

Hot-rolled structural steel sections —

Part 2: Specification for hot-finished hollow sections

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Piping Systems Components Standards Policy Committee (PSE/-) to Technical Committee PSE/8, upon which the following bodies were represented:

- Adhesive Tape Manufacturers' Association
- British Compressed Air Society
- British Gas plc
- British Malleable Tube Fittings Association
- British Steel Industry
- British Valve and Actuator Manufacturers' Association
- British Welded Steel Tube Association
- Engineering Equipment and Materials Users' Association
- Food and Drink Federation
- Institution of Civil Engineers
- Institution of Gas Engineers
- Institution of Water and Environmental Management
- Mechanical Handling Engineers' Association
- Stainless Steel Fabricators' Association of Great Britain
- TI (Group Services) Ltd.
- Water Companies Association
- Water Research Centre
- Water Services Association of England and Wales
- Wrought Fitting Makers' Association

This British Standard, having been prepared under the direction of the Piping Systems Components Standards Policy Committee, was published under the authority of the Board of BSI and comes into effect on 31 January 1991

© BSI 01-1999

First published December 1975
Second edition January 1991

The following BSI references relate to the work on this standard:
Committee reference PSE/8
Draft for comment 86/73708 DC

ISBN 0 580 18587 7

Amendments issued since publication

Amd. No.	Date	Comments
6747	June 1991	
7449	January 1993	Indicated by a sideline in the margin

Contents

	Page
Committees responsible	Inside front cover
Foreword	ii
1 Scope	1
2 Definition	1
3 Information to be supplied by the purchaser	1
4 Designation	1
5 Materials	1
6 Sectional properties	1
7 Tolerances	1
Appendix A Dimensions of ISO structural hollow sections not included in this British Standard	16
Figure 1 — Limiting positions for measuring the dimensions across opposite faces of square and rectangular hollow sections	3
Figure 2 — Measurements of concavity/convexity	3
Figure 3 — Measurement of twist	3
Figure 4 — Circular hollow section	4
Figure 5 — Rectangular hollow section	8
Figure 6 — Square hollow section	12
Figure 7 — Dimensions of circular hollow sections described in ISO 657-14 but not covered by this standard	16
Figure 8 — Dimensions of rectangular hollow sections described in ISO 657-14 but not covered by this standard	16
Figure 9 — Dimensions of square hollow sections described in ISO 657-14 but not covered by this standard	17
Table 1 — Circular hollow sections	4
Table 2 — Rectangular hollow sections	8
Table 3 — Square hollow sections	12
Table 4 — Dimensions of circular hollow sections described in ISO 657-14 but not covered by this standard	16
Table 5 — Dimensions of rectangular hollow sections described in ISO 657-14 but not covered by this standard	17
Table 6 — Dimensions of square hollow sections described in ISO 657-14 but not covered by this standard	18
Publications referred to	Inside back cover

Foreword

This revision of BS 4848-2 has been prepared under the direction of the Piping Systems Components Standards Policy Committee. It supersedes BS 4848-2:1975 which is withdrawn.

It is intended that BS 4848 will ultimately comprise five Parts, each Part will cover different section shapes, as follows.

- *Part 1: Beams, columns and tee bars¹⁾*;
- *Part 2: Hot-finished hollow sections*;
- *Part 3: Channels¹⁾*;
- *Part 4: Equal and unequal angles²⁾*;
- *Part 5: Bulb flats²⁾*.

This Part of BS 4848 gives the requirements for tolerances and sectional properties for hot-finished structural steel hollow sections and gives the sectional properties for a range of sizes and thicknesses. The range of sizes and thicknesses has been selected from ISO 657-14 published by the International Organization for Standardization (ISO) but includes some additional sizes and thicknesses. Other sizes and thicknesses contained in ISO 657-14 but not specified in this standard are given in Appendix A and may be available, as well as other intermediate thicknesses to those listed, by special order from the manufacturer. If the purchaser specifies such hollow sections in his enquiry or order it is recommended that he states the size and that he indicates that the hollow sections should comply with all the requirements other than size and/or thickness, of BS 4848-2 including tolerances.

For circular sections, square sections up to and including 120 mm × 120 mm and rectangular sections up to and including 160 mm × 80 mm the geometric properties given in this standard are the same as those given in ISO 657-14. For both square and rectangular sections above the limits of 120 mm × 120 mm and 160 mm × 80 mm respectively the geometric properties given in this standard differ from those in ISO 657-14 because of differences in the corner radius used for their calculation.

ISO 657-14 does not give geometric properties for sections greater than 10 mm thick.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 18, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

¹⁾ At present BS 4-1.

²⁾ At present BS 4848-4 and BS 4848-5.

1 Scope

This Part of BS 4848 specifies the requirements for tolerances and sectional properties for hot-finished steel structural hollow sections manufactured by a seamless or electrically welded process and gives sectional properties for the following range of sizes and thicknesses:

- a) circular, hot-formed with or without subsequent heat treatment or cold-formed with subsequent heat treatment, in the size range 21.3 mm to 508 mm diameter;
- b) rectangular, hot-formed with or without subsequent heat treatment, in the size range 50 mm × 25 mm to 500 mm × 300 mm;
- c) square, hot-formed with or without subsequent heat treatment, in the size range 20 mm × 20 mm to 400 mm × 400 mm.

NOTE 1 Dimensions and properties of welded cold-formed structural steel hollow sections are specified in BS 6363.

NOTE 2 The titles of the publications referred to in this standard are listed on the inside back cover.

2 Definition

For the purposes of this Part of BS 4848 the following definition applies.

hot-finished

a product manufactured by a hot-forming process with or without subsequent heat treatment, or by cold-forming with subsequent heat treatment to obtain similar metallurgical conditions to those obtained by hot-forming

3 Information to be supplied by the purchaser

The following information to be supplied by the purchaser shall be fully documented:

- a) the number and Part of this British Standard, i.e. BS 4848-2;
- b) the designation of the hollow section(s) (see clause 4);
- c) the steel grade in accordance with BS 4360 (see clause 5);
- d) quantities and length required (see 7.3).

NOTE It is essential that this information is supplied by the purchaser when placing an order.

4 Designation

A hot-finished hollow section shall be designated by its outside dimensions and thickness in millimetres and by the symbols HFCHS for circular hollow sections or HFRHS for rectangular and square hollow sections.

NOTE 1 The purchaser should state in his enquiry or order the designation of the hollow section(s) (see clause 3).

NOTE 2 The following are examples of designations:

- a) A circular hollow section of 114.3 mm outside diameter and 6.3 mm thick is designated
114.3 × 6.3 HFCHS.
- b) A rectangular hollow section of 100 mm × 50 mm sides and 4.0 mm thick is designated
100 × 50 × 4.0 HFRHS.
- c) A square hollow section of 100 mm × 100 mm sides and 6.3 mm thick is designated
100 × 100 × 6.3 HFRHS.

5 Materials

The steel shall comply with sections 1, 3 and 7 or 8, as appropriate, of BS 4360:1990.

NOTE The purchaser should state in his enquiry or order, the grade of steel.

6 Dimensions and sectional properties

The nominal section dimensions and sectional properties of hollow sections shall comply with Table 1, Table 2 and Table 3 (see also Figure 4, Figure 5 and Figure 6), where

B is the nominal length of the shorter side of a rectangular hollow section (in mm);

D is the nominal outside diameter of a circular hollow section or the nominal length of the longer side of a rectangular hollow section (in mm);

t is the nominal thickness of the section (in mm).

NOTE 1 The masses per unit length are calculated on the basis that steel weighs 0.785 kg/cm² per metre run.

NOTE 2 The sectional properties are calculated from the nominal outside dimensions and thicknesses, for rectangular and square hollow sections using the corner radii of 1.25*t* externally and 1.0*t* internally [see 7.1.3 b)].

NOTE 3 Dimensions of structural hollow sections complying with ISO 657-14 but not included in this Part of BS 4848 are given in Appendix A (see the foreword also).

7 Tolerances

7.1 Size and shape tolerances

7.1.1 Outside dimensions

The tolerance on outside dimensions, *D* and *B*, shall be as follows:

± 1 % with a minimum of ± 0.5 mm.

For rectangular and square hollow sections, these dimensions shall be measured across opposite faces as shown in Figure 1.

7.1.2 Thickness

The tolerance on thickness (t) shall be as follows.

- a) *Seamless sections*: + 15 %, – 12.5 % excluding the corners of square and rectangular hollow sections. The minimum thickness in the corners of square and rectangular hollow sections shall be not less than that permitted in the body of the section.
- b) *Welded sections*: ± 10 % with a minimum of ± 0.4 mm excluding the weld area and the corners of square and rectangular hollow sections. The minimum thickness in the weld area and the corners of square and rectangular hollow sections shall be not less than that permitted in the body of the section.

7.1.3 Rectangular and square hollow sections shape

The tolerances on shape shall be as follows.

- a) *Squareness of sides*: $90^\circ \pm 1^\circ$.
- b) *Radius of external corners*: $0.5t$ to $2.0t$.
Radius of internal corners: $0.5t$ to $1.5t$.

NOTE The radius need not be tangential to the sides.

- c) *Concavity (x_1)/convexity (x_2)*: ± 1 % of the outside dimension, D or B , of the side (see Figure 2).

This tolerance shall be measured independently of the tolerance on the outside dimension.

- d) *Twist* (measured as specified): 2 mm (+ 0.5 mm per metre maximum).

The twist shall be measured as follows.

- 1) The section as produced shall be placed on a horizontal surface with one face at one end pressed flat against the surface.
- 2) At the opposite end of the section, the difference in height, V (see Figure 3), of the two lower corners from the horizontal surface shall be measured, where V is a measure of twist and is measured where the corner arc meets the sidewall.

7.2 Mass tolerance

The tolerance on mass shall be as follows:

- a) ± 6 % on individual lengths;
- b) + 6 %, – 4 % on lots of 10 t and over.

7.3 Length tolerance

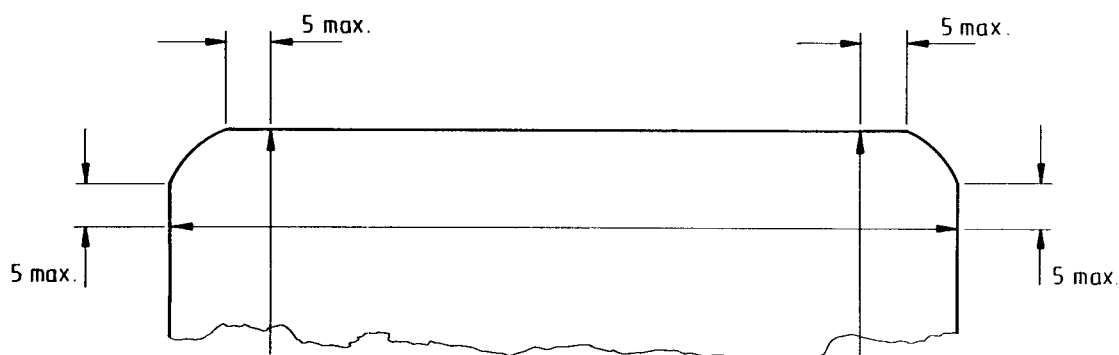
Where hollow sections are ordered to exact length the tolerance on length shall be + 6 mm, – 0 mm.

NOTE The purchaser should state in his enquiry or order the length, type of length and also the tolerance on the length for lengths other than exact lengths. (See clause 3.)

7.4 Straightness tolerance

Hollow sections shall not deviate from straightness by more than 0.2 % of the total length, measured at the centre of that length.

NOTE Smaller tolerances on straightness may be available, the purchaser should consult the manufacturer.



All dimensions are in millimetres.

Figure 1 — Limiting positions for measuring the dimensions across opposite faces of square and rectangular hollow sections

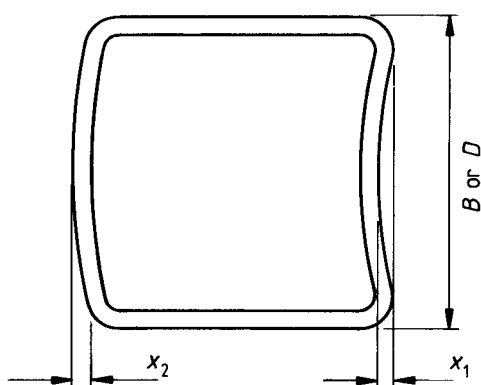


Figure 2 — Measurements of concavity/convexity

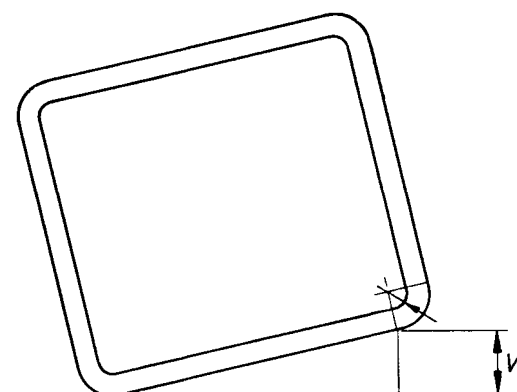


Figure 3 — Measurement of twist

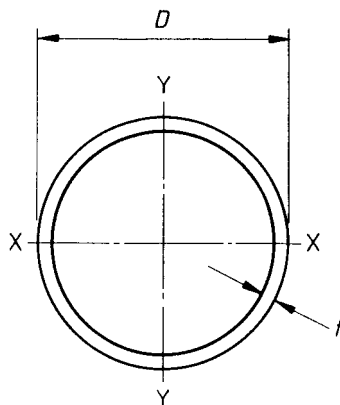


Figure 4 — Circular hollow section (see Table 1)

Table 1 — Circular hollow sections (see Figure 4)

Outside diameter, D	Thickness, t	Mass per unit length, M	Sectional area, A	Moment of inertia, I	Radius of gyration, r	Elastic modulus, Z	Plastic modulus, S	Torsional moment of inertia, J	Torsional modulus, C	Superficial area per metre length
mm	mm	kg/m	cm ²	cm ⁴	cm	cm ³	cm ³	cm ⁴	cm ³	m ²
21.3	3.2	1.43	1.82	0.77	0.650	0.72	1.06	1.54	1.44	0.067
26.9	3.2	1.87	2.38	1.70	0.846	1.27	1.81	3.41	2.53	0.085
33.7	2.6	1.99	2.54	3.09	1.10	1.84	2.52	6.19	3.67	0.106
	3.2	2.41	3.07	3.60	1.08	2.14	2.99	7.21	4.28	0.106
	4.0	2.93	3.73	4.19	1.06	2.49	3.55	8.38	4.97	0.106
42.4	2.6	2.55	3.25	6.46	1.41	3.05	4.12	12.9	6.10	0.133
	3.2	3.09	3.94	7.62	1.39	3.59	4.93	15.2	7.19	0.133
	4.0	3.79	4.83	8.99	1.36	4.24	5.92	18.0	8.48	0.133
48.3	3.2	3.56	4.53	11.6	1.60	4.80	6.52	23.2	9.59	0.152
	4.0	4.37	5.57	13.8	1.57	5.70	7.87	27.5	11.4	0.152
	5.0	5.34	6.80	16.2	1.54	6.69	9.42	32.3	13.4	0.152