BRITISH STANDARD

BS EN
10210-2:2006

Hot finished structural hollow sections of non-alloy and fine grain steels —

Part 2: Tolerances, dimensions and sectional properties

The European Standard EN 10210-2:2006 has the status of a British Standard

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BSi

British Standards

National foreword

This British Standard is the official English language version of EN 10210-2:2006. It supersedes BS EN 10210-2:1997 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee ISE/12, Structural steels, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

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Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 31 and a back cover.

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Amendments issued since publication

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EUROPEAN STANDARD

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EN 10210-2

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English Version

Hot finished structural hollow sections of non-alloy and fine grain steels - Part 2: Tolerances, dimensions and sectional properties

Profils creux pour la construction finis à chaud en aciers non alliés et à grains fins - Partie 2 : Tolérances, dimensions et caractéristiques de profil

Warmgefertigte Hohlprofile für den Stahlbau aus unlegierten Baustählen und aus Feinkornbaustählen - Teil 2: Grenzabmaße, Maße und statische Werte

This European Standard was approved by CEN on 16 March 2006.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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Contents

Page

2

Foreword

This European Standard (EN 10210-2:2006) has been prepared by Technical Committee ECISS/TC 10 "Structural steels - Grades and qualities", the secretariat of which is held by NEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by October 2006, and conflicting national standards shall be withdrawn at the latest by October 2006.

This European Standard supersedes EN 10210-2:1997.

This standard consists of the following parts under the general title 'Hot finished structural hollow sections of non-alloy and fine grain steels':

— Part 1: Technical delivery conditions

— Part 2: Tolerances, dimensions and sectional properties

It forms part of a series of standards on hollow sections together with EN 10219-1 and 2, which are also under revision.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

1   Scope

This part of EN 10210 specifies tolerances for hot finished circular, square, rectangular and elliptical structural hollow sections, manufactured in wall thicknesses up to 120 mm, in the following size ranges:

Circular: Outside diameters up to 2 500 mm

Square: Outside dimensions up to 800 mm x 800 mm

Rectangular: Outside dimensions up to 750 mm x 500 mm

Elliptical: Outside dimensions up to 500 mm x 250 mm

The formulae for calculating sectional properties of sections manufactured to the dimensional tolerances of this standard, to be used for the purposes of structural design, are given in Annex A.

Dimensions and sectional properties for a limited range of sizes are given in Annex B.

Technical delivery conditions are specified in EN 10210-1.

NOTE   The designation of the sections' major axis (yy) and its minor axis (zz) align with the axis designation used for structural design in the structural Eurocodes.

2   Normative references

The following referenced documents are indispensable for the application of this European Standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 10210-1:2006, *Hot finished structural hollow sections of non-alloy and fine grain steels — Part 1: Technical delivery conditions*

3   Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN 10210-1:2006 apply.

4   Symbols

For the purposes of this European Standard, the symbols defined in Table 1 apply.

Table 1 —Symbols and definitions

Symbol	Unit	Definition
A	cm^2	Cross-sectional area
A_m	mm^2	Area of the surface delimited by the perimeter at mid-thickness
A_s	m^2/m	Superficial area per metre length
B	mm	Specified side dimension of a square hollow section. Specified dimension of the shorter side of a rectangular hollow section. Specified outside dimension of an elliptical section on its minor axis
C_1/C_2	mm	Length of corner region of a square or rectangular hollow section
C_t	cm^3	Torsional modulus constant
D	mm	Specified outside diameter of a circular hollow section
D_{max}/D_{min}	mm	The maximum and minimum outside diameter of a circular hollow section measured in the same plane
e	mm	Deviation from straightness
H	mm	Specified dimension of the longer side of a rectangular hollow section. Specified outside dimension of an elliptical section on its major axis
I	cm^4	Second moment of area
I_t	cm^4	Torsional inertia constant (polar moment of inertia in the case of circular hollow sections only)
i	cm	Radius of gyration
L	mm	Length
M	kg/m	Mass per unit length
O	%	Out-of-roundness
P	mm	External perimeter of an elliptical hollow section
R	mm	External corner radius of a square or rectangular hollow section
T	mm	Specified thickness
U	mm	Perimeter of an elliptical hollow section at mid-thickness
V	mm	Total measured twist
V_1	mm	Twist measured at one end of a section
W_{el}	cm^3	Elastic section modulus
W_{pl}	cm^3	Plastic section modulus
x_1	mm	Concavity of a side of a square or rectangular hollow section
x_2	mm	Convexity of a side of a square or rectangular hollow section
yy	—	Axis of cross-section, major axis of a rectangular hollow section
zz	—	Axis of cross-section, minor axis of a rectangular hollow section
θ	°	Angle between adjacent sides of a square or rectangular hollow section

5   Information to be obtained by the manufacturer

5.1 Mandatory information

The following mandatory information from this part of EN 10210 shall be obtained by the manufacturer at the time of enquiry and order.

a)   The type of length, length range or length (see Table 3).

b)   The dimensions (see Clause 8).

NOTE   This information is included in the list of information to be obtained by the manufacturer contained in EN 10210-1.

5.2 Options

One option is specified in this part of EN 10210. In the event that the purchaser does not indicate a wish to implement this option at the time of enquiry and order, the manufacturer shall supply in accordance with the basic specification.

Option 2.1   the tolerance on approximate length shall be $^{+150}_{0}$ mm (see Table 3).

6   Tolerances

6.1   Tolerances shall not exceed the values given in Table 2 for shape, straightness and mass, Table 3 for manufacturer's delivered length and Table 4 for the height of the internal and external weld bead of submerged arc welded hollow sections.

6.2   The internal corners of square and rectangular hollow sections shall be rounded.

NOTE   The internal corner profile is not specified.

Table 2 — Tolerances on shape, straightness and mass

Characteristic	Circular hollow sections	Square and rectangular hollow sections	Elliptical hollow sections
Outside dimensions (D, B, H)	±1 % with a minimum of ± 0,5 mm and a maximum of ± 10 mm	± 1 % [a] with a minimum of ± 0,5 mm	
Thickness (T)	-10 % [b, c]		
Out-of-roundness (O)	2 % for hollow sections having a diameter to thickness ratio not exceeding 100 [d]	—	
Concavity/Convexity (x_1, x_2) [e]	—	1 %	—
Squareness of side (θ)	—	90° ± 1°	—
External corner profile (C_1, C_2 or R) [f]	—	$3T$ maximum at each corner	—
Twist (V)	—	2 mm [a] plus 0,5 mm/m length [a]	
Straightness (e)	0,2 [a] % of total length and 3 mm over any 1 m length		
Mass (M)	± 6 % on individual delivered lengths [g]		

[a] For elliptical hollow sections of sizes H < 250 mm the permitted tolerance is twice the value given in this table.

[b] The positive deviation is limited by the tolerance on mass.

[c] For seamless sections thicknesses of less than 10 % but not less than 12,5 % of the nominal thickness may occur in smooth transition areas over not more than 25 % of the circumference.

[d] Where the diameter to thickness ratio exceeds 100, the tolerance on out-of-roundness shall be agreed.

[e] The tolerance on convexity and concavity is independent of the tolerance on outside dimensions.

[f] The sides need not be tangential to the corner arcs.

[g] The positive tolerance on the mass of seamless hollow sections is 8 %.

Table 3 — Tolerances on manufacturer's delivered length

Dimensions in millimetres

Type of length [a]	Range of length or length L	Tolerance
Random length	4 000 $\leq L \leq$ 16 000 with a range of 2 000 per order item	10 % of sections supplied may be below the minimum for the ordered range but not shorter than 75 % of the minimum range length
Approximate length	4 000 $\leq L \leq$ 16 000	$\pm$ 500 mm [b]
Exact length	2 000 $\leq L \leq$ 6 000	$^{+10}_{\ 0}$ mm
	> 6 000 [c]	$^{+15}_{\ 0}$ mm

[a] The manufacturer shall establish at the time of enquiry and order the type of length required and the length range or length.

[b] Option 2.1   the tolerance on approximate length is $^{+150}_{\ \ 0}$ mm.

[c] Common lengths available are 6 m and 12 m.

Table 4 — Tolerance on height of internal and external weld bead for submerged arc welded hollow sections

Dimensions in millimetres

Thickness, T	Maximum weld bead height
$\leq$ 14,2	3,5
> 14,2	4,8

7   Measurement of size and shape

7.1 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 and elliptical sections, with a minimum of 100 mm.

7.2 Outside dimensions

For circular hollow sections the diameter (D) and for elliptical hollow sections the outside dimensions (B and H) shall be measured either directly, e.g. using a calliper gauge, or by circumference tape at the discretion of the manufacturer.

The limiting cross-sectional positions for measuring B and H for square and rectangular hollow sections are shown in Figure 1.

7.3 Thickness

The thickness (T) of welded hollow sections 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 hollow sections are shown in Figure 1.

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

Dimensions in millimetres
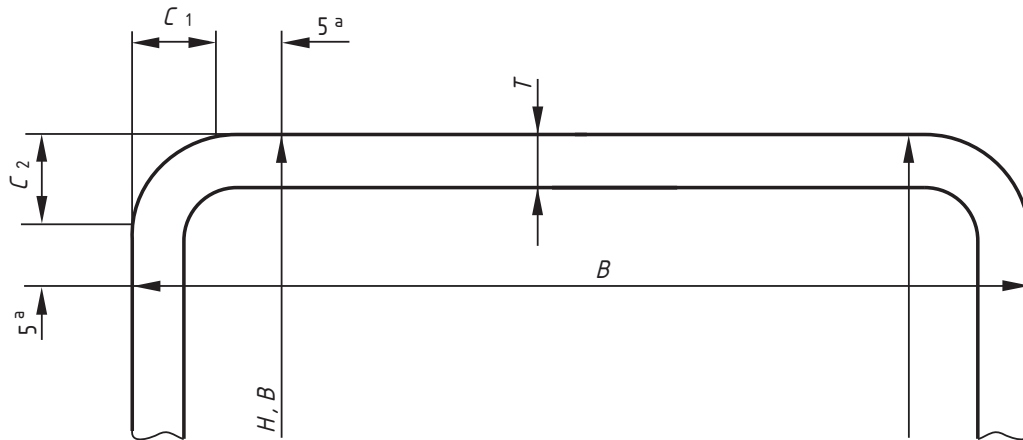
^a   This dimension is a maximum when measuring B or H and a minimum when measuring T.

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

7.4 Out-of-roundness

The out-of-roundness (O) of a circular hollow section shall be calculated from the following equation:

$$O(\%) = \frac{D_{max} - D_{min}}{D} \times 100$$

7.5 Concavity and convexity

The concavity (x_1) or the convexity (x_2) of the sides of a square or rectangular hollow section shall be measured as shown in Figure 2.

The percentage concavity or convexity shall be calculated as follows:

$$\frac{x_1}{B} \times 100\%; \frac{x_2}{B} \times 100\%; \frac{x_1}{H} \times 100\%; \frac{x_2}{H} \times 100\%$$

where B and H are the dimensions of the sides containing the concavity x_1 or the convexity x_2.
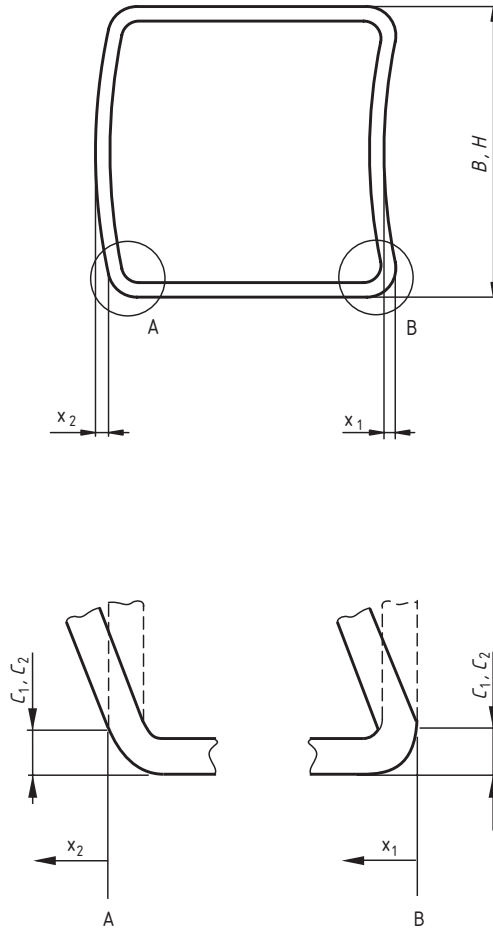
Figure 2 — Measurement of concavity/convexity of square or rectangular hollow sections

7.6 Squareness of sides

The deviation from squareness of the sides of a square or rectangular hollow section shall be measured as the difference between 90º and θ as shown in Figure 3.
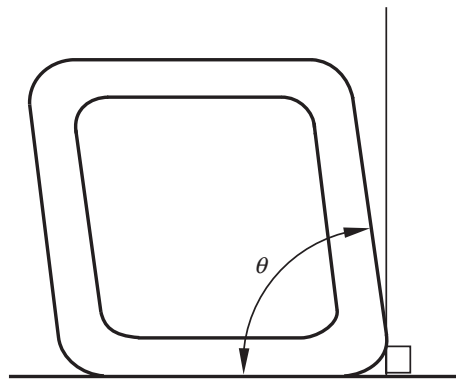
Figure 3 — Squareness of sides of square or rectangular hollow sections

7.7 External corner profile

7.7.1   The external corner profile of a square or rectangular hollow section shall be measured according to 7.7.2 or 7.7.3 at the discretion of the manufacturer.

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

7.7.3   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.
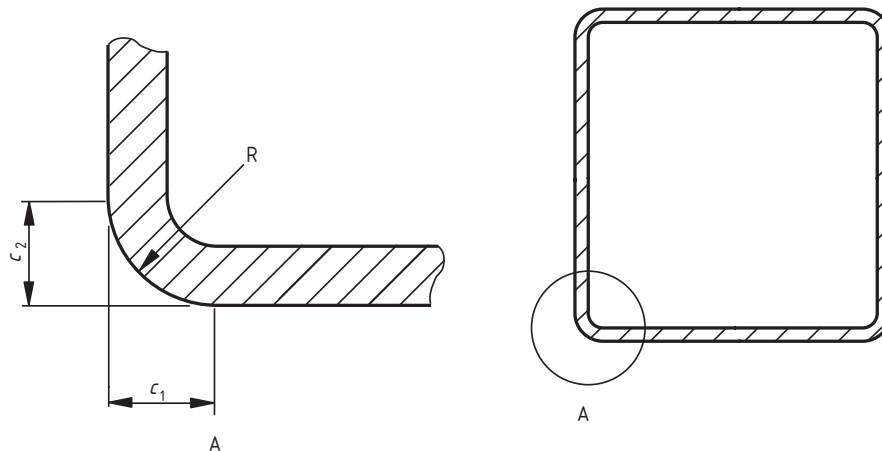
Figure 4 — Outside corner profile of square or rectangular hollow sections

7.8 Twist

7.8.1   The twist (V) in a square or rectangular hollow section shall be determined in accordance with 7.8.2 or 7.8.3 at the discretion of the manufacturer. The twist (V) in an elliptical hollow section shall be determined in accordance with 7.8.4.

7.8.2   The hollow section shall be placed on a horizontal surface with one side at one end pressed flat against the surface. At the opposite end of the hollow section the difference in height of the two lower corners from the horizontal surface (see Figure 5) shall be determined.
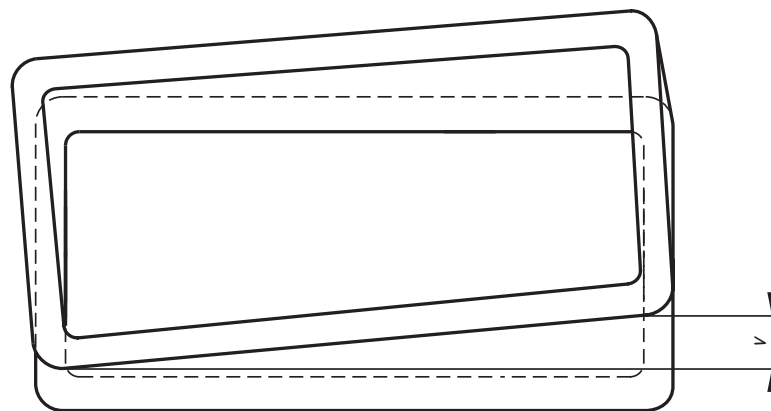
Figure 5 — Twist of square or rectangular hollow sections

7.8.3 The twist of square and rectangular hollow sections shall be measured with a spirit level and micrometer 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 hollow section.
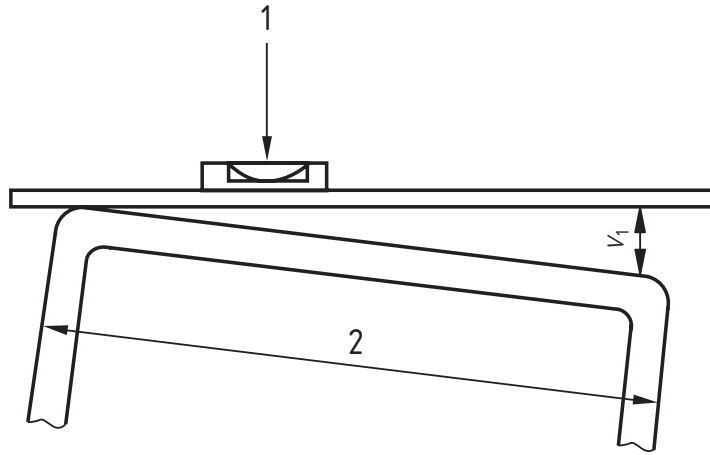
Key

1   Spirit level

2   H for rectangular sections, B for square sections

Figure 6 — Measurement of twist of square or rectangular hollow sections

7.8.4 The twist of elliptical hollow sections shall be measured with a spirit level and micrometer gauge (screw). The reference length of the spirit level shall be the dimension of the sections major axis (H). The twist V is the difference between the values V_1 (see Figure 7) measured at each end of the hollow section.
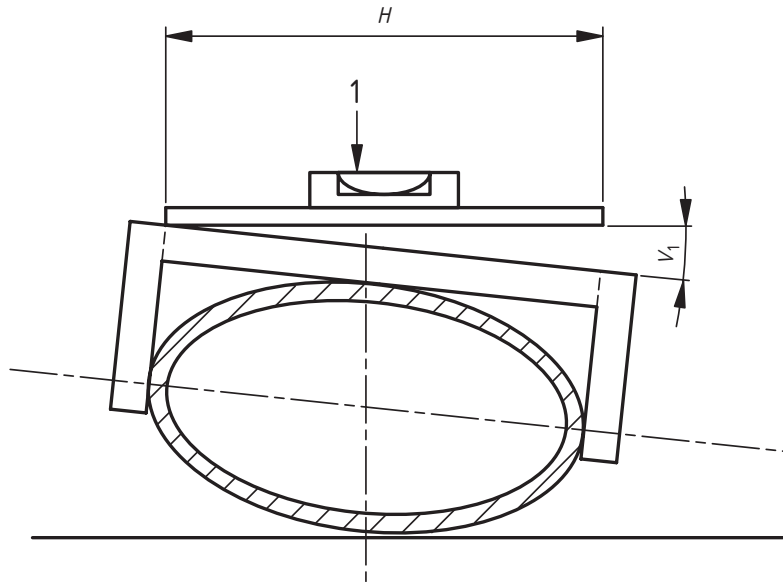
Key

1   Spirit level

Figure 7 – Measurement of twist of elliptical hollow sections

7.9 Straightness

The deviation from straightness (e) of the 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 8 where L is the manufacturer's delivered length. The percentage deviation from straightness shall be calculated as follows:

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

In addition the local deviation (e) from straightness of a hollow section, measured at any point along its length from a straight line length L of 1 m, shall be not more than 3 mm.
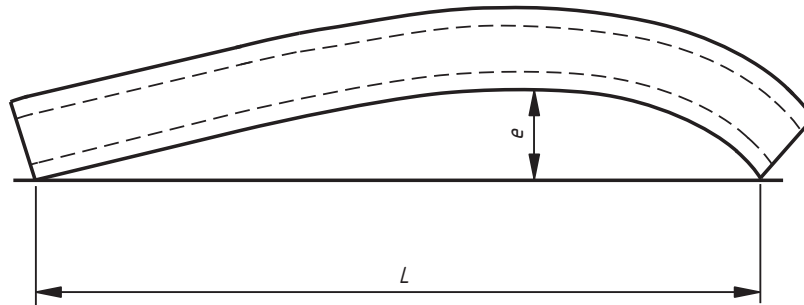
Figure 8 — Measurement of deviation from straightness

8 Dimensions and sectional properties

The nominal sectional properties of hollow sections within the scope of this part of EN 10210 and manufactured to the dimensional tolerances of this standard, required for the purposes of structural design, shall be calculated in accordance with Annex A.

The sectional properties for a limited range of standard sizes of hot finished circular, square, rectangular and elliptical hollow sections are given in Table B.1 for circular sections, Table B.2 for square sections, Table B.3 for rectangular sections and Table B.4 for elliptical sections. These sectional properties were calculated from the formulae given in Annex A.

NOTE   Not all sizes and thicknesses shown in Tables B.1, B.2, B.3 and B.4 are available from all manufacturers and the user is recommended to check availability. Other sizes and thicknesses within the scope of this standard may be available.

Annex A
(normative)

Formulae for the calculation of sectional properties

A.1 General

Tables B.1, B.2, B.3 and B.4 of this standard give nominal sectional properties for a limited range of sizes of hot finished hollow sections. The nominal sectional properties of hollow sections supplied to the requirements of this standard shall be calculated using the formulae given below.

NOTE   The designation of the sections' major axis (yy) and its minor axis (zz) align with the axis designation used for structural design in the structural Eurocodes. This is a change from previous axis designations.

A.2 Circular hollow sections

The sectional properties for circular hollow sections in Table B.1 are calculated using the formulae given below.

Specified outside diameter	(D)	(mm)
Specified thickness	(T)	(mm)
Inside diameter	$(d = D - 2T)$	(mm)

These parameters, which characterize the shape of circular hollow sections, may vary within the tolerances allowed by this standard and the sectional properties still remain valid.

Superficial area per metre length	$A_s = \dfrac{\pi D}{10^3}$	(m²/m)
Cross-sectional area	$A = \dfrac{\pi\left(D^2 - d^2\right)}{4 \times 10^2}$	(cm²)
Mass per unit length	$M = 0{,}785 \times A$	(kg/m)
Second moment of area	$I = \dfrac{\pi\left(D^4 - d^4\right)}{64 \times 10^4}$	(cm⁴)
Radius of gyration	$i = \sqrt{\dfrac{I}{A}}$	(cm)

Elastic section modulus

$$W_{el} = \frac{2I \times 10}{D}$$

(cm³)

Plastic section modulus

$$W_{pl} = \frac{D^3 - d^3}{6 \times 10^3}$$

(cm³)

Torsional inertia constant
(polar moment of inertia)

$$I_t = 2I$$

(cm⁴)

Torsional modulus constant

$$C_t = 2W_{el}$$

(cm³)

A.3 Rectangular, including square, hollow sections

The sectional properties for square hollow sections, in Table B.2, and for rectangular hollow sections, in Table B.3, are calculated using the formulae given below.

Specified side dimension of a square hollow section or shorter side of a rectangular hollow section

(B)

(mm)

Specified dimension of the longer side of a rectangular hollow section

(H)

(mm)

Specified thickness

(T)

(mm)

External corner radius (r_o) for calculation is:

$(r_o = 1,5T)$

(mm)

Internal corner radius (r_i) for calculation is:

$(r_i = 1,0T)$

(mm)

These parameters, which characterize the geometric shape of rectangular, including square, hollow sections, may vary within the tolerances allowed by this standard and the sectional properties still remain valid.

Superficial area per metre length

$$A_s = \frac{2}{10^3}\left(H + B - 4r_o + \pi r_o\right)$$

(m²/m)

Cross-sectional area

$$A = \frac{2T(B + H - 2T) - (4 - \pi)\left(r_o^2 - r_i^2\right)}{10^2}$$

(cm²)

Mass per unit length

$$M = 0,785A$$

(kg/m)

Second moment of area

Major axis

$$I_{yy} = \frac{1}{10^4}\left[\frac{BH^3}{12} - \frac{(B - 2T)(H - 2T)^3}{12} - 4\left(I_g + A_g h_g^2\right) + 4\left(I_{\xi\xi} + A_\xi h_\xi^2\right)\right]$$

(cm⁴)

Minor axis

$$I_{zz} = \frac{1}{10^4}\left[\frac{HB^3}{12} - \frac{(H-2T)(B-2T)^3}{12} - 4\left(I_g + A_g h_g{}^2\right) + 4\left(I_{\xi\xi} + A_\xi h_\xi{}^2\right)\right]$$

(cm^4)

Radius of gyration

Major axis

$$i_{yy} = \sqrt{\frac{I_{yy}}{A}}$$

(cm)

Minor axis

$$i_{zz} = \sqrt{\frac{I_{zz}}{A}}$$

(cm)

Elastic section modulus

Major axis

$$W_{el\,yy} = \frac{2I_{yy}}{H} \times 10$$

(cm^3)

Minor axis

$$W_{el\,zz} = \frac{2I_{zz}}{B} \times 10$$

(cm^3)

Plastic section modulus

Major axis

$$W_{pl\,yy} = \frac{1}{10^3}\left[\frac{BH^2}{4} - \frac{(B-2T)(H-2T)^2}{4} - 4\left(A_g h_g\right) + 4\left(A_\xi h_\xi\right)\right]$$

(cm^3)

Minor axis

$$W_{pl\,zz} = \frac{1}{10^3}\left[\frac{HB^2}{4} - \frac{(H-2T)(B-2T)^2}{4} - 4\left(A_g h_g\right) + 4\left(A_\xi h_\xi\right)\right]$$

(cm^3)

Torsional inertia constant

$$I_t = \frac{1}{10^4}\left[T^3\frac{h}{3} + 2KA_h\right]$$

(cm^4)

Torsional modulus constant

$$C_t = 10\left[\frac{I_t}{T + K/T}\right]$$

(cm^3)

Where

$$A_g = \left(1 - \frac{\pi}{4}\right)r_o{}^2$$

(mm^2)

$$A_\xi = \left(1 - \frac{\pi}{4}\right)r_i{}^2$$

(mm^2)

Major axis

$$h_{\mathrm{g}} = \frac{H}{2} - \left(\frac{10-3\pi}{12-3\pi}\right)r_{\mathrm{o}}$$ (mm)

(For minor axis substitute B for H.)

Major axis

$$h_{\xi} = \frac{H-2T}{2} - \left(\frac{10-3\pi}{12-3\pi}\right)r_{\mathrm{i}}$$ (mm)

(For minor axis substitute B for H.)

$$I_{\mathrm{g}} = \left(\frac{1}{3} - \frac{\pi}{16} - \frac{1}{3(12-3\pi)}\right)r_{\mathrm{o}}^{4}$$ (mm^4)

$$I_{\xi\xi} = \left(\frac{1}{3} - \frac{\pi}{16} - \frac{1}{3(12-3\pi)}\right)r_{\mathrm{i}}^{4}$$ (mm^4)

$$h = 2[(B-T)+(H-T)] - 2R_{\mathrm{C}}(4-\pi)$$ (mm)

$$A_{\mathrm{h}} = (B-T)(H-T) - R_{\mathrm{C}}^{2}(4-\pi)$$ (mm)

$$K = \frac{2A_{\mathrm{h}}T}{h}$$ (mm^2)

$$R_{\mathrm{C}} = \frac{r_{\mathrm{o}}+r_{\mathrm{i}}}{2}$$ (mm)

A.4 Elliptical hollow sections

The sectional properties for elliptical hollow sections in Table B.4 are calculated using the formulae given below.

Specified outside dimension of an elliptical section on its major axis   (H)   (mm)

Specified outside dimension of an elliptical section on its minor axis   (B)   (mm)

Specified thickness   (T)   (mm)

These parameters, which characterize the geometric shape of elliptical hollow sections, may vary within the tolerances allowed by this standard and the sectional properties still remain valid.

Superficial area

$$A_{\mathrm{s}} = \frac{P}{10^3}$$

(m^2/m)

Cross sectional area

$$A = \frac{\pi\left[HB - (H-2T)(B-2T)\right]}{4\times10^2}$$

(cm^2)

Mass per unit length

$$M = 0,785\,A$$

(kg/m)

Second moment of area

    Major axis

$$I_{yy} = \frac{\left[BH^3 - (B-2T)(H-2T)^3\right]\dfrac{\pi}{64}}{10^4}$$

(cm^4)

    Minor axis

$$I_{zz} = \frac{\left[HB^3 - (H-2T)(B-2T)^3\right]\dfrac{\pi}{64}}{10^4}$$

(cm^4)

Radius of gyration

    Major axis

$$i_{yy} = \sqrt{\frac{I_{yy}}{A}}$$

(cm)

    Minor axis

$$i_{zz} = \sqrt{\frac{I_{zz}}{A}}$$

(cm)

Elastic section modulus

    Major axis

$$W_{elyy} = \frac{20I_{yy}}{H}$$

(cm^3)

    Minor axis

$$W_{elzz} = \frac{20I_{zz}}{B}$$

(cm^3)

Plastic section modulus

    Major axis

$$W_{plyy} = \frac{\left[H^2B - (H-2T)^2(B-2T)\right]}{6\times10^3}$$

(cm^3)

    Minor axis

$$W_{plzz} = \frac{\left[B^2H - (B-2T)^2(H-2T)\right]}{6\times10^3}$$

(cm^3)

18

Torsional inertia constant

$$I_t = \frac{1}{10^4}\left[\frac{4A_m{}^2 T}{U} + \frac{UT^3}{3}\right]$$

(cm^4)

Torsional modulus constant

$$C_t = \left[\frac{10 I_t}{T + \left(\dfrac{2A_m}{U}\right)}\right]$$

(cm^3)

where

$$A_m = \frac{\pi(H-T)(B-T)}{4}$$

(mm^2)

$$P = \frac{\pi}{2}(H+B)\left(1 + 0{,}25\left(\frac{H-B}{H+B}\right)^2\right)$$

(mm)

$$U = \frac{\pi}{2}(H+B-2T)\left(1 + 0{,}25\left(\frac{H-B}{H+B-2T}\right)^2\right)$$

(mm)

Annex B
(normative)

Sectional properties for a limited range of standard sizes

Table B.1 — Dimensions and sectional properties of a limited range of circular hollow sections (see Figure B.1)

Specified outside diameter	Specified thickness	Mass per unit length	Cross-sectional area	Second moment of area	Radius of gyration	Elastic section modulus	Plastic section modulus	Torsional inertia constant	Torsional modulus constant	Super-ficial area per metre length	Nominal length per tonne
D	T	M	A	I	i	W_{el}	W_{pl}	I_t	C_t	A_s	
mm	mm	kg/m	cm^2	cm^4	cm	cm^3	cm^3	cm^4	cm^3	m^2/m	M
21,3	2,3	1,08	1,37	0,629	0,677	0,590	0,834	1,26	1,18	0,067	928
21,3	2,6	1,20	1,53	0,681	0,668	0,639	0,915	1,36	1,28	0,067	834
21,3	3,2	1,43	1,82	0,768	0,650	0,722	1,06	1,54	1,44	0,067	700
26,9	2,3	1,40	1,78	1,36	0,874	1,01	1,40	2,71	2,02	0,085	717
26,9	2,6	1,56	1,98	1,48	0,864	1,10	1,54	2,96	2,20	0,085	642
26,9	3,2	1,87	2,38	1,70	0,846	1,27	1,81	3,41	2,53	0,085	535
33,7	2,6	1,99	2,54	3,09	1,10	1,84	2,52	6,19	3,67	0,106	501
33,7	3,2	2,41	3,07	3,60	1,08	2,14	2,99	7,21	4,28	0,106	415
33,7	4,0	2,93	3,73	4,19	1,06	2,49	3,55	8,38	4,97	0,106	341
42,4	2,6	2,55	3,25	6,46	1,41	3,05	4,12	12,9	6,10	0,133	392
42,4	3,2	3,09	3,94	7,62	1,39	3,59	4,93	15,2	7,19	0,133	323
42,4	4,0	3,79	4,83	8,99	1,36	4,24	5,92	18,0	8,48	0,133	264
48,3	2,6	2,93	3,73	9,8	1,62	4,05	5,44	19,6	8,10	0,152	341
48,3	3,2	3,56	4,53	11,6	1,60	4,80	6,52	23,2	9,59	0,152	281
48,3	4,0	4,37	5,57	13,8	1,57	5,70	7,87	27,5	11,4	0,152	229
48,3	5,0	5,34	6,80	16,2	1,54	6,69	9,42	32,3	13,4	0,152	187
60,3	2,6	3,70	4,71	19,7	2,04	6,52	8,66	39,3	13,0	0,189	270
60,3	3,2	4,51	5,74	23,5	2,02	7,78	10,4	46,9	15,6	0,189	222
60,3	4,0	5,55	7,07	28,2	2,00	9,34	12,7	56,3	18,7	0,189	180
60,3	5,0	6,82	8,69	33,5	1,96	11,1	15,3	67,0	22,2	0,189	147
76,1	2,6	4,71	6,00	40,6	2,60	10,7	14,1	81,2	21,3	0,239	212
76,1	3,2	5,75	7,33	48,8	2,58	12,8	17,0	97,6	25,6	0,239	174
76,1	4,0	7,11	9,06	59,1	2,55	15,5	20,8	118	31,0	0,239	141
76,1	5,0	8,77	11,2	70,9	2,52	18,6	25,3	142	37,3	0,239	114
88,9	3,2	6,76	8,62	79,2	3,03	17,8	23,5	158	35,6	0,279	148
88,9	4,0	8,38	10,7	96,3	3,00	21,7	28,9	193	43,3	0,279	119
88,9	5,0	10,3	13,2	116	2,97	26,2	35,2	233	52,4	0,279	96,7
88,9	6,3	12,8	16,3	140	2,93	31,5	43,1	280	63,1	0,279	77,9
101,6	3,2	7,77	9,89	120	3,48	23,6	31,0	240	47,2	0,319	128,8
101,6	4,0	9,63	12,3	146	3,45	28,8	38,1	293	57,6	0,319	103,9
101,6	5,0	11,9	15,2	177	3,42	34,9	46,7	355	69,9	0,319	84,0
101,6	6,3	14,8	18,9	215	3,38	42,3	57,3	430	84,7	0,319	67,5
101,6	8,0	18,5	23,5	260	3,32	51,1	70,3	519	102	0,319	54,2
101,6	10,0	22,6	28,8	305	3,26	60,1	84,2	611	120	0,319	44,3
114,3	3,2	8,77	11,2	172	3,93	30,2	39,5	345	60,4	0,359	114,1
114,3	4,0	10,9	13,9	211	3,90	36,9	48,7	422	73,9	0,359	91,9
114,3	5,0	13,5	17,2	257	3,87	45,0	59,8	514	89,9	0,359	74,2
114,3	6,3	16,8	21,4	313	3,82	54,7	73,6	625	109	0,359	59,6
114,3	8,0	21,0	26,7	379	3,77	66,4	90,6	759	133	0,359	47,7
114,3	10,0	25,7	32,8	450	3,70	78,7	109	899	157	0,359	38,9
139,7	4,0	13,4	17,1	393	4,80	56,2	73,7	786	112	0,439	74,7
139,7	5,0	16,6	21,2	481	4,77	68,8	90,8	961	138	0,439	60,2
139,7	6,3	20,7	26,4	589	4,72	84,3	112	1177	169	0,439	48,2
139,7	8,0	26,0	33,1	720	4,66	103	139	1441	206	0,439	38,5
139,7	10,0	32,0	40,7	862	4,60	123	169	1724	247	0,439	31,3
139,7	12,5	39,2	50,0	1020	4,52	146	203	2040	292	0,439	25,5
168,3	4,0	16,2	20,6	697	5,81	83	108	1394	166	0,529	61,7
168,3	5,0	20,1	25,7	856	5,78	102	133	1712	203	0,529	49,7
168,3	6,3	25,2	32,1	1053	5,73	125	165	2107	250	0,529	39,7
168,3	8,0	31,6	40,3	1297	5,67	154	206	2595	308	0,529	31,6
168,3	10,0	39,0	49,7	1564	5,61	186	251	3128	372	0,529	25,6

Specified outside diameter	Specified thickness	Mass per unit length	Cross-sectional area	Second moment of area	Radius of gyration	Elastic section modulus	Plastic section modulus	Torsional inertia constant	Torsional modulus constant	Super-ficial area per metre length	Nominal length per tonne
D	T	M	A	I	i	W_{el}	W_{pl}	I_t	C_t	A_s	
mm	mm	kg/m	cm^2	cm^4	cm	cm^3	cm^3	cm^4	cm^3	m^2/m	M
168,3	12,5	48,0	61,2	1868	5,53	222	304	3737	444	0,529	20,8
177,8	5,0	21,3	27,1	1014	6,11	114	149	2028	228	0,559	46,9
177,8	6,3	26,6	33,9	1250	6,07	141	185	2499	281	0,559	37,5
177,8	8,0	33,5	42,7	1541	6,01	173	231	3083	347	0,559	29,9
177,8	10,0	41,4	52,7	1862	5,94	209	282	3724	419	0,559	24,2
177,8	12,5	51,0	64,9	2230	5,86	251	342	4460	502	0,559	19,6
193,7	5,0	23,3	29,6	1320	6,67	136	178	2640	273	0,609	43,0
193,7	6,3	29,1	37,1	1630	6,63	168	221	3260	337	0,609	34,3
193,7	8,0	36,6	46,7	2016	6,57	208	276	4031	416	0,609	27,3
193,7	10,0	45,3	57,7	2442	6,50	252	338	4883	504	0,609	22,1
193,7	12,5	55,9	71,2	2934	6,42	303	411	5869	606	0,609	17,9
193,7	14,2	62,9	80,1	3245	6,37	335	458	6491	670	0,609	15,9
193,7	16,0	70,1	89,3	3554	6,31	367	507	7109	734	0,609	14,3
219,1	5,0	26,4	33,6	1928	7,57	176	229	3856	352	0,688	37,9
219,1	6,3	33,1	42,1	2386	7,53	218	285	4772	436	0,688	30,2
219,1	8,0	41,6	53,1	2960	7,47	270	357	5919	540	0,688	24,0
219,1	10,0	51,6	65,7	3598	7,40	328	438	7197	657	0,688	19,4
219,1	12,5	63,7	81,1	4345	7,32	397	534	8689	793	0,688	15,7
219,1	14,2	71,8	91,4	4820	7,26	440	597	9640	880	0,688	13,9
219,1	16,0	80,1	102	5297	7,20	483	661	10590	967	0,688	12,5
219,1	20,0	98,2	125	6261	7,07	572	795	12520	1143	0,688	10,2
244,5	5,0	29,5	37,6	2699	8,47	221	287	5397	441	0,768	33,9
244,5	6,3	37,0	47,1	3346	8,42	274	358	6692	547	0,768	27,0
244,5	8,0	46,7	59,4	4160	8,37	340	448	8321	681	0,768	21,4
244,5	10,0	57,8	73,7	5073	8,30	415	550	10150	830	0,768	17,3
244,5	12,5	71,5	91,1	6147	8,21	503	673	12300	1006	0,768	14,0
244,5	14,2	80,6	102,7	6837	8,16	559	754	13670	1119	0,768	12,4
244,5	16,0	90,2	115	7533	8,10	616	837	15070	1232	0,768	11,1
244,5	20,0	110,7	141	8957	7,97	733	1011	17910	1465	0,768	9,0
244,5	25,0	135	172	10520	7,81	860	1210	21030	1721	0,768	7,39
273,0	5,0	33,0	42,1	3781	9,48	277	359	7562	554	0,858	30,3
273,0	6,3	41,4	52,8	4696	9,43	344	448	9392	688	0,858	24,1
273,0	8,0	52,3	66,6	5852	9,37	429	562	11700	857	0,858	19,1
273,0	10,0	64,9	82,6	7154	9,31	524	692	14310	1048	0,858	15,4
273,0	12,5	80,3	102	8697	9,22	637	849	17400	1274	0,858	12,5
273,0	14,2	90,6	115	9695	9,16	710	952	19390	1421	0,858	11,0
273,0	16,0	101	129	10710	9,10	784	1058	21410	1569	0,858	9,9
273,0	20,0	125	159	12800	8,97	938	1283	25600	1875	0,858	8,0
273,0	25,0	153	195	15130	8,81	1108	1543	30250	2216	0,858	6,5
323,9	5,0	39,3	50,1	6369	11,3	393	509	12740	787	1,02	25,4
323,9	6,3	49,3	62,9	7929	11,2	490	636	15860	979	1,02	20,3
323,9	8,0	62,3	79,4	9910	11,2	612	799	19820	1224	1,02	16,0
323,9	10,0	77,4	98,6	12160	11,1	751	986	24320	1501	1,02	12,9
323,9	12,5	96,0	122	14850	11,0	917	1213	29690	1833	1,02	10,4
323,9	14,2	108,5	138	16600	11,0	1025	1363	33200	2050	1,02	9,2
323,9	16,0	121	155	18390	10,9	1136	1518	36780	2271	1,02	8,23
323,9	20,0	150	191	22140	10,8	1367	1850	44280	2734	1,02	6,67
323,9	25,0	184	235	26400	10,6	1630	2239	52800	3260	1,02	5,43
355,6	6,3	54,3	69,1	10550	12,4	593	769	21090	1186	1,12	18,4
355,6	8,0	68,6	87,4	13200	12,3	742	967	26400	1485	1,12	14,6
355,6	10,0	85,2	109	16220	12,2	912	1195	32450	1825	1,12	11,7
355,6	12,5	106	135	19850	12,1	1117	1472	39700	2233	1,12	9,45
355,6	14,2	120	152	22230	12,1	1250	1656	44460	2500	1,12	8,36
355,6	16,0	134	171	24660	12,0	1387	1847	49330	2774	1,12	7,46
355,6	20,0	166	211	29790	11,9	1676	2255	59580	3351	1,12	6,04
355,6	25,0	204	260	35680	11,7	2007	2738	71350	4013	1,12	4,91
406,4	6,3	62,2	79,2	15850	14,1	780	1009	31700	1560	1,28	16,1
406,4	8,0	78,6	100	19870	14,1	978	1270	39750	1956	1,28	12,7
406,4	10,0	97,8	125	24480	14,0	1205	1572	48950	2409	1,28	10,2
406,4	12,5	121	155	30030	13,9	1478	1940	60060	2956	1,28	8,24
406,4	14,2	137	175	33690	13,9	1658	2185	67370	3315	1,28	7,28
406,4	16,0	154	196	37450	13,8	1843	2440	74900	3686	1,28	6,49
406,4	20,0	191	243	45430	13,7	2236	2989	90860	4472	1,28	5,25
406,4	25,0	235	300	54700	13,5	2692	3642	109400	5384	1,28	4,25
406,4	30,0	278	355	63220	13,3	3111	4259	126500	6223	1,28	3,59

Specified outside diameter	Specified thickness	Mass per unit length	Cross-sectional area	Second moment of area	Radius of gyration	Elastic section modulus	Plastic section modulus	Torsional inertia constant	Torsional modulus constant	Super-ficial area per metre length	Nominal length per tonne
D	T	M	A	I	i	W_{el}	W_{pl}	I_t	C_t	A_s	
mm	mm	kg/m	cm^2	cm^4	cm	cm^3	cm^3	cm^4	cm^3	m^2/m	M
406,4	40,0	361	460	78190	13,0	3848	5391	156000	7696	1,28	2,77
457,0	6,3	70,0	89,2	22650	15,9	991	1280	45310	1983	1,44	14,3
457,0	8,0	88,6	113	28450	15,9	1245	1613	56900	2490	1,44	11,3
457,0	10,0	110	140	35090	15,8	1536	1998	70180	3071	1,44	9,07
457,0	12,5	137	175	43150	15,7	1888	2470	86290	3776	1,44	7,30
457,0	14,2	155	198	48460	15,7	2121	2785	96930	4242	1,44	6,45
457,0	16,0	174	222	53960	15,6	2361	3113	107900	4723	1,44	5,75
457,0	20,0	216	275	65680	15,5	2874	3822	131400	5749	1,44	4,64
457,0	25,0	266	339	79420	15,3	3475	4671	158800	6951	1,44	3,75
457,0	30,0	316	402	92170	15,1	4034	5479	184300	8068	1,44	3,17
457,0	40,0	411	524	115000	14,8	5031	6977	229900	10060	1,44	2,43
508,0	6,3	77,9	99,3	31250	17,7	1230	1586	62490	2460	1,60	12,8
508,0	8,0	98,6	126	39280	17,7	1546	2000	78560	3093	1,60	10,1
508,0	10,0	123	156	48520	17,6	1910	2480	97040	3820	1,60	8,14
508,0	12,5	153	195	59760	17,5	2353	3070	119500	4705	1,60	6,55
508,0	14,2	173	220	67200	17,5	2646	3463	134400	5291	1,60	5,78
508,0	16,0	194	247	74910	17,4	2949	3874	149800	5898	1,60	5,15
508,0	20,0	241	307	91430	17,3	3600	4766	182900	7199	1,60	4,15
508,0	25,0	298	379	111000	17,1	4367	5837	221800	8734	1,60	3,36
508,0	30,0	354	451	129200	16,9	5086	6864	258400	10170	1,60	2,83
508,0	40,0	462	588	162200	16,6	6385	8782	324400	12770	1,60	2,17
508,0	50,0	565	719	190900	16,3	7515	10530	381800	15030	1,60	1,77
610,0	6,3	93,8	119	54440	21,3	1785	2296	108900	3570	1,9	10,7
610,0	8,0	119	151	68550	21,3	2248	2899	137100	4495	1,9	8,42
610,0	10,0	148	188	84850	21,2	2782	3600	169700	5564	1,9	6,76
610,0	12,5	184	235	104800	21,1	3435	4463	209600	6869	1,9	5,43
610,0	14,2	209	266	118000	21,1	3869	5042	236000	7738	1,9	4,79
610,0	16,0	234	299	131800	21,0	4321	5647	263600	8641	1,9	4,27
610,0	20,0	291	371	161500	20,9	5295	6965	323000	10590	1,9	3,44
610,0	25,0	361	459	196900	20,7	6456	8561	393800	12910	1,9	2,77
610,0	30,0	429	547	230500	20,5	7557	10100	461000	15110	1,9	2,33
610,0	40,0	562	716	292300	20,2	9585	13020	585000	19170	1,9	1,78
610,0	50,0	691	880	347600	19,9	11400	15720	695000	22790	1,9	1,45
711,0	6,3	109	139	86590	24,9	2436	3129	173000	4871	2,23	9,13
711,0	8,0	139	177	109200	24,9	3071	3954	218000	6141	2,23	7,21
711,0	10,0	173	220	135500	24,8	3806	4914	270600	7612	2,23	5,78
711,0	12,5	215	274	167300	24,7	4707	6099	334700	9415	2,23	4,64
711,0	14,2	244	311	188700	24,6	5309	6895	377500	10620	2,23	4,10
711,0	16,0	274	349	211000	24,6	5936	7730	422100	11870	2,23	3,65
711,0	20,0	341	434	259400	24,4	7295	9552	518700	14590	2,23	2,93
711,0	25,0	423	539	317400	24,3	8927	11770	634700	17850	2,23	2,36
711,0	30,0	504	642	372800	24,1	10490	13920	745600	20970	2,23	1,98
711,0	40,0	662	843	476200	23,8	13400	18030	952500	26790	2,23	1,51
711,0	50,0	815	1038	570300	23,4	16040	21890	1141000	32090	2,23	1,23
711,0	60,0	963	1227	655600	23,1	18440	25500	1311000	36890	2,23	1,04
762,0	6,3	117	150	106800	26,7	2803	3598	213600	5605	2,39	8,52
762,0	8,0	149	190	134700	26,7	3535	4548	269400	7070	2,39	6,72
762,0	10,0	185	236	167000	26,6	4384	5655	334100	8768	2,39	5,39
762,0	12,5	231	294	206700	26,5	5426	7023	413500	10850	2,39	4,33
762,0	14,2	262	334	233000	26,4	6120	7940	467000	12300	2,39	3,82
762,0	16,0	294	375	261000	26,4	6850	8906	522000	13700	2,39	3,40
762,0	20,0	366	466	321100	26,2	8427	11010	642200	16860	2,39	2,73
762,0	25,0	454	579	393500	26,1	10330	13580	786900	20650	2,39	2,20
762,0	30,0	542	690	462900	25,9	12150	16080	925700	24300	2,39	1,85
762,0	40,0	712	907	593000	25,6	15570	20870	1186000	31130	2,39	1,40
762,0	50,0	878	1118	712200	25,2	18690	25390	1424000	37390	2,39	1,14
813,0	8,0	159	202	163900	28,5	4032	5184	327800	8064	2,55	6,30
813,0	10,0	198	252	203400	28,4	5003	6448	406800	10010	2,55	5,05
813,0	12,5	247	314	251900	28,3	6196	8011	503700	12390	2,55	4,05
813,0	14,2	280	356	284000	28,2	6990	9060	569000	14000	2,55	3,57
813,0	16,0	314	401	318200	28,2	7828	10170	636400	15660	2,55	3,18
813,0	20,0	391	498	391900	28,0	9641	12580	783800	19280	2,55	2,56
813,0	25,0	486	619	480900	27,9	11830	15530	961700	23660	2,55	2,06
813,0	30,0	579	738	566400	27,7	13930	18400	1132800	27870	2,55	1,73
914,0	8,0	179	228	233700	32,0	5113	6567	467300	10230	2,87	5,59

Specified outside diameter	Specified thickness	Mass per unit length	Cross-sectional area	Second moment of area	Radius of gyration	Elastic section modulus	Plastic section modulus	Torsional inertia constant	Torsional modulus constant	Super-ficial area per metre length	Nominal length per tonne
D	T	M	A	I	i	W_{el}	W_{pl}	I_t	C_t	A_s	
mm	mm	kg/m	cm^2	cm^4	cm	cm^3	cm^3	cm^4	cm^3	m^2/m	M
914,0	10,0	223	284	290500	32,0	6349	8172	580300	12700	2,87	4,49
914,0	12,5	278	354	359700	31,9	7871	10160	719400	15740	2,87	3,60
914,0	14,2	315	401	406000	31,8	8890	11500	813000	17800	2,87	3,17
914,0	16,0	354	451	455100	31,8	9959	12900	910300	19920	2,87	2,82
914,0	20,0	441	562	561500	31,6	12290	15990	1123000	24570	2,87	2,27
914,0	25,0	548	698	690320	31,4	15100	19760	1381000	30210	2,87	1,82
914,0	30,0	654	833	814800	31,3	17830	23450	1630000	35660	2,87	1,53
1016,0	8,0	199	253	321800	35,6	6334	8129	643600	12670	3,19	5,03
1016,0	10,0	248	316	399900	35,6	7871	10120	799700	15740	3,19	4,03
1016,0	12,5	309	394	496100	35,5	9766	12590	992250	19530	3,19	3,23
1016,0	14,2	351	447	561000	35,4	11000	14300	1120000	22100	3,19	2,85
1016,0	16,0	395	503	628480	35,4	12370	16000	1257000	24740	3,19	2,53
1016,0	20,0	491	626	776300	35,2	15280	19840	1553000	30560	3,19	2,04
1016,0	25,0	611	778	956100	35,0	18820	24560	1912000	37640	3,19	1,64
1016,0	30,0	729	929	1130000	34,9	22250	29180	2261000	44500	3,19	1,37
1067,0	10,0	261	332	463800	37,4	8693	11170	927500	17390	3,35	3,84
1067,0	12,5	325	414	575670	37,3	10790	13900	1151000	21580	3,35	3,08
1067,0	14,2	369	470	651000	37,2	12200	15700	1300000	24400	3,35	2,71
1067,0	16,0	415	528	729610	37,2	13680	17680	1459000	27350	3,35	2,41
1067,0	20,0	516	658	901800	37,0	16900	21930	1804000	33810	3,35	1,94
1067,0	25,0	642	818	1111000	36,9	20830	27150	2223000	41660	3,35	1,56
1067,0	30,0	767	977	1315000	36,7	24650	32270	2630000	49290	3,35	1,30
1168,0	10,0	286	364	609800	40,9	10440	13410	1220000	20890	3,67	3,50
1168,0	12,5	356	454	757400	40,9	12970	16690	1515000	25940	3,67	2,81
1168,0	14,2	404	515	856700	40,8	14670	18910	1713000	29340	3,67	2,47
1168,0	16,0	455	579	960800	40,7	16450	21240	1922000	32900	3,67	2,20
1168,0	20,0	566	721	1189000	40,6	20350	26360	2377000	40710	3,67	1,77
1168,0	25,0	705	898	1467000	40,4	25120	32670	2933000	50230	3,67	1,42
1219,0	10,0	298	380	694000	42,7	11390	14620	1388000	22770	3,83	3,35
1219,0	12,5	372	474	862200	42,7	14150	18200	1724000	28290	3,83	2,69
1219,0	14,2	422	537	975300	42,6	16000	20610	1951000	32000	3,83	2,37
1219,0	16,0	475	605	1094000	42,5	17950	23160	2188000	35900	3,83	2,11
1219,0	20,0	591	753	1354000	42,4	22220	28760	2708000	44440	3,83	1,69
1219,0	25,0	736	938	1672000	42,2	27430	35650	3344000	54860	3,83	1,36
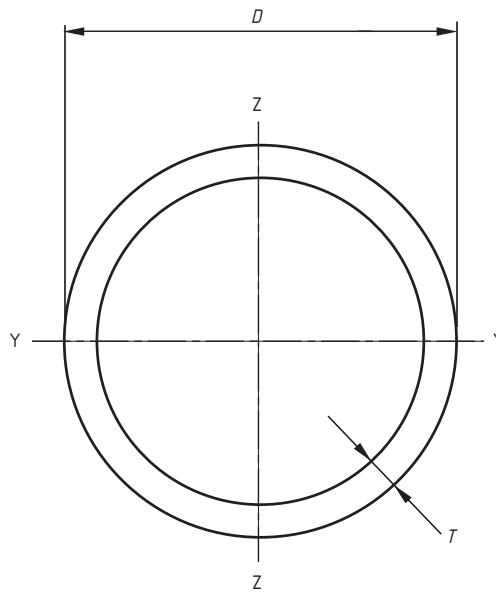
Figure B.1 — Circular hollow section

Table B.2 — Dimensions and sectional properties of a limited range of square hollow sections (see Figure B.2)

Specified side dimension	Specified thickness	Mass per unit length	Cross-sectional area	Second moment of area	Radius of gyration	Elastic section modulus	Plastic section modulus	Torsional inertia constant	Torsional modulus constant	Super-ficial area per metre length	Nominal length per tonne
B	T	M	A	I	i	W_{el}	W_{pl}	I_t	C_t	A_s	
mm	mm	kg/m	cm^2	cm^4	cm	cm^3	cm^3	cm^4	cm^3	m^2/m	m
40	2,6	3,00	3,82	8,80	1,52	4,40	5,31	14,0	6,41	0,153	334
40	3,2	3,61	4,60	10,2	1,49	5,11	6,28	16,5	7,42	0,152	277
40	4,0	4,39	5,59	11,8	1,45	5,91	7,44	19,5	8,54	0,150	228
40	5,0	5,28	6,73	13,4	1,41	6,68	8,66	22,5	9,60	0,147	189
50	2,6	3,81	4,86	18,0	1,93	7,21	8,58	28,4	10,6	0,193	262
50	3,2	4,62	5,88	21,2	1,90	8,49	10,2	33,8	12,4	0,192	217
50	4,0	5,64	7,19	25,0	1,86	9,99	12,3	40,4	14,5	0,190	177
50	5,0	6,85	8,73	28,9	1,82	11,6	14,5	47,6	16,7	0,187	146
50	6,3	8,31	10,6	32,8	1,76	13,1	17,0	55,2	18,8	0,184	120
60	2,6	4,63	5,90	32,2	2,34	10,7	12,6	50,2	15,7	0,233	216
60	3,2	5,62	7,16	38,2	2,31	12,7	15,2	60,2	18,6	0,232	178
60	4,0	6,90	8,79	45,4	2,27	15,1	18,3	72,5	22,0	0,230	145
60	5,0	8,42	10,7	53,3	2,23	17,8	21,9	86,4	25,7	0,227	119
60	6,3	10,3	13,1	61,6	2,17	20,5	26,0	102	29,6	0,224	97,2
60	8,0	12,5	16,0	69,7	2,09	23,2	30,4	118	33,4	0,219	79,9
70	3,2	6,63	8,4	62,3	2,72	17,8	21,0	97,6	26,1	0,272	151
70	4,0	8,15	10,4	74,7	2,68	21,3	25,5	118	31,2	0,270	123
70	5,0	9,99	12,7	88,5	2,64	25,3	30,8	142	36,8	0,267	100
70	6,3	12,3	15,6	104	2,58	29,7	36,9	169	42,9	0,264	81,5
70	8,0	15,0	19,2	120	2,50	34,2	43,8	200	49,2	0,259	66,5
80	3,2	7,63	9,72	95	3,13	23,7	27,9	148	34,9	0,312	131
80	4,0	9,41	12,0	114	3,09	28,6	34,0	180	41,9	0,310	106
80	5,0	11,6	14,7	137	3,05	34,2	41,1	217	49,8	0,307	86,5
80	6,3	14,2	18,1	162	2,99	40,5	49,7	262	58,7	0,304	70,2
80	8,0	17,5	22,4	189	2,91	47,3	59,5	312	68,3	0,299	57,0
90	4,0	10,7	13,6	166	3,50	37,0	43,6	260	54,2	0,350	93,7
90	5,0	13,1	16,7	200	3,45	44,4	53,0	316	64,8	0,347	76,1
90	6,3	16,2	20,7	238	3,40	53,0	64,3	382	77,0	0,344	61,6
90	8,0	20,1	25,6	281	3,32	62,6	77,6	459	90,5	0,339	49,9
100	4,0	11,9	15,2	232	3,91	46,4	54,4	361	68,2	0,390	83,9
100	5,0	14,7	18,7	279	3,86	55,9	66,4	439	81,8	0,387	68,0
100	6,3	18,2	23,2	336	3,80	67,1	80,9	534	97,8	0,384	54,9
100	8,0	22,6	28,8	400	3,73	79,9	98,2	646	116	0,379	44,3
100	10,0	27,4	34,9	462	3,64	92,4	116	761	133	0,374	36,5
120	5,0	17,8	22,7	498	4,68	83,0	97,6	777	122	0,467	56,0
120	6,3	22,2	28,2	603	4,62	100	120	950	147	0,464	45,1
120	8,0	27,6	35,2	726	4,55	121	146	1160	176	0,459	36,2
120	10,0	33,7	42,9	852	4,46	142	175	1382	206	0,454	29,7
120	12,5	40,9	52,1	982	4,34	164	207	1623	236	0,448	24,5
140	5,0	21,0	26,7	807	5,50	115	135	1253	170	0,547	47,7
140	6,3	26,1	33,3	984	5,44	141	166	1540	206	0,544	38,3
140	8,0	32,6	41,6	1195	5,36	171	204	1892	249	0,539	30,7
140	10,0	40,0	50,9	1416	5,27	202	246	2272	294	0,534	25,0
140	12,5	48,7	62,1	1653	5,16	236	293	2696	342	0,528	20,5
150	5,0	22,6	28,7	1002	5,90	134	156	1550	197	0,587	44,3
150	6,3	28,1	35,8	1223	5,85	163	192	1909	240	0,584	35,6
150	8,0	35,1	44,8	1491	5,77	199	237	2351	291	0,579	28,5
150	10,0	43,1	54,9	1773	5,68	236	286	2832	344	0,574	23,2
150	12,5	52,7	67,1	2080	5,57	277	342	3375	402	0,568	19,0
150	14,2	58,9	75,0	2262	5,49	302	377	3707	436	0,563	17,0
150	16,0	65,2	83,0	2430	5,41	324	411	4026	467	0,559	15,3
160	5,0	24,1	30,7	1225	6,31	153	178	1892	226	0,627	41,5
160	6,3	30,1	38,3	1499	6,26	187	220	2333	275	0,624	33,3
160	8,0	37,6	48,0	1831	6,18	229	272	2880	335	0,619	26,6
160	10,0	46,3	58,9	2186	6,09	273	329	3478	398	0,614	21,6
160	12,5	56,6	72,1	2576	5,98	322	395	4158	467	0,608	17,7
160	14,2	63,3	80,7	2809	5,90	351	436	4579	508	0,603	15,8
160	16,0	70,2	89,4	3028	5,82	379	476	4988	546	0,599	14,2
180	5,0	27,3	34,7	1765	7,13	196	227	2718	290	0,707	36,7
180	6,3	34,0	43,3	2168	7,07	241	281	3361	355	0,704	29,4
180	8,0	42,7	54,4	2661	7,00	296	349	4162	434	0,699	23,4
180	10,0	52,5	66,9	3193	6,91	355	424	5048	518	0,694	19,0

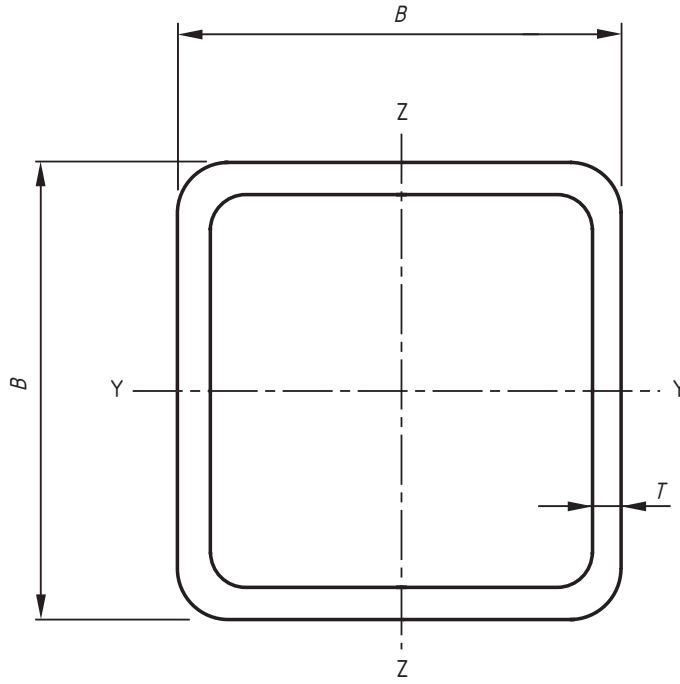| Specified side dimension	Specified thickness	Mass per unit length	Cross-sectional area	Second moment of area	Radius of gyration	Elastic section modulus	Plastic section modulus	Torsional inertia constant	Torsional modulus constant	Super-ficial area per metre length	Nominal length per tonne
B	T	M	A	I	i	W_{el}	W_{pl}	I_t	C_t	A_s	
mm	mm	kg/m	cm^2	cm^4	cm	cm^3	cm^3	cm^4	cm^3	m^2/m	m
180	12,5	64,4	82,1	3790	6,80	421	511	6070	613	0,688	15,5
180	14,2	72,2	92,0	4154	6,72	462	566	6711	670	0,683	13,8
180	16,0	80,2	102	4504	6,64	500	621	7343	724	0,679	12,5
200	5,0	30,4	38,7	2445	7,95	245	283	3756	362	0,787	32,9
200	6,3	38,0	48,4	3011	7,89	301	350	4653	444	0,784	26,3
200	8,0	47,7	60,8	3709	7,81	371	436	5778	545	0,779	21,0
200	10,0	58,8	74,9	4471	7,72	447	531	7031	655	0,774	17,0
200	12,5	72,3	92,1	5336	7,61	534	643	8491	778	0,768	13,8
200	14,2	81,1	103	5872	7,54	587	714	9417	854	0,763	12,3
200	16,0	90,3	115	6394	7,46	639	785	10340	927	0,759	11,1
220	6,3	41,9	53,4	4049	8,71	368	427	6240	544	0,864	23,8
220	8,0	52,7	67,2	5002	8,63	455	532	7765	669	0,859	19,0
220	10,0	65,1	82,9	6050	8,54	550	650	9473	807	0,854	15,4
220	12,5	80,1	102	7254	8,43	659	789	11480	963	0,848	12,5
220	14,2	90,1	115	8007	8,35	728	879	12770	1060	0,843	11,1
220	16,0	100	128	8749	8,27	795	969	14050	1156	0,839	10,0
250	6,3	47,9	61,0	6014	9,93	481	556	9238	712	0,984	20,9
250	8,0	60,3	76,8	7455	9,86	596	694	11530	880	0,979	16,6
250	10,0	74,5	94,9	9055	9,77	724	851	14110	1065	0,974	13,4
250	12,5	91,9	117	10920	9,66	873	1037	17160	1279	0,968	10,9
250	14,2	103	132	12090	9,58	967	1158	19140	1413	0,963	9,67
250	16,0	115	147	13270	9,50	1061	1280	21140	1546	0,959	8,67
260	6,3	49,9	63,5	6788	10,3	522	603	10420	773	1,02	20,1
260	8,0	62,8	80,0	8423	10,3	648	753	13010	956	1,02	15,9
260	10,0	77,7	98,9	10240	10,2	788	924	15930	1159	1,01	12,9
260	12,5	95,8	122	12370	10,1	951	1127	19410	1394	1,01	10,4
260	14,2	108	137	13710	10,0	1055	1259	21660	1542	1,00	9,27
260	16,0	120	153	15060	9,9	1159	1394	23940	1689	1,00	8,30
300	6,3	57,8	74	10550	12,0	703	809	16140	1043	1,18	17,3
300	8,0	72,8	93	13130	11,9	875	1013	20190	1294	1,18	13,7
300	10,0	90,2	115	16030	11,8	1068	1246	24810	1575	1,17	11,1
300	12,5	112	142	19440	11,7	1296	1525	30330	1904	1,17	8,97
300	14,2	126	160	21640	11,6	1442	1708	33940	2114	1,16	7,95
300	16,0	141	179	23850	11,5	1590	1895	37620	2325	1,16	7,12
350	8,0	85,4	109	21130	13,9	1207	1392	32380	1789	1,38	11,7
350	10,0	106	135	25880	13,9	1479	1715	39890	2185	1,37	9,44
350	12,5	131	167	31540	13,7	1802	2107	48930	2654	1,37	7,62
350	14,2	148	189	35210	13,7	2012	2364	54880	2957	1,36	6,76
350	16,0	166	211	38940	13,6	2225	2630	60990	3264	1,36	6,04
400	10,0	122	155	39130	15,9	1956	2260	60090	2895	1,57	8,22
400	12,5	151	192	47840	15,8	2392	2782	73910	3530	1,57	6,63
400	14,2	170	217	53530	15,7	2676	3127	83030	3942	1,56	5,87
400	16,0	191	243	59340	15,6	2967	3484	92440	4362	1,56	5,24
400	20,0	235	300	71540	15,4	3577	4247	112500	5237	1,55	4,25

Figure B.2 — Square hollow section

Table B.3 — Dimensions and sectional properties of a limited range of rectangular hollow sections (see Figure B.3)

Specified side dimensions		Spec-ified thick-ness	Mass per unit length	Cross-sec-tional area	Second moment of area		Radius of gyration		Elastic section modulus		Plastic section modulus		Tor-sional inertia constant	Tor-sional modulus constant	Super-ficial area per metre length	Nom-inal length per tonne
$H \times B$		T	M	A	I_{yy}	I_{zz}	i_{yy}	i_{zz}	$W_{el\,xx}$	$W_{el\,yy}$	$W_{pl\,yy}$	$W_{pl\,zz}$	I_t	C_t	A_s	
mm	mm	mm	kg/m	cm²	cm⁴	cm⁴	cm	Cm	cm³	cm³	cm³	cm³	cm⁴	cm³	m²/m	m
50	30	2,6	3,00	3,82	12,2	5,38	1,79	1,19	4,87	3,58	6,12	4,25	12,1	5,90	0,15	334
50	30	3,2	3,61	4,60	14,2	6,20	1,76	1,16	5,68	4,13	7,25	5,00	14,2	6,80	0,15	277
50	30	4,0	4,39	5,59	16,5	7,08	1,72	1,13	6,60	4,72	8,59	5,88	16,6	7,77	0,15	228
50	30	5,0	5,28	6,73	18,7	7,89	1,67	1,08	7,49	5,26	10,0	6,80	19,0	8,67	0,15	189
60	40	2,6	3,81	4,86	23,6	12,4	2,20	1,60	7,86	6,22	9,65	7,26	25,9	10,04	0,19	262
60	40	3,2	4,62	5,88	27,8	14,6	2,18	1,57	9,27	7,29	11,5	8,64	30,8	11,74	0,19	217
60	40	4,0	5,64	7,19	32,8	17,0	2,14	1,54	10,9	8,52	13,8	10,3	36,7	13,71	0,19	177
60	40	5,0	6,85	8,73	38,1	19,5	2,09	1,50	12,7	9,77	16,4	12,2	43,0	15,71	0,19	146
60	40	6,3	8,31	10,6	43,4	21,9	2,02	1,44	14,5	11,0	19,2	14,2	49,5	17,64	0,18	120
80	40	3,2	5,62	7,16	57,2	18,9	2,83	1,63	14,3	9,5	18,0	11,0	46,2	16,08	0,23	178
80	40	4,0	6,90	8,79	68,2	22,2	2,79	1,59	17,1	11,1	21,8	13,2	55,2	18,90	0,23	145
80	40	5,0	8,42	10,7	80,3	25,7	2,74	1,55	20,1	12,9	26,1	15,7	65,1	21,85	0,23	119
80	40	6,3	10,3	13,1	93,3	29,2	2,67	1,49	23,3	14,6	31,1	18,4	75,6	24,84	0,22	97,2
80	40	8,0	12,5	16,0	106	32,1	2,58	1,42	26,5	16,1	36,5	21,2	85,8	27,45	0,22	79,9
90	50	3,2	6,63	8,44	89,1	35,3	3,25	2,04	19,8	14,1	24,6	16,2	80,9	23,58	0,27	151
90	50	4,0	8,15	10,4	107	41,9	3,21	2,01	23,8	16,8	29,8	19,6	97,5	28,02	0,27	123
90	50	5,0	9,99	12,7	127	49,2	3,16	1,97	28,3	19,7	36,0	23,5	116	32,86	0,27	100
90	50	6,3	12,3	15,6	150	57,0	3,10	1,91	33,3	22,8	43,2	28,0	138	38,06	0,26	81,5
90	50	8,0	15,0	19,2	174	64,6	3,01	1,84	38,6	25,8	51,4	32,9	160	43,21	0,26	66,5
100	50	3,2	7,13	9,08	116	38,8	3,57	2,07	23,2	15,5	28,9	17,7	93,4	26,38	0,29	140
100	50	4,0	8,78	11,2	140	46,2	3,53	2,03	27,9	18,5	35,2	21,5	113	31,40	0,29	114
100	50	5,0	10,8	13,7	167	54,3	3,48	1,99	33,3	21,7	42,6	25,8	135	36,91	0,29	92,8
100	50	6,3	13,3	16,9	197	63,0	3,42	1,93	39,4	25,2	51,3	30,8	160	42,89	0,28	75,4
100	50	8,0	16,3	20,8	230	71,7	3,33	1,86	46,0	28,7	61,4	36,3	186	48,89	0,28	61,4
100	60	3,2	7,63	9,72	131	58,8	3,67	2,46	26,2	19,6	32,0	22,4	129	32,36	0,31	131
100	60	4,0	9,41	12,0	158	70,5	3,63	2,43	31,6	23,5	39,1	27,3	156	38,74	0,31	106
100	60	5,0	11,6	14,7	189	83,6	3,58	2,38	37,8	27,9	47,4	32,9	188	45,86	0,31	86,5
100	60	6,3	14,2	18,1	225	98,1	3,52	2,33	45,0	32,7	57,3	39,5	224	53,81	0,30	70,2
100	60	8,0	17,5	22,4	264	113	3,44	2,25	52,8	37,8	68,7	47,1	265	62,17	0,30	57,0
120	60	4,0	10,7	13,6	249	83,1	4,28	2,47	41,5	27,7	51,9	31,7	201	47,10	0,35	93,7
120	60	5,0	13,1	16,7	299	98,8	4,23	2,43	49,9	32,9	63,1	38,4	242	55,95	0,35	76,1
120	60	6,3	16,2	20,7	358	116	4,16	2,37	59,7	38,8	76,7	46,3	290	65,94	0,34	61,6
120	60	8,0	20,1	25,6	425	135	4,08	2,30	70,8	45,0	92,7	55,4	344	76,64	0,34	49,9
120	60	10,0	24,3	30,9	488	152	3,97	2,21	81,4	50,5	109	64,4	396	86,13	0,33	41,2
120	80	4,0	11,9	15,2	303	161	4,46	3,25	50,4	40,2	61,2	46,1	330	64,98	0,39	83,9
120	80	5,0	14,7	18,7	365	193	4,42	3,21	60,9	48,2	74,6	56,1	401	77,88	0,39	68,0
120	80	6,3	18,2	23,2	440	230	4,36	3,15	73,3	57,6	91,0	68,2	487	92,87	0,38	54,9
120	80	8,0	22,6	28,8	525	273	4,27	3,08	87,5	68,1	111	82,6	587	110	0,38	44,3
120	80	10,0	27,4	34,9	609	313	4,18	2,99	102	78,1	131	97,3	688	126	0,37	36,5
140	80	4,0	13,2	16,8	441	184	5,12	3,31	62,9	46,0	77,1	52,2	411	77	0,43	75,9
140	80	5,0	16,3	20,7	534	221	5,08	3,27	76,3	55,3	94,3	63,6	499	92	0,43	61,4
140	80	6,3	20,2	25,7	646	265	5,01	3,21	92,3	66,2	115	77,5	607	110	0,42	49,6
140	80	8,0	25,1	32,0	776	314	4,93	3,14	111	78,5	141	94,1	733	130	0,42	39,9
140	80	10,0	30,6	38,9	908	362	4,83	3,05	130	90,5	168	111	862	150	0,41	32,7
150	100	4,0	15,1	19,2	607	324	5,63	4,11	81,0	64,8	97,4	73,6	660	105	0,49	66,4
150	100	5,0	18,6	23,7	739	392	5,58	4,07	98,5	78,5	119	90,1	807	127	0,49	53,7
150	100	6,3	23,1	29,5	898	474	5,52	4,01	120	94,8	147	110	986	153	0,48	43,2
150	100	8,0	28,9	36,8	1087	569	5,44	3,94	145	113,9	180	135	1203	183	0,48	34,7
150	100	10,0	35,3	44,9	1282	665	5,34	3,85	171	133,1	216	161	1432	214	0,47	28,4
150	100	12,5	42,8	54,6	1488	763	5,22	3,74	198	152,6	256	190	1679	246	0,47	23,3
160	80	4,0	14,4	18,4	612	207	5,77	3,35	76,5	51,7	94,7	58,3	493	88	0,47	69,3
160	80	5,0	17,8	22,7	744	249	5,72	3,31	93,0	62,3	116	71,1	600	106	0,47	56,0
160	80	6,3	22,2	28,2	903	299	5,66	3,26	113	74,8	142	86,8	730	127	0,46	45,1
160	80	8,0	27,6	35,2	1091	356	5,57	3,18	136	89,0	175	106	883	151	0,46	36,2
160	80	10,0	33,7	42,9	1284	411	5,47	3,10	161	103	209	125	1041	175	0,45	29,7
160	80	12,5	40,9	52,1	1485	465	5,34	2,99	186	116	247	146	1204	198	0,45	24,5
180	100	4,0	16,9	21,6	945	379	6,61	4,19	105	75,9	128	85,2	852	127	0,55	59,0
180	100	5,0	21,0	26,7	1153	460	6,57	4,15	128	92,0	157	104	1042	154	0,55	47,7
180	100	6,3	26,1	33,3	1407	557	6,50	4,09	156	111	194	128	1277	186	0,54	38,3

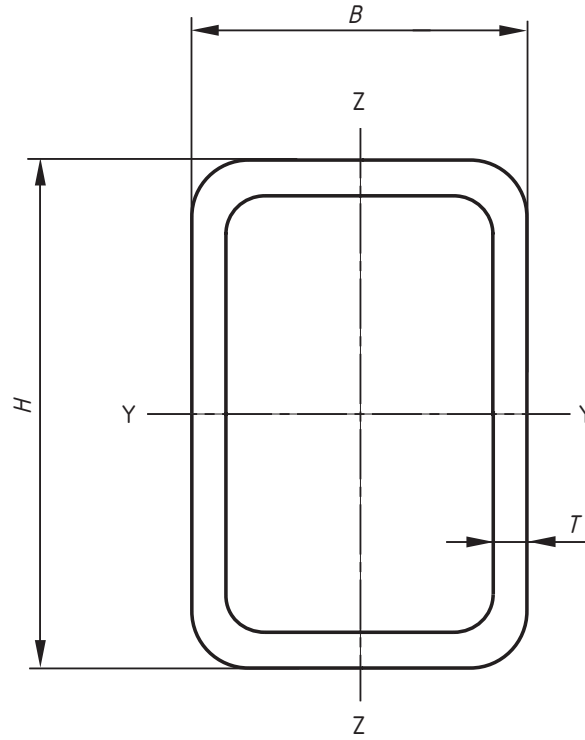| Specified side dimensions		Specified thickness	Mass per unit length	Cross-sectional area	Second moment of area		Radius of gyration		Elastic section modulus		Plastic section modulus		Torsional inertia constant	Torsional modulus constant	Superficial area per metre length	Nominal length per tonne
H	B	T	M	A	I_{yy}	I_{zz}	i_{yy}	i_{zz}	$W_{el\,xx}$	$W_{el\,yy}$	$W_{pl\,yy}$	$W_{pl\,zz}$	I_t	C_t	A_s	
mm	mm	mm	kg/m	cm²	cm⁴	cm⁴	cm	Cm	cm³	cm³	cm³	cm³	cm⁴	cm³	m²/m	m
180	100	8,0	32,6	41,6	1713	671	6,42	4,02	190	134	239	157	1560	224	0,54	30,7
180	100	10,0	40,0	50,9	2036	787	6,32	3,93	226	157	288	188	1862	263	0,53	25,0
180	100	12,5	48,7	62,1	2385	908	6,20	3,82	265	182	344	223	2191	303	0,53	20,5
200	100	4,0	18,2	23,2	1223	416	7,26	4,24	122	83	150	93	983	142	0,59	54,9
200	100	5,0	22,6	28,7	1495	505	7,21	4,19	149	101	185	114	1204	172	0,59	44,3
200	100	6,3	28,1	35,8	1829	613	7,15	4,14	183	123	228	140	1475	208	0,58	35,6
200	100	8,0	35,1	44,8	2234	739	7,06	4,06	223	148	282	172	1804	251	0,58	28,5
200	100	10,0	43,1	54,9	2664	869	6,96	3,98	266	174	341	206	2156	295	0,57	23,2
200	100	12,5	52,7	67,1	3136	1004	6,84	3,87	314	201	408	245	2541	341	0,57	19,0
200	100	16,0	65,2	83,0	3678	1147	6,66	3,72	368	229	491	290	2982	391	0,56	15,3
200	120	6,3	30,1	38,3	2065	929	7,34	4,92	207	155	253	177	2028	255	0,62	33,3
200	120	8,0	37,6	48,0	2529	1128	7,26	4,85	253	188	313	218	2495	310	0,62	26,6
200	120	10,0	46,3	58,9	3026	1337	7,17	4,76	303	223	379	263	3001	367	0,61	21,6
200	120	12,5	56,6	72,1	3576	1562	7,04	4,66	358	260	455	314	3569	428	0,61	17,7
250	150	6,3	38,0	48,4	4143	1874	9,25	6,22	331	250	402	283	4054	413	0,78	26,3
250	150	8,0	47,7	60,8	5111	2298	9,17	6,15	409	306	501	350	5021	506	0,78	21,0
250	150	10,0	58,8	74,9	6174	2755	9,08	6,06	494	367	611	426	6090	605	0,77	17,0
250	150	12,5	72,3	92,1	7387	3265	8,96	5,96	591	435	740	514	7326	717	0,77	13,8
250	150	14,2	81,1	103	8141	3576	8,87	5,88	651	477	823	570	8102	784	0,76	12,3
250	150	16,0	90,3	115	8879	3873	8,79	5,80	710	516	906	625	8868	849	0,76	11,1
260	180	6,3	41,9	53,4	5166	2929	9,83	7,40	397	325	475	369	5810	524	0,86	23,8
260	180	8,0	52,7	67,2	6390	3608	9,75	7,33	492	401	592	459	7221	644	0,86	19,0
260	180	10,0	65,1	82,9	7741	4351	9,66	7,24	595	483	724	560	8798	775	0,85	15,4
260	180	12,5	80,1	102	9299	5196	9,54	7,13	715	577	879	679	10640	924	0,85	12,5
260	180	14,2	90,1	115	10280	5719	9,46	7,06	791	635	980	755	11820	1016	0,84	11,1
260	180	16,0	100	128	11250	6231	9,38	6,98	865	692	1081	831	12990	1106	0,84	9,97
300	200	6,3	47,9	61,0	7829	4193	11,3	8,29	522	419	624	472	8476	681	0,98	20,9
300	200	8,0	60,3	76,8	9717	5184	11,3	8,22	648	518	779	589	10560	840	0,98	16,6
300	200	10,0	74,5	94,9	11820	6278	11,2	8,13	788	628	956	721	12910	1015	0,97	13,4
300	200	12,5	91,9	117	14270	7537	11,0	8,02	952	754	1165	877	15680	1217	0,97	10,9
300	200	14,2	103	132	15830	8328	11,0	7,95	1055	833	1302	978	17460	1343	0,96	9,7
300	200	16,0	115	147	17390	9109	10,9	7,87	1159	911	1441	1080	19250	1468	0,96	8,67
350	250	6,3	57,8	73,6	13200	7885	13,4	10,4	754	631	892	709	15220	1011	1,18	17,3
350	250	8,0	72,8	92,8	16450	9798	13,3	10,3	940	784	1118	888	19030	1254	1,18	13,7
350	250	10,0	90,2	115	20100	11940	13,2	10,2	1149	955	1375	1091	23350	1525	1,17	11,1
350	250	12,5	112	142	24420	14440	13,1	10,1	1395	1156	1685	1334	28530	1842	1,17	8,97
350	250	14,2	126	160	27200	16050	13,0	10,0	1554	1284	1887	1492	31890	2044	1,16	7,95
350	250	16,0	141	179	30010	17650	12,9	9,93	1715	1412	2095	1655	35330	2246	1,16	7,12
400	200	8,0	72,8	92,8	19560	6660	14,5	8,47	978	666	1203	743	15740	1135	1,18	13,7
400	200	10,0	90,2	115	23910	8084	14,4	8,39	1196	808	1480	911	19260	1376	1,17	11,1
400	200	12,5	112	142	29060	9738	14,3	8,28	1453	974	1813	1111	23440	1656	1,17	8,97
400	200	14,2	126	160	32380	10780	14,2	8,21	1619	1078	2032	1242	26140	1834	1,16	7,95
400	200	16,0	141	179	35740	11820	14,1	8,13	1787	1182	2256	1374	28870	2010	1,16	7,12
450	250	8,0	85,4	109	30080	12140	16,6	10,6	1337	971	1622	1081	27080	1629	1,38	11,7
450	250	10,0	106	135	36900	14820	16,5	10,5	1640	1185	2000	1331	33280	1986	1,37	9,44
450	250	12,5	131	167	45030	17970	16,4	10,4	2001	1438	2458	1631	40720	2406	1,37	7,62
450	250	14,2	148	189	50320	20000	16,3	10,3	2236	1600	2759	1827	45580	2675	1,36	6,76
450	250	16,0	166	211	55710	22040	16,2	10,2	2476	1763	3070	2029	50550	2947	1,36	6,04
500	300	10,0	122	155	53760	24440	18,6	12,6	2150	1629	2595	1826	52450	2696	1,57	8,22
500	300	12,5	151	192	65810	29780	18,5	12,5	2633	1985	3196	2244	64390	3281	1,57	6,63
500	300	14,2	170	217	73700	33250	18,4	12,4	2948	2216	3593	2519	72240	3660	1,56	5,87
500	300	16,0	191	243	81780	36770	18,3	12,3	3271	2451	4005	2804	80330	4044	1,56	5,24
500	300	20,0	235	300	98780	44080	18,2	12,1	3951	2939	4885	3408	97450	4842	1,55	4,25

Figure B.3 — Rectangular hollow section

Table B.4 — Dimensions and sectional properties of elliptical hollow sections (see Figure B.4)

| Specified dimensions		Specified thick-ness	Mass per unit length	Cross-sectional area	Second moment of area		Radius of gyration		Elastic section modulus		Plastic section modulus		Torsional inertia constant	Torsional modulus constant	Superficial area per metre length	Nominal length per tonne
$H \times B$		T	M	A	I_{yy}	I_{zz}	i_{yy}	i_{zz}	$W_{el\,yy}$	$W_{el\,zz}$	$W_{pl\,yy}$	$W_{pl\,zz}$	I_t	C_t	A_s	
mm	mm	mm	kg/m	cm²	cm⁴	cm⁴	cm	cm	cm³	Cm³	cm³	cm³	cm⁴	cm³	m²/m	M
120	60	3,2	6,85	8,7	123	41,4	3,76	2,18	20,5	13,8	28,7	17,6	124	30,8	0,291	146
120	60	4,0	8,48	10,8	150	49,9	3,73	2,15	25,1	16,6	35,3	21,5	150	36,9	0,291	118
120	60	5,0	10,5	13,4	182	59,7	3,69	2,12	30,4	19,9	43,2	26,2	180	43,9	0,291	95,4
120	60	6,0	12,4	15,8	212	68,6	3,66	2,08	35,4	22,9	50,7	30,5	208	50,1	0,291	80,5
120	60	8,0	16,2	20,6	266	83,7	3,59	2,02	44,3	27,9	64,7	38,4	256	60,4	0,291	61,8
150	75	4,0	10,7	13,6	301	101	4,70	2,72	40,1	26,9	56,1	34,4	303	60,1	0,364	93,4
150	75	5,0	13,3	16,9	367	122	4,66	2,69	48,9	32,5	68,9	42,0	367	72,2	0,364	75,4
150	75	6,0	15,8	20,1	430	141	4,63	2,65	57,3	37,7	81,3	49,3	426	83,2	0,364	63,5
150	75	6,3	16,5	21,0	448	147	4,62	2,64	59,7	39,1	84,9	51,5	443	86,3	0,364	60,6
150	75	8,0	20,6	26,3	546	176	4,56	2,59	72,8	46,8	105	62,9	533	102	0,364	48,5
150	75	10,0	25,3	32,2	649	204	4,49	2,52	86,6	54,5	126	75,1	625	118	0,364	39,6
180	90	6,0	19,1	24,3	761	253	5,59	3,22	84,6	56,2	119	72,6	760	125	0,436	52,4
180	90	8,0	25,1	31,9	974	318	5,52	3,16	108	70,6	154	93,3	961	155	0,436	39,9
180	90	10,0	30,8	39,3	1169	375	5,46	3,09	130	83,3	187	112	1139	182	0,436	32,4
200	100	6,3	22,3	28,4	1103	368	6,23	3,60	110	73,5	155	94,7	1105	163	0,485	44,8
200	100	8,0	28,0	35,7	1358	446	6,17	3,54	136	89,3	193	117	1347	197	0,485	35,7
200	100	10,0	34,5	44,0	1637	529	6,10	3,47	164	106	235	141	1605	232	0,485	29,0
200	100	12,5	42,4	54,0	1954	619	6,02	3,39	195	124	284	169	1889	269	0,485	23,6
220	110	6,0	23,5	30,0	1421	476	6,88	3,99	129	86,6	181	111	1429	193	0,533	42,5
220	110	8,0	31,0	39,5	1832	606	6,81	3,92	167	110	235	143	1824	244	0,533	32,3
220	110	10,0	38,2	48,7	2215	722	6,74	3,85	201	131	287	174	2183	288	0,533	26,2
250	125	6,0	26,9	34,2	2109	711	7,85	4,56	169	114	235	144,5	2130	254,5	0,606	37,2
250	125	6,3	28,2	35,9	2205	742	7,84	4,55	176	119	246	151	2224	265	0,606	35,5
250	125	8,0	35,4	45,1	2732	909	7,78	4,49	219	145	307	188	2734	323	0,606	28,2
250	125	10,0	43,8	55,8	3316	1090	7,71	4,42	265	174	376	228	3288	385	0,606	22,8
250	125	12,0	51,9	66,2	3864	1254	7,64	4,35	309	201	442	267	3798	440	0,606	19,3
250	125	12,5	53,9	68,7	3996	1292	7,63	4,34	320	207	458	276	3918	453	0,606	18,5
300	150	8,0	42,8	54,5	4813	1616	9,39	5,44	321	215	449	275	4846	481	0,727	23,4
300	150	10,0	53,0	67,5	5872	1950	9,32	5,37	391	260	551	336	5867	577	0,727	18,9
300	150	12,5	65,5	83,4	7120	2334	9,24	5,29	475	311	674	409	7047	686	0,727	15,3
300	150	16,0	82,5	105	8731	2809	9,12	5,17	582	374	837	503	8529	818	0,727	12,1
320	160	8,0	45,8	58,3	5877	1978	10,0	5,82	367	247	513	315	5928	553	0,776	21,8
320	160	10,0	56,7	72,3	7181	2393	9,97	5,75	449	299	631	385	7192	665	0,776	17,6
320	160	12,0	67,5	86,0	8422	2779	9,90	5,69	526	347	745	453	8375	769	0,776	14,8
320	160	14,0	78,0	99,4	9604	3137	9,83	5,62	600	392	855	517	9483	863	0,776	12,8
400	200	8,0	57,6	73,4	11690	3966	12,6	7,35	584	397	811	500	11860	890	0,969	17,4
400	200	10,0	71,5	91,1	14340	4829	12,5	7,28	717	483	1001	615	14470	1079	0,969	14,0
400	200	12,0	85,2	109	16910	5646	12,5	7,21	845	565	1186	726	16960	1257	0,969	11,7
400	200	12,5	88,6	113	17530	5843	12,5	7,19	877	584	1232	753	17560	1299	0,969	11,3
400	200	14,0	98,7	126	19370	6416	12,4	7,14	968	642	1366	832	19310	1422	0,969	10,1
480	240	10,0	86,3	110	25170	8529	15,1	8,81	1049	711	1457	897	25510	1594	1,16	11,6
480	240	12,0	103	131	29750	10010	15,1	8,74	1240	835	1730	1062	30010	1865	1,16	9,71
480	240	14,0	119	152	34190	11430	15,0	8,67	1425	953	1997	1222	34320	2121	1,16	8,37
500	250	10,0	90,0	115	28540	9682	15,8	9,19	1142	775	1585	976	28950	1739	1,21	11,1
500	250	12,5	112	142	35030	11790	15,7	9,10	1401	943	1956	1201	35330	2108	1,21	8,95
500	250	16,0	142	180	43710	14550	15,6	8,98	1748	1164	2459	1501	43740	2586	1,21	7,06
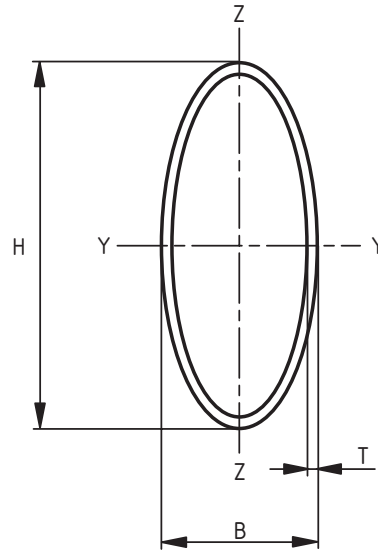
Figure B.4 — Elliptical hollow section

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