



DEAS 134: 2025

ICS 77.140.75

HS 7216.91.00, 7216.99.00

DRAFT EAST AFRICAN STANDARD

Cold formed structural steel sections — Specification

EAST AFRICAN COMMUNITY

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Foreword

Development of the East African Standards has been necessitated by the need for harmonizing requirements governing quality of products and services in the East African Community. It is envisaged that through harmonized standardization, trade barriers that are encountered when goods and services are exchanged within the Community will be removed.

The Community has established an East African Standards Committee (EASC) mandated to develop and issue East African Standards (EAS). The Committee is composed of representatives of the National Standards Bodies in Partner States, together with the representatives from the public and private sector organizations in the community.

East African Standards are developed through Technical Committees that are representative of key stakeholders including government, academia, consumer groups, private sector and other interested parties. Draft East African Standards are circulated to stakeholders through the National Standards Bodies in the Partner States. The comments received are discussed and incorporated before finalization of standards, in accordance with the principles and procedures for development of East African Standards.

East African Standards are subject to review, to keep pace with technological advances. Users of the East African Standards are therefore expected to ensure that they always have the latest versions of the standards they are implementing.

The committee responsible for this document is Technical Committee EASC/TC 035, *Steel and steel products*.

This fourth edition cancels and replaces the third edition (EAS 134:2019), which has been technically revised.

Attention is drawn to the possibility that some of the elements of this document may be subject of patent rights. EAC shall not be held responsible for identifying any or all such patent rights.

Cold formed structural steel sections — Specification

1 Scope

This Final Draft East African Standard specifies requirements and sectional properties of cold formed structural steel sections of thickness of 1 mm to 8 mm for use in structural and general engineering applications.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 148-1, *Metallic materials — Charpy pendulum impact test — Part 1: Test method*

ISO 377, *Steel and steel products — Location and preparation of samples and test pieces for mechanical testing*

ISO 404, *Steel and steel products — General technical delivery requirements*

ISO 1461, *Hot dip galvanized coatings on fabricated iron and steel articles — Specifications and test methods*

ISO 3575, *Continuous hot-dip zinc-coated and zinc-iron alloy-coated carbon steel sheet of commercial and drawing qualities*

ISO 4998, *Steel sheet, zinc-coated and zinc-iron alloy-coated by the continuous hot-dip process, of structural quality*

ISO 6892-1, *Metallic materials — Tensile testing — Part 1: Method of test at room temperature*

ISO 8492, *Metallic materials — Tube — Flattening test*

ISO 8493, *Metallic materials — Tube — Drift-expanding test*

ISO 9364, *Steel sheet, 55 % aluminium-zinc alloy-coated by the continuous hot-dip process, of commercial, drawing and structural qualities*

ISO 10799-2, *Cold-formed welded structural hollow sections of non-alloy and fine grain steels — Part 2: Dimensions and sectional properties*

ISO 12633-1, *Hot-finished structural hollow sections of non-alloy and fine grain steels — Part 1: Technical delivery conditions.*

ISO 12633-2, *Hot-finished structural hollow sections of non-alloy and fine grain steels — Part 2: Dimensions and sectional properties*

ISO 12944-5, *Paints and varnishes — Corrosion protection of steel structures by protective paint systems Part 5: Protective paint systems*

ISO 14347, *Fatigue — Design procedure for welded hollow-section joints — Recommendations*

ISO 16172, *Steel sheet, metallic-coated by the continuous hot-dip process for corrugated steel pipe*

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at <http://www.iso.org/obp>

— IEC Electropedia: available at <https://www.electropedia.org>

4 Symbols and/or abbreviated terms

The following symbols shall be used. Units for dimensions are in millimetres and those for section properties in centimetres.

— t	section thickness	mm
— p	distance from edge to section centre of gravity	- cm
— A	sectional area	- cm ²
— Z	section modulus of section I/p	- cm ³
— I	second moment of area	- cm ⁴
— r	radius of gyration of section $\sqrt{I/A}$	- cm
— x, y	with reference to x or y axis	
— w	mass per linear metre	- kg/m
— L	length	- m.

5 Dimensions and tolerances

5.1 Dimensions and section properties

5.1.1 Dimensions and section properties shall be as given in the relevant tables and figures in Annex A.

5.1.2 Other dimensions and their sectional properties may be produced according to ISO 10799-2 or ISO 12633-2.

5.2 Tolerances

Tolerances for characteristic properties shall be as given in Table 1.

Table 1 — Tolerances for characteristic properties

Characteristic	Tolerance
Outside dimension ^a	±1.5 mm or 2 %, whichever is less
Deviation from straightness	0.17 % of total length
Squareness of corners	90° ± 2°
Twist	Not to exceed 2 mm ± 0.5 mm per metre
Concavity/convexity	Maximum 0.8 % or 0.5 mm whichever is less for square and rectangular hollow sections
Outside bend radii for right angle bends	- If thickness is less than 6 mm, tolerance is between 1.5 t to 2.5 t - If thickness is between 6 mm to 8 mm, tolerance is between 2 t to 3 t
Length (6 m): - Exact - Standard	0 mm and +10 mm 0 mm and +50 mm
Thickness	±3 % for 1 mm ±7.5 % for above 1 mm
Mass per metre for 1 mm thick	±3 %
Mass per metre for above 1 mm thick	±6.0 %
Deviation from out of roundness	- For D/T ratio ≤ 100: ±2 % - For D/T ratio > 100: ±2 % by agreement
^a This tolerance shall be measured at a distance of not less than 100 mm from the end of the section.	

5.3 Measurement

5.3.1 General

All external dimensions including out-of-roundness shall be measured at a distance from the end of the hollow section of not less than Diameter (D) for circular sections, Width (B) for square sections or Height (H) for rectangular sections, with a minimum of 100 mm.

5.3.2 Outside dimension

When inspecting circular hollow sections, the D shall be measured directly. The limiting cross-sectional positions for measuring B and H are shown in Figure 1, and shall be in accordance with Annex A. Formulae for calculation of sectional properties of steel hollow sections shall be in accordance with ISO 10799-2 and ISO 12633-2. The cross section area of rectangular and square section shall be calculated as follows:

$$A = \frac{1}{10^2} [2T(B + H - 2T) - (4 - \pi)(Ro^2 - Ri^2)]$$

where

T thickness of the section in millimeters

H, B side lengths in millimeters

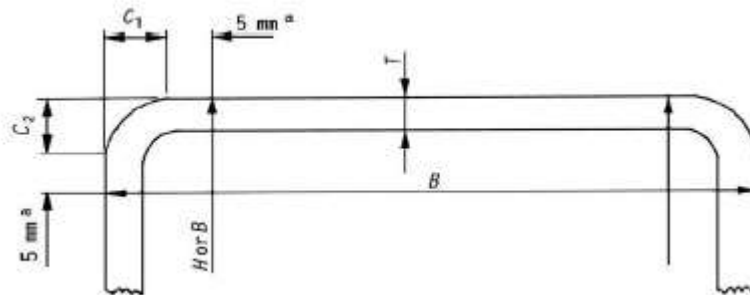
Ro outside radius in millimeters

Ri inside radius in millimeters

5.3.3 Thickness

The thickness (t) shall be measured at a position not less than 2t from the weld. The limiting cross-sectional positions for measuring the thickness of square and rectangular sections are shown in Figure 1.

NOTE Thickness is normally measured within a distance of half of the outside diameter or half of the length of the longer side from the end of the section.



Key

C₁ Concavity

C₂ Convexity

T Thickness (t)

^a This dimension is a maximum when measuring B or H and a minimum when measuring t.

Figure 1 — Limiting cross-sectional positions for measuring the dimensions B, H and t for square or rectangular sections

5.3.4 Out-of-roundness

The out-of-roundness, O, of a circular hollow section shall be calculated as follows:

$$\frac{D_{max} - D_{min}}{D} \times 100 \%$$

where

D is the nominal outside diameter of a circular hollow section in millimeters;

D_{max} is the maximum outside diameter in millimeters;

D_{min} is the minimum outside diameter in millimeters.

5.3.5 Concavity and convexity

The concavity (C_1) and convexity (C_2) of the sides of the square or rectangular hollow section shall be measured as shown in Figure 2.

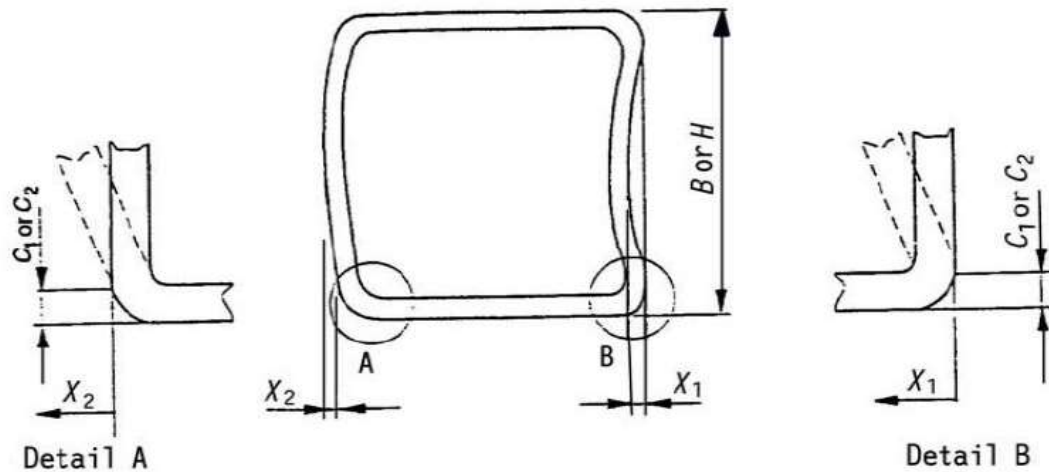


Figure 2 — Measurement of concavity/convexity of square or rectangular hollow sections

C_1 shall be calculated as follows:

$$C_1 = \frac{X_1}{B} \times 100 \%$$

or

$$C_1 = \frac{X_1}{H} \times 100 \%$$

where

X_1 is the measured value in millimeters of inward deviation from the normal shape

C_2 shall be calculated as follows:

$$C_2 = \frac{X_2}{B} \times 100 \%$$

or

$$C_2 = \frac{X_2}{H} \times 100 \%$$

where

X_2 is the measured value in millimeters of outward deviation from the normal shape;

B and H are the dimensions of the sides containing the concavity (C_1) or convexity (C_2).

5.3.6 Squareness

Squareness of the sides of a square or rectangular hollow section shall be measured as difference between 90° and θ as shown in Figure 3.

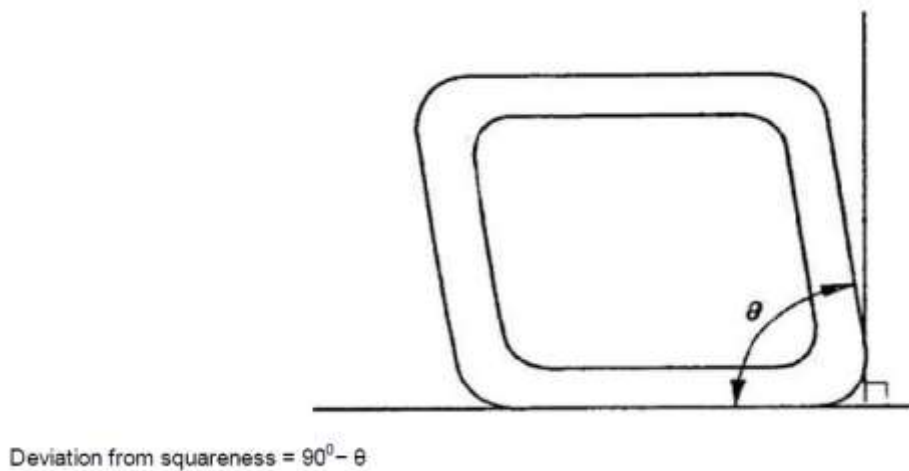


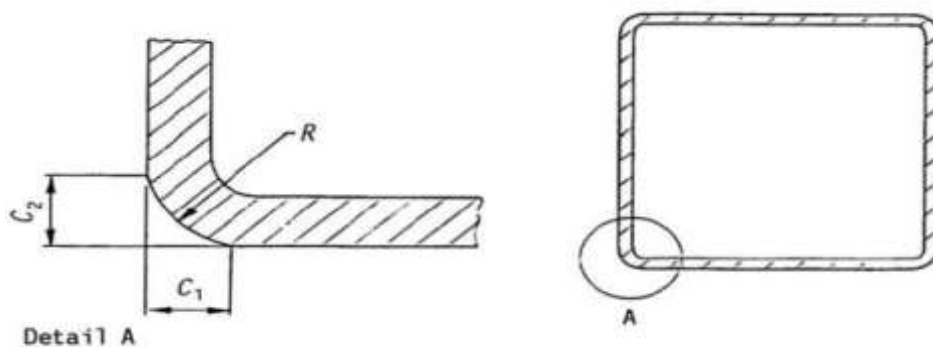
Figure 3 — Squareness of sides of square or rectangular hollow sections

5.3.7 External corner profile

5.3.7.1 The external corner profile of a square or rectangular hollow section shall be measured in accordance with 5.3.7.2 or 5.3.7.3.

5.3.7.2 The corner arc shall be measured with a radius gauge.

5.3.7.3 The distance between the intersection of the flat side and the corner arc and the intersection of the projections of the flat sides to the corner C_1 and C_2 in Figure 4 shall be measured.



Key

R is the radius of the curvature

Figure 4 — Outside corner profile of square or rectangular hollow sections

5.3.8 Twist

5.3.8.1 The twist (V) in a square or rectangular hollow section shall be determined in accordance with 5.3.8.2 or 5.3.8.3.

5.3.8.2 The hollow section shall be placed on a horizontal surface with one side at one end pressed against the surface. At the opposite end of the hollow section, the difference in height of the two lower corners from a horizontal surface, (V), as shown in Figure 5, shall be measured.

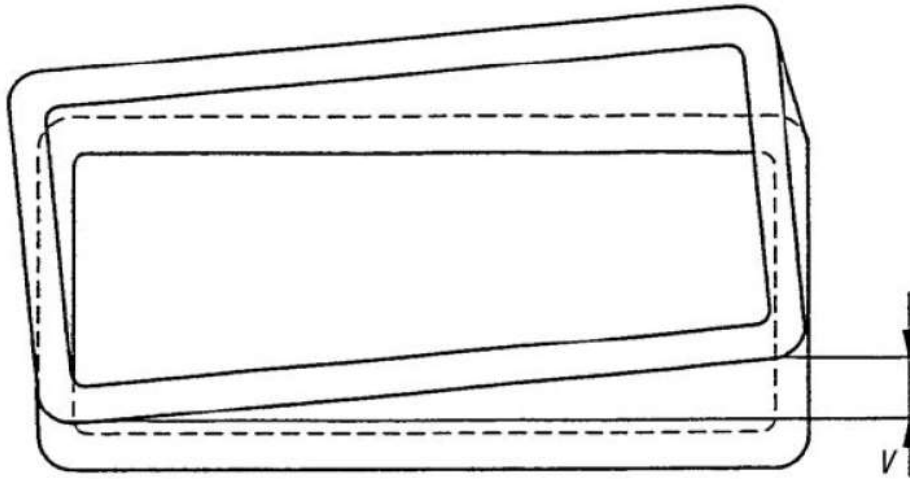


Figure 5 — Twist of square or rectangular hollow sections

5.3.8.3 The twist shall be measured with a spirit level and micrometre gauge (screw). The reference length of the spirit level shall be the distance between the intersection of the flat sides and the corner arcs (Figure 6). The twist (V) is the difference between the values V_1 (Figure 6) measured at each end of the section.

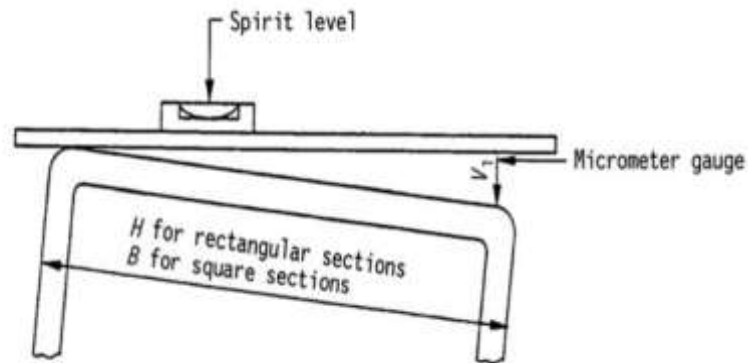


Figure 6 — Measurement of twist

5.3.9 Straightness

The deviation from straightness (e) of total length (L) of a hollow section shall be measured at the point of maximum departure of the hollow section from a straight line connecting its two ends as shown in Figure 7.

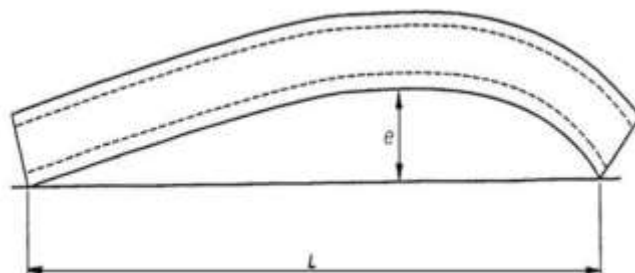


Figure 7 — Measurement of deviation from straightness

The percentage deviation from straightness shall be calculated as follows:

$$\frac{e}{L} \times 100\%$$

6 Compound sections

6.1 Compound sections may be formed by suitably connecting two or more simple sections. For example, an 'I' section can be made from two channels back-to-back, a tube from two inwardly lipped channels lip-to-lip, a 'T' from two angles, etc. Methods of joining sections shall be as specified in ISO 14347.

6.2 Section properties of compound sections may be calculated using the properties of simple sections.

6.3 Compound sections shall be flush at matching joints within 2.0 mm.

7 Material requirements

7.1 Grade designation

The designation of the grades of material shall be based on minimum permissible yield stress and shall be as given in Table 2.

Table 2 — Grade designation

Yield stress N/mm ² , min.	Designation of grade
210	210
250	250
360	360

7.2 Chemical composition

The results of ladle chemical analysis of steel from which a hollow section is manufactured shall comply with appropriate limits given in Table 3. For grade 360, it shall be permissible to add suitable grain-refining elements to achieve the minimum specified tensile stress, but the total content of these elements shall not exceed 0.15 %.

Table 3 — Ladle chemical analysis limits

Grade of steel	Content %, max.		
	Carbon	Phosphorous	Sulphur
210	0.20	0.05	0.05
250	0.25	0.06	0.06
360	-	-	0.04

7.3 Mechanical properties

The mechanical properties obtained from test samples taken from the hollow section in accordance with ISO 6892-1, shall comply with the requirements given in Table 4. If other grades of steel are used, their mechanical properties shall be as agreed upon between the purchaser and the manufacturer.

Table 4 — Tensile test requirements

Grade of steel	Yield stress N/mm ² , min.	Ultimate tensile strength N/mm ² , min.	Elongation as a proportion of gauge length %, min.
210	210	340	24
250	250	420	22
360	360	480	20

7.4 Coating properties (If applicable)

7.4.1 The cold formed steel sections may be supplied with or without coatings. When sections are supplied with coatings, sections shall be hot dip galvanized, aluminium zinc coated, pre-painted or in combination.

7.4.2 When sections are hot dip galvanized, they shall comply with ISO 1461, ISO 3575 or ISO 4998.

7.4.3 When sections are aluminium zinc coated, they shall comply with ISO 16172 or ISO 9364.

7.4.4 When sections are pre-painted, they shall comply with ISO 12944-5.

8 Test methods

8.1 Tensile tests

Tensile test shall be done in accordance with ISO 6892-1.

8.2 Impact tests

When requested, impact test shall be done in accordance with ISO 148-1 and shall be assessed in accordance with ISO 404.

8.3 Flattening tests

Flattening tests shall be done in accordance with ISO 8492 and shall show no sign of cracking.

8.4 Flare tests (Drift-expanding tests)

Flare tests (Drift-expanding tests) shall be done in accordance with ISO 8493 and shall not crack or show any other defect.

8.5 Test results

Results shall be rounded to the following precisions:

- a) strength values in Mpa to the nearest whole number;
- b) elongation in % to the nearest whole number;

- c) outside dimension and thickness in mm to the nearest two decimal points; and
- d) mass per unit length in Kg/m to the nearest 3 decimal points.

9 Marking

Each piece shall be indelibly and legibly marked at least once per 6-m length with the following information:

- a) manufacturer's name and/or registered trademark;
- b) outside dimension in millimetres;
- c) nominal thickness in millimetres;
- d) steel grade;
- e) country of origin, and
- f) coating information (if applicable).

10 Sampling

10.1 At least one sample shall be selected from the following batch sizes:

- a) a 20-tonne or less batch of sections having outside diameter of less than 90 mm; and
- b) a batch of less than 40 tonnes for all other sections.

10.2 If the test fails, two more samples shall be drawn from the batch and tested. If one or both test specimens re-tested fail, the whole batch shall be deemed not to have complied with this standard unless all sections in the batch are tested individually.

10.3 Location of samples and test pieces shall be done in accordance with ISO 377, ISO 10799-1 or ISO 12633-1.

Annex A (normative)

Section properties

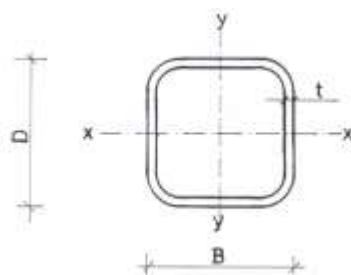


Figure A.1 — Square hollow sections

Formula for dimensions and properties of square hollow sections are provided in ISO 10799-2.

Table A.1 — Dimensions and properties for cold formed square hollow sections

Size, B x D mm	Thickne ss, t mm	Cross- sectional area, A cm ²	Mass per metre run, w kg/m	Second moment of area, $I_x = I_y$ cm ⁴	Radius of gyration, $R_x = R_y$ cm	Section elastic modulus, $Z_x = Z_y$ cm ³
10 x 10	1.2	0.39	0.30	0.047129	0.349722	0.09
10 x 10	1.5	0.45	0.35	0.050548	0.334382	0.10
12 x 12	1.0	0.41	0.33	0.080793	0.441622	0.13
12 x 12	1.2	0.48	0.38	0.089707	0.431708	0.15
12 x 12	1.5	0.57	0.45	0.099303	0.416629	0.17
14 x 14	1.0	0.49	0.39	0.135455	0.523503	0.19
14 x 14	1.2	0.58	0.45	0.152281	0.513581	0.22
14 x 14	1.5	0.69	0.54	0.172098	0.498665	0.25
16 x 16	1.0	0.57	0.45	0.210312	0.605170	0.26
16 x 16	1.2	0.67	0.53	0.238689	0.595389	0.30
16 x 16	1.5	0.81	0.64	0.273736	0.580584	0.34
16 x 16	2.0	1.02	0.80	0.313845	0.555506	0.39
18 x 18	1.2	0.77	0.60	0.352772	0.677157	0.39
18 x 18	1.5	0.93	0.73	0.409015	0.662433	0.45
18 x 18	2.0	1.18	0.92	0.478445	0.637559	0.53
20 x 20	1.0	0.73	0.58	0.433771	0.768609	0.43
20 x 20	1.2	0.87	0.68	0.498369	0.758898	0.50

20 x 20	1.5	1.05	0.83	0.582737	0.744236	0.58
20 x 20	2.0	1.34	1.05	0.692186	0.719514	0.69
25 x 25	1.0	0.93	0.73	0.884200	0.972840	0.71
25 x 25	1.2	1.11	0.87	1.025440	0.963182	0.82
25 x 25	1.5	1.35	1.06	1.216722	0.948623	0.97
25 x 25	2.0	1.74	1.36	1.483530	0.924152	1.19
25 x 25	2.5	2.09	1.64	1.689908	0.899393	1.35
25 x 25	3.0	2.41	1.89	1.840962	0.874306	1.47
30 x 30	1.0	1.13	0.89	1.571411	1.177033	1.05
30 x 30	1.2	1.35	1.06	1.833477	1.167408	1.22
30 x 30	1.5	1.65	1.30	2.195967	1.152914	1.46
30 x 30	2.0	2.14	1.68	2.722004	1.128595	1.81
30 x 30	2.5	2.59	2.03	3.155984	1.104055	2.10
30 x 30	3.0	3.01	2.36	3.504194	1.079271	2.34
40 x 40	1.0	1.53	1.20	3.856181	1.585365	1.93
40 x 40	1.2	1.83	1.43	4.532452	1.575779	2.27
40 x 40	1.5	2.25	1.77	5.490241	1.561361	2.75
40 x 40	2.0	2.94	2.31	6.940341	1.537218	3.47
40 x 40	2.5	3.59	2.82	8.215307	1.512926	4.11
40 x 40	3.0	4.21	3.30	9.323785	1.488472	4.66
40 x 40	4.0	5.35	4.20	11.074982	1.439028	5.54
50 x 50	1.2	2.31	1.81	9.075294	1.984099	3.63
50 x 50	1.5	2.85	2.24	11.065556	1.969724	4.43
50 x 50	2.0	3.74	2.93	14.147198	1.945680	5.66
50 x 50	2.5	4.59	3.60	16.944192	1.921523	6.78
50 x 50	3.0	5.41	4.25	19.467546	1.897246	7.79
50 x 50	4.0	6.95	5.45	23.736481	1.848303	9.49
60 x 60	1.5	3.45	2.71	19.521915	2.378047	6.51
60 x 60	2.0	4.54	3.56	25.142576	2.354066	8.38
60 x 60	2.5	5.59	4.39	30.342640	2.329994	10.11
60 x 60	3.0	6.61	5.19	35.135477	2.305827	11.71
60 x 60	4.0	8.55	6.71	43.552060	2.257190	14.52
75 x 75	2.5	7.09	5.56	61.383242	2.942582	16.37
75 x 75	3.0	8.41	6.60	71.620192	2.918520	19.10
75 x 75	4.0	10.95	8.59	90.189328	2.870166	24.05
75 x 75	5.0	13.36	10.48	106.328271	2.821487	28.35
75 x 75	6.0	15.63	12.27	120.165935	2.772455	32.04
100 x 100	3.0	11.41	8.96	177.048901	3.939448	35.41
100 x 100	4.0	14.95	11.73	226.355174	3.891359	45.27
100 x 100	5.0	18.36	14.41	271.107073	3.843045	54.22

100 x 100	6.0	21.63	16.98	311.480730	3.794492	62.30
100 x 100	8.0	27.79	21.82	379.783697	3.696607	75.96
120 x 120	3.0	13.81	10.84	312.350633	4.756094	52.06
120 x 120	4.0	18.15	14.25	402.281212	4.708131	67.05
120 x 120	5.0	22.36	17.55	485.482240	4.659988	80.91
120 x 120	6.0	26.43	20.75	562.167626	4.611654	93.69
125 x 125	3.0	14.41	11.31	354.503672	4.960248	56.72
125 x 125	4.0	18.95	14.87	457.234021	4.912310	73.16
125 x 125	5.0	23.36	18.33	552.624938	4.864199	88.42
125 x 125	6.0	27.63	21.69	640.899775	4.815908	102.54
125 x 125	8.0	35.79	28.10	775.342601	4.654253	124.05
150 x 150	4.0	22.95	18.01	807.825868	5.933145	107.71
150 x 150	5.0	28.36	22.26	982.131865	5.885164	130.95
150 x 150	6.0	33.63	26.40	1 145.923070	5.837039	152.79
150 x 150	8.0	43.24	33.95	1 411.866334	5.714180	188.25
175 x 175	4.0	26.95	21.15	1 303.130714	6.953916	148.93
175 x 175	5.0	33.36	26.18	1 590.877854	6.906026	181.81
175 x 175	6.0	39.63	31.11	1 864.050615	6.858015	213.03
175 x 175	8.0	51.79	40.66	2 325.526067	6.700799	265.77
200 x 200	4.0	30.95	24.29	1 968.148561	7.974648	196.81
200 x 200	5.0	38.36	30.11	2 410.112906	7.926824	241.01
200 x 200	6.0	45.63	35.82	2 832.782410	7.878896	283.28
200 x 200	8.0	59.24	46.51	3 566.321801	7.758946	356.63
250 x 250	4.0	38.95	30.57	3 907.323254	10.016043	312.59
250 x 250	5.0	48.36	37.96	4 805.050198	9.968310	384.40
250 x 250	6.0	57.63	45.24	5 672.058750	9.920496	453.76
250 x 250	8.0	75.24	59.06	7 229.321267	9.802218	578.35

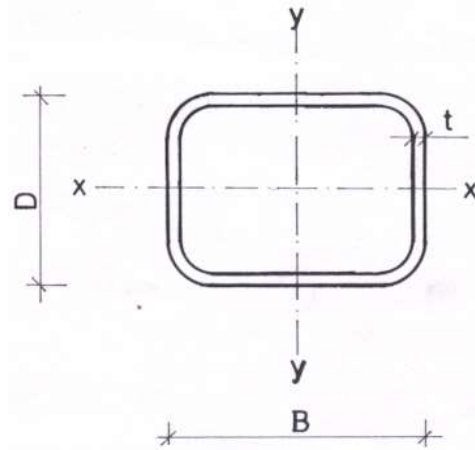


Figure A.2 — Rectangular hollow section

Formula for dimensions and properties of rectangular hollow sections are provided in ISO 10799-2.

Table A.2 – Dimensions and properties for cold formed rectangular hollow sections

Size, B x D mm	Thickness, t mm	Cross Sectional Area, A cm ²	Mass per metre run, w kg/m	Second moment of area		Radius of gyration		Elastic section modulus	
				Major axis x-x I_x cm ⁴	Minor axis y-y I_y cm ⁴	Major axis x-x R_x cm	Minor axis y-y R_y cm	Major axis x-x Z_x cm ³	Minor axis y-y Z_y cm ³
30 x 10	1.0	0.73	0.57	0.730	0.125	1.000	0.413	0.487	0.249
30 x 10	1.2	0.87	0.68	0.838	0.141	0.984	0.403	0.558	0.281
30 x 10	1.5	1.05	0.83	0.976	0.160	0.963	0.390	0.651	0.320
30 x 20	1.0	0.93	0.73	1.151	0.614	1.110	0.811	0.767	0.614
30 x 20	1.2	1.11	0.87	1.336	0.711	1.099	0.802	0.890	0.711
30 x 20	1.5	1.35	1.06	1.586	0.840	1.083	0.788	1.057	0.840
30 x 20	2.0	1.74	1.36	1.937	1.018	1.056	0.765	1.291	1.018
35 x 15	1.0	0.93	0.73	1.390	0.370	1.220	0.630	0.790	0.490
35 x 15	1.2	1.11	0.87	1.611	0.421	1.207	0.617	0.921	0.562
35 x 15	1.5	1.35	1.06	1.911	0.494	1.189	0.604	1.092	0.658
35 x 15	2.0	1.74	1.36	2.327	0.589	1.157	0.582	1.330	0.785
35 x 15	3.0	2.41	1.89	2.867	0.699	1.091	0.539	1.639	0.932
35 x 25	1.0	1.13	0.89	1.967	1.172	1.317	1.017	1.124	0.938
35 x 25	1.2	1.35	1.06	2.297	1.366	1.307	1.008	1.312	1.092
35 x 25	1.5	1.65	1.30	2.753	1.631	1.291	0.994	1.573	1.305
35 x 25	2.0	2.14	1.68	3.417	2.014	1.265	0.971	1.953	1.611
35 x 25	3.0	3.01	2.36	4.408	2.571	1.210	0.925	2.519	2.057

Size, B x D mm	Thickness, t mm	Cross Sectional Area, A cm ²	Mass per metre run, w kg/m	Second moment of area		Radius of gyration		Elastic section modulus	
				Major axis x-x I _x cm ⁴	Minor axis y-y I _y cm ⁴	Major axis x-x R _x cm	Minor axis y-y R _y cm	Major axis x-x Z _x cm ³	Minor axis y-y Z _y cm ³
35 x 30	1.0	1.23	0.97	2.260	1.780	1.350	1.200	1.290	1.190
35 x 30	1.2	1.47	1.15	2.640	2.082	1.342	1.192	1.508	1.388
35 x 30	1.5	1.80	1.41	3.174	2.501	1.327	1.178	1.814	1.667
35 x 30	2.0	2.34	1.83	3.962	3.115	1.302	1.154	2.264	2.076
35 x 30	3.0	3.31	2.60	5.178	4.053	1.251	1.107	2.959	2.702
40 x 10	1.0	0.93	0.73	1.574	0.165	1.298	0.421	0.787	0.331
40 x 10	1.2	1.11	0.87	1.822	0.187	1.284	0.412	0.911	0.375
40 x 10	1.5	1.35	1.06	2.153	0.215	1.262	0.399	1.077	0.430
40 x 10	2.0	1.74	1.36	2.604	0.247	1.224	0.377	1.302	0.494
40 x 20	1.0	1.13	0.89	2.335	0.795	1.435	0.837	1.167	0.795
40 x 20	1.2	1.35	1.06	2.725	0.923	1.423	0.828	1.363	0.923
40 x 20	1.5	1.65	1.30	3.266	1.097	1.406	0.815	1.633	1.097
40 x 20	2.0	2.14	1.68	4.050	1.343	1.377	0.793	2.025	1.343
40 x 20	3.0	3.01	2.36	5.208	1.685	1.316	0.748	2.604	1.685
40 x 25	1.0	1.23	0.97	2.715	1.316	1.483	1.033	1.358	1.053
40 x 25	1.2	1.47	1.15	3.177	1.536	1.472	1.024	1.589	1.229
40 x 25	1.5	1.80	1.41	3.822	1.839	1.456	1.010	1.911	1.471
40 x 25	2.0	2.34	1.83	4.772	2.279	1.429	0.988	2.386	1.823
40 x 25	3.0	3.31	2.60	6.237	2.937	1.373	0.942	3.118	2.349
40 x 35	1.2	1.71	1.34	4.081	3.325	1.547	1.396	2.040	1.900
40 x 35	1.5	2.10	1.65	4.934	4.017	1.532	1.382	2.467	2.295
40 x 35	2.0	2.74	2.15	6.218	5.053	1.507	1.359	3.109	2.887
40 x 35	3.0	3.91	3.07	8.295	6.719	1.457	1.311	4.147	3.839
45 x 15	1.2	1.35	1.06	3.089	0.536	1.515	0.631	1.373	0.715
45 x 15	1.5	1.65	1.30	3.696	0.631	1.496	0.618	1.643	0.841
45 x 30	1.2	1.71	1.34	4.816	2.580	1.681	1.230	2.141	1.720
45 x 30	1.5	2.10	1.65	5.826	3.111	1.665	1.216	2.589	2.074
45 x 30	2.0	2.74	2.15	7.345	3.900	1.638	1.194	3.264	2.600
45 x 30	3.0	3.91	3.07	9.804	5.151	1.584	1.148	4.358	3.434
50 x 10	1.0	1.13	0.89	2.885	0.206	1.595	0.426	1.154	0.412
50 x 10	1.2	1.35	1.06	3.359	0.234	1.580	0.417	1.343	0.468
50 x 10	1.5	1.65	1.30	4.007	0.270	1.557	0.404	1.603	0.539
50 x 10	2.0	2.14	1.68	4.926	0.312	1.518	0.382	1.970	0.624
50 x 10	3.0	3.01	2.36	6.196	0.350	1.435	0.341	2.478	0.699
50 x 15	1.2	1.47	1.15	4.073	0.593	1.667	0.636	1.629	0.791
50 x 15	1.5	1.80	1.41	4.889	0.699	1.647	0.623	1.956	0.933

Size, B x D mm	Thickness, t mm	Cross Sectional Area, A cm ²	Mass per metre run, w kg/m	Second moment of area		Radius of gyration		Elastic section modulus	
				Major axis x-x I _x cm ⁴	Minor axis y-y I _y cm ⁴	Major axis x-x R _x cm	Minor axis y-y R _y cm	Major axis x-x Z _x cm ³	Minor axis y-y Z _y cm ³
50 x 15	2.0	2.34	1.83	6.079	0.844	1.613	0.601	2.431	1.126
50 x 15	3.0	3.31	2.60	7.855	1.029	1.541	0.558	3.142	1.373
50 x 25	1.0	1.43	1.13	4.686	1.605	1.808	1.058	1.875	1.284
50 x 25	1.2	1.71	1.34	5.502	1.876	1.796	1.049	2.201	1.501
50 x 25	1.5	2.10	1.65	6.654	2.254	1.779	1.035	2.662	1.803
50 x 25	2.0	2.74	2.15	8.384	2.809	1.750	1.013	3.354	2.247
50 x 25	3.0	3.91	3.07	11.173	3.667	1.691	0.969	4.469	2.934
55 x 10	2.0	2.34	1.83	6.475	0.345	1.664	0.384	2.354	0.690
55 x 10	3.0	3.31	2.60	8.264	0.389	1.580	0.343	3.005	0.777
55 x 20	1.2	1.71	1.34	6.109	1.242	1.893	0.853	2.221	1.242
55 x 20	1.5	2.10	1.65	7.381	1.483	1.874	0.840	2.684	1.483
55 x 20	2.0	2.74	2.15	9.285	1.831	1.842	0.818	3.376	1.831
55 x 20	3.0	3.91	3.07	12.324	2.342	1.776	0.774	4.482	2.342
55 x 25	1.2	1.83	1.43	6.977	2.046	1.955	1.059	2.537	1.637
55 x 25	1.5	2.25	1.77	8.454	2.461	1.938	1.045	3.074	1.969
55 x 25	2.0	2.94	2.31	10.690	3.075	1.908	1.023	3.887	2.460
55 x 25	3.0	4.21	3.30	14.354	4.032	1.847	0.979	5.220	3.226
55 x 35	1.2	2.07	1.62	8.714	4.354	2.054	1.452	3.169	2.488
55 x 35	1.5	2.55	2.00	10.602	5.280	2.038	1.438	3.855	3.017
55 x 35	2.0	3.34	2.62	13.501	6.688	2.011	1.416	4.909	3.822
55 x 35	3.0	4.81	3.77	18.415	9.029	1.957	1.370	6.696	5.160
55 x 45	1.2	2.31	1.81	10.451	7.695	2.129	1.827	3.800	3.420
55 x 45	1.5	2.85	2.24	12.749	9.375	2.114	1.813	4.636	4.167
55 x 45	2.0	3.74	2.93	16.311	11.971	2.089	1.790	5.931	5.320
55 x 45	3.0	5.41	4.25	22.475	16.431	2.039	1.743	8.173	7.303
60 x 15	1.2	1.71	1.34	6.606	0.708	1.968	0.644	2.202	0.944
60 x 15	1.5	2.10	1.65	7.969	0.837	1.947	0.631	2.656	1.116
60 x 15	2.0	2.74	2.15	9.999	1.014	1.911	0.609	3.333	1.353
60 x 15	3.0	3.91	3.07	13.184	1.250	1.837	0.566	4.395	1.667
60 x 20	1.2	1.83	1.43	7.643	1.348	2.046	0.859	2.548	1.348
60 x 20	1.5	2.25	1.77	9.253	1.612	2.027	0.846	3.084	1.612
60 x 20	2.0	2.94	2.31	11.681	1.994	1.994	0.824	3.894	1.994
60 x 20	3.0	4.21	3.30	15.623	2.561	1.927	0.780	5.208	2.561
60 x 30	1.2	2.07	1.62	9.718	3.327	2.169	1.269	3.239	2.218

Size, B x D mm	Thickness, t mm	Cross Sectional Area, A cm ²	Mass per metre run, w kg/m	Second moment of area		Radius of gyration		Elastic section modulus	
				Major axis x-x I _x cm ⁴	Minor axis y-y I _y cm ⁴	Major axis x-x R _x cm	Minor axis y-y R _y cm	Major axis x-x Z _x cm ³	Minor axis y-y Z _y cm ³
60 x 30	1.5	2.55	2.00	11.820	4.025	2.152	1.256	3.940	2.683
60 x 30	2.0	3.34	2.62	15.047	5.078	2.123	1.234	5.016	3.385
60 x 30	3.0	4.81	3.77	20.501	6.798	2.065	1.189	6.834	4.532
60 x 40	1.0	1.93	1.52	9.986	5.378	2.272	1.667	3.329	2.689
60 x 40	1.2	2.31	1.81	11.792	6.340	2.262	1.658	3.931	3.170
60 x 40	1.5	2.85	2.24	14.387	7.715	2.246	1.645	4.796	3.857
60 x 40	2.0	3.74	2.93	18.412	9.831	2.220	1.622	6.137	4.916
60 x 40	3.0	5.41	4.25	25.379	13.440	2.166	1.576	8.460	6.720
60 x 40	4.0	6.95	5.45	30.987	16.280	2.112	1.531	10.329	8.140
65 x 25	1.2	2.07	1.62	10.627	2.386	2.268	1.075	3.270	1.909
65 x 25	1.5	2.55	2.00	12.919	2.876	2.250	1.062	3.975	2.301
65 x 25	2.0	3.34	2.62	16.430	3.605	2.219	1.039	5.055	2.884
65 x 25	3.0	4.81	3.77	22.334	4.763	2.155	0.995	6.872	3.810
65 x 25	4.0	6.15	4.83	26.832	5.567	2.089	0.952	8.256	4.454
65 x 30	1.2	2.19	1.72	11.848	3.576	2.328	1.279	3.646	2.384
65 x 30	1.5	2.70	2.12	14.431	4.330	2.311	1.266	4.440	2.887
65 x 30	2.0	3.54	2.78	18.415	5.471	2.282	1.244	5.666	3.647
65 x 30	3.0	5.11	4.01	25.219	7.347	2.222	1.199	7.760	4.898
65 x 30	4.0	6.55	5.14	30.558	8.737	2.160	1.155	9.403	5.825
65 x 35	1.2	2.31	1.81	13.069	5.040	2.381	1.479	4.021	2.880
65 x 35	1.5	2.85	2.24	15.944	6.122	2.364	1.465	4.906	3.498
65 x 35	2.0	3.74	2.93	20.400	7.779	2.336	1.443	6.277	4.445
65 x 35	3.0	5.41	4.25	28.105	10.570	2.280	1.398	8.648	6.040
65 x 35	4.0	6.95	5.45	34.285	12.725	2.221	1.353	10.549	7.271
70 x 20	1.2	2.07	1.62	11.411	1.560	2.351	0.869	3.260	1.560
70 x 20	1.5	2.55	2.00	13.861	1.869	2.330	0.856	3.960	1.869
70 x 20	2.0	3.34	2.62	17.600	2.319	2.297	0.834	5.029	2.319
70 x 20	3.0	4.81	3.77	23.838	2.999	2.227	0.790	6.811	2.999
70 x 20	4.0	6.15	4.83	28.508	3.428	2.153	0.747	8.145	3.428
70 x 30	1.2	2.31	1.81	14.251	3.825	2.486	1.288	4.072	2.550
70 x 30	1.5	2.85	2.24	17.380	4.635	2.469	1.275	4.966	3.090
70 x 30	2.0	3.74	2.93	22.225	5.863	2.439	1.253	6.350	3.909
70 x 30	3.0	5.41	4.25	30.576	7.896	2.378	1.208	8.736	5.264
70 x 30	4.0	6.95	5.45	37.231	9.418	2.315	1.164	10.637	6.279
70 x 50	1.2	2.79	2.19	19.932	11.934	2.675	2.070	5.695	4.773
70 x 50	1.5	3.45	2.71	24.420	14.595	2.660	2.056	6.977	5.838

Size, B x D mm	Thickness, t mm	Cross Sectional Area, A cm ²	Mass per metre run, w kg/m	Second moment of area		Radius of gyration		Elastic section modulus	
				Major axis x-x I _x cm ⁴	Minor axis y-y I _y cm ⁴	Major axis x-x R _x cm	Minor axis y-y R _y cm	Major axis x-x Z _x cm ³	Minor axis y-y Z _y cm ³
70 x 50	2.0	4.54	3.56	31.476	18.758	2.634	2.033	8.993	7.503
70 x 50	3.0	6.61	5.19	44.052	26.104	2.582	1.987	12.586	10.441
70 x 50	4.0	8.55	6.71	54.676	32.222	2.529	1.942	15.622	12.889
75 x 25	1.2	2.31	1.81	15.309	2.726	2.577	1.087	4.082	2.181
75 x 25	1.5	2.85	2.24	18.660	3.290	2.558	1.074	4.976	2.632
75 x 25	2.0	3.74	2.93	23.837	4.135	2.526	1.052	6.357	3.308
75 x 25	3.0	5.41	4.25	32.718	5.493	2.460	1.008	8.725	4.395
75 x 25	4.0	6.95	5.45	39.726	6.460	2.391	0.964	10.594	5.168
75 x 50	1.5	3.602	2.828	28.791	15.478	2.827	2.073	7.677	6.191
75 x 50	2.0	4.74	3.72	37.163	19.911	2.801	2.050	9.910	7.964
75 x 50	2.5	5.84	4.58	44.951	24.001	2.775	2.027	11.987	9.601
75 x 50	3.0	6.91	5.42	52.169	27.763	2.748	2.005	13.912	11.105
75 x 50	4.0	8.95	7.02	64.958	34.343	2.694	1.959	17.322	13.737
75 x 50	5.0	10.86	8.52	75.651	39.747	2.640	1.913	20.174	15.899
80 x 40	1.2	2.79	2.19	23.663	8.147	2.915	1.710	5.916	4.073
80 x 40	1.5	3.45	2.71	28.989	9.939	2.898	1.697	7.247	4.970
80 x 40	2.0	4.54	3.56	37.358	12.722	2.869	1.675	9.339	6.361
80 x 40	3.0	6.61	5.19	52.252	17.556	2.812	1.630	13.063	8.778
80 x 40	4.0	8.55	6.71	64.795	21.486	2.753	1.585	16.199	10.743
80 x 60	1.5	4.05	3.18	38.233	24.656	3.072	2.467	9.558	8.219
80 x 60	2.0	5.34	4.19	49.528	31.873	3.046	2.444	12.382	10.624
80 x 60	3.0	7.81	6.13	70.048	44.891	2.995	2.398	17.512	14.964
80 x 60	4.0	10.15	7.97	87.920	56.117	2.943	2.352	21.980	18.706
90 x 30	1.5	3.45	2.71	32.929	5.854	3.088	1.302	7.317	3.903
90 x 30	2.0	4.54	3.56	42.388	7.434	3.057	1.280	9.420	4.956
90 x 30	3.0	6.61	5.19	59.136	10.092	2.991	1.236	13.141	6.728
90 x 30	4.0	8.55	6.71	73.107	12.144	2.924	1.192	16.246	8.096
100 x 20	1.5	3.45	2.71	35.940	2.641	3.227	0.875	7.188	2.641
100 x 20	2.0	4.54	3.56	46.167	3.295	3.190	0.852	9.233	3.295
100 x 20	3.0	6.61	5.19	64.105	4.313	3.115	0.808	12.821	4.313
100 x 20	4.0	8.55	6.71	78.814	4.996	3.036	0.764	15.763	4.996
100 x 40	2.0	5.34	4.19	65.377	15.612	3.500	1.710	13.075	7.806
100 x 40	3.0	7.81	6.13	92.341	21.672	3.439	1.666	18.468	10.836
100 x 40	4.0	10.15	7.97	115.699	26.691	3.377	1.622	23.140	13.345

Size, B x D mm	Thickness, t mm	Cross Sectional Area, A cm ²	Mass per metre run, w kg/m	Second moment of area		Radius of gyration		Elastic section modulus	
				Major axis x-x I _x cm ⁴	Minor axis y-y I _y cm ⁴	Major axis x-x R _x cm	Minor axis y-y R _y cm	Major axis x-x Z _x cm ³	Minor axis y-y Z _y cm ³
100 x 50	2.5	7.09	5.56	91.205	31.059	3.587	2.093	18.241	12.424
100 x 50	3.0	8.41	6.60	106.459	36.058	3.558	2.071	21.292	14.423
100 x 50	4.0	10.95	8.59	134.142	44.950	3.500	2.026	26.828	17.980
100 x 50	5.0	13.36	10.48	158.190	52.455	3.441	1.982	31.638	20.982
100 x 50	6.0	15.63	12.27	178.761	58.675	3.382	1.937	35.752	23.470
120 x 60	3.0	10.21	8.01	189.123	64.403	4.304	2.512	31.520	21.468
120 x 60	4.0	13.35	10.48	240.745	81.248	4.247	2.467	40.124	27.083
120 x 80	2.0	7.74	6.07	159.772	86.040	4.544	3.335	26.629	21.510
120 x 80	2.5	9.59	7.53	195.754	105.192	4.518	3.312	32.626	26.296
120 x 80	3.0	11.41	8.96	230.199	123.436	4.492	3.289	38.366	30.859
120 x 80	4.0	14.95	11.73	294.591	157.296	4.439	3.244	49.098	39.324
125 x 75	3.0	11.41	8.96	242.851	110.523	4.614	3.113	38.856	29.473
125 x 75	4.0	14.95	11.73	310.771	140.653	4.560	3.067	49.723	37.507
125 x 75	5.0	18.36	14.41	372.521	167.682	4.505	3.022	59.603	44.715
125 x 75	6.0	21.63	16.98	428.305	191.761	4.450	2.977	68.529	51.136
140 x 60	2.0	7.74	6.07	193.130	52.065	4.996	2.594	27.590	17.355
140 x 60	2.5	9.59	7.53	236.550	63.430	4.967	2.572	33.793	21.143
140 x 60	3.0	11.41	8.96	278.085	74.159	4.937	2.550	39.726	24.720
140 x 60	4.0	14.95	11.73	355.602	93.813	4.877	2.505	50.800	31.271
150 x 50	3.0	11.41	8.96	298.555	52.648	5.116	2.148	39.807	21.059
150 x 50	4.0	14.95	11.73	381.399	66.163	5.051	2.104	50.853	26.465
150 x 50	5.0	18.36	14.41	456.299	77.872	4.986	2.060	60.840	31.149
150 x 50	6.0	21.63	16.98	523.483	87.895	4.919	2.016	69.798	35.158
150 x 75	3.0	12.91	10.13	379.600	129.974	5.423	3.173	50.613	34.660
150 x 75	4.0	16.95	13.30	488.006	165.884	5.366	3.129	65.067	44.236
150 x 75	5.0	20.86	16.37	587.757	198.360	5.309	3.084	78.368	52.896
150 x 75	6.0	24.63	19.34	679.093	227.558	5.251	3.039	90.546	60.682
150 x 100	3.0	14.41	11.31	460.645	247.639	5.654	4.146	61.419	49.528
150 x 100	4.0	18.95	14.87	594.613	318.569	5.602	4.100	79.282	63.714
150 x 100	5.0	23.36	18.33	719.215	384.024	5.549	4.055	95.895	76.805
150 x 100	6.0	27.63	21.69	800.121	429.761	5.381	3.944	106.683	85.952
150 x 100	8.0	35.79	28.10	1 067.140	559.760	5.460	3.950	142.290	111.950
200 x 50	4.0	18.948	14.874	815.520	87.388	6.560	2.148	81.552	34.955
200 x 50	5.0	23.36	18.33	983.891	103.316	6.490	2.103	98.389	41.327
200 x 50	6.0	27.63	21.69	1 138.680	117.173	6.419	2.059	113.868	46.869
200 x 50	8.0	35.79	28.10	1 408.746	139.249	6.274	1.972	140.875	55.700

Size, B x D mm	Thickness, t mm	Cross Sectional Area, A cm ²	Mass per metre run, w kg/m	Second moment of area		Radius of gyration		Elastic section modulus	
				Major axis x-x I _x cm ⁴	Minor axis y-y I _y cm ⁴	Major axis x-x R _x cm	Minor axis y-y R _y cm	Major axis x-x Z _x cm ³	Minor axis y-y Z _y cm ³
200 x 100	4.0	22.95	18.01	1 199.722	410.782	7.230	4.231	119.972	82.156
200 x 100	5.0	28.36	22.26	1 459.280	496.940	7.174	4.186	145.928	99.388
200 x 100	6.0	33.63	26.40	1 703.342	576.921	7.116	4.142	170.334	115.384
200 x 100	8.0	43.24	33.94	2 090.910	705.370	6.950	4.040	209.090	141.070
200 x 150	4.0	26.95	21.15	1 583.935	1 021.039	7.667	6.155	158.394	136.139
200 x 150	5.0	33.36	26.19	1 934.696	1 245.049	7.616	6.109	193.470	166.006
200 x 150	6.0	39.63	31.11	2 268.062	1 457.143	7.565	6.063	226.806	194.286
200 x 150	8.0	51.24	40.22	2 828.620	1 815.570	7.430	5.950	282.860	242.08
300 x 100	4.0	30.95	24.29	3 289.494	591.748	10.310	4.373	219.300	118.350
300 x 100	5.0	38.36	30.11	4 065.277	722.774	10.295	4.341	271.018	144.555
300 x 100	6.0	45.63	35.82	4 776.872	842.361	10.231	4.296	318.458	168.472
300 x 100	8.0	59.24	46.50	5 978.040	1 044.780	10.050	4.200	398.540	208.960
300 x 200	4.0	38.95	30.57	5 072.923	2 736.575	11.413	8.382	338.195	273.658
300 x 200	5.0	48.36	37.96	6 241.110	3 360.946	11.361	8.337	416.074	336.095
300 x 200	6.0	57.63	45.24	7 370.312	3 962.222	11.309	8.291	491.354	396.222
300 x 200	8.0	75.24	59.06	9 389.451	5 041.735	11.171	8.186	625.963	504.174
350 x 150	4.0	38.95	30.57	6 133.375	1 660.679	12.549	6.530	350.479	221.424
350 x 150	5.0	48.36	37.96	7 544.127	2 033.799	12.490	6.485	431.093	271.173
350 x 150	6.0	57.63	45.24	8 906.982	2 390.803	12.432	6.441	508.970	318.774
350 x 150	8.0	75.24	59.06	11 322.126	3 026.693	12.267	6.342	646.979	403.559
400 x 100	6.0	57.63	45.24	10 132.070	1 107.801	13.259	4.384	506.603	221.560
400 x 100	8.0	75.24	59.06	12 827.344	1 384.195	13.057	4.289	641.367	276.839

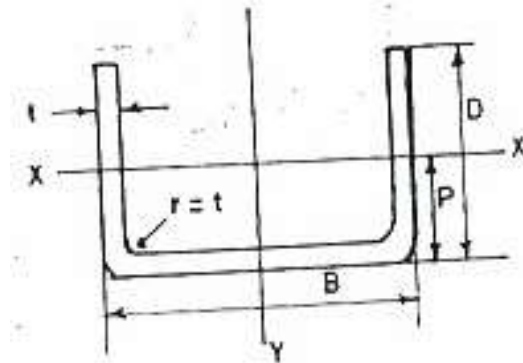


Figure A.3 — Plain channel section

Formulas for plain channels sections**Cross section area, A:**

$$A = [(B+2D-4R_o)t + \pi/2(R_o^2-Ri^2)]/100 \quad [\text{cm}^2]$$

where:

 t is the thickness of channel section B is the base of the channel section D is the height of the channel sectionNominal external corner radius, R_o , for calculation is:for thickness less than or equal to 6 mm: $2t$ [mm]for thicknesses more than 6 mm and less than or equal to 10 mm: $2,5t$ [mm]

for thicknesses more than 10 mm: $3t$ [mm]

Nominal internal corner radius, R_i , for calculation is:

for thicknesses less than or equal to 6 mm: $1t$ [mm]

for thicknesses more than 6 mm and less than or equal to 10 mm: $1,5t$ [mm]

for thicknesses more than 10 mm: $2t$ [mm]

Mass per metre run, w :

$$w = 0.785 A \quad [\text{kg/m}]$$

where:

A is the cross section area of the channel section

Table A.3 — Dimensions and properties for cold formed plain channel sections

Size, B x D mm	Thickness, t mm	Cross Sectional Area, A cm ²	Mass per metre run, w kg/m	Centroid Y-axis Py cm	Second moment of area		Elastic section modulus		Radius of gyration	
					Axis x-x I _x cm ⁴	Axis y-y I _y cm ⁴	Axis x-x Z _x cm ³	Axis y-y Z _y cm ³	Axis x-x R _x cm	Axis y-y R _y cm
40 x 25	1.5	1.276	1.002	0.750	1.430	3.414	1.907	0.171	1.047	1.617
40 x 25	2.0	1.668	1.310	0.769	1.904	4.391	2.477	0.220	1.052	1.598
40 x 40	1.5	1.726	1.355	1.391	5.768	5.082	4.146	0.254	1.813	1.702
40 x 40	2.0	2.268	1.781	1.410	7.681	6.559	5.446	0.328	1.820	1.681

Size, B x D mm	Thickness, t mm	Cross Sectional Area, A cm ²	Mass per metre run, w kg/m	Centroid Y-axis Py cm	Second moment of area		Elastic section modulus		Radius of gyration	
					Axis x-x I _x cm ⁴	Axis y-y I _y cm ⁴	Axis x-x Z _x cm ³	Axis y-y Z _y cm ³	Axis x-x R _x cm	Axis y-y R _y cm
50 x 25	3.0	2.704	2.123	0.735	2.875	10.425	3.912	0.417	1.010	1.923
60 x 40	3.0	3.904	3.065	1.254	11.674	23.449	9.306	0.782	1.704	2.415
60x 40	4.0	5.074	3.983	1.291	15.535	29.818	12.034	0.994	1.715	2.376
75 x 40	3.0	4.354	3.418	1.143	11.779	39.335	10.303	1.049	1.623	2.966
75 x 40	4.0	5.674	4.454	1.180	15.679	50.396	13.292	1.344	1.633	2.928
75 x 40	4.5	6.309	4.953	1.198	17.626	55.574	14.717	1.482	1.638	2.908
100 x 50	3.0	5.704	4.478	1.361	23.090	91.355	16.961	1.827	1.992	3.962
100 x 50	4.0	7.474	5.867	1.398	30.743	118.170	21.992	2.363	2.001	3.923
100 x 50	4.5	8.334	6.542	1.416	34.563	130.938	24.407	2.619	2.005	3.903
100 x 50	6.0	10.816	8.491	1.470	46.007	166.794	31.293	3.336	2.020	3.845
120 x 50	3.0	6.304	4.949	1.248	23.256	139.729	18.633	2.329	1.903	4.665
120 x 50	4.0	8.274	6.495	1.285	30.969	181.444	24.102	3.024	1.911	4.626
120 x 50	6.0	12.016	9.433	1.358	46.365	258.106	34.150	4.302	1.927	4.548
120 x 65	4.5	10.584	8.309	1.857	75.799	246.486	40.824	4.108	2.644	4.767
125 x 65	4.0	9.674	7.594	1.805	67.526	243.789	37.405	3.901	2.614	4.967
125 x 65	6.0	14.116	11.081	1.878	101.071	348.518	53.813	5.576	2.633	4.889
150 x 50	6.0	13.816	10.846	1.224	46.800	442.624	38.224	5.902	1.810	5.567
150 x 70	4.0	11.074	8.693	1.838	84.728	393.942	46.091	5.253	2.741	5.910
150 x 70	6.0	13.816	10.846	1.912	126.844	567.112	66.358	7.561	2.758	5.831
150 x 75	4.0	11.474	9.007	2.024	103.961	415.263	51.373	5.537	2.983	5.963

Size, B x D mm	Thickness, t mm	Cross Sectional Area, A cm ²	Mass per metre run, w kg/m	Centroid Y-axis Py cm	Second moment of area		Elastic section modulus		Radius of gyration	
					Axis x-x I _x cm ⁴	Axis y-y I _y cm ⁴	Axis x-x Z _x cm ³	Axis y-y Z _y cm ³	Axis x-x R _x cm	Axis y-y R _y cm
150 x 75	6.0	16.816	13.201	2.097	155.636	598.234	74.223	7.976	3.001	5.884
200 x 75	4.5	15.084	11.841	1.776	118.215	906.376	66.578	9.064	2.776	7.685
200 x 75	4.0	13.474	10.577	1.757	105.128	812.250	59.833	8.122	2.772	7.706
200 x 75	5.0	16.678	13.092	1.794	131.294	998.917	73.180	9.989	2.779	7.665
200 x 75	6.0	19.816	15.556	1.831	157.433	1 179.314	85.979	11.793	2.786	7.626
200 x 100	6.0	22.816	17.911	2.723	369.445	1 461.674	135.692	14.617	3.984	7.924

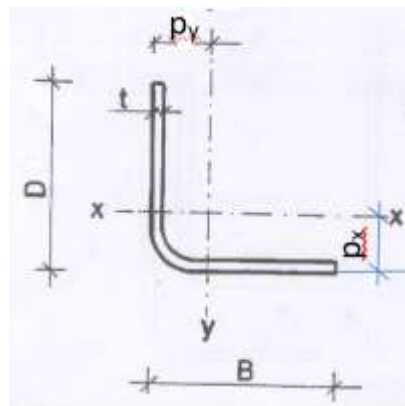


Figure A.4 — Plain equal angles section

Formulas for plain equal angles section

Cross section area:

$$A = [(D+B-2R_o)t + \pi/4(R_o^2 - R_i^2)]/100 \quad [\text{cm}^2]$$

where:

t is the thickness of plain equal angles section

B is the base of the plain equal angles section

D is the height of the plain equal angles section

Nominal external corner radius, R_o , for calculation is:

for thickness less than or equal to 6 mm: $2t$ [mm]

for thicknesses more than 6 mm and less than or equal to 10 mm: $2,5t$ [mm]

for thicknesses more than 10 mm: $3t$ [mm]

Nominal internal corner radius, R_i , for calculation is:

for thicknesses less than or equal to 6 mm: $1t$ [mm]

for thicknesses more than 6 mm and less than or equal to 10 mm: $1,5t$ [mm]

for thicknesses more than 10 mm: $2t$ [mm]

Mass per metre run, w :

$$w = 0.785 A \quad [\text{kg/m}]$$

where:

A is the cross section area of the plain equal angles section

Table A.4 — Dimensions and properties for cold formed plain equal angles sections

Size, $B \times D$ mm	Thickness, t mm	Cross sectional area, A cm ²	Mass per metre run, w kg/m	Centroid, P cm	Axis x-x			Axis y-y		
					I_x cm ⁴	Z_x cm ³	R_x cm	I_y cm ⁴	Z_y cm ³	R_y cm
20 x 20	2.5	0.897	0.704	1.10	0.33	0.24	0.614	0.33	0.23	0.614
25 x 25	2.0	0.934	0.733	0.75	0.68	0.39	0.775	0.68	0.38	0.775
25 x 25	2.5	1.147	0.901	0.70	0.42	1.06	1.120	0.42	1.06	1.120
25 x 25	3.0	1.352	1.061	0.78	0.80	0.46	0.773	0.80	0.46	0.773
30 x 30	2.0	1.134	0.890	0.84	1.10	1.05	1.090	1.10	1.05	1.090
30 x 30	2.5	1.397	1.097	0.87	1.24	0.58	0.941	1.24	0.58	0.941

Size, B × D mm	Thickness, t mm	Cross sectional area, A cm ²	Mass per metre run, w kg/m	Centroid, P cm	Axis x-x			Axis y-y		
					I _x cm ⁴	Z _x cm ³	R _x cm	I _y cm ⁴	Z _y cm ³	R _y cm
30 x 30	3.0	1.652	1.297	0.90	1.43	0.68	0.935	1.43	0.68	0.935
32 x 32	3.0	1.772	1.391	0.91	1.54	0.67	0.94	1.54	0.67	0.94
32 x 32	4.0	2.297	1.803	0.898	1.86	0.81	0.91	1.86	0.81	0.91
32 x 32	4.5	2.547	1.999	0.906	1.99	0.87	0.90	1.99	0.87	0.90
32 x 32	6.0	3.248	2.550	1.03	2.30	1.06	0.86	2.30	1.06	0.86
40 x 40	2.0	1.534	1.204	1.09	2.46	1.23	1.21	2.46	1.23	1.21
40 x 40	2.5	1.897	1.489	1.13	2.96	1.03	1.25	2.96	1.03	1.25
40 x 40	3.0	2.252	1.768	1.06	3.18	1.08	1.20	3.18	1.08	1.20
40 x 40	4.0	2.937	2.306	1.097	3.92	1.32	1.17	3.92	1.32	1.17
40 x 40	4.5	3.267	2.565	1.11	4.24	1.47	1.15	4.24	1.47	1.15
40 x 40	6.0	4.208	3.303	1.23	5.66	2.04	1.18	5.66	2.04	1.18
50 x 50	2.0	1.934	1.518	1.34	4.85	1.33	1.59	4.85	1.33	1.59
50 x 50	3.0	2.852	2.239	1.40	7.01	1.94	1.57	7.01	1.94	1.57
50 x 50	4.0	3.737	2.934	1.45	8.89	2.50	1.56	8.89	2.50	1.56
50 x 50	4.4	4.082	3.204	1.42	8.91	2.49	1.47	8.91	2.49	1.47
50 x 50	6.0	5.408	4.245	1.48	12.43	3.53	1.53	12.43	3.53	1.53
60 x 60	4.0	4.537	3.562	1.68	16.01	3.70	1.88	16.01	3.70	1.88
60 x 60	6.0	6.608	5.187	1.80	22.55	5.37	1.87	22.55	5.37	1.87
65 x 65	4.5	5.517	4.331	1.79	19.03	4.04	1.87	19.03	4.04	1.87
65 x 65	6.0	7.208	5.658	1.85	25.90	5.57	1.91	25.90	5.57	1.91

Size, B × D mm	Thickness, t mm	Cross sectional area, A cm ²	Mass per metre run, w kg/m	Centroid, P cm	Axis x-x			Axis y-y		
					I _x cm ⁴	Z _x cm ³	R _x cm	I _y cm ⁴	Z _y cm ³	R _y cm
75 x 75	6.0	8.408	6.600	2.09	46.88	8.67	2.33	46.88	8.67	2.33
90 x 90	6.0	10.208	8.013	2.48	74.42	11.41	2.72	74.42	11.41	2.72
100 x 100	6.0	11.408	8.955	2.80	112.59	15.59	3.15	112.28	15.59	3.15

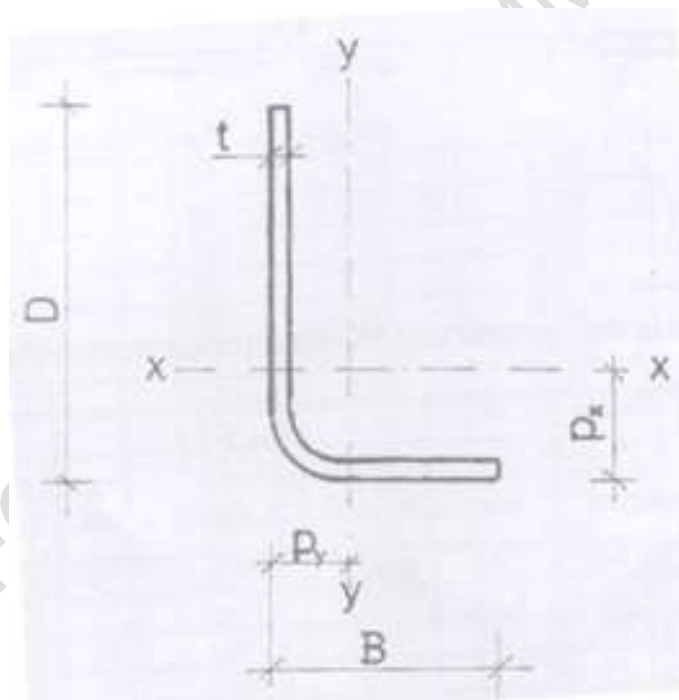


Figure A.5 — Plain unequal angles

Formulas for plain unequal angles section

Cross section area:

$$A = [(D+B-2R_o)t + \pi/4(R_o^2 - R_i^2)]/100 \quad [\text{cm}^2]$$

where:

t is the thickness of plain unequal angles section

B is the base of the plain unequal angles section

D is the height of the plain unequal angles section

Nominal external corner radius, R_o , for calculation is:

for thickness less than or equal to 6 mm: $2t$ [mm]

for thicknesses more than 6 mm and less than or equal to 10 mm: $2,5t$ [mm]

for thicknesses more than 10 mm: $3t$ [mm]

Nominal internal corner radius, R_i , for calculation is:

for thicknesses less than or equal to 6 mm: $1t$ [mm]

for thicknesses more than 6 mm and less than or equal to 10 mm: $1,5t$ [mm]

for thicknesses more than 10 mm: $2t$ [mm]

Mass per metre run, w :

$$w = 0.785 A \quad [\text{kg/m}]$$

where:

A is the cross section area of the plain unequal angles section

Table A.5 — Dimensions and properties for cold formed plain unequal angle sections

Size, B x D mm	Thickness, t mm	Cross sectional Area, A cm ²	Mass per metre run, w kg/m	Centroid		Axis, x-x			Axis, y-y		
				P _x cm	P _y cm	I _x cm ⁴	Z _x cm ³	r _x cm	I _y cm ⁴	Z _y cm ³	r _y cm
50 x 40	6.0	4.808	3.774	1.53	1.11	9.96	2.87	1.04	5.41	1.83	1.08
65 x 50	6.0	6.308	4.952	1.99	1.31	11.68	2.59	1.24	11.74	3.12	1.38
75 x 50	6.0	6.908	5.423	2.40	1.22	35.81	7.02	1.15	17.58	4.57	1.61
90 x 65	6.0	8.708	6.836	2.76	1.59	66.56	10.67	1.51	28.58	5.73	1.83
90 x 75	6.0	9.308	7.307	3.01	1.93	94.54	13.53	1.76	45.09	7.86	2.15

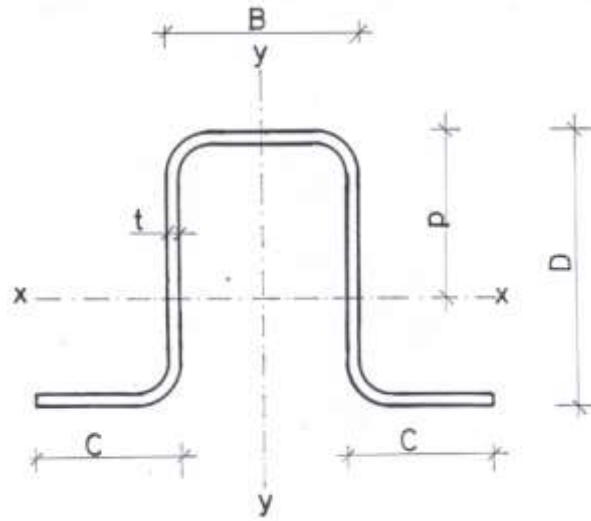


Figure A.6 — Cold formed outwardly lipped channel section

Formulas for cold formed outwardly lipped channel section

Cross section area:

$$A = [t(2C+2D+B-8R_o) + \pi(R_o^2-R_i^2)]/100 \quad [\text{cm}^2]$$

where:

t is the thickness of the outwardly lipped channel section

B is the base of the outwardly lipped channel section

D is the height of the outwardly lipped channel section

C is the length of the outward lip of the channel section

Nominal external corner radius, R_o , for calculation is:

for thickness less than or equal to 6 mm: $2t$ [mm]

for thicknesses more than 6 mm and less than or equal to 10 mm: $2,5t$ [mm]

for thicknesses more than 10 mm: $3t$ [mm]

Nominal internal corner radius, R_i , for calculation is:

for thicknesses less than or equal to 6 mm: $1t$ [mm]

for thicknesses more than 6 mm and less than or equal to 10 mm: $1,5t$ [mm]

for thicknesses more than 10 mm: $2t$ [mm]

Mass per metre run, w :

$w = 0.785 A$ [kg/m]

where:

A is the cross section area of the outwardly lipped channel section

Table A.6 — Dimensions and properties for cold formed outwardly lipped channel sections

Size mm			Thickness, t mm	Cross Sectional Area, A cm ²	Mass per metre run, w kg/m	Centroid, p cm	Axis x-x			Axis y-y		
B	D	C					I_x cm ⁴	Z_x cm ³	r_x cm	I_y cm ⁴	Z_y cm ³	r_y cm
20	20	10	1.5	1.052	0.826	1.116	0.6860	0.610	1.75	1.7260	1.730	1.195

Size mm			Thickness, t mm	Cross Sectional Area, A cm ²	Mass per metre run, w kg/m	Centroid, p cm	Axis x-x			Axis y-y		
B	D	C					I _x cm ⁴	Z _x cm ³	r _x cm	I _y cm ⁴	Z _y cm ³	r _y cm
20	20	15	2.0	1.537	1.207	1.118	0.7910	0.710	0.72	2.1300	0.930	1.180
25	25	15	1.5	1.427	1.120	1.305	1.2900	0.990	0.95	2.6540	1.020	1.363
25	25	15	2.0	1.837	1.442	1.313	1.5630	0.920	0.92	3.3000	1.290	1.340
40	25	15	1.5	1.652	1.297	2.077	4.0470	1.950	1.47	3.2760	1.260	1.321
40	25	15	2.0	2.137	1.678	2.078	5.0220	2.410	1.44	4.0900	1.600	1.295
50	50	20	1.5	2.702	2.121	2.366	10.0800	3.820	1.93	16.4500	3.780	2.467
50	50	20	2.0	3.537	2.777	2.365	12.8000	3.850	1.90	21.0600	4.900	2.442
75	50	20	2.0	4.037	3.169	3.590	36.9700	9.850	2.79	31.0100	6.460	2.559
75	50	20	2.5	4.964	3.897	3.588	44.5700	11.880	2.76	37.4300	7.880	2.532
75	50	20	3.0	5.858	4.599	3.586	51.5600	13.740	2.73	43.4000	9.230	2.507
100	50	30	2.0	4.937	3.876	5.166	79.3600	15.360	3.66	41.8500	7.890	2.657
100	50	30	2.5	6.089	4.780	5.167	96.4000	18.650	3.63	50.7400	9.660	2.631
100	50	30	3.0	7.208	5.658	5.166	112.4000	21.750	3.60	59.0600	11.350	2.605

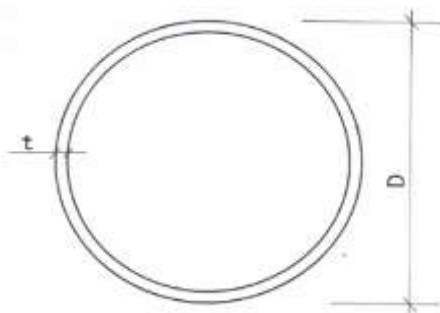


Figure A.7 — Circular tubes (Circular hollow sections)

Formula for dimensions and properties of circular hollow sections are provided in ISO 10799-2.

Table A.7 — Dimensions and properties for cold formed circular tubes

Diameter, D mm	Thickness, t mm	Cross Sectional Area, A cm ²	Mass per metre run, w kg/m	Second moment of area, I cm ⁴	Radius of gyration, r cm	Elastic section modulus, z cm ³
10	1.00	0.28	0.22	0.0290	0.3202	0.06
10	1.20	0.33	0.26	0.0327	0.3140	0.07
10	1.50	0.40	0.31	0.0373	0.3052	0.07
12	1.00	0.35	0.27	0.0527	0.3905	0.09
12	1.20	0.41	0.32	0.0601	0.3842	0.10
12	1.50	0.49	0.39	0.0696	0.3750	0.12
16	1.00	0.47	0.37	0.1331	0.5315	0.17
16	1.20	0.56	0.44	0.1538	0.5250	0.19
16	1.50	0.68	0.54	0.1815	0.5154	0.23
16	2.00	0.88	0.69	0.2199	0.5000	0.27
20	1.00	0.60	0.47	0.2701	0.6727	0.27
20	1.20	0.71	0.56	0.3144	0.6660	0.31
20	1.50	0.87	0.68	0.3755	0.6562	0.38
20	2.00	1.13	0.89	0.4638	0.6403	0.46
22	1.00	0.66	0.52	0.3646	0.7433	0.33
22	1.20	0.78	0.62	0.4255	0.7366	0.39
22	1.50	0.97	0.76	0.5103	0.7267	0.46
22	2.00	1.26	0.99	0.6347	0.7106	0.58
25	1.00	0.75	0.59	0.5439	0.8493	0.44
25	1.20	0.90	0.70	0.6370	0.8425	0.51
25	1.50	1.11	0.87	0.7677	0.8325	0.61
25	2.00	1.45	1.13	0.9629	0.8162	0.77
28	1.00	0.85	0.67	0.7741	0.9552	0.55

Diameter, D mm	Thickness, t mm	Cross Sectional Area, A cm ²	Mass per metre run, w kg/m	Second moment of area, I cm ⁴	Radius of gyration, r cm	Elastic section modulus, z cm ³
28	1.20	1.01	0.79	0.9090	0.9485	0.65
28	1.50	1.25	0.98	1.0999	0.9384	0.79
28	2.00	1.63	1.28	1.3888	0.9220	0.99
30	1.00	0.91	0.72	0.9590	1.0259	0.64
30	1.20	1.09	0.85	1.1278	1.0191	0.75
30	1.50	1.34	1.05	1.3676	1.0090	0.91
30	2.00	1.76	1.38	1.7331	0.9925	1.16
30	3.00	2.55	2.00	2.3478	0.9605	1.57
32	1.00	0.97	0.76	1.1713	1.0966	0.73
32	1.20	1.16	0.91	1.3791	1.0898	0.86
32	1.50	1.44	1.13	1.6755	1.0796	1.05
32	2.00	1.89	1.48	2.1303	1.0630	1.33
32	3.00	2.73	2.15	2.9044	1.0308	1.82
38	1.00	1.16	0.91	1.9908	1.3086	1.05
38	1.20	1.39	1.09	2.3513	1.3018	1.24
38	1.50	1.72	1.35	2.8696	1.2916	1.51
38	2.00	2.26	1.78	3.6761	1.2748	1.93
38	3.00	3.30	2.59	5.0889	1.2420	2.68
42	1.00	1.29	1.01	2.7085	1.4500	1.29
42	1.20	1.54	1.21	3.2037	1.4431	1.53
42	1.50	1.91	1.50	3.9189	1.4329	1.87
42	2.00	2.51	1.97	5.0398	1.4160	2.40
42	3.00	3.68	2.89	7.0306	1.3829	3.35
45	1.00	1.38	1.09	3.3473	1.5560	1.49
45	1.20	1.65	1.30	3.9632	1.5491	1.76
45	1.50	2.05	1.61	4.8550	1.5389	2.16
45	2.00	2.70	2.12	6.2588	1.5219	2.78
45	3.00	3.96	3.11	8.7740	1.4887	3.90
48	1.00	1.48	1.16	4.0795	1.6621	1.70
48	1.20	1.76	1.39	4.8342	1.6552	2.01
48	1.50	2.19	1.72	5.9295	1.6449	2.47
48	2.00	2.89	2.27	7.6602	1.6279	3.19
48	3.00	4.24	3.33	10.7845	1.5945	4.49
50	1.20	1.84	1.44	5.4805	1.7259	2.19
50	1.50	2.29	1.79	6.7274	1.7156	2.69
50	2.00	3.02	2.37	8.7021	1.6985	3.48
50	3.00	4.43	3.48	12.2828	1.6651	4.91
51	1.00	1.57	1.23	4.9113	1.7681	1.93

Diameter, D mm	Thickness, t mm	Cross Sectional Area, A cm ²	Mass per metre run, w kg/m	Second moment of area, I cm ⁴	Radius of gyration, r cm	Elastic section modulus, z cm ³
51	1.20	1.88	1.47	5.8242	1.7612	2.28
51	1.50	2.33	1.83	7.1519	1.7509	2.80
51	2.00	3.08	2.42	9.2567	1.7339	3.63
51	3.00	4.52	3.55	13.0814	1.7004	5.13
57	1.20	2.10	1.65	8.1922	1.9733	2.87
57	1.50	2.62	2.05	10.0787	1.9629	3.54
57	2.00	3.46	2.71	13.0860	1.9458	4.59
57	3.00	5.09	4.00	18.6105	1.9121	6.53
60	1.20	2.22	1.74	9.5854	2.0793	3.20
60	1.50	2.76	2.16	11.8021	2.0690	3.93
60	2.00	3.64	2.86	15.3443	2.0518	5.11
60	3.00	5.37	4.22	21.8808	2.0180	7.29
63	1.20	2.33	1.83	11.1282	2.1854	3.53
63	1.50	2.90	2.28	13.7117	2.1750	4.35
63	2.00	3.83	3.01	17.8485	2.1578	5.67
63	3.00	5.66	4.44	25.5138	2.1240	8.10
76	1.50	3.51	2.76	24.3698	2.6345	6.41
76	2.00	4.65	3.65	31.8536	2.6173	8.38
76	3.00	6.88	5.40	45.9133	2.5831	12.08
89	2.00	5.47	4.29	51.7527	3.0767	11.63
89	3.00	8.11	6.36	75.0345	3.0424	16.86
89	3.25	8.76	6.87	80.5982	3.0339	18.11
89	4.00	10.68	8.39	96.6927	3.0085	21.73
89	4.85	12.82	10.07	113.8834	2.9801	25.59
100	2.00	6.16	4.83	73.9614	3.4655	14.79
100	3.00	9.14	7.18	107.6386	3.4311	21.53
100	4.00	12.07	9.47	139.2333	3.3971	27.85
114	2.00	7.04	5.52	110.3923	3.9604	19.37
114	3.00	10.46	8.21	161.2588	3.9259	28.29
114	5.00	17.12	13.44	254.8464	3.8578	44.71
114	6.00	20.36	15.98	297.7673	3.8243	52.24
127	3.00	11.69	9.18	224.7795	4.3853	35.40
127	4.00	15.46	12.14	292.6514	4.3510	46.09
127	5.00	19.17	15.05	357.1861	4.3170	56.25
127	6.00	22.81	17.91	418.4948	4.2833	65.90
140	3.00	12.91	10.14	303.1149	4.8448	43.30
140	4.00	17.09	13.42	395.5200	4.8104	56.50
140	5.00	21.21	16.65	483.8189	4.7762	69.12

Diameter, D mm	Thickness, t mm	Cross Sectional Area, A cm ²	Mass per metre run, w kg/m	Second moment of area, I cm ⁴	Radius of gyration, r cm	Elastic section modulus, z cm ³
140	6.00	25.26	19.83	568.1352	4.7424	81.16
152	3.00	14.04	11.03	389.9171	5.2690	51.30
152	4.00	18.60	14.60	509.6575	5.2345	67.06
165	3.00	15.27	11.99	501.1081	5.7285	60.74
165	4.00	20.23	15.88	656.0271	5.6940	79.52
165	4.85	24.40	19.16	783.1354	5.6648	94.93
216	5.00	33.15	26.02	1 845.7691	7.4621	170.90
216	6.00	39.59	31.08	2 184.1362	7.4277	202.23
216	7.00	45.97	36.08	2 512.6963	7.3934	232.66

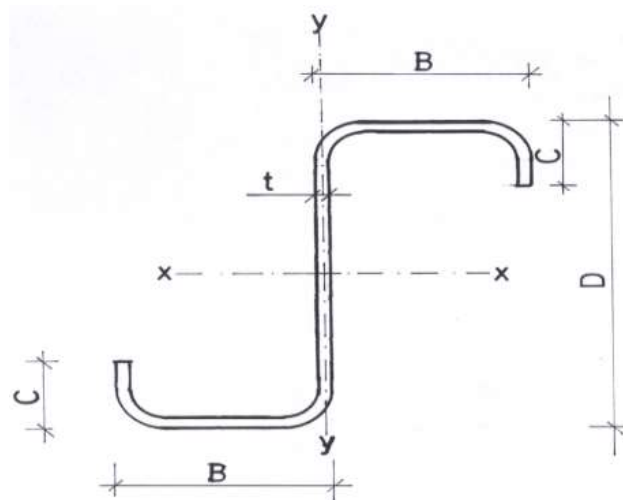


Figure A.8 — Zed purlins

Formulas for cold formed zed purlins

Cross section area:

$$A = [t(2B+2C+D-8R_o) + \pi(R_o^2-R_i^2)]/100 \quad [\text{cm}^2]$$

where:

t is the thickness of zed purlins

B is the base of the zed purlins

D is the height of the zed purlins

C is the length of the lip of the zed purlins

Nominal external corner radius, R_o , for calculation is:

for thickness less than or equal to 6 mm: $2t$ [mm]

for thicknesses more than 6 mm and less than or equal to 10 mm: $2,5t$ [mm]

for thicknesses more than 10 mm: $3t$ [mm]

Nominal internal corner radius, R_i , for calculation is:

for thicknesses less than or equal to 6 mm: $1t$ [mm]

for thicknesses more than 6 mm and less than or equal to 10 mm: $1,5t$ [mm]

for thicknesses more than 10 mm: $2t$ [mm]

Mass per metre run, w :

$$w = 0.785 A \quad [\text{kg/m}]$$

where:

A is the cross section area of the zed purlins

Table A.8 — Dimensions and properties for cold formed structural steel zed purlins

Dimension mm			Thickness mm	Cross Sectional Area cm ²	Mass per metre run kg/m	Centroid cm		Moment of Inertia cm ⁴		Section modulus of elasticity cm ³		Radius of gyration cm	
B	D	C	t	A	W	C _x	C _y	I _{xx}	I _{yy}	Z _{xx}	Z _{yy}	R _{xx}	R _{yy}
50	75	20	1.5	3.077	2.415	3.75	5	33.594	61.256	6.719	16.335	3.2735	4.4203

Dimension mm			Thickness mm	Cross Sectional Area cm ²	Mass per metre run kg/m	Centroid cm		Moment of Inertia cm ⁴		Section modulus of elasticity cm ³		Radius of gyration cm	
B	D	C	t	A	W	C _x	C _y	I _{xx}	I _{yy}	Z _{xx}	Z _{yy}	R _{xx}	R _{yy}
50	75	20	2.0	4.037	3.169	3.75	5	43.917	77.754	8.783	20.734	3.2570	4.3337
50	100	20	2.0	4.537	3.562	5.00	5	86.718	77.755	17.344	15.551	4.3231	4.0936
50	113	20	2.0	4.797	3.766	5.65	5	115.594	77.756	23.119	13.762	4.8570	3.9835
50	125	20	2.0	5.037	3.954	6.25	5	146.518	77.757	29.304	12.441	5.3391	3.8895
50	138	20	2.0	5.297	4.158	6.90	5	184.852	77.758	36.970	11.269	5.8508	3.7947
50	150	20	2.0	5.537	4.347	7.50	5	224.881	77.759	44.976	10.368	6.3145	3.7131
50	150	20	2.5	6.839	5.369	7.50	5.0	277.536	92.451	55.507	12.327	6.2967	3.6342
50	163	20	2.0	5.797	4.551	8.15	5.0	273.485	77.760	54.697	9.541	6.8083	3.6304
50	163	20	2.5	7.164	5.624	8.15	5.0	337.715	92.452	67.543	11.344	6.7900	3.5527
50	175	20	2.0	6.037	4.739	8.75	5.0	323.369	77.760	64.674	8.887	7.2571	3.5587
50	175	20	2.5	7.464	5.859	8.75	5.0	399.503	92.454	79.901	10.566	7.2384	3.4821
63	175	20	2.0	6.557	5.147	8.75	6.3	362.279	147.516	57.505	16.859	7.3754	4.7063
63	175	20	2.5	8.114	6.370	8.75	6.3	447.860	177.244	71.089	20.256	7.3568	4.6281
75	175	20	3.0	10.358	8.131	8.75	7.5	584.760	336.506	77.968	38.458	7.4309	5.6370
50	200	20	2.0	6.537	5.132	10.00	5.0	443.545	77.762	88.709	7.776	8.1731	3.4222
50	200	20	2.5	8.089	6.350	10.00	5.0	548.422	92.457	109.684	9.246	8.1532	3.3477
75	200	20	2.5	9.339	7.331	10.00	7.5	670.323	290.003	89.376	29.000	8.4000	5.5251
75	200	20	3.0	11.108	8.720	10.00	7.5	796.504	336.512	106.201	33.651	8.3808	5.4475
50	225	20	2.0	7.037	5.524	11.25	5.0	586.970	77.764	117.394	6.912	9.0669	3.3002

Dimension mm			Thickness mm	Cross Sectional Area cm ²	Mass per metre run kg/m	Centroid cm		Moment of Inertia cm ⁴		Section modulus of elasticity cm ³		Radius of gyration cm	
B	D	C	t	A	W	C _x	C _y	I _{xx}	I _{yy}	Z _{xx}	Z _{yy}	R _{xx}	R _{yy}
50	225	20	2.5	8.714	6.841	11.25	5.0	726.247	92.460	145.249	8.219	9.0460	3.2277
50	225	20	3.0	10.358	8.131	11.25	5.0	862.610	105.437	172.522	9.372	9.0252	3.1554
75	225	20	2.0	8.037	6.309	11.25	7.5	711.296	239.830	94.839	21.318	9.3479	5.4280
75	225	20	2.5	9.964	7.822	11.25	7.5	880.961	290.006	117.461	25.778	9.3278	5.3519
75	225	20	3.0	11.858	9.309	11.25	7.5	1 047.436	336.517	139.658	29.913	9.3079	5.2758
50	250	20	2.0	7.537	5.917	12.50	5.0	755.208	77.765	151.042	6.221	9.9423	3.1904
50	250	20	2.5	9.339	7.331	12.50	5.0	934.932	92.464	186.986	7.397	9.9204	3.1198
50	250	20	3.0	11.108	8.720	12.50	5.0	1 111.104	105.443	222.221	8.435	9.8985	3.0493
75	250	20	2.0	8.537	6.702	12.50	7.5	908.971	239.831	121.196	19.187	10.2569	5.2686
75	250	20	2.5	10.589	8.312	12.50	7.5	1 126.365	290.009	150.182	23.201	10.2361	5.1940
75	250	20	3.0	12.608	9.897	12.50	7.5	1 339.899	336.523	178.653	26.922	10.2154	5.1195

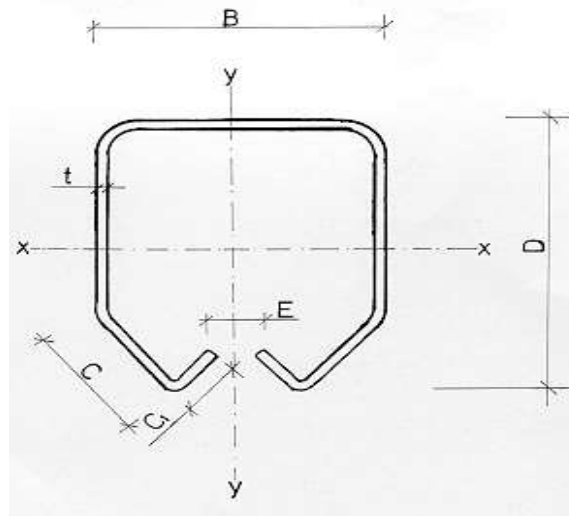


Figure A.9 — Cold formed mono rail sections

Table A.9 — Dimensions and properties or cold formed steel mono rail sections

Dimension mm					Thickness mm	Area cm ²	Mass kg/m	Axis x-x			Axis y-y		
<i>B</i>	<i>D</i>	<i>C</i>	<i>C</i> ₁	<i>E</i>	<i>t</i>	<i>A</i>	<i>w</i>	<i>I</i> _x cm ⁴	<i>Z</i> _x cm ³	<i>r</i> _x cm	<i>I</i> _y cm ⁴	<i>Z</i> _y cm ³	<i>r</i> _y cm
57	67	15.0	10.0	13.7	3.0	6.27	4.92	34.3400	9.190	2.34	31.6300	11.100	2.25
42	54	12.5	8.0	8.0	2.5	3.97	3.12	14.3500	4.640	1.90	11.1100	5.290	1.67
33	34	9.5	6.5	10.5	2.0	2.22	1.74	3.2200	1.650	1.20	3.6700	2.220	1.28

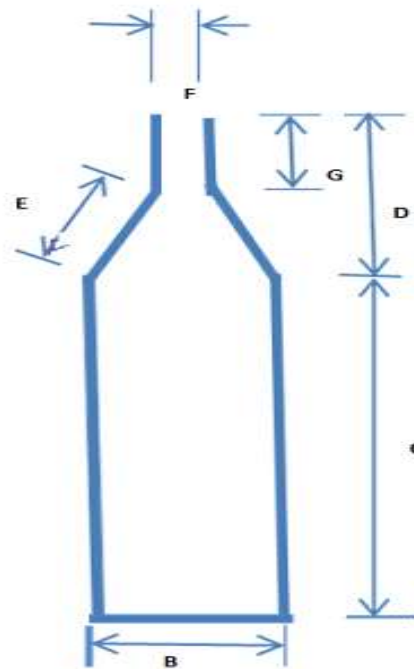


Figure A.10 — Bottle sections

Table A.10 — Dimensions and properties of cold formed steel bottle sections

Nominal size mm	Dimension mm						Thickness mm	Mass kg/m
	B	C	D	E	F	G	t	w
94	34	64	30	15	2	15	1.0	1.74
94	34	64	30	15	2	15	1.2	2.10
94	34	64	30	15	2	15	1.5	2.60
94	34	64	30	15	2	15	2.0	3.50

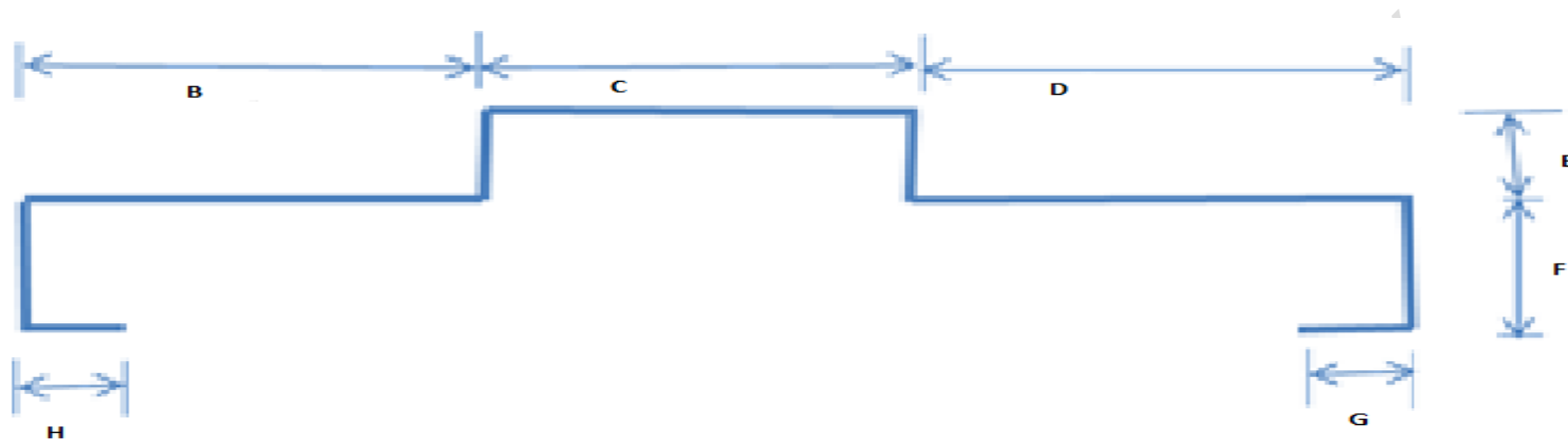


Figure A.11 — Steel door frame

Table A.11 — Dimensions and properties of cold formed steel door frame sections

Nominal size mm	Dimension mm						Thickness mm	Mass kg/m
	B	C	D	E	F	G/H	t	w
150	48	54	48	13.00	30.00	12.00	1.0	1.9
130	45	50	35	15.00	30.15	15.15	1.0	1.8
130	45	50	35	15.00	30.15	15.15	1.2	2.1
130	45	50	35	15.00	30.15	15.15	1.5	2.6
130	45	50	35	15.00	30.15	15.15	2.0	3.5

Remember to insert thickness, t in the figure.

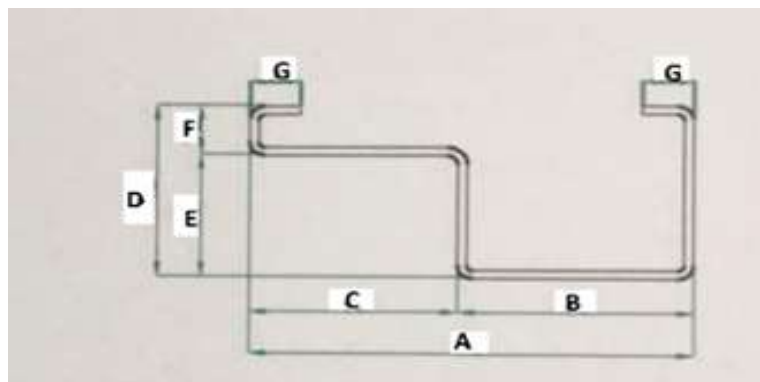


Figure A.12 — Half door frame steel section

Formulas for Cold formed half door frame steel section

Cross section area:

$$A = [t(2G+F+D+B+C+E-10R_o-2R_i) + 3\pi/2(R_o^2-R_i^2)]/100 \quad [\text{cm}^2]$$

where:

t is the thickness of half door frame steel section

B , C , D , E , F and G are dimensions of half door frame steel section as given in Figure A.12.

Nominal external corner radius, R_o , for calculation is:

for thickness less than or equal to 6 mm: $2t$ [mm]

for thicknesses more than 6 mm and less than or equal to 10 mm: $2,5t$ [mm]

for thicknesses more than 10 mm: $3t$ [mm]

Nominal internal corner radius, R_i , for calculation is:

for thicknesses less than or equal to 6 mm: $1t$ [mm]

for thicknesses more than 6 mm and less than or equal to 10 mm: $1,5t$ [mm]

for thicknesses more than 10 mm: $2t$ [mm]

Mass per metre run, w :

$$w = 0.785 A \quad [\text{kg/m}]$$

where:

A is the cross section area of the half door frame steel section

Table A.12 — Dimensions and properties of cold formed half door frame steel section

Dimension mm							Thickness, t mm	Cross Sectional Area, A	Mass per unit length, w
A	B	C	D	E	F	G		cm ²	kg/m
95	50	45	42	15	30	11	1.0	1.961	1.540
95	50	45	42	15	30	11	1.2	2.402	1.886
95	50	45	42	15	30	11	1.5	2.989	2.346
100	48	52	42	12	29	13	1.0	2.058	1.616
100	48	52	42	12	29	13	1.2	2.462	1.933

100	48	52	42	12	29	13	1.5	3.064	2.405
105	60	45	60	15	45	12	1.0	2.458	1.930
105	60	45	60	15	45	12	1.2	2.942	2.310
105	60	45	60	15	45	12	1.5	3.664	2.876
125	70	55	60	15	45	12	1.0	2.658	2.087
125	70	55	60	15	45	12	1.2	3.182	2.498
125	70	55	60	15	45	12	1.5	3.964	3.112



Figure A.13 — Cold formed fascia board steel section

Table A.13 — Dimensions and properties of cold formed fascia board steel sections

Nominal size mm	Dimension mm			Thickness mm	Mass kg/m
	B	C	D or E	t	w
150 x 30	150	30	13	1.0	1.80

150 x 30	150	30	13	1.2	2.17
150 x 30	150	30	13	1.5	2.58
190 x 30	190	30	13	1.2	2.38
190 x 30	190	30	13	1.5	2.88
200 x 30	200	30	13	1.2	2.67
200 x 30	200	30	13	1.5	3.25

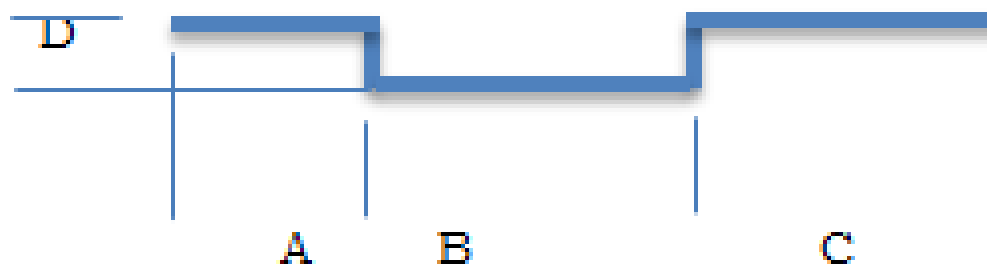


Figure A.14 — Omega sections

Table A.14 — Dimensions and properties of Omega sections

Dimension mm				Thickness, t mm
A	B	C	D	
35	50	45	17	1.0
35	50	45	17	1.2
35	50	45	17	1.5
35	50	45	17	2.0

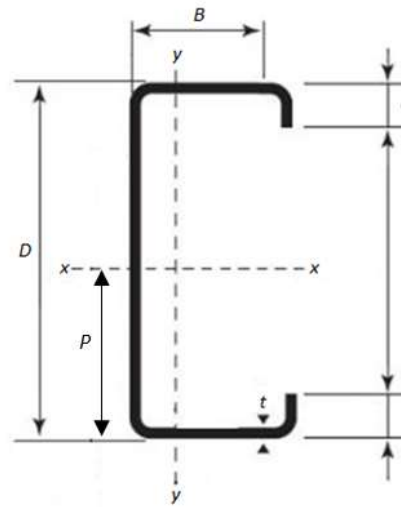


Figure A.15 — Cold formed inwardly lipped channel section

Formulas for Cold formed inwardly lipped channel section

Cross section area:

$$A = [t(2B+2C+D-8R_o) + \pi(R_o^2-R_i^2)]/100 \quad [\text{cm}^2]$$

where:

t is the thickness of inwardly lipped channel section

B is the base of the inwardly lipped channel section

D is the height of the inwardly lipped channel section

C is the length of the lip of the inwardly lipped channel section

Nominal external corner radius, R_o , for calculation is:

for thickness less than or equal to 6 mm: $2t$ [mm]

for thicknesses more than 6 mm and less than or equal to 10 mm: $2,5t$ [mm]

for thicknesses more than 10 mm: $3t$ [mm]

Nominal internal corner radius, R_i , for calculation is:

for thicknesses less than or equal to 6 mm: $1t$ [mm]

for thicknesses more than 6 mm and less than or equal to 10 mm: $1,5t$ [mm]

for thicknesses more than 10 mm: $2t$ [mm]

Mass per metre run, w :

$$w = 0.785 A \quad [\text{kg/m}]$$

where:

A is the cross section area of the inwardly lipped channel section

Table A.15 — Dimensions and properties for cold formed inwardly lipped channel sections

Dimension mm			Thickness mm	Cross Sectional Area cm ²	Mass per metre run kg/m	Centroid cm		Moment of inertia cm ⁴		Section modulus of elasticity cm ³		Radius of gyration cm	
B	D	C	t	A	W	C _x	C _y	I _{xx}	I _{yy}	Z _{xx}	Z _{yy}	R _{xx}	R _{yy}

Dimension mm			Thickness mm	Cross Sectional Area cm ²	Mass per metre run kg/m	Centroid cm		Moment of inertia cm ⁴		Section modulus of elasticity cm ³		Radius of gyration cm	
B	D	C	t	A	W	C _x	C _y	I _{xx}	I _{yy}	Z _{xx}	Z _{yy}	R _{xx}	R _{yy}
50	75	20	1.5	3.077	2.415	2.0939	3.7500	29.0565	12.2259	7.7484	5.8388	3.0444	1.9748
50	75	20	2.0	4.037	3.169	2.0942	3.7500	37.8675	15.8185	10.0980	7.5535	3.0244	1.9547
50	100	20	2.0	4.537	3.562	1.8793	5.0000	73.9179	17.5943	14.7836	9.3621	3.9913	1.9473
50	100	20	2.5	5.589	4.387	1.8804	5.0000	90.6510	21.3501	18.1302	11.3538	3.9706	1.9269
50	125	20	2.0	5.037	3.954	1.7062	6.2500	124.4683	19.0249	19.9149	11.1503	4.9209	1.9239
50	125	20	2.5	6.214	4.878	1.7083	6.2500	153.0078	23.0905	24.4813	13.5164	4.8991	1.9032
50	138	20	2.0	5.297	4.158	1.6289	6.9000	157.0036	19.6643	22.7541	12.0722	5.3921	1.9083
50	138	20	2.5	6.539	5.133	1.6315	6.9000	193.1830	23.8674	27.9975	14.6289	5.3697	1.8874
50	150	20	2.0	5.537	4.347	1.5638	7.5000	191.0812	20.2022	25.4775	12.9184	5.8206	1.8926
50	150	20	2.5	6.839	5.369	1.5670	7.5000	235.2865	24.5207	31.3715	15.6485	5.7976	1.8716
50	150	20	3.0	8.108	6.365	1.5701	7.5000	278.1142	28.5692	37.0819	18.1953	5.7747	1.8508
50	163	20	2.0	5.797	4.551	1.4993	8.1500	232.5865	20.7357	28.5382	13.8300	6.2786	1.8747
50	163	20	2.5	7.164	5.624	1.5030	8.1500	286.5929	25.1682	35.1648	16.7454	6.2550	1.8536
50	163	20	3.0	8.498	6.671	1.5067	8.1500	338.9955	29.3235	41.5945	19.4621	6.2315	1.8327
50	175	20	2.0	6.037	4.739	1.4446	8.7500	275.3191	21.1880	31.4650	14.6668	6.6963	1.8576
50	175	20	2.5	7.464	5.859	1.4488	8.7500	339.4401	25.7170	38.7932	17.7509	6.6721	1.8365
50	175	20	3.0	8.858	6.954	1.4530	8.7500	401.7336	29.9626	45.9124	20.6216	6.6479	1.8155
63	175	20	2.0	6.557	5.147	1.9135	8.7500	314.2286	36.6786	35.9118	19.1682	6.8689	2.3468
63	175	20	2.5	8.114	6.370	1.9162	8.7500	387.7974	44.7463	44.3197	23.3511	6.8457	2.3254
63	175	20	3.0	9.638	7.566	1.9190	8.7500	459.4282	52.4013	52.5061	27.3066	6.8226	2.3042
50	200	20	2.0	6.537	5.132	1.3434	10.0000	378.7445	22.0256	37.8745	16.3958	7.5525	1.8213
50	200	20	2.5	8.089	6.350	1.3485	10.0000	467.4219	26.7325	46.7422	19.8241	7.5271	1.8001
50	200	20	3.0	9.608	7.542	1.3537	10.0000	553.7592	31.1445	55.3759	23.0076	7.5018	1.7791

Dimension mm			Thickness mm	Cross Sectional Area cm ²	Mass per metre run kg/m	Centroid cm		Moment of inertia cm ⁴		Section modulus of elasticity cm ³		Radius of gyration cm	
B	D	C	t	A	W	C _x	C _y	I _{xx}	I _{yy}	Z _{xx}	Z _{yy}	R _{xx}	R _{yy}
75	200	20	2.0	7.537	5.917	2.2212	10.0000	476.7579	58.0380	47.6758	26.1291	7.8995	2.7562
75	200	20	2.5	9.339	7.331	2.2237	10.0000	589.3229	71.0351	58.9323	31.9448	7.8762	2.7345
75	200	20	3.0	11.108	8.720	2.2262	10.0000	699.3042	83.4600	69.9304	37.4901	7.8528	2.7129

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