

Specification for

Steel pipes and joints for hydraulic purposes

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The Government departments and scientific and industrial organizations marked with an asterisk in the above list, together with the following, were directly represented on the committee entrusted with the preparation of this standard:

Association of Hydraulic Equipment Manufacturers	Lloyd's Register of Shipping
British Bolt, Nut, Screw and Rivet Federation	National Association of Drop Forgers and Stampers
British Plastics Federation	North East Coast Institution of Engineers and Shipbuilders
British Valve Manufacturers Association	Water-tube Boilermakers Association
Hydraulic Association	Manufacturers of pipes and flanges
Institute of Welding	

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Foreword

This standard makes reference to the following British Standards:

BS 10, *Flanges and bolting for pipes, valves and fittings*.

BS 899, *Rolled copper sheet, strip and foil*.

BS 916, *Black bolts, screws and nuts*.

BS 1083, *Precision hexagon bolts, screws and nuts*.

BS 1501-6, *Steels for use in the chemical, petroleum and allied industries*.

BS 1768, *Unified precision hexagon bolts, screws and nuts (UNC and UNF threads). Normal series*.

BS 1769, *Unified black hexagon bolts, screws and nuts (UNC and UNF threads). Heavy series*.

BS 2051, *Tube and pipe fittings for engineering purposes Part 3: Steel compression pipe fittings*.

BS 2633, *Class I metal-arc welding of steel pipelines and pipe assemblies for carrying fluids*.

BS 2708, *Unified black square and hexagon bolts, screws and nuts (UNC and UNF threads). Normal series*.

BS 2779, *Fastening threads of BSP sizes (formerly in BS 84:1940)*.

BS 3601, *Steel pipes and tubes for pressure purposes. Carbon steel: ordinary duties*.

This British Standard has been prepared under the authority of the Mechanical Engineering Industry Standards Committee.

The first edition of this standard was published in 1938 and dealt with screwed flange joints for pipelines for pressures up to 4 500 lbf/in², but included only recommended minimum thickness for pipes for such pipelines. In the 1951 edition complete specifications for flanges and pipes for working pressures up to 4 500 lbf/in² were given, the flanges being suitable for pipelines and for valves on hydraulic machines.

In this revision account has been taken of the publication of BS 3601, *Steel pipes and tubes for pressure purposes: carbon steel: ordinary duties*, and the pipes specified in that standard are called for in this revision. At the same time the basis of establishing the design thickness of pipes has been included in the Appendix.

The dimensions of the screwed flanges have been checked on the same basis as was used for the dimensions of flanges to BS 10 and this check showed that the flanges were adequate for the design pressures given.

In preparing this revision the committee reviewed the practices in current use in the hydraulic industry. Arising from this review, it became apparent that the type of joint employing freely fitting screwed flanges which draw pipe ends together to grip a ductile joint ring was not used for such a wide range of sizes as formerly and that there was a need for standards covering the use of compression type joints in the smaller sizes and welding neck flanges in the larger sizes and for higher pressures.

Part 1 of this revision now covers a range of pipe sizes $1\frac{17}{32}$ in o.d. to $5\frac{1}{2}$ in o.d. with screwed flanges.

Part 2 gives a range of pipes and materials for use with welding neck flanges in sizes 4 in o.d. to $12\frac{3}{4}$ in o.d.

Part 3 gives a range of pipes and materials for use with the type of compression joint specified in BS 2051, *Tube and pipe fittings for engineering purposes*, Part 3, *Steel compression pipe fittings* in sizes 0.250 in to 2.000 in o.d., and for design pressures not exceeding 6 000 lbf/in².

NOTE 1 In place of the customary, but incorrect, use of the pound as a unit of force, the unit called a pound force (abbreviation lbf) has been used in this standard. It is the force which, when acting on a body of mass one pound, gives it an acceleration equal to that of standard gravity. The unit of ton force (tonf) is similarly used.

NOTE 2 When metric equivalents of the pipe dimensions in this standard are required, reference should be made to the corresponding values in the following ISO Recommendations:

ISO R 64, *Steel tubes, outside diameters* .

ISO R 221, *Steel tubes, thicknesses* .

NOTE 3 When it is required to convert other figures in this standard from British units into metric units it is recommended that the conversion factors and tables of conversion contained in BS 350, *Conversion factors and tables* be used. Attention is also drawn to BS 2856, *Precise conversion of inch and metric sizes on engineering drawings* .

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 to iv, pages 1 to 14 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.

Part 1. Screwed flange joints and pipes

1.1 Scope

1.1.1 This part covers steel pipes and flange joints for hydraulic purposes employing working fluids such as water and oil in sizes from $1\frac{7}{32}$ in to $5\frac{1}{2}$ in outside diameter, suitable for the following design pressures:

- 1) up to and including 1 500 lbf/in²
- 2) above 1 500 lbf/in² up to and including 2 500 lbf/in²
- 3) above 2 500 lbf/in² up to and including 5 000 lbf/in².

The joint comprises freely fitting flanges screwed on to the pipe with a joint ring between the ends of the pipes themselves.

1.2 Information to be supplied by the purchaser

1.2.1 The purchaser shall include the following items in his enquiry or order:

- 1) Design pressure (see 1.1).
- 2) Type of pipe and grade of steel required by the designation given in BS 3601¹⁾.
- 3) Outside diameter and thickness (see Table 1) and length of pipes required.
- 4) Whether pipes are to have plain ends, screwed ends without flanges, or screwed ends with flanges screwed on.
- 5) Types of flanges required (see Table 2 to Table 7).
- 6) Whether bolts are to be supplied and the type required.
- 7) Whether joint rings are required.
- 8) If it is desired to witness mechanical or other tests or if test certificates are required.
- 9) Details of any additional marking required.
- 10) Details of any protection required.

1.3 Materials and process of manufacture

1.3.1 Pipes. The pipes shall comply with the requirements of BS 3601¹⁾ except for the hydraulic test pressure and shall be of the following types and grades:

Type of pipe	Grade of steel
Hot finished seamless (HFS)	22 and 27
Cold drawn seamless (CDS)	22 and 27
Electric resistance welded (ERW)	22 and 27

The hydraulic test pressure shall be $1\frac{1}{2}$ times the design pressure given in 1.1.

1.3.2 Flanges. The flanges shall be made from steel complying with any of the grades given in BS 1501-151 for plates, BS 1502-151 for bars and BS 1503-161 for forgings²⁾.

The flanges shall be sawn or flame cut from bars or plates, or shall be forged.

1.3.3 Joint rings. Unless otherwise specified by the purchaser, the joint rings shall be made of copper to BS 899³⁾.

Soft materials which are likely to be extruded shall not be used.

1.3.4 Bolts and nuts. The bolts and nuts shall be in accordance with BS 916⁴⁾ or BS 1083⁴⁾ or where bolts with unified threads are required, in accordance with BS 1768⁴⁾, BS 1769⁴⁾ or BS 2708⁴⁾.

The bolts shall be made from steel having a minimum tensile strength of 28 tonf/in².

1.4 Dimensions, tolerances and workmanship

1.4.1 Pipes

1.4.1.1 Dimensions. The dimensions of the pipes shall be in accordance with Table 1.

The outside diameters that have been standardized are those appropriate to the screw threads, which are utilized in joining the pipes. The thicknesses tabulated are those appropriate to the design conditions specified (see Appendix A).

¹⁾ BS 3601, *Steel pipes and tubes for pressure purposes. Carbon steel: ordinary duties*.

²⁾ BS 1501, *Steels for fired and unfired pressure vessels. Plates*.

BS 1502, *Steels for fired and unfired pressure vessels. Sections and bars*. (In course of preparation.)

BS 1503, *Steels for fired and unfired pressure vessels. Forgings*.

³⁾ BS 899, *Rolled copper sheet, strip and foil*.

⁴⁾ BS 916, *Black bolts, screws and nuts*.

BS 1083, *Precision hexagon bolts, screws and nuts*.

BS 1768, *Unified precision hexagon bolts, screws and nuts (UNC and UNF threads). Normal series*.

BS 1769, *Unified black hexagon bolts, screws and nuts (UNC and UNF threads). Heavy series*.

BS 2708, *Unified black square and hexagon bolts, screws and nuts (UNC and UNF threads). Normal series*.