DEAS 134:2023

ICS 77.140.75

DRAFT EAST AFRICAN STANDARD

Cold formed steel sections — Specification

DRAFT FOR PUBLIC REVIEW STAGE

EAST AFRICAN COMMUNITY

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Fourth Edition 2023

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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 35, *Steel and steel products.*

This fourth edition (DEAS 134:2023) cancels and replaces the third edition (EAS 134:2019), which has been technically revised.

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Cold formed steel sections — Specification

1 Scope

This East African Standard specifies the requirements and sectional properties of cold formed steel sections of thickness of 1 mm to 8 mm for use in structural and general engineering applications. The sections and their sectional properties are listed in Annex A.

2 Normative references

The following document is referred to in the text in such a way that some or all of its 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 14347, *Fatigue — Design procedure for welded hollow-section joints — Recommendations*

3 Terms and definitions

No terms and definition are listed in this document.

4 Symbols

The following nomenclature shall be used. Units for dimensions are 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

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5 Dimensions and tolerance

5.1 Dimensions

Dimensions of sections shall be in accordance with those listed in the relevant tables in Annex A of this standard.

5.2 Tolerances

Tolerance of characteristic properties shall be as given in Table 1.

Table 1 — Tolerances in dimensions

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	lower than 5 mm ± 10 % or 0.5 mm whichever is lower above 5 mm ± 0.5 mm
Outside bend radii for right angle bends	If thickness is less than 6 mm, tolerance is between 1.5t to 2.5t If thickness is between 6 mm to 8 mm tolerance s between 2t to 3t
Length (6 metres) – Exact – Standard	 0 and + 10 mm 0 mm and + 50 mm
Thickness	± 3 % for 1 mm above 1 mm ± 7.5 %
Mass per metre for 1 mm thick	± 3.0 %
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 D for circular sections, B for square sections or H for rectangular sections, with a minimum of 100 mm.

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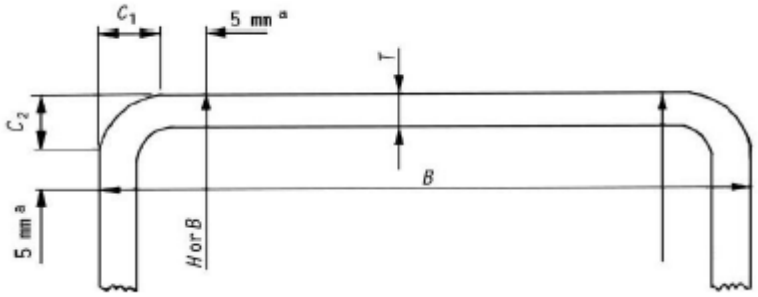
5.3.2 Outside dimension

When inspecting circular hollow sections, the diameter *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 Table 6.

5.3.3 Thickness

The thickness t shall be measured at a positon 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 with in a distance of half of the outside diameter or half of the length of the longer side from the end of the section.



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:

$$O = \frac{\mathrm{Dmax - Dmin}}{D} * 100\%$$

where

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

D_{max} is the maximum outside diameter; and

D_{min} is the minimum outside diameter.

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.

The percentage concavity C_1 shall be calculated as follows:

$$C_1 = \frac{X_1}{B} \times 100\% \quad \ldots 1a)$$

or

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$$C_1 = \frac{X_1}{H} \times 100\% \quad \text{…1b)}$$

The percentage convexity C_2 shall be calculated as follows:

$$C_2 = \frac{X_2}{B} \times 100\% \quad \text{…2a)}$$

Or

$$C_2 = \frac{X_2}{H} \times 100\% \quad \text{…2b)}$$

Where B and H are the lengths of the sides containing the concavity C_1 or convexity C_2.

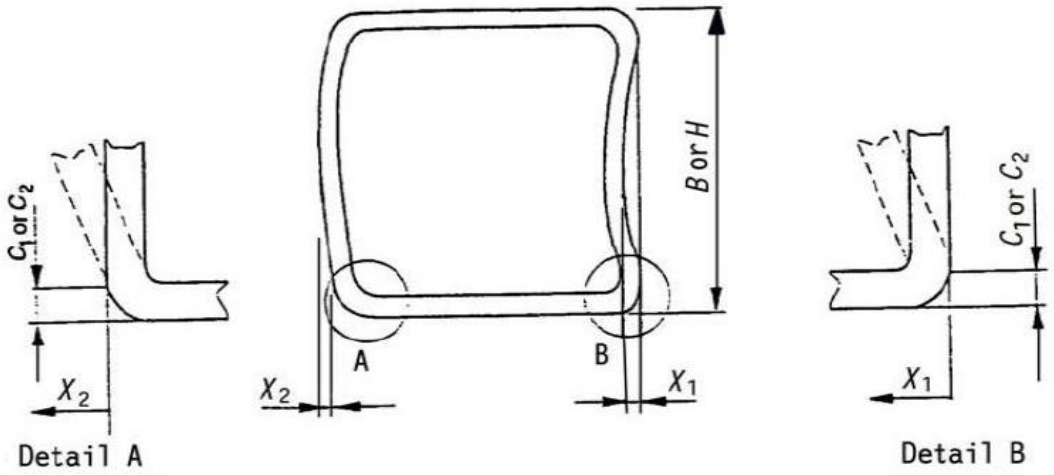

Figure 2 — Measurement of concavity/convexity of square or rectangular hollow sections

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

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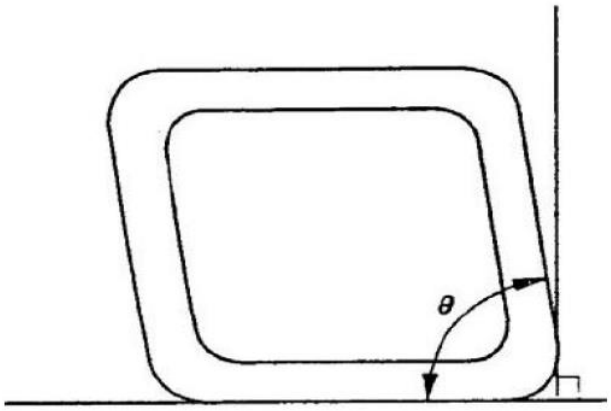

Deviation from squareness = $90^0 - \theta$

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 according to 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.

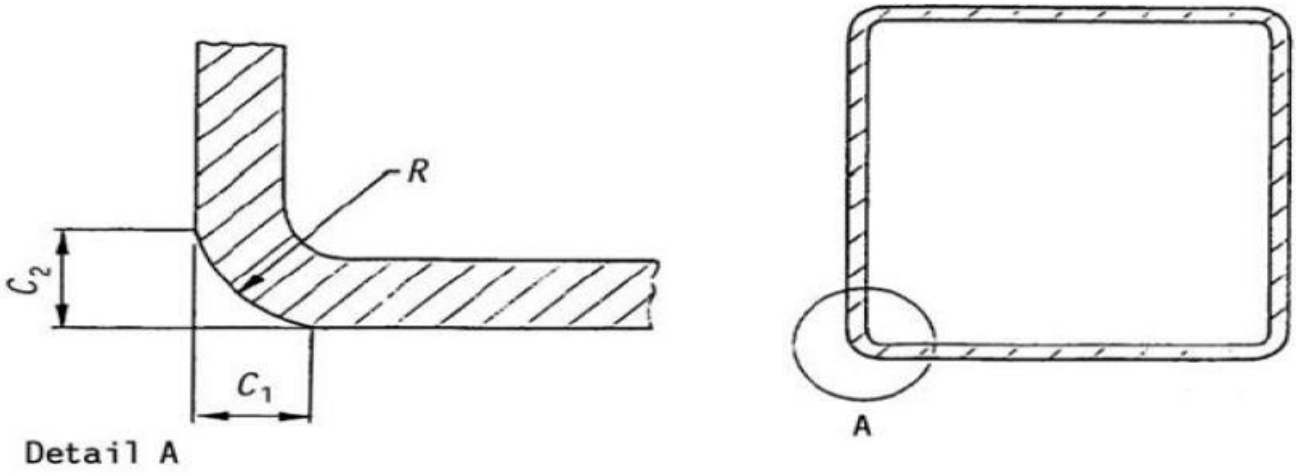

Figure 4 — Outside corner profile of square or rectangular hollow sections

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.

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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 as shown in Figure 5, shall be measured.

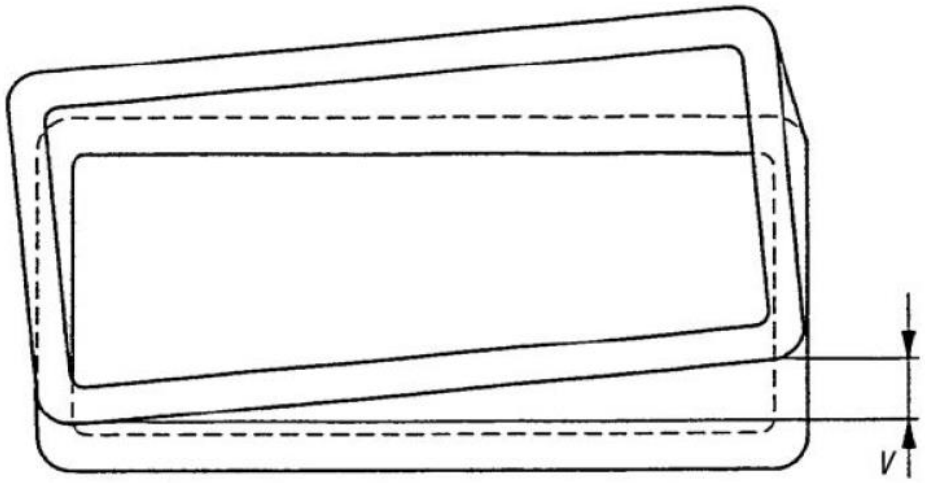

Figure 5 — Twist of square or rectangular hollow sections

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 (see Figure 6). The twist V is the difference between the values V_1 (See Figure 6) measured at each end of the section.

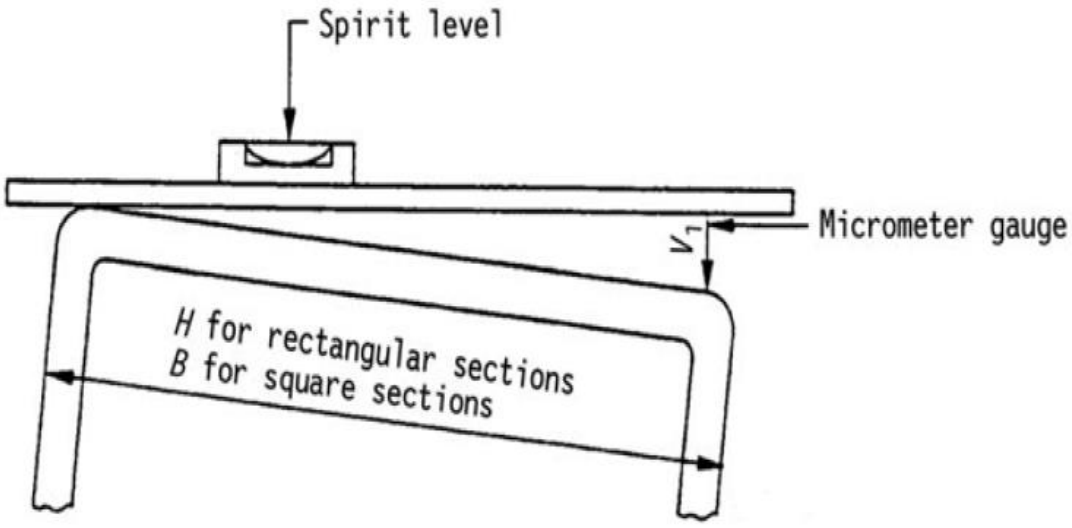

Figure 6 — Measurement of twist

5.3.9 Straightness

The deviation from straightness (e) of total length 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.

The percentage deviation from straightness shall be calculated as follows:

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$$Deviation = \frac{e}{L} \times 100\% \quad \text{...3)}$$

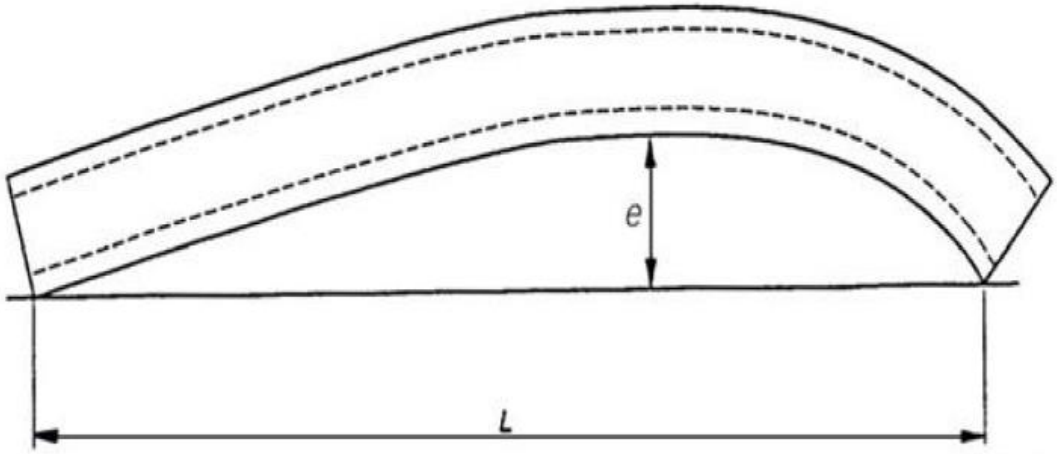

Figure 7 — Measurement of deviation from straightness

6 Compound sections

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 are specified in ISO 14347.

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

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

7 Material requirement

7.1 Grade designation

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

Table 2 — Grade designation

Minimum yield stress, N/mm^2	**Designation of grade**
210	210
250	250
360	360

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7.2 Chemical composition

The results of ladle chemical analysis of steel from which a hollow section is manufactured shall comply with appropriate limits of 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	Maximum content, %			
	Carbon	Phosphorous	Sulphur	Mn
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 8, shall comply with the requirements in Table 4. If other grades of steel are used, their mechanical properties shall be agreed on between the purchaser and the manufacturer.

Table 4 — Tensile test requirements

Grade of steel	Minimum yield stress, N/mm^2	Ultimate tensile strength, N/mm^2	Minimum elongation as a proportion of gauge length, %
210	210	340	24
250	250	420	22
360	360	480	20

8 Sampling

8.1 General

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.

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 the specification unless all sections in the batch are tested individually.

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8.2 Test pieces

The test piece shall consist of a strip taken from the section. The strip shall be taken longitudinally at any point of the section except for welded sections when it shall not be taken from the weld zone. The strip shall comply with the following conditions:

a) sides of the test piece shall be parallel within a maximum variation, along parallel length, of ± 0.2 % of nominal width;

b) the tripped ends and parallel lengths of the test piece shall be coaxial;

c) $L_0 = 5.65\sqrt{A}$ and shall be within ± 5 % of the nominal value:

where

L_o is the gauge length; and

A is the sectional area.

d) minimum parallel length $L_p = L_o + 2D$ for circular sections, and $L_p = L_o + 2$ nominal width for square or rectangular sections:

where,

L_o is the gauge length.

e) the width of the test piece shall not be less than 6 mm, unless the product width precludes use of wider pieces; and

f) the test piece shall not be flattened and machined between the gauge marks except for the purposes of gripping the test piece in a test machine.

9 Marking

Each piece shall be indelibly and legibly marked /printed at least once in every 6 meters length with the following:

a) manufacturer's name and/ or registered trademark;

b) outside dimension (in mm);

c) nominal thickness (in mm);

d) The steel grade; and

e) Country of origin

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Annex A
(normative)

Section properties

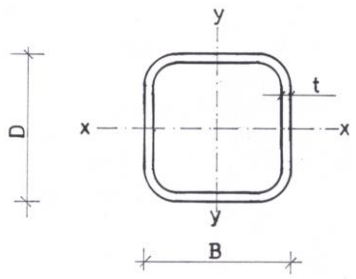

Figure A.1 — Square hollow sections

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

Size, **B x D** mm	**Thick ness,** **t** mm	**Area,** **A** cm^2	**Mass,** **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	0.388	0.135	0.523	
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

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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

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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

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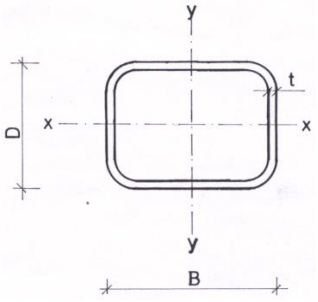

Figure A.2 — Rectangular section

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

Size, B x D mm	Thickness, t mm	Area, A cm^2	Mass, 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	1.39	0.37	1.22	0.63	0.79	0.49
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
35 x 30	1.0	1.23	0.97	2.26	1.78	1.35	1.20	1.29	1.19
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

REVIEW STAGE

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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
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	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

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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
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

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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
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	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
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

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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	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	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	1,067.14	559.76	5.46	3.95	142.29	111.95
200 x 50	5.0	23.36	18.33	1067.138	559.765	5.460	3.955	142.285	111.953
200 x 50	6.0	27.63	21.69	983.863	103.289	6.490	2.103	98.386	41.315
200 x 50	8.0	35.24	27.66	1138.622	117.115	6.419	2.059	113.862	46.846
200 x 100	4.0	22.95	18.01	1199.722	410.782	7.230	4.231	119.972	82.156
200 x 100	5.0	28.36	22.26	1459.280	496.940	7.174	4.186	145.928	99.388
200 x 100	6.0	33.63	26.40	1703.342	576.921	7.116	4.142	170.334	115.384
200 x 100	8.0	43.24	33.94	2,090.91	705.37	6.95	4.04	209.09	141.07
200 x 150	4.0	26.95	21.15	1583.935	1021.039	7.667	6.155	158.394	136.139
200 x 150	5.0	33.36	26.18	1934.696	1245.049	7.616	6.109	193.470	166.006
200 x 150	6.0	39.63	31.11	2268.062	1457.143	7.565	6.063	226.806	194.286
200 x 150	8.0	51.24	40.22	2,828.62	1,815.57	7.43	5.95	282.86	242.08
300 x 100	4.0	30.95	24.29	3289.494	591.748	10.310	4.373	219.300	118.350
300 x 100	5.0	38.36	30.11	4065.277	722.774	10.295	4.341	271.018	144.555
300 x 100	6.0	45.63	35.82	4776.872	842.361	10.231	4.296	318.458	168.472
300 x 100	8.0	59.24	46.50	5,978.04	1,044.78	10.05	4.20	398.54	208.96
300 x 200	4.0	38.95	30.57	5072.923	2736.575	11.413	8.382	338.195	273.658
300 x 200	5.0	48.36	37.96	6241.110	3360.946	11.361	8.337	416.074	336.095
300 x 200	6.0	57.63	45.24	7370.312	3962.222	11.309	8.291	491.354	396.222
300 x 200	8.0	75.24	59.06	9389.451	5041.735	11.171	8.186	625.963	504.174
350 x 150	4.0	38.95	30.57	6133.375	1660.679	12.549	6.530	350.479	221.424
350 x 150	5.0	48.36	37.96	7544.127	2033.799	12.490	6.485	431.093	271.173

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350 x 150	6.0	57.63	45.24	8906.982	2390.803	12.432	6.441	508.970	318.774
350 x 150	8.0	75.24	59.06	11322.126	3026.693	12.267	6.342	646.979	403.559
400 x 100	6.0	57.63	45.24	10132.070	1107.801	13.259	4.384	506.603	221.560
400 x 100	8.0	75.24	59.06	12827.344	1384.195	13.057	4.289	641.367	276.839

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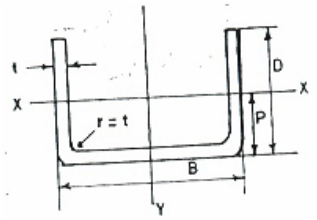

Figure A.3 — Plain channel section

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

Size B x D	**Thickness, t**	**Area, A**	**Mass, w**	**Centroid**	**Second Moment of area**		**Elastic section modulus**		**Radius of gyration**	
mm	mm	cm^2	Kg/m	Y-axis P_y cm	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	1.305	1.024	0.750	1.430	3.414	1.907	0.171	1.047	1.617
40 x 25	2.0	1.720	1.350	0.769	1.904	4.391	2.477	0.220	1.052	1.598
40 x 40	1.5	1.755	1.378	1.391	5.768	5.082	4.146	0.254	1.813	1.702
40 x 40	2.0	2.320	1.821	1.410	7.681	6.559	5.446	0.328	1.820	1.681
50 x 25	3.0	2.820	2.214	0.735	2.875	10.425	3.912	0.417	1.010	1.923
60 x 40	3.0	4.020	3.156	1.254	11.674	23.449	9.306	0.782	1.704	2.415
60x 40	4.0	5.280	4.145	1.291	15.535	29.818	12.034	0.994	1.715	2.376
75 x 40	3.0	4.470	3.509	1.143	11.779	39.335	10.303	1.049	1.623	2.966
75 x 40	4.0	5.880	4.616	1.180	15.679	50.396	13.292	1.344	1.633	2.928
75 x 40	4.5	6.570	5.157	1.198	17.626	55.574	14.717	1.482	1.638	2.908
100 x 50	3.0	5.820	4.569	1.361	23.090	91.355	16.961	1.827	1.992	3.962
100 x 50	4.0	7.680	6.029	1.398	30.743	118.170	21.992	2.363	2.001	3.923
100 x 50	4.5	8.595	6.747	1.416	34.563	130.938	24.407	2.619	2.005	3.903
100 x 50	6.0	11.280	8.855	1.470	46.007	166.794	31.293	3.336	2.020	3.845
120 x 50	3.0	6.420	5.040	1.248	23.256	139.729	18.633	2.329	1.903	4.665
120 x 50	4.0	8.480	6.657	1.285	30.969	181.444	24.102	3.024	1.911	4.626
120 x 50	6.0	12.480	9.797	1.358	46.365	258.106	34.150	4.302	1.927	4.548
120 x 65	4.5	10.845	8.513	1.857	75.799	246.486	40.824	4.108	2.644	4.767
125 x 65	4.0	9.880	7.756	1.805	67.526	243.789	37.405	3.901	2.614	4.967
125 x 65	6.0	14.580	11.445	1.878	101.071	348.518	53.813	5.576	2.633	4.889
150 x 50	6.0	14.280	11.210	1.224	46.800	442.624	38.224	5.902	1.810	5.567
150 x 70	4.0	11.280	8.855	1.838	84.728	393.942	46.091	5.253	2.741	5.910
150 x 70	6.0	16.680	13.094	1.912	126.844	567.112	66.358	7.561	2.758	5.831
150 x 75	4.0	11.680	9.169	2.024	103.961	415.263	51.373	5.537	2.983	5.963
150 x 75	6.0	17.280	13.565	2.097	155.636	598.234	74.223	7.976	3.001	5.884
200 x 75	4.5	15.345	12.046	1.776	118.215	906.376	66.578	9.064	2.776	7.685

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Size B x D	**Thickness, t**	**Area, A**	**Mass, w**	**Centroid**	**Second Moment of area**		**Elastic section modulus**		**Radius of gyration**	
mm	mm	cm^2	Kg/m	Y-axis P_y cm	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
200 x 75	4.0	13.680	10.739	1.757	105.128	812.250	59.833	8.122	2.772	7.706
200 x 75	5.0	17.000	13.345	1.794	131.294	998.917	73.180	9.989	2.779	7.665
200 x 75	6.0	20.280	15.920	1.831	157.433	1179.314	85.979	11.793	2.786	7.626
200 x 100	6.0	23.280	18.275	2.723	369.445	1461.674	135.692	14.617	3.984	7.924

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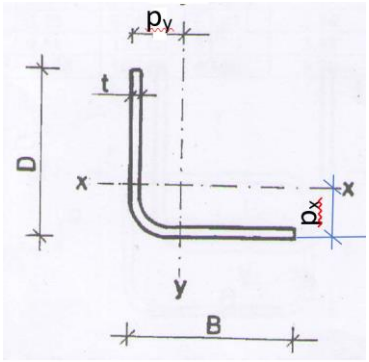

Figure A.4 — Plain equal angles section

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

Size, B × D, mm	**Thickness, t,** mm	**Cross sectional area, A,** cm^2	**Mass, 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	0.888	0.69	1.10	0.33	0.24	0.614	0.33	0.23	0.614
25 x 25	2.5	1.13	0.89	0.75	0.68	0.39	0.775	0.68	0.38	0.775
25 x 25	2.0	1.65	1.09		0.42	1.06	1.12	0.42	1.06	1.12
25 x 25	3	1.33	1.05	0.78	0.80	0.46	0.773	0.80	0.46	0.773
30 x 30	2.0	1.23	1.10		1.10	1.05	1.09	1.10	1.05	1.09
30 x 30	2.5	1.38	1.08	0.87	1.24	0.58	0.941	1.24	0.58	0.941
30 x 30	3	1.63	1.28	0.90	1.43	0.68	0.935	1.43	0.68	0.935
32 x 32	3	1.74	1.37	0.91	1.54	0.67	0.94	1.54	0.67	0.94
32 x 32	4	2.24	1.76	0.898	1.86	0.81	0.91	1.86	0.81	0.91
32 x 32	4.5	2.48	1.88	0.906	1.99	0.87	0.90	1.99	0.87	0.90
32 x 32	6	3.12	2.45	1.03	2.30	1.06	0.86	2.30	1.06	0.86
40 x 40	2.0	1.46	1.14		2.46	1.23	1.21	2.46	1.23	1.21
40 x 40	2.5	1.88	1.47	1.13	2.96	1.03	1.25	2.96	1.03	1.25
40 x 40	3	2.22	1.74	1.06	3.18	1.08	1.20	3.18	1.08	1.20
40 x 40	4	2.88	2.26	1.097	3.92	1.32	1.17	3.92	1.32	1.17
40 x 40	4.5	3.20	2.51	1.11	4.24	1.47	1.15	4.24	1.47	1.15
40 x 40	6	4.08	3.20	1.23	5.66	2.04	1.18	5.66	2.04	1.18
50 x 50	2.0	1.86	1.46							
50 x 50	3	2.83	2.22	1.40	7.01	1.94	1.57	7.01	1.94	1.57
50 x 50	4	3.70	2.90	1.45	8.89	2.50	1.56	8.89	2.50	1,56
50 x 50	4.4	4.10	3.22	1.42	8.91	2.49	1.47	8.91	2.49	1.47
50 x 50	6	5.28	4.14	1.48	12.43	3.53	1.53	12.43	3.53	1.53
60 x 60	4	4.50	3.53	1.68	16.01	3.70	1.88	16.01	3.70	1.88
60 x 60	6	6.53	5.13	1.80	22.55	5.37	1.87	22.55	5.37	1.87
65 x 65	4.5	5.45	4.28	1.79	19.03	4.04	1.87	19.03	4.04	1.87
65 x 65	6	7.08	5.56	1.85	25.90	5.57	1.91	25.90	5.57	1.91
75 x 75	6	8.69	6.78	2.09	46.88	8.67	2.33	46.88	8.67	2.33
90 x 90	6	10.08	7.91	2.48	74.42	11.41	2.72	74.42	11.41	2.72
100 x 100	6	11.30	8.87	2.80	112.59	15.59	3.15	112.28	15.59	3.15

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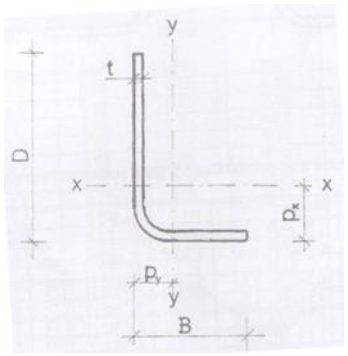

Figure A.5 — Plain unequal angles

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

Size B x D	Thickness *t*	Area A	Mass w	Centroid		Axis x-x			Axis y-y		
				P_x	P_y	I_x	z_x	r_x	I_y	z_y	r_y
mm	mm	cm^2	Kg/m	cm	cm	cm^4	cm^3	cm	cm^4	cm^3	cm
50 x 40	6.0	4.65	3.67	1.53	1.11	9.96	2.87	1.04	5.41	1.83	1.08
65 x 50	6.0	6.18	4.85	1.99	1.31	11.68	2.59	1.24	11.74	3.12	1.38
75 x 50	6.0	6.78	5.32	2.40	1.22	35.81	7.02	1.15	17.58	4.57	1.61
90 x 65	6.0	8.58	6.73	2.76	1.59	66.56	10.67	1.51	28.58	5.73	1.83
90 x 75	6.0	9.78	7.61	3.01	1.93	94.54	13.53	1.76	45.09	7.86	2.15

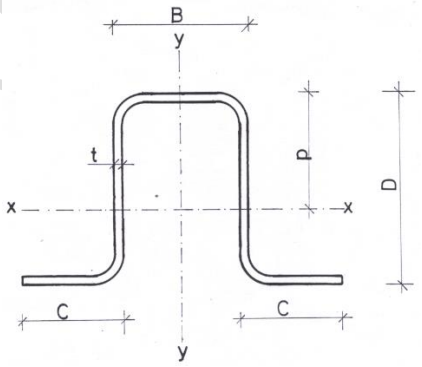

Figure A.6 — Cold formed outwardly lipped channel section

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

Size			Thickness	Area	Mass	Centroid	Axis x-x			Axis y-y		
B	*D*	*C*	*t*	*A*	*w*	*p*	I_x	z_x	r_x	I_y	z_y	r_y
mm	mm	mm		cm^2	Kg/m		cm^4	cm^3	cm	cm^4	cm^3	cm

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			mm			cm						
20	20	10	1.5	1.20	0.94	1.116	0.6860	0.610	1.75	1.7260	1.730	1.195
20	20	15	2.0	1.54	1.20	1.118	0.7910	0.710	0.72	2.1300	0.930	1.180
25	25	15	1.5	1.43	1.12	1.305	1.2900	0.990	0.95	2.6540	1.020	1.363
25	25	15	2.0	1.84	1.44	1.313	1.5630	0.920	0.92	3.3000	1.290	1.340
40	25	15	1.5	1.88	1.47	2.077	4.0470	1.950	1.47	3.2760	1.260	1.321
40	25	15	2.0	2.44	1.91	2.078	5.0220	2.410	1.44	4.0900	1.600	1.295
50	50	20	1.5	2.70	2.12	2.366	10.0800	3.820	1.93	16.4500	3.780	2.467
50	50	20	2.0	3.54	2.77	2.365	12.8000	3.850	1.90	21.0600	4.900	2.442
75	50	20	2.0	4.74	3.71	3.590	36.9700	9.850	2.79	31.0100	6.460	2.559
75	50	20	2.5	5.84	4.58	3.588	44.5700	11.880	2.76	37.4300	7.880	2.532
75	50	20	3.0	6.91	5.42	3.586	51.5600	13.740	2.73	43.4000	9.230	2.507
100	50	30	2.0	5.93	4.66	5.166	79.3600	15.360	3.66	41.8500	7.890	2.657
100	50	30	2.5	7.33	5.76	5.167	96.400	18.650	3.63	50.7400	9.660	2.631
100	50	30	3.0	8.70	6.28	5.166	112.40000	21.750	3.60	59.0600	11.350	2.605

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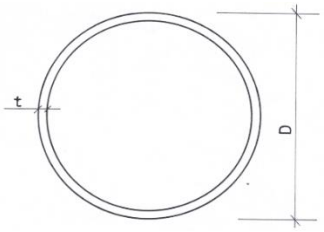

Figure A.7 — Circular tubes

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

Diameter, D mm	**Thickness, t** mm	**Area, A** cm^2	**Mass, 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
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

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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
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

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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
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

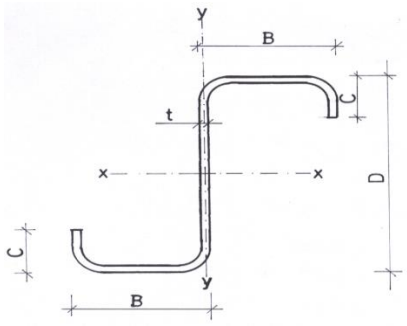

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Figure A.8 — Zed purlins

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

Dimensions				Area	Mass	Axis x-x		Axis y-y		
B	*D*	*C*	*t*	*A*	*w*	I_x	z_x	I_y	z_y	r_y
mm	mm	mm	mm	cm^2	kg/m	cm^4	cm^3	cm^4	cm^3	cm
50.0	100.0	22.0	2.0	4.44	3.54	70.1000	18.810	33.8700	6.800	2.70
50.0	115.0	22.0	2.0	4.78	3.78	98.2400	17.910	33.8900	6.800	2.82
50.0	130.0	22.0	2.0	5.06	4.02	125.9900	19.040	33.8700	6.800	2.56
50.0	140.0	22.0	2.0	5.28	4.17	157.8000	22.600	33.8700	6.800	2.50
50.0	150.0	22.0	2.0	5.44	4.33	194.1400	25.470	33.8700	6.800	2.44
50.8	165.1	22.2	2.0	5.92	4.65	234.9600	28.460	33.8700	6.800	2.39
50.8	165.1	22.2	2.5	7.25	5.94	278.7000	33.780	33.8700	7.590	2.33
50.8	177.8	22.2	2.5	7.59	5.90	340.7300	38.320	37.6300	7.590	2.23
63.5	177.8	22.2	2.5	8.23	6.40	389.5100	43.810	67.9100	10.910	2.88
65.0	175.0	22.0	2.0	6.58	5.17	331.7000	37.310	36.1300	10.100	3.04
76.2	177.8	22.2	3.0	10.42	8.17	516.5200	58.100	128.5800	17.210	3.50
76.2	254.0	22.2	3.0	13.12	10.30	123.6000	97.380	148.9900	19.950	3.37
50.8	76.0	19.0	1.5	2.90	2.28	38.2500	8.030	20.2700	4.070	1.63
50.8	76.0	19.0	2.0	3.83	3.01	51.0000	10.700	27.0200	5.430	2.18
50.8	95.3	20.0	2.0	4.52	3.52	63.9400	13.420	33.8700	6.800	2.73
50.8	101.6	20.0	2.0	4.26	3.34	70.1800	13.810	31.4500	4.980	2.41
50.8	114.6	20.0	2.0	4.90	3.85	98.2400	17.190	33.8700	6.800	2.62
50.8	127.0	20.0	2.0	5.16	4.05	125.9900	19.840	33.8700	6.800	2.56
50.8	139.7	20.0	2.0	5.40	4.24	157.9000	22.600	33.8700	6.800	2.50
50.8	152.4	20.0	2.0	5.66	4.44	194.1400	25.470	33.8700	6.800	2.44
50.8	165.1	20.0	2.0	5.92	4.65	234.9600	28.460	33.8700	6.800	2.39
50.8	165.1	20.0	2.5	7.25	5.94	278.7000	33.780	33.8700	7.590	2.33
63.5	165.1	20.0	2.5	9.91	6.14	301.5000	36.540	36.7900	10.910	2.31
50.8	177.8	20.0	2.0	6.07	4.72	272.5800	30.660	30.1000	6.072	1.78
50.8	177.8	20.0	2.5	7.59	5.90	340.7300	38.320	37.6300	7.590	2.23
63.5	177.8	20.0	2.5	8.23	6.40	389.5100	43.810	67.9100	10.910	2.88
76.2	177.8	20.0	3.0	10.42	8.17	516.5200	58.100	128.5800	17.210	3.50
50.8	203.0	20.0	2.0	6.95	5.66	440.8000	43.700	55.1000	8.010	2.78
76.2	203.0	20.0	2.5	7.10	7.93	548.2100	49.300	58.7100	57.400	9.01

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76.2	203.0	20.0	3.0	10.42	8.36	751.5000	56.800	68.3000	11.120	2.85
76.2	254.0	20.0	2.5	9.84	7.65	962.0000	71.500	57.4000	9.070	2.31
76.2	254.0	20.0	3.0	13.12	10.30	123.6000	97.380	148.9900	19.950	3.37
63.5	304.0	20.0	2.5	12.61	9.91	1568.1000	98.100	148.2000	17.810	3.81
76.2	304.0	20.0	2.5	12.78	10.04	1570.5000	99.400	149.5000	17.960	3.94
63.5	304.0	20.0	3.0	13.82	11.56	1748.3000	116.820	178.2000	19.620	3.48
76.2	304.0	20.0	3.0	13.96	11.81	1761.5000	117.900	179.5200	20.050	3.53

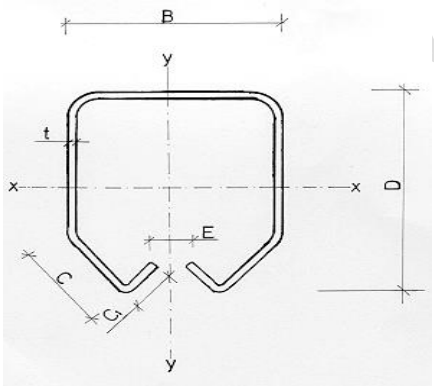

Figure A.9 — Cold formed mono rail sections

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

Dimensions					Thickness	Area	Mass	Axis x-x			Axis y-y		
B mm	D mm	C mm	C_1 mm	E mm	t mm	A cm^2	w kg/m	I_x cm^4	z_x cm^3	r_x cm	I_y cm^4	z_y cm^3	r_x 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	14.35000	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

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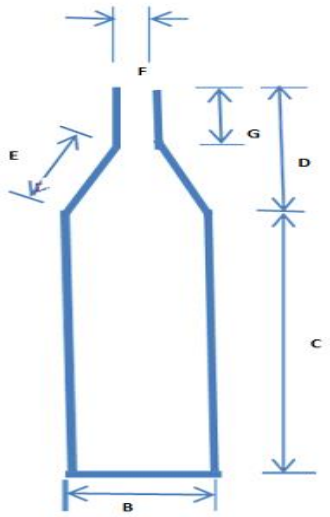

Figure A.10 — Bottle sections

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

Nominal size	Dimensions						Thickness	Mass
	B mm	*C* mm	*D* mm	*E* mm	*F* mm	*G* mm	*t* mm	*w* kg/m
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

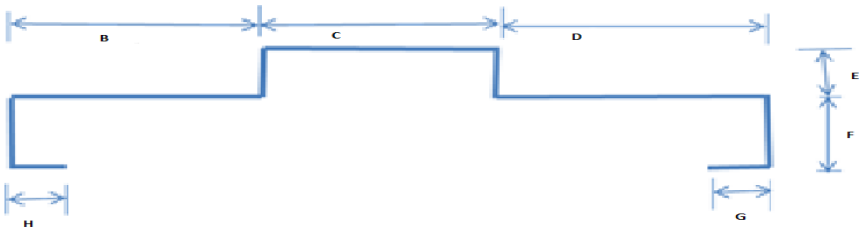

Figure A.11 — Door frame

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

Nominal size	Dimensions						Thickness	Mass
	B mm	*C* mm	*D* mm	*E* mm	*F* mm	*G/H* mm	*t* mm	*w* kg/m
150	48	54	48	13	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

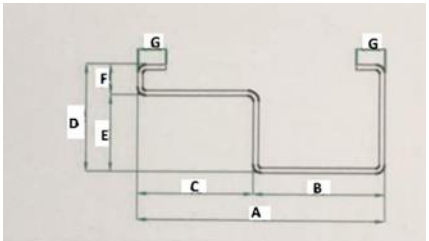

Figure A.12 — Half door frame section

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Table A.11 (b) – Dimensions and properties of cold formed steel door frame section

A	B	C	D	E	F	G	Thickness
95	50	45	42	15	30	11	1.0
95	50	45	42	15	30	11	1.2
95	50	45	42	15	30	11	1.5
100	48	52	42	12	29	13	1.0
100	48	52	42	12	29	13	1.2
100	48	52	42	12	29	13	1.5
105	60	45	60	15	45	12	1.0
105	60	45	60	15	45	12	1.2
105	60	45	60	15	45	12	1.5
125	70	55	60	15	45	12	1.0
125	70	55	60	15	45	12	1.2
125	70	55	60	15	45	12	1.5

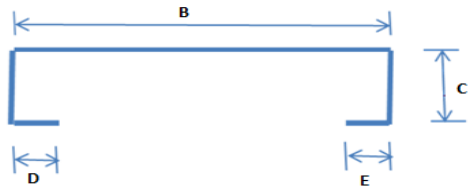

Figure A.13 — Cold formed fascia board

Table A.12 — Dimensions and properties of cold formed steel fascia board sections

Nominal size mm	Dimensions			Thickness	Mass
	B mm	*C* mm	*D or E* mm	*t* mm	*w* kg/m
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

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Figure A.14 — Omega sections

Table A.13 — Dimensions and properties of Omega sections

Dimensions in millimetres

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

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