7.10	2.99	3.82	0.043	93.2
70 × 40 × 20 × 3.15	70	40	20	3.15	4.73	4.03	5.13	1.66	35.8	11.6	2.64	1.50	10.2	4.95	4.20	0.164	181
70 × 40 × 25 × 4.00	70	40	25	4.00	6.00	5.20	6.62	1.78	42.2	14.9	2.52	1.50	12.1	6.73	4.55	0.339	303
80 × 40 × 10 × 1.60	80	40	10	1.60	2.40	2.09	2.66	1.31	27.0	5.51	3.19	1.44	6.76	2.04	3.28	0.022	70.6
80 × 40 × 20 × 3.15	80	40	20	3.15	4.73	4.28	5.45	1.57	49.7	12.2	3.02	1.50	12.4	5.05	4.02	0.175	221
80 × 40 × 25 × 4.00	80	40	25	4.00	6.00	5.51	7.02	1.69	59.3	15.9	2.91	1.50	14.8	6.88	4.36	0.360	354
80 × 50 × 10 × 1.60	80	50	10	1.60	2.40	2.34	2.98	1.72	32.0	9.59	3.28	1.79	7.99	2.92	4.21	0.025	123
80 × 50 × 15 × 2.00	80	50	15	2.00	3.00	3.03	3.86	1.88	40.1	13.3	3.23	1.86	10.0	4.27	4.61	0.050	203
80 × 50 × 20 × 3.15	80	50	20	3.15	4.73	4.77	6.08	2.01	59.0	21.1	3.12	1.86	14.7	7.07	5.02	0.196	382
80 × 50 × 25 × 4.00	80	50	25	4.00	6.00	6.14	7.82	2.15	70.8	27.4	3.01	1.87	17.7	9.61	5.40	0.403	616
90 × 40 × 10 × 1.60	90	40	10	1.60	2.40	2.21	2.82	1.24	35.6	5.74	3.55	1.43	7.90	2.07	3.15	0.024	90.8
90 × 40 × 15 × 2.00	90	40	15	2.00	3.00	2.87	3.65	1.38	45.0	8.12	3.51	1.49	9.99	3.09	3.50	0.048	148
90 × 40 × 20 × 3.15	90	40	20	3.15	4.73	4.52	5.76	1.50	66.3	12.8	3.39	1.49	14.72	5.13	3.85	0.185	267
90 × 50 × 10 × 1.60	90	50	10	1.60	2.40	2.46	3.14	1.64	41.8	10.0	3.65	1.78	9.29	2.97	4.06	0.026	158
90 × 50 × 15 × 2.00	90	50	15	2.00	3.00	3.18	4.06	1.79	52.7	13.9	3.60	1.85	11.7	4.34	4.44	0.053	253
90 × 50 × 20 × 3.15	90	50	20	3.15	4.73	5.02	6.39	1.92	78.1	22.1	3.50	1.86	17.4	7.20	4.84	0.206	463
100 × 40 × 10 × 1.60	100	40	10	1.60	2.40	2.34	2.98	1.18	45.5	5.94	3.91	1.41	9.09	2.10	3.02	0.025	114
100 × 40 × 15 × 2.00	100	40	15	2.00	3.00	3.03	3.86	1.31	57.7	8.43	3.87	1.48	11.5	3.13	3.36	0.050	182
100 × 40 × 25 × 3.15	100	40	25	3.15	4.73	5.02	6.39	1.55	88.1	15.1	3.71	1.54	17.6	6.17	3.99	0.206	438
100 × 50 × 15 × 2.00	100	50	15	2.00	3.00	3.34	4.26	1.71	67.3	14.5	3.98	1.84	13.5	4.40	4.29	0.056	312
100 × 50 × 20 × 3.15	100	50	20	3.15	4.73	5.26	6.71	1.84	101	23.1	3.87	1.86	20.1	7.30	4.66	0.216	557
100 × 50 × 25 × 4.00	100	50	25	4.00	6.00	6.77	8.62	1.97	123	30.2	3.77	1.87	24.5	9.95	5.02	0.446	847
100 × 25 × 25 × 4.00	100	25	25	4.00	6.00	5.20	6.62	0.933	76.5	5.43	3.40	0.905	15.3	3.46	2.46	0.339	144
100 × 60 × 15 × 2.00	100	60	15	2.00	3.00	3.66	4.66	2.13	76.9	22.6	4.06	2.20	15.4	5.84	5.23	0.061	485
100 × 60 × 20 × 3.15	100	60	20	3.15	4.73	5.76	7.34	2.27	115	36.1	3.96	2.23	23.1	9.66	5.64	0.237	872
100 × 60 × 25 × 4.00	100	60	25	4.00	6.00	7.40	9.42	2.41	141	47.1	3.87	2.24	28.2	13.1	6.03	0.488	1330
100 × 60 × 25 × 5.00	100	60	25	5.00	7.50	8.91	11.3	2.39	164	53.9	3.80	2.18	32.9	15.0	6.07	0.912	1460
120 × 50 × 15 × 2.00	120	50	15	2.00	3.00	3.66	4.67	1.57	103	15.4	4.70	1.82	17.2	4.50	4.04	0.061	453
120 × 50 × 20 × 3.15	120	50	20	3.15	4.73	5.76	7.34	1.70	155	24.7	4.60	1.84	25.9	7.48	4.36	0.237	786
120 × 50 × 25 × 4.00	120	50	25	4.00	6.00	7.40	9.42	1.82	192	32.5	4.51	1.86	31.9	10.2	4.69	0.488	1150
120 × 50 × 25 × 5.00	120	50	25	5.00	7.50	8.91	11.3	1.81	223	36.8	4.43	1.80	37.2	11.5	4.71	0.912	1240
120 × 60 × 20 × 3.15	120	60	20	3.15	4.73	6.25	7.97	2.10	177	38.6	4.71	2.20	29.5	9.91	5.30	0.258	1230
120 × 60 × 25 × 4.00	120	60	25	4.00	6.00	8.02	10.2	2.23	216	50.7	4.62	2.23	36.4	13.5	5.67	0.531	1800
120 × 60 × 25 × 5.00	120	60	25	5.00	7.50	9.69	12.4	2.22	256	58.2	4.55	2.17	42.7	15.4	5.70	0.995	1990
140 × 60 × 20 × 3.15	140	60	20	3.15	4.73	6.75	8.60	1.96	255	40.8	5.44	2.18	36.4	10.1	5.1	0.279	1670
140 × 60 × 25 × 4.00	140	60	25	4.00	6.00	8.65	11.0	2.09	316	53.8	5.36	2.21	45.2	13.7	5.35	0.574	2390

(*Continued*)

TABLE 6 CHANNELS WITH LIPS — RECTANGULAR — *Contd*

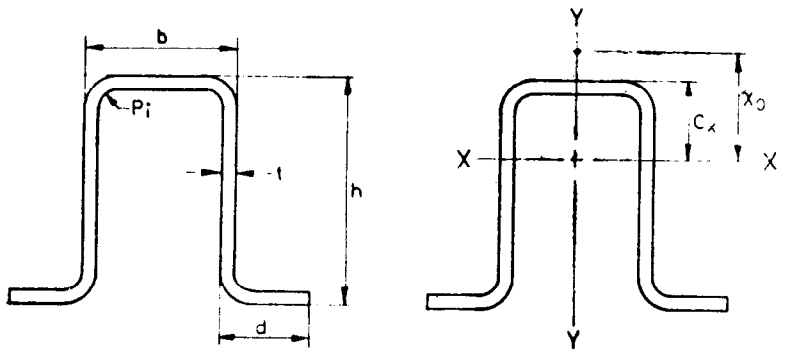
Designation	Dimensions					Mass/ Unit Length	Area of Section	Centre of Gravity	Moment of Inertia		Radius of Gyration		Section Modulus		Shear Centre	Torsion Constant	Warping Constant
$h \times b \times c \times t$ mm	h mm	b mm	c mm	t mm	R_i mm	M kg/m	A cm^2	C_y cm	I_{xx} cm^4	I_{yy} cm^4	R_{xx} cm	R_{yy} cm	Z_{xx} cm^3	Z_{yy} cm^3	X_o cm	J cm^4	CW cm^6
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
140 × 60 × 25 × 5.00	140	60	25	5.00	7.50	10.6	13.3	2.07	373	61.8	5.28	2.15	53.2	15.7	5.34	1.08	2640
150 × 50 × 20 × 3.15	150	50	20	3.15	4.73	6.50	8.28	1.52	266	26.7	5.66	1.80	35.4	7.67	3.97	0.268	1240
150 × 50 × 25 × 4.00	150	50	25	4.00	6.00	8.34	10.6	1.63	331	35.3	5.58	1.82	44.1	10.5	4.27	0.552	1750
150 × 50 × 25 × 5.00	150	50	25	5.00	7.50	10.2	12.8	1.62	388	40.1	5.50	1.77	51.8	11.9	4.27	1.04	1900
180 × 50 × 20 × 3.15	180	50	20	3.15	4.73	7.24	9.23	1.38	413	28.3	6.69	1.75	45.9	7.82	3.66	0.38	1840
180 × 50 × 25 × 4.00	180	50	25	4.00	6.00	9.28	11.8	1.49	518	37.5	6.62	1.78	57.6	10.7	3.93	0.616	2540
180 × 50 × 25 × 5.00	180	50	25	5.00	7.50	11.3	14.3	1.48	611	42.6	6.53	1.72	67.9	12.1	3.92	1.16	2790
180 × 80 × 20 × 3.15	180	80	20	3.15	4.73	8.73	11.1	2.48	561	90.7	7.10	2.86	62.4	16.4	6.29	0.362	5790
180 × 80 × 25 × 4.00	180	80	25	4.00	6.00	11.2	14.2	2.61	704	119.4	7.04	2.89	78.2	22.2	6.65	0.744	7990
180 × 80 × 25 × 5.00	180	80	25	5.00	7.50	13.6	17.3	2.60	841	139.4	6.96	2.84	93.4	25.8	6.66	1.41	9090
200 × 50 × 20 × 3.15	200	50	20	3.15	4.73	7.74	9.86	1.30	535	29.2	7.36	1.72	53.5	7.89	3.48	0.321	2320
200 × 50 × 25 × 4.00	200	50	25	4.00	6.00	9.91	12.6	1.41	672	38.8	7.30	1.75	67.2	10.8	3.74	0.659	3190
200 × 50 × 25 × 5.00	200	50	25	5.00	7.50	12.0	15.3	1.40	795	44.1	7.20	1.69	79.5	12.2	3.72	1.24	3510
200 × 80 × 20 × 3.15	200	80	20	3.15	4.73	9.22	11.7	2.35	718	93.9	7.82	2.83	71.8	16.6	6.04	0.383	7230
200 × 80 × 25 × 4.00	200	80	25	4.00	6.00	11.8	15.0	2.48	903	124	7.75	2.87	90.3	22.4	6.39	0.787	997
200 × 80 × 25 × 5.00	200	80	25	5.00	7.50	14.4	18.3	2.47	1080	145	7.67	2.81	108	26.1	6.38	1.49	1190
250 × 50 × 20 × 3.15	250	50	20	3.15	4.73	8.97	11.4	1.14	927	31.0	9.00	1.65	74.1	8.03	3.10	0.373	3850
250 × 50 × 25 × 4.00	250	50	25	4.00	6.00	11.5	14.6	1.24	1170	41.3	8.95	1.68	93.7	11.0	3.33	0.766	5230
250 × 50 × 25 × 5.00	250	50	25	5.00	7.50	14.0	17.8	1.24	1390	47.0	8.84	1.62	112	12.0	3.30	1.45	5830
250 × 80 × 20 × 3.15	250	80	20	3.15	4.73	10.5	13.3	2.09	1210	101	9.55	2.75	97.2	17.0	5.51	0.435	11900
250 × 80 × 25 × 4.00	250	80	25	4.00	6.00	13.4	17.0	2.21	1530	133	9.49	2.80	123	23.0	5.82	0.894	16200
250 × 80 × 25 × 5.00	250	80	25	5.00	7.50	16.4	20.8	2.20	1840	156	9.41	2.73	148	26.8	5.80	1.70	18600

TABLE 7 HAT SECTIONS - SQUARE



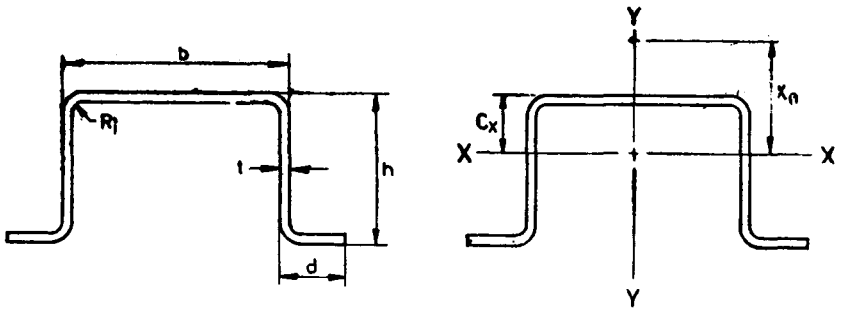
Designation	Dimensions				Mass/ Unit Length	Area of Section	Centre of Gravity	Moment of Inertia		Radius of Gyration		Section Modulus		Shear Centre	Torsion Constant	Warping Constant
$h \times h \times d \times t$	h	d	t	R_i	M	A	C_y	I_{xx}	I_{yy}	R_{xx}	R_{yy}	Z_{xx}	Z_{yy}	X_o	J	C_w
mm	mm	mm	mm	mm	kg/m	cm^2	cm	cm^4	cm^4	cm	cm	cm^3	cm^3	cm	cm^4	cm^6
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
30 × 30 × 10 × 1.25	30	10	1.25	1.88	0.974	1.24	1.36	1.55	2.45	1.12	1.41	0.941	1.03	2.73	0.006	1.48
30 × 30 × 10 × 1.60	30	10	1.60	2.40	1.26	1.54	1.35	1.85	2.96	1.10	1.39	1.12	1.27	2.75	0.013	1.67
35 × 35 × 10 × 1.25	35	10	1.25	1.88	1.12	1.43	1.53	2.40	3.71	1.30	1.61	1.22	1.41	3.19	0.007	3.26
35 × 35 × 10 × 1.60	35	10	1.60	2.40	1.40	1.78	1.52	2.88	4.51	1.27	1.60	1.46	1.74	3.21	0.015	3.74
40 × 40 × 10 × 1.25	40	10	1.25	1.88	1.27	1.62	1.70	3.50	5.35	1.47	1.82	1.52	1.86	3.63	0.008	6.55
40 × 40 × 10 × 1.60	40	10	1.60	2.40	1.59	2.02	1.70	4.24	6.54	1.45	1.80	1.84	2.30	3.65	0.017	7.65
40 × 40 × 15 × 2.00	40	15	2.00	3.00	2.08	2.66	1.86	5.87	9.62	1.49	1.90	2.74	2.91	3.63	0.034	9.74
40 × 40 × 20 × 3.15	40	20	3.15	4.73	3.29	4.19	2.00	8.95	16.8	1.46	2.01	4.48	4.57	3.48	0.133	15.9
50 × 50 × 10 × 1.60	50	10	1.60	2.40	1.96	2.50	2.04	8.05	12.4	1.80	2.22	2.72	3.70	4.49	0.021	25.3
50 × 50 × 15 × 2.00	50	15	2.00	3.00	2.56	3.26	2.20	11.1	17.3	1.85	2.31	3.97	4.56	4.57	0.042	29.9
50 × 50 × 20 × 3.15	50	20	3.15	4.73	4.03	5.13	2.36	17.2	29.1	1.83	2.38	6.52	6.95	4.52	0.164	42.8
60 × 60 × 10 × 1.60	60	10	1.60	2.40	2.34	2.98	2.37	13.6	21	2.14	2.65	3.75	5.46	5.30	0.025	66.4
60 × 60 × 15 × 2.00	60	15	2.00	3.00	3.03	3.86	2.55	18.6	28.6	2.20	2.72	5.40	6.64	5.45	0.050	77.9
60 × 60 × 20 × 3.15	60	20	3.15	4.73	4.77	6.08	2.70	29.3	46.9	2.20	2.78	8.88	10.0	5.50	0.196	106
60 × 60 × 25 × 4.00	60	25	4.00	6.00	6.14	7.82	2.86	37.7	64.7	2.20	2.88	12.0	12.7	5.41	0.403	135
80 × 80 × 15 × 2.00	80	15	2.00	3.00	3.97	5.06	3.23	42.3	64.5	2.89	3.57	8.86	12.2	7.12	0.066	356
80 × 80 × 20 × 3.15	80	20	3.15	4.73	6.25	7.97	3.39	67.0	103	2.90	3.60	14.5	18.2	7.30	0.258	485
80 × 80 × 25 × 4.00	80	25	4.00	6.00	8.02	10.2	3.55	87.0	138	2.92	3.67	19.6	22.6	7.34	0.531	569
80 × 80 × 30 × 5.00	80	30	5.00	7.50	10.1	12.8	3.71	109	181	2.92	3.75	25.4	27.8	7.30	1.04	677
100 × 100 × 15 × 2.00	100	15	2.00	3.00	4.91	6.26	3.90	79.9	123	3.58	4.44	13.1	19.5	8.74	0.082	1140
100 × 100 × 20 × 3.15	100	20	3.15	4.73	7.74	9.86	4.07	127	195	3.59	4.45	21.5	29.2	8.98	0.320	1600
100 × 100 × 25 × 4.00	100	25	4.00	6.00	9.91	12.6	4.24	166	255	3.62	4.50	28.7	36.0	9.12	0.659	1970
100 × 100 × 30 × 5.00	100	30	5.00	7.50	12.4	15.8	4.40	209	329	3.63	4.56	37.3	43.9	9.18	1.29	2150
100 × 100 × 30 × 6.00	100	30	6.00	9.00	14.5	18.5	4.39	236	375	3.57	4.50	42.0	50.7	9.23	2.15	2300

TABLE 8 HAT SECTIONS — RECTANGULAR $h > b$



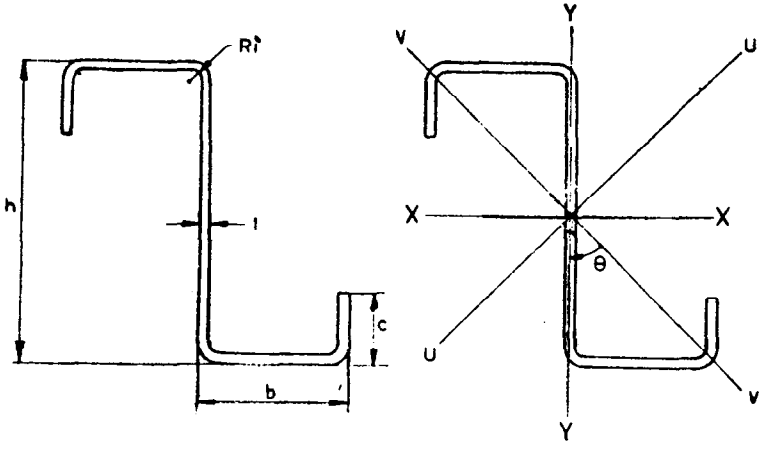
Designation	Dimensions					Mass/ Unit Length	Area of Section	Centre of Gravity	Moment of Inertia		Radius of Gyration		Section Modulus		Shear Centre	Torsion Constant	Warping Constant
$h \times b \times d \times t$ mm	h mm	b mm	d mm	t mm	R_i mm	M kg/m	A cm^2	C_y cm	I_{xx} cm^4	I_{yy} cm^4	R_{xx} cm	R_{yy} cm	Z_{xx} cm^3	Z_{yy} cm^3	X_o cm	J cm^4	C_w cm^6
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
50 × 40 × 10 × 1.60	50	40	10	1.60	2.40	1.84	2.34	2.17	7.40	7.72	1.78	1.82	2.61	2.72	4.26	0.020	14.5
50 × 40 × 15 × 2.00	50	40	15	2.00	3.00	2.40	3.06	2.34	10.2	11.1	1.82	1.90	3.82	3.35	4.30	0.040	18.5
50 × 40 × 20 × 3.15	50	40	20	3.15	4.73	3.78	4.82	2.50	15.6	19.0	1.80	1.99	6.25	5.15	4.18	0.154	30.7
60 × 40 × 15 × 2.00	60	40	15	2.00	3.00	2.71	3.46	2.83	16.0	12.5	2.15	1.90	5.04	3.79	4.93	0.045	31.2
60 × 40 × 20 × 3.15	60	40	20	3.15	4.73	4.28	5.45	3.00	24.7	21.1	2.13	1.97	8.23	5.74	4.85	0.175	52.1
60 × 50 × 15 × 2.00	60	50	15	2.00	3.00	2.87	3.66	2.68	17.4	19.6	2.18	2.32	5.24	5.16	5.21	0.048	50.3
60 × 50 × 20 × 3.15	60	50	20	3.15	4.73	4.52	5.76	2.84	27.1	32.6	2.17	2.38	8.59	7.78	5.21	0.185	73.1
60 × 50 × 25 × 4.00	60	50	25	4.00	6.00	5.83	7.42	3.00	34.8	45.8	2.16	2.48	11.6	9.95	5.06	0.382	104
80 × 40 × 15 × 2.00	80	40	15	2.00	3.00	3.34	4.26	3.82	32.9	15.4	2.78	1.90	7.88	4.67	6.11	0.056	71.7
80 × 40 × 20 × 3.15	80	40	20	3.15	4.73	5.26	6.71	4.00	51.3	25.4	2.77	1.95	12.8	6.90	6.09	0.216	120
80 × 50 × 15 × 2.00	80	50	15	2.00	3.00	3.50	4.46	3.65	35.6	24.2	2.83	2.33	8.18	6.38	6.41	0.058	115
80 × 50 × 20 × 3.15	80	50	20	3.15	4.73	5.51	7.02	3.83	55.8	39.5	2.82	2.37	13.4	9.43	6.48	0.227	170
80 × 50 × 25 × 4.00	80	50	25	4.00	6.00	7.08	9.02	4.00	71.7	54.3	2.82	2.45	17.9	11.8	6.38	0.467	241
80 × 60 × 15 × 2.00	80	60	15	2.00	3.00	3.66	4.66	3.50	38.0	35.3	2.86	2.75	8.44	8.21	6.67	0.061	175
80 × 60 × 20 × 3.15	80	60	20	3.15	4.73	5.76	7.34	3.67	59.8	57.0	2.86	2.79	13.8	12.2	6.79	0.237	245
80 × 60 × 25 × 4.00	80	60	25	4.00	6.00	7.40	9.42	3.84	77.3	77.3	2.86	2.86	18.6	15.2	6.76	0.488	316
100 × 80 × 15 × 2.00	100	80	15	2.00	3.00	4.60	5.86	4.16	73.7	76.7	3.55	3.62	12.6	14.5	8.29	0.077	659
100 × 80 × 20 × 3.15	100	80	20	3.15	4.73	7.24	9.23	4.34	117	122	3.56	3.64	20.7	21.5	8.52	0.300	918
100 × 80 × 25 × 4.00	100	80	25	4.00	6.00	9.28	11.8	4.51	152	161	3.58	3.69	27.6	26.4	8.62	0.616	1090
100 × 80 × 30 × 5.00	100	80	30	5.00	7.50	11.7	14.8	4.68	191	209	3.58	3.75	35.8	32.2	8.64	1.20	1310

TABLE 9 HAT SECTIONS — RECTANGULAR $b > h$



Designation	Dimensions					Mass/ Unit Length	Area of Section	Centre of Gravity	Moment of Inertia		Radius of Gyration		Section Modulus		Shear Centre	Torsion Constant	Warping Constant
$h \times b \times d \times t$ mm	h mm	b mm	d mm	t mm	R_i mm	M kg/m	A cm^2	C_y cm	I_{xx} cm^4	I_{yy} cm^4	R_{xx} cm	R_{yy} cm	Z_{xx} cm^3	Z_{yy} cm^3	X_o cm	J cm^4	C_w cm^6
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
30 × 50 × 10 × 1.25	30	50	10	1.25	1.88	1.17	1.49	1.14	1.90	7.05	1.13	2.17	1.02	2.09	3.16	0.008	5.30
30 × 50 × 10 × 1.60	30	50	10	1.60	2.40	1.46	1.86	1.13	2.28	8.61	1.11	2.15	1.22	2.58	3.18	0.016	6.14
40 × 50 × 10 × 1.25	40	50	10	1.25	1.88	1.37	1.74	1.58	3.81	8.53	1.48	2.21	1.57	2.53	3.84	0.009	11.5
40 × 50 × 10 × 1.60	40	50	10	1.60	2.40	1.71	2.18	1.58	4.62	10.5	1.46	2.19	1.91	3.14	3.86	0.018	13.6
40 × 60 × 15 × 2.00	40	60	15	2.00	3.00	2.40	3.06	1.63	6.95	21.8	1.51	2.67	2.93	5.08	4.10	0.040	25.2
40 × 60 × 20 × 3.15	40	60	20	3.15	4.73	3.78	4.82	1.76	10.8	36.7	1.50	2.76	4.83	7.83	4.04	0.154	32.4

TABLE 10 LIPPED ZED SECTIONS — EQUAL FLANGES



Designation / Dimensions	Mass/ Unit Length	Area of Section	Moment of Inertia				Radius of Gyration	Angle	Section Modulus				Product Moment of Inertia	Torsion Constant	Warping Constant
$h \times b \times t$ mm	M kg/m	A cm^2	I_{xx} cm^4	I_{yy} cm^4	I_{uu} cm^4	I_{vv} cm^4	$Min\text{-}R_{vv}$ cm	$\tan\theta$	Z_{xx} cm^3	Z_{yy} cm^3	Z_{uu} cm^3	Z_{vv} cm^3	I_{xy} cm^4	J cm^4	C_w cm^6
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
80 × 40 × 20 × 1.60	2.34	2.98	29.1	14.2	38.7	4.61	1.24	0.627	7.27	3.63	7.31	2.02	15.3	0.025	172
80 × 40 × 20 × 2.00	2.87	3.66	35.1	17.0	46.5	5.49	1.23	0.623	8.77	4.35	8.89	2.40	18.41	0.048	206
80 × 40 × 20 × 2.30	3.25	4.14	39.2	18.8	52.0	6.10	1.21	0.619	9.81	4.84	10.0	2.66	20.5	0.072	230
80 × 40 × 20 × 2.55	3.56	4.54	42.5	20.2	56.2	6.56	1.20	0.616	10.6	5.22	10.9	2.86	22.2	0.096	248
80 × 40 × 20 × 3.15	4.28	5.45	49.7	23.2	65.3	7.51	1.17	0.610	12.4	6.03	12.8	3.28	25.7	0.175	288
85 × 40 × 20 × 1.60	2.40	3.06	33.6	14.2	43.0	4.80	1.25	0.572	7.90	3.63	7.87	2.08	16.5	0.026	195
85 × 40 × 20 × 2.00	2.95	3.76	40.5	17.0	51.8	5.73	1.24	0.568	9.54	4.35	9.58	2.48	19.8	0.049	234
85 × 40 × 20 × 2.30	3.34	4.26	45.4	18.8	57.9	6.36	1.22	0.565	10.7	4.84	10.8	2.76	22.1	0.074	260
85 × 40 × 20 × 2.55	3.66	4.67	49.2	20.2	62.6	6.84	1.21	0.562	11.6	5.22	11.8	2.96	23.8	0.099	281
85 × 40 × 20 × 3.15	4.40	5.60	57.6	23.2	72.9	7.84	1.18	0.555	13.6	6.03	13.9	3.40	27.6	0.180	326
90 × 40 × 20 × 1.60	2.46	3.14	38.5	14.2	47.7	4.99	1.26	0.526	8.55	3.63	8.47	2.15	17.6	0.026	219
90 × 40 × 20 × 2.00	3.03	3.86	46.5	17.0	57.5	5.95	1.24	0.521	10.3	4.35	10.3	2.56	21.1	0.059	263

90 × 40 × 20 × 2.30	3.43	4.38	52.1	18.8	64.3	6.60	1.23	0.518	11.6	4.84	11.6	2.84	23.6	0.076	293
90 × 40 × 20 × 2.55	3.76	4.80	56.5	20.2	69.7	7.10	1.22	0.515	12.6	5.22	12.7	3.06	25.5	0.102	317
90 × 40 × 20 × 3.15	4.52	5.76	66.3	23.2	81.3	8.16	1.19	0.509	14.7	6.03	15.0	3.51	29.5	0.185	368
95 × 40 × 20 × 1.60	2.53	3.22	43.7	14.2	52.8	5.16	1.26	0.485	9.20	3.63	9.08	2.20	18.7	0.027	245
95 × 40 × 20 × 2.00	3.11	3.96	52.9	17.0	63.7	6.15	1.25	0.481	11.1	4.35	11.1	2.63	22.5	0.052	294
95 × 40 × 20 × 2.30	3.52	4.49	59.4	18.8	71.3	6.83	1.23	0.478	12.5	4.84	12.5	2.92	25.1	0.078	328
95 × 40 × 20 × 2.55	3.86	4.92	64.4	20.2	77.3	7.35	1.22	0.475	13.6	5.22	13.6	3.14	27.1	0.104	355
95 × 40 × 20 × 3.15	4.65	5.92	75.6	23.2	90.4	8.43	1.19	0.468	15.9	6.03	16.1	3.61	31.5	0.190	412
100 × 40 × 20 × 1.60	2.59	3.30	49.4	14.2	58.3	5.31	1.27	0.450	9.88	3.63	9.7	2.26	19.8	0.028	272
100 × 40 × 20 × 2.00	3.18	4.06	59.8	17.0	70.5	6.34	1.25	0.446	12.0	4.35	11.9	2.70	23.8	0.053	327
100 × 40 × 20 × 2.30	3.62	4.60	67.2	18.8	78.9	7.04	1.24	0.443	13.4	4.84	13.4	2.99	26.6	0.080	365
100 × 40 × 20 × 2.55	3.96	5.05	73.0	20.2	85.6	7.57	1.22	0.440	14.6	5.22	14.6	3.22	28.8	0.107	395
100 × 40 × 20 × 3.15	4.77	6.08	85.7	23.2	100	8.69	1.20	0.434	17.1	6.03	17.3	3.71	33.4	0.196	459
105 × 45 × 20 × 1.60	2.78	3.54	59.8	19.2	72.1	6.90	1.40	0.482	11.4	4.34	11.1	2.67	25.5	0.030	393
105 × 45 × 20 × 2.00	3.42	4.36	72.6	23.0	87.3	8.27	1.38	0.478	13.8	5.22	13.6	3.20	30.7	0.057	474
105 × 45 × 20 × 2.30	3.89	4.95	81.6	25.5	97.9	9.21	1.36	0.475	15.5	5.82	15.4	3.56	34.4	0.086	530
105 × 45 × 20 × 2.55	4.26	5.43	88.8	27.5	106	9.93	1.35	0.472	16.9	6.29	16.8	3.84	37.3	0.115	574
105 × 45 × 20 × 3.15	5.14	6.55	105	31.7	125	11.5	1.32	0.466	20.0	7.31	20.0	4.44	43.5	0.211	671
110 × 45 × 20 × 1.60	2.84	3.62	66.7	19.2	78.8	7.10	1.40	0.450	12.1	4.34	11.6	2.73	26.8	0.030	433
110 × 45 × 20 × 2.00	3.50	4.46	81.1	23.0	95.5	8.51	1.38	0.446	14.7	5.22	14.5	3.27	32.4	0.058	522
110 × 45 × 20 × 2.30	3.98	5.06	91.2	25.5	107	9.47	1.37	0.443	16.6	5.82	16.3	3.64	36.2	0.088	585
110 × 45 × 20 × 2.55	4.36	5.56	99.3	27.5	117	10.2	1.36	0.441	18.0	6.29	17.9	3.93	39.3	0.118	634
110 × 45 × 20 × 3.15	5.26	6.71	117	31.7	137	11.8	1.33	0.435	21.3	7.31	21.3	4.54	45.8	0.216	742
115 × 45 × 20 × 1.60	2.90	3.70	74.1	19.2	86.0	7.29	1.40	0.422	12.9	4.34	12.6	2.78	28.2	0.031	476
115 × 45 × 20 × 2.00	3.58	4.56	90.1	23.8	104	8.73	1.38	0.418	15.7	5.22	15.4	3.33	34.0	0.060	574
115 × 45 × 20 × 2.30	4.07	5.18	101	25.5	117	9.72	1.37	0.415	17.6	5.82	17.4	3.71	38.1	0.090	643
115 × 45 × 20 × 2.55	4.46	5.69	110	27.5	127	10.5	1.36	0.413	19.2	6.30	19.0	4.01	41.3	0.121	697
115 × 45 × 20 × 3.15	5.39	6.86	131	31.7	150	12.1	1.33	0.407	22.7	7.31	22.6	4.63	48.2	0.222	816
120 × 45 × 20 × 1.60	2.97	3.78	82.0	19.2	93.3	7.46	1.40	0.397	13.7	4.34	13.3	2.83	29.6	0.032	521
120 × 45 × 20 × 2.00	3.66	4.66	99.7	23.0	144	8.94	1.39	0.393	16.6	5.22	16.3	3.39	35.7	0.061	629
120 × 45 × 20 × 2.30	4.16	5.30	112	25.5	128	9.96	1.37	0.390	18.7	5.82	18.4	3.78	39.9	0.092	704
120 × 45 × 20 × 2.55	4.56	5.82	122	27.5	139	10.7	1.36	0.388	20.4	6.30	20.1	4.08	43.3	0.124	764
120 × 45 × 20 × 3.15	5.51	7.02	145	31.7	164	12.4	1.33	0.382	24.1	7.31	24.0	4.72	50.5	0.227	895
125 × 45 × 20 × 1.60	3.03	3.86	90.3	19.2	102	7.63	1.41	0.374	14.4	4.34	14.1	2.88	30.9	0.033	568
125 × 45 × 20 × 2.00	3.73	4.76	110	23.0	124	9.14	1.39	0.370	17.6	5.22	17.2	3.45	37.3	0.062	686
125 × 45 × 20 × 2.30	4.25	5.41	124	25.5	139	10.2	1.37	0.368	19.8	5.82	19.5	3.85	41.8	0.094	769
125 × 45 × 20 × 2.55	4.66	5.94	135	27.5	151	11.0	1.36	0.365	21.6	6.30	21.3	4.15	45.3	0.126	834
125 × 45 × 20 × 3.15	5.64	7.18	160	31.7	179	12.7	1.33	0.360	25.6	7.31	25.4	4.80	52.9	0.232	977
130 × 45 × 20 × 1.60	3.09	3.94	99.1	19.2	111	7.79	1.41	0.353	15.2	4.34	14.9	2.92	32.3	0.033	618
130 × 45 × 20 × 2.00	3.81	4.86	121	23.0	134	9.33	1.39	0.350	18.6	5.22	18.2	3.50	38.9	0.064	746

(*Continued*)

TABLE 10 LIPPED ZED SECTIONS — EQUAL FLANGES — *Contd*

Designation / Dimensions	Mass/ Unit Length	Area of Section	Moment of Inertia			Radius of Gyration	Angle	Section Modulus				Product Moment of Inertia	Torsion Constant	Warping Constant
$h \times b \times c \times t$ mm	M kg/m	A cm^2	I_{yy} cm^4	I_{uu} cm^4	I_{vv} cm^4	*Min-*R_{vv} cm	tanθ	Z_{xx} cm^3	Z_{yy} cm^3	Z_{uu} cm^3	Z_{vv} cm^3	I_{xy} cm^4	J cm^4	C_w cm^6
1	2	3	5	6	7	8	9	10	11	12	13	14	15	16
130 × 45 × 20 × 2.30	4.34	5.52	25.5	151	10.4	1.37	0.347	20.9	5.82	20.6	3.91	43.6	0.096	836
130 × 45 × 20 × 2.55	4.76	6.07	27.5	165	11.2	1.36	0.345	22.8	6.30	22.5	4.22	47.3	0.129	908
130 × 45 × 20 × 3.15	5.76	7.34	31.7	194	13.0	1.33	0.340	27.0	7.31	26.9	4.88	55.3	0.237	1060
140 × 60 × 20 × 1.60	3.60	4.58	40.2	167	14.7	1.79	0.449	20.2	6.74	19.3	4.38	56.8	0.039	1400
140 × 60 × 20 × 2.00	4.44	5.66	48.5	203	17.8	1.77	0.445	24.7	8.22	23.7	5.28	69.0	0.074	1700
140 × 60 × 20 × 2.30	5.06	6.44	54.3	230	19.9	1.76	0.443	27.9	9.22	26.9	5.91	77.6	0.112	1910
140 × 60 × 20 × 2.55	5.57	7.09	58.8	251	21.6	1.74	0.441	30.5	10.0	29.5	6.41	84.5	0.151	2100
140 × 60 × 20 × 3.15	6.75	8.60	68.7	298	25.3	1.71	0.435	36.4	11.8	35.4	7.48	99.8	0.279	2500
150 × 60 × 20 × 1.60	3.72	4.74	40.2	191	15.4	1.80	0.406	22.1	6.79	21.2	4.50	61.1	0.040	1600
150 × 60 × 20 × 2.00	4.60	5.86	48.5	233	18.6	1.78	0.403	27.0	8.22	26.0	5.43	74.3	0.077	1970
150 × 60 × 20 × 2.30	5.24	6.68	54.3	263	20.8	1.76	0.401	30.6	9.22	29.5	6.08	83.6	0.116	2220
150 × 60 × 20 × 2.55	5.77	7.34	58.8	287	22.6	1.75	0.399	33.5	10.0	32.4	6.59	91.0	0.157	2420
150 × 60 × 20 × 3.15	7.00	8.91	68.7	342	26.4	1.72	0.394	40.0	11.8	38.9	7.70	108	0.289	2870
160 × 60 × 20 × 1.60	3.85	4.90	40.2	217	16.0	1.80	0.370	24.1	6.79	23.1	4.60	65.5	0.042	1870
160 × 60 × 20 × 2.00	4.75	6.06	48.5	265	19.3	1.78	0.367	29.5	8.22	28.4	5.56	79.6	0.080	2270
160 × 60 × 20 × 2.30	5.42	6.90	54.3	300	21.6	1.77	0.365	33.4	9.22	32.2	6.22	89.6	0.120	2560
160 × 60 × 20 × 2.55	5.97	7.60	58.8	328	23.4	1.76	0.363	36.5	10.0	35.4	6.75	97.5	0.162	2790
160 × 60 × 20 × 3.15	7.24	9.23	68.7	391	27.4	1.72	0.358	43.7	11.8	42.6	7.90	115.3	0.300	3310
170 × 60 × 20 × 1.60	3.97	5.06	40.2	246	16.5	1.81	0.339	26.1	6.79	25.1	4.70	69.8	0.043	2130
170 × 60 × 20 × 2.00	4.91	6.26	48.5	301	19.9	1.78	0.337	32.0	8.22	30.9	5.67	84.9	0.082	2600
170 × 60 × 20 × 2.30	5.60	7.14	54.3	340	22.3	1.77	0.334	36.3	9.22	35.1	6.36	95.5	0.124	2920
170 × 60 × 20 × 2.55	6.17	7.86	58.8	372	24.2	1.75	0.332	39.7	10.0	38.5	6.90	104	0.168	3190
170 × 60 × 20 × 3.15	7.49	9.54	68.7	444	28.4	1.72	0.328	47.5	11.8	46.3	8.07	123	0.310	3780
180 × 60 × 20 × 1.60	4.10	5.22	40.2	277	17.0	1.80	0.313	28.2	6.79	27.2	4.78	74.2	0.044	2430
180 × 60 × 20 × 2.00	5.07	6.46	48.5	339	20.5	1.78	0.310	34.6	8.22	33.5	5.78	90.2	0.085	2940
180 × 60 × 20 × 2.30	5.78	7.36	54.3	384	23.0	1.77	0.308	39.2	9.22	38.0	6.48	102	0.128	3320
180 × 60 × 20 × 2.55	6.37	8.11	58.8	420	25.0	1.76	0.306	42.9	10.0	41.7	7.03	111	0.174	3620
180 × 60 × 20 × 3.15	7.74	9.86	68.7	502	29.3	1.72	0.302	51.4	11.8	50.3	8.24	131	0.321	4290
190 × 60 × 20 × 1.60	4.22	5.38	40.2	311	17.5	1.80	0.289	30.4	6.79	29.3	4.84	78.5	0.046	2720
190 × 60 × 20 × 2.00	5.22	6.67	48.5	381	21.1	1.78	0.287	37.3	8.22	36.1	5.88	95.5	0.088	3310

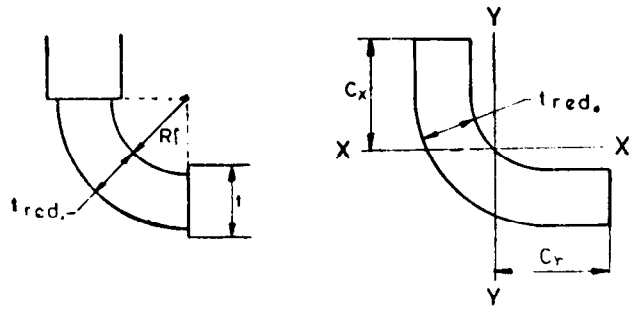
190 × 60 × 20 × 2.30	5.96	7.60	401	54.3	432	23.7	1.76	0.285	42.2	9.22	41.0	6.59	108	0.132	3740
190 × 60 × 20 × 2.55	6.57	8.37	439	58.8	472	25.7	1.75	0.283	46.2	10.0	45.0	7.15	117	0.179	4070
190 × 60 × 20 × 3.15	7.98	10.17	527	68.7	565	30.1	1.72	0.279	55.4	11.8	54.3	8.38	139	0.331	4840
200 × 60 × 20 × 1.60	4.35	5.54	326	40.2	348	17.9	1.80	0.269	32.6	6.79	31.5	4.94	82.9	0.047	3040
200 × 60 × 20 × 2.00	5.38	6.86	400	48.5	427	21.6	1.78	0.266	40.0	8.22	38.8	5.97	101	0.090	3710
200 × 60 × 20 × 2.30	6.14	7.8	453	54.3	483	24.3	1.76	0.265	45.3	9.22	44.1	6.70	113	0.136	4180
200 × 60 × 20 × 2.55	6.77	8.62	496	58.8	529	26.3	1.75	0.263	49.6	10.0	48.5	7.27	124	0.184	4560
200 × 60 × 20 × 3.15	8.23	10.49	596	68.7	634	30.9	1.72	0.259	59.6	11.8	58.4	8.52	146	0.341	5420
210 × 60 × 20 × 1.60	4.47	5.70	366	40.2	388	18.3	1.79	0.251	34.9	6.79	33.8	5.01	87.2	0.048	3390
210 × 60 × 20 × 2.00	5.54	7.06	449	48.5	475	22.1	1.77	0.248	42.8	8.22	41.6	6.06	106	0.093	4130
210 × 60 × 20 × 2.30	6.32	8.05	509	54.3	539	24.8	1.76	0.247	48.5	9.22	47.3	6.79	119	0.140	4650
210 × 60 × 20 × 2.55	6.97	8.88	558	58.8	590	26.9	1.74	0.245	53.1	10.0	52.0	7.37	130	0.190	5080
210 × 60 × 20 × 3.15	8.48	10.80	667	68.7	707	31.6	1.71	0.241	63.8	11.8	62.7	8.65	154	0.352	6030
220 × 60 × 20 × 1.60	4.60	5.86	409	40.2	430	18.7	1.79	0.235	37.2	6.79	36.1	5.07	91.6	0.050	3750
220 × 60 × 20 × 2.00	5.70	7.26	502	48.5	528	22.6	1.76	0.232	45.6	8.22	44.5	6.13	111	0.096	4570
220 × 60 × 20 × 2.30	6.50	8.28	569	54.3	598	25.4	1.75	0.231	51.8	9.22	50.6	6.88	125	0.145	5160
220 × 60 × 20 × 2.55	7.17	9.13	624	58.8	655	27.5	1.74	0.229	56.7	10.0	55.6	7.47	131	0.196	5620
220 × 60 × 20 × 3.15	8.73	11.1	750	68.8	786	32.3	1.70	0.226	68.1	11.8	67.1	8.76	162	0.362	6680
230 × 75 × 20 × 1.60	5.10	6.50	517	72.1	558	31.4	2.20	0.290	45.0	9.72	43.1	7.01	141	0.055	6990
230 × 75 × 20 × 2.00	6.32	8.06	636	87.5	686	38.1	2.18	0.287	55.3	11.8	53.2	8.52	172	0.106	8550
230 × 75 × 20 × 2.30	7.23	9.20	723	98.3	778	42.9	2.16	0.285	62.9	13.3	60.5	9.58	194	0.161	9670
230 × 75 × 20 × 2.55	7.97	10.2	793	107	854	46.7	2.14	0.284	69.0	14.5	66.6	10.4	212	0.218	10600
230 × 75 × 20 × 3.15	9.72	12.4	956	126	1030	55.2	2.11	0.280	83.2	17.2	80.6	12.3	253	0.404	12600
240 × 75 × 20 × 1.60	5.23	6.66	512	72.1	612	32.1	2.19	0.272	47.6	9.72	45.7	7.10	147	0.056	7680
240 × 75 × 20 × 2.00	6.48	8.26	703	87.5	752	38.9	2.17	0.270	58.6	11.8	56.5	8.62	180	0.109	9390
240 × 75 × 20 × 2.30	7.41	9.44	799	98.3	854	43.8	2.16	0.269	66.6	13.3	64.3	9.70	203	0.165	10600
240 × 75 × 20 × 2.55	8.17	10.4	878	107	937	47.7	2.14	0.267	73.1	14.5	70.7	10.6	222	0.223	11600
240 × 75 × 20 × 3.15	9.96	12.7	1060	126	1130	56.4	2.11	0.264	88.2	17.2	85.7	12.5	264	0.414	13900
250 × 75 × 20 × 1.60	5.35	6.82	629	72.1	669	32.7	2.19	0.257	50.3	9.72	48.5	7.17	153	0.058	8400
250 × 75 × 20 × 2.00	6.64	8.46	775	87.5	822	39.7	2.17	0.255	62.0	11.8	59.8	8.71	187	0.112	10300
250 × 75 × 20 × 2.30	7.59	9.66	881	98.3	934	44.7	2.15	0.353	70.5	13.3	68.2	9.81	212	0.169	11600
250 × 75 × 20 × 2.55	8.37	10.7	967	107	1025	48.7	2.14	0.252	77.4	14.5	75.0	10.7	231	0.229	12700
250 × 75 × 20 × 3.15	10.2	13.0	1170	126	1235	57.5	2.10	0.249	93.3	17.2	90.8	12.6	276	0.428	15200
260 × 75 × 20 × 1.60	5.98	6.98	697	72.1	729	33.3	2.18	0.243	53.1	9.72	51.3	7.24	160	0.059	9160
260 × 75 × 20 × 2.00	6.80	8.66	850	87.5	897	40.5	2.16	0.241	65.4	11.8	63.3	8.80	195	0.114	11200
260 × 75 × 20 × 2.30	7.77	9.90	967	98.3	1020	45.5	2.14	0.279	74.4	13.3	72.1	9.91	221	0.173	12700
260 × 75 × 20 × 2.55	8.57	10.9	1060	107	1120	49.6	2.13	0.238	81.7	14.5	79.3	10.8	241	0.234	13900
260 × 75 × 20 × 3.15	10.5	13.3	1280	126	1350	58.6	2.10	0.235	98.6	17.2	96.1	12.7	287	0.435	16600
270 × 75 × 20 × 1.60	5.60	7.14	755	72.1	793	33.9	2.18	0.230	55.9	9.72	54.1	7.31	166	0.061	9960
270 × 75 × 20 × 2.00	6.95	8.86	930	87.5	976	41.2	2.16	0.228	68.9	11.8	66.8	8.89	203	0.117	12200

(*Continued*)

TABLE 10 LIPPED ZED SECTIONS — EQUAL FLANGES — *Contd*

Designation / Dimensions	Mass/ Unit Length	Area of Section	Moment of Inertia				Radius of Gyration	Angle	Section Modulus				Product Moment of Inertia	Torsion Constant	Warping Constant
$h \times b \times c \times t$ mm	M kg/m	A cm^2	I_{xx} cm^4	I_{yy} cm^4	I_{uu} cm^4	I_{vv} cm^4	$Min\text{-}R_{vv}$ cm	$\tan\theta$	Z_{xx} cm^3	Z_{yy} cm^3	Z_{uu} cm^3	Z_{vv} cm^3	I_{xy} cm^4	J cm^4	C_w cm^6
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
270 × 75 × 20 × 2.30	7.95	10.1	1060	98.3	1110	46.3	2.14	0.227	78.3	13.3	76.1	10.0	229	0.177	13800
270 × 75 × 20 × 2.55	8.77	11.2	1160	107	1220	50.5	2.12	0.225	86.1	14.5	83.7	10.9	251	0.240	15100
270 × 75 × 20 × 3.15	10.7	13.6	1400	126	1470	59.7	2.09	0.222	104.0	17.2	102	12.9	299	0.446	18100
280 × 75 × 20 × 1.60	5.73	7.30	823	72.1	861	34.4	2.17	0.219	58.8	9.72	57.0	7.38	172	0.062	10800
280 × 75 × 20 × 2.00	7.11	9.06	1010	87.5	1060	41.8	2.15	0.217	72.5	11.8	70.4	8.97	211	0.120	13200
280 × 75 × 20 × 2.30	8.13	10.4	1150	98.3	1200	47.1	2.13	0.215	82.4	13.3	80.2	10.1	238	0.181	15000
280 × 75 × 20 × 2.55	8.97	11.4	1270	106.9	1320	51.3	2.12	0.214	90.5	14.5	88.3	11.0	260	0.245	16400
280 × 75 × 20 × 3.15	11.0	14.0	1530	126	1600	60.6	2.08	0.211	109	17.2	107	13.0	310	0.456	19600
290 × 75 × 20 × 1.60	5.86	7.46	895	72.1	932	35.0	2.16	0.208	61.7	9.72	59.2	7.44	179	0.063	11700
290 × 75 × 20 × 2.00	7.27	9.26	1100	87.5	1150	42.5	2.14	0.206	76.1	11.8	74.0	9.04	218	0.122	14300
290 × 75 × 20 × 2.30	8.37	10.6	1250	98.3	1310	47.8	2.13	0.205	86.5	13.3	84.4	10.2	247	0.185	16200
290 × 75 × 20 × 2.55	9.17	11.7	1380	107	1430	52.1	2.11	0.203	95.1	14.5	92.9	11.1	270	0.251	17700
290 × 75 × 20 × 3.15	11.2	14.3	1670	126	1740	61.6	2.08	0.200	115	17.2	113	13.1	322	0.466	21200
300 × 75 × 20 × 1.60	5.98	7.62	970	72.1	1010	35.5	2.10	0.198	64.7	9.72	62.9	7.50	185	0.065	12600
300 × 75 × 20 × 2.00	7.42	9.46	1200	87.5	1240	43.1	2.14	0.196	79.81	11.6	77.8	9.11	226	0.125	15400
300 × 75 × 20 × 2.30	8.49	10.8	1360	98.3	1410	48.5	2.12	0.195	90.8	13.3	88.7	10.3	256	0.189	17400
300 × 75 × 20 × 2.55	9.37	11.9	1500	107	1550	52.9	2.10	0.194	99.7	14.5	97.6	11.2	279	0.256	19100
300 × 75 × 20 × 3.15	11.5	14.6	1810	126.0	1870	62.5	2.07	0.191	121	17.2	118	13.2	333	0.477	22800

TABLE 11 PROPERTIES AND DIMENSIONS OF 90° CORNER



THICKNESS t mm	RADIUS R_i mm	REDUCED THICKNESS $t_{red.}$ mm	MASS/ UNIT LENGTH m kg/m	AREA OF SECTION A mm^2	MOMENT OF INERTIA $I_{xx} = I_{yy}$ mm^4	CENTRE OF GRAVITY $C_x = C_y$ mm
1	2	3	4	5	6	7
1.25	1.87	1.16	0.035	4.45	2.54	1.52
1.60	2.40	1.48	0.057	7.29	6.82	1.94
2.00	3.00	1.85	0.089	11.4	16.7	2.42
2.30	3.45	2.13	0.118	15.1	29.1	2.79
2.55	3.82	2.36	0.145	18.5	44.01	3.09
3.15	4.72	2.91	0.222	28.3	102	3.82
4.00	6.00	3.70	0.358	45.6	266	4.85
5.00	7.50	4.62	0.559	71.2	65.1	6.06
6.00	9.00	5.55	0.805	102	1350	7.27

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act,* 1986 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Handbook' and 'Standards : Monthly Additions'.

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones : 323 01 31, 323 94 02, 323 33 75

Telegrams: Manaksanstha
(Common to all offices)

Regional Offices: Telephone

Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg
NEW DELHI 110002 — 323 76 17, 323 38 41

Eastern : 1/14 C. I. T. Scheme VII M, V. I. P. Road, Maniktola
CALCUTTA 700054 — 337 84 99, 337 85 61, 337 86 26, 337 86 62

Northern : SCO 335-336, Sector 34-A, CHANDIGARH 160022 — 60 38 43, 60 20 25

Southern : C. I. T. Campus, IV Cross Road, CHENNAI 600113 — 235 02 16, 235 04 42, 235 15 19, 235 23 15

Western : Manakalaya, E9 MIDC, Marol, Andheri (East)
MUMBAI 400093 — 832 92 95, 832 78 58, 832 78 91, 832 78 92

Branches : AHMADABAD. BANGALORE. BHOPAL. BHUBANESHWAR. COIMBATORE. FARIDABAD. GHAZIABAD. GUWAHATI. HYDERABAD. JAIPUR. KANPUR. LUCKNOW. NAGPUR. PATNA. PUNE. THIRUVANANTHAPURAM.

Printed at New India Printing Press, Khurja, India