BRITISH STANDARD

BS 6323-2: 1982

(Reprinted, incorporating Amendment Nos. 1 and 2)

Specification for

Seamless and welded steel tubes for automobile, mechanical and general engineering purposes —

Part 2: Specific requirements for hot finished welded steel tubes

UDC 669.14-462.2:621.774.21

Cooperating organizations

The Iron and Steel Standards Committee, under whose direction this British Standard was prepared, consists of representatives from the following:

British Constructional Steelwork Association
British Internal Combustion Engine Manufacturers' Association
British Ironfounders' Association
British Railways Board
British Steel Industry*
British Steel Industry — Wire Section
Concrete Society Ltd
Council of Ironfoundry Associations
Department of Industry (National Physical Laboratory)
Electricity Supply Industry in England and Wales
Engineering Equipment Users' Association
Federation of Civil Engineering Contractors
Institute of Quality Assurance
Institution of Production Engineers
Institution of Structural Engineers
International Tin Research Institute
Lloyd's Register of Shipping
National Association of Drop Forgers and Stampers
Oil Companies' Materials Association
Process Plant Association
Royal Institute of British Architects
Society of Motor Manufacturers and Traders Ltd*
Steel Casting Research and Trade Association
Water-tube Boilermakers' Association

The organizations marked with an asterisk in the above list, together with the following, were directly represented on the Technical Committee entrusted with the preparation of this British Standard:

Association of Hydraulic Equipment Manufacturers
British Steel Corporation
British Welded Steel Tube Manufacturers' Association
Chartered Institution of Building Services
Confederation of British Industry
Mechanical Handling Engineers' Association
Ministry of Defence
Motor Cycle Association of Great Britain
Coopted members

This British Standard, having been prepared under the direction of the Iron and Steel Standards Committee, was published under the authority of the Board of BSI and comes into effect on
31 December 1982

The following BSI references relate to the work on this standard:
Committee reference PSE/8 (formerly ISE/50)
Draft for comment 78/74961 DC

ISBN 0 580 12970 5

Amendments issued since publication

Amd. No.	Date of issue	Comments
5138	June 1986	
6021	June 1989	Indicated by a sideline in the margin

Contents

Foreword

This British Standard has been prepared under the direction of the Iron and Steel Standards Committee. It is a combined standard superseding BS 980:1950, BS 1775:1964 and BS 3014:1958 which are withdrawn.

In BS 6323, manufacturing processes have been aligned with current procedures, and processes no longer used, i.e. oxy-acetylene welding and hydraulic lap welding, have been deleted. Terminology relating to the designation of certain manufacturing processes has been updated, i.e. SAW replaces EFW, and CFS replaces CDS. Additionally, in combining the standards, steel grades have been rationalized and aligned, with delivery conditions now being clearly designated by letter codes.

This standard is published in eight separate Parts as follows:

— *Part 1: General requirements;*

— *Part 2: Specific requirements for hot finished welded steel tubes;*

— *Part 3: Specific requirements for hot finished seamless steel tubes;*

— *Part 4: Specific requirements for cold finished seamless steel tubes;*

— *Part 5: Specific requirements for electric resistance welded (including induction welded) steel tubes;*

— *Part 6: Specific requirements for cold finished electric resistance welded (including induction welded) steel tubes;*

— *Part 7: Specific requirements for submerged arc welded steel tubes;*

— *Part 8: Specific requirements for longitudinally welded stainless steel tubes.*

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 and 2, 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 Scope

This Part of BS 6323, which is used in conjunction with Part 1 of the same standard, covers the specific requirements for hot finished welded steel tubes for use in the automobile, mechanical and general engineering industries. It specifies the chemical composition, mechanical properties, dimensions, dimensional tolerances and technical delivery condition of the tubes.

NOTE 1 For tubes for pressure purposes, attention is drawn to BS 3601 to BS 3605 and for hollow sections for structural purposes to BS 4360 and BS 4848-2.

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

2 General

The tubes shall comply with the general requirements of BS 6323-1 and the specific requirements of this Part of the same standard, which covers tubes up to and including 139.7 mm outside diameter.

The tubes shall be of steel grades 2, 3, 4 or 5. The grade required shall be specified in the enquiry and order, together with other details as specified in clause **5** of BS 6323-1:1982, as appropriate.

3 Method of manufacture

The tubes shall be manufactured from flat rolled strip with a longitudinal seam welded by a continuous process without the addition of filler metal, and shall be hot finished.

4 Delivery condition

The tubes shall be supplied in the hot finished condition.

5 Chemical composition

The steel shall show on ladle analysis the composition given in Table 1 appropriate to the steel grade specified.

6 Mechanical properties

The tensile properties of the tubes, appropriate to their steel grade, determined in accordance with **15.2** of BS 6323-1:1982, shall be as given in Table 1.

For other mechanical properties, see clause **9**.

7 Dimensions and sectional properties

The dimensions of the tubes shall be in accordance with Table 3. The sectional properties are given in appendix B of BS 6323-1:1982.

8 Tolerances

8.1 Outside diameter. The tolerance on the outside diameter, including ovality, shall be ± 1 % with a minimum of ± 0.5 mm.

8.2 Thickness

8.2.1 For furnace buttwelded tubes the tolerance on thickness, including eccentricity, shall be ± 10 %.

8.2.2 For electric resistance welded, including induction welded, tubes the following apply.

a) The tolerance on thickness, including eccentricity but excluding the weld, shall be ± 10 %.

b) The external weld upset shall be removed completely, i.e. flush with the outside surface of the tube.

c) The maximum height of the weld bead on the internal surface of the tube shall be not greater than 60 % of the specified thickness.

d) If specified on the order, the internal weld upset shall be reduced so that the residual height does not exceed 0.25 mm.

e) The minimum thickness in the weld area shall be not less than that permitted in the body of the tube.

8.3 Length. Tubes shall be supplied in either:

a) random lengths of from 4 m to 7 m, or

b) specified cut lengths to the following tolerances:

up to and including 6 000 mm: $^{+\ 10}_{-\ 0}$ mm

over 6 000 mm: $^{+\ 15}_{-\ 0}$ mm

NOTE Closer tolerances may be obtained by agreement between the purchaser and the manufacturer.

For orders of over 150 m of any one size of tube, it shall be permissible, unless otherwise agreed between purchaser and manufacturer, to supply short random lengths of from 2 m to 4 m provided that the number of such lengths does not exceed 7.5 % of the total number of lengths for sizes 76.1 mm to 114.3 mm outside diameter inclusive and 5 % for all other sizes.

Table 1 — Chemical compositions and mechanical properties (see note)

Designation	Chemical composition (ladle analysis)					Mechanical properties		
	C max.	Si max.	Mn max.	P max.	S max.	R_e min.	R_m min.	A min.
	%	%	%	%	%	N/mm^2	N/mm^2	%
HFW 2	0.16[a]	—	0.70	0.050	0.050	195	320	25
HFW 3	0.20[a]	0.35	0.90	0.050	0.050	215	360	24
HFW 4	0.25	0.35	1.20	0.050	0.050	235	410	22
HFW 5[b]	0.23	0.35	1.50	0.050	0.050	340	490	20

NOTE Welding of tubes of these grades does not require special techniques but care should be taken and welding should be carried out in accordance with the guidance given in the appropriate British Standards for welding, e.g. BS 5135.

[a] If rimming or semi-killed steel is used for grade 2, the carbon content may be increased to 0.19 %, and if used for grade 3, to 0.23 %.

[b] Grain refining elements may be added to this grade at the option of the manufacturer.

9 Tests

9.1 General. In addition to the tensile test specified in clause **6** and dependent upon the dimensions, the tube shall be subjected to either a flattening test, in the case of tubes of over 60.3 mm outside diameter, as given in **9.2** or a bend test (whole tube), in the case of tubes up to and including 60.3 mm outside diameter, as given in **9.3**. The tests shall be carried out in accordance with **15.3** and **15.5** respectively of BS 6323-1:1982.

9.2 Flattening test (for tubes of over 60.3 mm outside diameter). The distance between platens, or in the case of flattening by hammer blows the distance between outside surfaces, shall be expressed as a percentage of the original outside diameter as shown in Table 2. The weld shall be placed at 90° to the direction of flattening.

9.3 Bend test (whole tube) (for tubes up to and including 60.3 mm outside diameter). The radius at the bottom of the grooved former shall be 6 times the original outside diameter of the tube.

Table 2 — Distance between platens for flattening test

Designation	Distance between platens
	%
HFW 2	75
HFW 3	85
HFW 4	85
HFW 5	85

Table 3 — Dimensions of hot finished welded steel tubes

Outside diameter	Designation HFW 2 and 3 Thicknesses			Designation HFW 4 and 5 Thicknesses		
mm	mm	mm	mm	mm	mm	mm
21.3	2.0	2.6	3.2	3.2		
26.9	2.3	2.6	3.2	3.2		
33.7	2.6	3.2	4.0	2.6	3.2	4.0
42.4	2.6	3.2	4.0	2.6	3.2	4.0
48.3	2.9	3.2	4.0	3.2	4.0	5.0
60.3	2.9	3.6	4.5	3.2	4.0	5.0
76.1	3.2	3.6	4.5	3.2	4.0	5.0
88.9	3.2	4.0	5.0	3.2	4.0	5.0
114.3	3.6	4.5	5.4	3.6	5.0	6.3
139.7	6.3			6.3		

NOTE For sectional properties including mass per unit length, see appendix B of BS 6323-1:1982.

Publications referred to

BS 3601, *Steel pipes and tubes for pressure purposes: carbon steel with specified room temperature properties.*

BS 3602, *Specification for steel pipes and tubes for pressure purposes: carbon and carbon manganese steel with specified elevated temperature properties.*

BS 3602-1, *Seamless electric resistance welded and induction welded tubes.*

BS 3602-2, *Submerged arc welded tubes.*

BS 3603, *Specification for steel pipes and tubes for pressure purposes: carbon and alloy steel with specified low temperature properties.*

BS 3604, *Specification for steel pipes and tubes for pressure purposes: ferritic alloy steel with specified elevated temperature properties.*

BS 3605, *Seamless and welded austenitic stainless steel pipes and tubes for pressure purposes.*

BS 4360, *Specification for weldable structural steels.*

BS 4848, *Hot-rolled structural steel sections.*

BS 4848-2, *Hollow sections.*

BS 5135, *Metal-arc welding of carbon and carbon manganese steels.*

BS 6323, *Specification for seamless and welded steel tubes for automobile, mechanical and general engineering purposes.*

BS 6323-1, *General requirements.*

BSI — British Standards Institution

BSI is the independent national body responsible for preparing British Standards. It presents the UK view on standards in Europe and at the international level. It is incorporated by Royal Charter.

Revisions

British Standards are updated by amendment or revision. Users of British Standards should make sure that they possess the latest amendments or editions.

It is the constant aim of BSI to improve the quality of our products and services. We would be grateful if anyone finding an inaccuracy or ambiguity while using this British Standard would inform the Secretary of the technical committee responsible, the identity of which can be found on the inside front cover. Tel: 020 8996 9000. Fax: 020 8996 7400.

BSI offers members an individual updating service called PLUS which ensures that subscribers automatically receive the latest editions of standards.

Buying standards

Orders for all BSI, international and foreign standards publications should be addressed to Customer Services. Tel: 020 8996 9001. Fax: 020 8996 7001.

In response to orders for international standards, it is BSI policy to supply the BSI implementation of those that have been published as British Standards, unless otherwise requested.

Information on standards

BSI provides a wide range of information on national, European and international standards through its Library and its Technical Help to Exporters Service. Various BSI electronic information services are also available which give details on all its products and services. Contact the Information Centre. Tel: 020 8996 7111. Fax: 020 8996 7048.

Subscribing members of BSI are kept up to date with standards developments and receive substantial discounts on the purchase price of standards. For details of these and other benefits contact Membership Administration. Tel: 020 8996 7002. Fax: 020 8996 7001.

Copyright

BSI
389 Chiswick High Road
London
W4 4AL