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Confirmed July 1983

SPECIFICATION FOR

GREY IRON

PIPES AND FITTINGS

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BS 4622 : 1970

Incorporating amendments issued October 1970 (AMD 614),
October 1973 (AMD 1298) and October 1981 (AMD 3772)

Confirmed July 1983

BRITISH STANDARDS INSTITUTION

Incorporated by Royal Charter

THIS BRITISH STANDARD, having been approved by the Iron and Steel Industry Standards Committee, was published under the authority of the Executive Board on 29th July, 1970.

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The Institution desires to call attention to the fact that this British Standard does not purport to include all the necessary provisions of a contract.

In order to keep abreast of progress in the industries concerned, British Standards are subject to periodical review. Suggestions for improvements will be recorded and in due course brought to the notice of the committees charged with the revision of the standards to which they refer.

This standard makes reference to the following British Standards:

- BS 10. Flanges and bolting for pipes, valves and fittings.
- BS 78. Cast iron spigot and socket pipes (vertically cast) and spigot and socket fittings.
 - Part 1: Pipes
 - Part 2: Fittings
- BS 240. Method for Brinell hardness test.
 - Part 1. Testing of metals.
- BS 1211. Centrifugally cast (spun) iron pressure pipes for water, gas and sewage.
- BS 2035. Cast iron flanged pipes and flanged fittings.
- BS 3416. Black bitumen coating solutions for cold application.
- BS 4164. Coal tar based hot applied coating materials for protecting iron and steel, including suitable primers where required.
- BS 4772 . Ductile iron pipes and fittings.

British Standards are revised, when necessary, by the issue either of amendment slips or of revised editions. It is important that users of British Standards should ascertain that they are in possession of the latest amendments or editions.

The following BSI references relate to the work on this standard:
Committee reference ISE/16 Draft for comment 66/15749

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CO-OPERATING ORGANIZATIONS

The Iron and Steel Industry Standards Committee, under whose supervision this British Standard was prepared, consists of representatives from the following Government departments and scientific and industrial organizations:

Board of Trade

- *British Cast Iron Research Association
- British Constructional Steelwork Association
- British Electrical and Allied Manufacturers' Association
- *British Ironfounders' Association
- British Mechanical Engineering Federation
- British Railways Board
- British Steel Industry
- Council of Ironfoundry Associations
- Council of Iron Producers
- *Crown Agents for Oversea Governments and Administrations
- Department of Employment and Productivity
- *Engineering Equipment Users' Association
- Federation of Civil Engineering Contractors
- *Institute of British Foundrymen
- Institute of Iron and Steel Wire Manufacturers
- Institute of Marine Engineers
- *Institution of Civil Engineers
- *Institution of Mechanical Engineers (Automobile Division)
- Institution of Production Engineers
- Institution of Structural Engineers
- Joint Iron Council
- Lloyd's Register of Shipping
- Ministry of Defence, Army Department
- Ministry of Defence, Navy Department
- National Association of Drop Forgers and Stampers
- National Physical Laboratory (Ministry of Technology)
- *Oil Companies Materials Association
- Royal Institute of British Architects
- Shipbuilders & Repairers National Federation
- Society of British Aerospace Companies Ltd.
- Society of Motor Manufacturers and Traders Ltd.
- Stainless Steel Development Association
- Steel Castings Research and Trade Association

The 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 British Standard:

- British Valve Manufacturers Association
- British Waterworks Association
- Gas Council
- Institution of Gas Engineers
- Institution of Municipal Engineers
- Institution of Public Health Engineers
- Institution of Water Engineers
- Ministry of Housing and Local Government
- Ministry of Public Building and Works
- Post Office
- Individual companies

BRITISH STANDARD SPECIFICATION FOR GREY IRON PIPES AND FITTINGS

FOREWORD

This British Standard has been prepared under the authority of the Iron and Steel Industry Standards Committee and has been based on ISO Recommendation R 13, 'Cast iron pipes, special castings and cast iron parts for pressure main lines', except that the working dimensions of fittings are generally shorter. The shorter dimensions have been adopted as they align with working dimensions of fittings made from ductile or spheroidal graphite cast iron and a British Standard is in course of preparation covering pipes and fittings in this material. This is being based on a draft ISO proposal for ductile iron pipes, fittings and accessories for pressure pipelines which is currently being considered in ISO (International Organization for Standardization).

Although it is intended that this standard will be one of those which will eventually supersede existing standards such as BS 78*, BS 1211† and BS 2035‡ there is no direct interchangeability between the metric sizes included and either the spigot and socket pipes to BS 78, Part 1 and BS 1211 or fittings to BS 78, Part 2. For this reason, two methods of interconnection are provided as follows:

(1) The use of either a double-socket change collar in accordance with Table 23 of this standard, or a ductile iron double-socket change collar in accordance with BS 4772§ or

*As amended
Oct., 1981*

(2) The use of ductile iron spigot and socket change pieces in accordance with BS 4772§, utilizing the method indicated in Appendix C.

*As amended
Oct., 1981*

Hydrostatic works test pressures, suggested maximum hydraulic working pressures and suggested maximum hydrostatic site test pressures have been specified, and are detailed in Table 8.

Guidance on the use of pipes and fittings to this standard is provided in CP 2010 Part 3||.

Appendix B gives conversions for values of both stress and pressure.

* BS 78, 'Cast iron spigot and socket pipes (vertically cast) and spigot and socket fittings'

† BS 1211, 'Centrifugally cast (spun) iron pressure pipes for water, gas and sewage'

‡ BS 2035, 'Cast iron flanged pipes and flanged fittings'

§ BS 4772, 'Ductile iron pipes and fittings'

|| CP 2010, 'Pipelines', Part 3, 'Design and construction of cast iron pipelines in land'

SPECIFICATION

1. SCOPE

1.1 This British Standard specifies requirements for the following:

1.1.1 Grey iron* pipes manufactured by any of the following processes:

- (1) Centrifugal casting in metal moulds.
- (2) Centrifugal casting in sand moulds.
- (3) Casting in sand moulds.

1.1.2 Grey iron* fittings.

1.2 This standard is applicable to all grey iron pipes and fittings having spigots, sockets or flanges as specified in this standard, and also to pipes and fittings with other types of joints, the general dimensions of which, except those relating to the joints, conform to this standard.

2. TYPES OF JOINTS

2.1 Mechanical joints. Although increasing use is being made of various forms of mechanical or 'push-in' flexible joints, in which the seal is achieved by means of a suitably retained gasket, it is not possible to include such joints in this standard without restricting their future development.

2.2 Lead-caulked joints. Where lead-caulked joints are required, the spigot and socket ends shall be as detailed in Table 9 of this standard.

2.3 Flanged joints

2.3.1 Flanges for pipes and fittings of 80 mm to 300 mm inclusive nominal internal diameter shall be in accordance with Table 10 (designated NP10) or Table 11 (designated NP16) as specified by the purchaser. (See also Table 8).

Flanges for pipes and fittings of 350–700 mm inclusive nominal internal diameter shall be in accordance with Table 10 (designated NP10) (See also Table 8.)

NOTE. The flange dimensions given in Tables 10 and 11 differ marginally from those specified in BS 4504 'Flanges and bolting for pipes, valves and fittings (metric series)' but these differences do not affect the mating dimensions.

2.3.2 Flanges in accordance with BS 10† shall be supplied where specifically stated by the purchaser on his enquiry and order. See Appendix A.

2.3.3 The faces of the flanges of pipes shall be at right angles to, and concentric with, the axis of the bore.

The faces of flanges of fittings shall be at right angles to the directional axes.

Flanges shall be plain faced over the contact surface with a tool mark finish having a pitch of 1 ± 0.3 mm; serrations may be spiral or concentric.

* The type of iron in which the carbon exists in flake form.

† BS 10, 'Flanges and bolting for pipes, valves and fittings'.

2.3.4 Bolt holes shall be drilled unless the purchaser agrees that they shall be cored. The bolt hole circle shall be concentric with the bore. The bolt holes shall be located off the centre lines, unless otherwise specified by the purchaser, and, where there are two or more flanges, the bolt holes shall be correctly aligned.

2.3.5 Grey iron pipes to Table 13, having screwed-on flanges shall be sealed at the threaded joint between the pipe and the flange by a suitable sealing compound. Unless otherwise specified, the sealing compound applied to the threaded joint shall be suitable for use with 'raw' and potable water up to a temperature of 100°C, gas and normal domestic sewage.

Alternative types of sealing compound for pipes used for other duties, such as the carrying of industrial effluents or chemicals, shall be the subject of an agreement between the manufacturer and the purchaser.

3. PIPES

3.1 The external diameters, thicknesses and standard length of the three classes of spigot and socket pipes shall be as specified in Table 12 of this standard.

3.2 The external diameters, thicknesses and standard lengths of flanged pipes are specified in Tables 13 and 14 of this standard.

3.3 Pipe lengths, other than standard, shall be as specified by the purchaser on his enquiry and order.

3.4 The hydrostatic works test pressures, suggested maximum hydraulic working pressures and suggested maximum hydrostatic site test pressures are specified in Table 8 of this standard.

4. FITTINGS

4.1 The shape and dimensions of the single class of grey iron fittings shall be as specified in Tables 15 to 38 of this standard.

4.2 The hydrostatic works test pressures, suggested maximum hydraulic working pressures and suggested maximum hydrostatic site test pressures are specified in Table 8 of this standard.

Where fittings are required to withstand pressures higher than those specified in Table 8 of this standard, ductile iron fittings in accordance with BS 4772*, or strengthened grey iron fittings, should be used. The strengthening of grey iron fittings may be achieved by means of increased wall thickness (if necessary at the expense of the internal diameter), by suitable ribbing or by any other method proposed by the manufacturer, and approved by the purchaser, to suit the pressure specified by the latter.

* BS 4772, 'Ductile iron pipes and fittings'.

4.3 A range of double-socket change collars is given in Table 23, which will enable metric size grey iron pipes and fittings to be jointed to inch size pipes to BS 1211†, Class B, to fittings to BS 78*, Part 2, Class AB, and, for metric sizes up to and including 200 mm only, to pipes to BS 1211†, Classes C and D, and to fittings to BS 78*, Part 2, Class CD. Change collars in this range shall normally be supplied with a socket for a flexible joint (see 2.1) at the metric size end, but may be supplied with a socket either for a flexible joint or a lead-caulked joint, in accordance with BS 78*, Part 2, at the inch size end. The use of change collars is recommended only where the differential force due to internal pressure is insufficient to cause movement of the change collar.

To enable metric size grey iron pipes and fittings, above 200 mm, to be jointed to inch size pipes to BS 1211†, Classes C and D, and to fittings to BS 78*, Part 2, Class CD, a range of ductile iron spigot and socket change pieces are specified in BS 4772‡. The method for the use of these change pieces is detailed in Appendix C.

*As amended
Oct., 1981*

5. MARKING

5.1 Each pipe and fitting shall have cast, stamped or indelibly painted on it the following appropriate marks:

- (1) Manufacturer's name, initials or identification mark.
- (2) The nominal internal diameter.
- (3) The class reference (on pipes only).
- (4) The number of this British Standard, BS 4622.
- (5) The length of the pipe if supplied shorter than the specified length.
- (6) The last two digits of the year of manufacture (at the option of the purchaser).
- (7) The angle of bends, in degrees (on fittings only).

The individual mass of pipes of 150 mm nominal internal diameter and over shall be stamped or indelibly painted on the socket face.

The nominal mass of fittings shall be cast or indelibly painted on castings weighing more than 100 kg.

Any other marks required by the purchaser shall be the subject of an agreement between the purchaser and the manufacturer.

5.2 The marks specified in 5.1 shall be positioned in the following locations except that, where marks are to be stamped on pipes or fittings, they shall be positioned only on the face of sockets or on the periphery of flanges.

- (1) Pipes centrifugally cast in metal moulds: Items (3) and (6) on the socket face and items (1), (2), (4), (5) and (7) positioned where convenient,

* BS 78, 'Cast iron spigot and socket pipes (vertically cast) and spigot and socket fittings', Part 2: Fittings.

† BS 1211, 'Centrifugally cast (spun) iron pressure pipes for water, gas and sewage'.

‡ BS 4772, 'Ductile iron pipes and fittings'.

- (2) Pipes centrifugally cast in sand moulds: Items (3) and (6) on the socket face or on the barrel of the pipe and items (1), (2), (4), (5) and (7) positioned where convenient.
- (3) Pipes cast in sand moulds, fittings and flanged pipes positioned where practicable.

NOTE. Attention is drawn to certification facilities offered by BSI; see the back cover of this standard.

6. QUALITY OF METAL USED

The metal used for the manufacture of pipes and fittings shall be of good quality grey cast iron* and shall be prepared, at the discretion of the manufacturer, in a cupola, active mixer or other suitable furnace. The material shall comply with the mechanical properties specified in Clause 14.

7. QUALITY OF PIPES AND FITTINGS

7.1 Pipes and fittings shall be removed from the moulds with every necessary precaution to avoid warping or shrinkage defects detrimental to their good quality.

7.2 Pipes and fittings shall be sound and free from surface or other defects, but any castings showing small imperfections inseparable from the method of manufacture, which are not detrimental to their use, shall not be rejected on that account alone.

7.3 By agreement between the manufacturer and the purchaser, or his representative, defects may be rectified. Any dressing to remove imperfections shall not reduce the casting below the minimum thickness.

8. HEAT TREATMENT

After withdrawal from the mould, pipes which are centrifugally cast in unlined water-cooled moulds shall be heat-treated in order to achieve the necessary mechanical properties and to relieve casting stresses. Provided the quality requirements are met, all pipes cast under controlled cooling conditions need not be heat-treated.

9. TESTING FOR STRAIGHTNESS AND UNIFORMITY

9.1 All pipes shall be tested for straightness, and for uniformity of thickness and diameter, by being rolled on a level steel gantry and by the use of suitable straightedges and callipers, which, with the gantry, shall be provided and maintained in proper condition by the manufacturer.

9.2 The deviation of the pipe from the straight shall not be more than $0.001\ 25 \times$ the effective length of the pipe.

* The type of iron in which the carbon exists in flake form.

10. TOLERANCES ON DIMENSIONS

10.1 External diameters of barrel of pipes and internal diameters and depth of sockets for lead-caulked joints

10.1.1 The tolerances for the external diameter of the barrel of pipes, flanged spigot pieces and plugs, and on the internal diameter and depth of sockets for lead-caulked joints, shall be in accordance with Table 1.

TABLE 1. TOLERANCES ON EXTERNAL DIAMETER OF BARREL OF PIPES, FLANGED SPIGOT PIECES AND PLUGS, AND INTERNAL DIAMETER AND DEPTH OF SOCKETS FOR LEAD-CAULKED JOINTS

Nominal internal diameter <i>DN</i>	Tolerance on		
	internal diameter of socket <i>DI</i>	external diameter of barrel of pipe <i>DE</i>	depth of socket <i>P</i>
mm	mm	mm	mm
80	± 3.0	$+ 1.5$ $- 3.5$	± 5
100	± 3.1		
150			
200	± 3.2		
250			
300	± 3.3	$+ 1.5$ $- 4.0$	
350			
400	± 3.4		
450			
500	± 3.5		
600	± 3.6	$+ 2.0$ $- 4.5$	± 10
700	± 3.7		

NOTE 1. The maximum and minimum jointing space in lead-caulked sockets resulting from these tolerances is such that the jointing of the pipes and fittings is not adversely affected.

NOTE 2. The jointing tolerances applicable to mechanical or push-in joints shall be as specified by their manufacturer and shall be within the tolerances specified in Table 1.

10.1.2 No tolerance on the external diameter of fittings is specified in this standard with the exception of flanged spigot pieces and plugs.

10.2 Tolerance on thickness

10.2.1 The tolerance on the wall thickness and flange thickness shall be in accordance with Table 2.

TABLE 2. TOLERANCES ON WALL AND FLANGE THICKNESS

Type of casting	Dimension	Tolerance in millimetres
Pipes	Wall thickness	$-(1 + 0.05e)^*$
	Flange thickness	$\pm (1 + 0.05b)$
Fittings	Wall thickness	$-(2 + 0.05e)^*$
	Flange thickness	$\pm (1 + 0.05b)$

* No limit for the plus tolerances has been specified in this standard (see Clause 11).

NOTE. In Table 2, e is the standard thickness of the wall in millimetres and b is the standard thickness of the flange in millimetres.

10.2.2 The thickness of fittings may exceptionally be reduced locally to the minimum thickness of Class 3 pipe with the same diameter, provided that the area of the affected part is not more than $\frac{1}{10}$ of the cross-sectional area of the bore.

10.3 Tolerance on length

10.3.1 The tolerances on the lengths of pipes shall be in accordance with Table 3.

10.3.2 The tolerances on the lengths of fittings shall be as specified in the applicable tables of this standard.

10.3.3 By agreement with the purchaser, the manufacturer may supply up to 10% of the total number of spigot and socket pipe to be supplied in each diameter, in lengths shorter than the specified length of 5.5 m (see Table 12). This percentage may be supplied in lengths of either 5.0 m, 4.5 m, 4.0 m or 3.5 m.

11. TOLERANCES ON STANDARD MASS

11.1 The standard mass is dependent upon the design of the ends of pipes and fittings and shall be calculated on the nominal wall thickness taking the density of grey iron as 7.15 kg/dm³.

TABLE 3. TOLERANCES ON LENGTHS OF PIPES

Type of casting	Nominal internal diameter <i>DN</i>	Tolerance
	mm	mm
Socket and spigot pipes Double plain-ended pipes	All diameters	± 20
Flanged pipes of length up to and including 2 m	All diameters	± 1.5
Flanged pipes of over 2 m in length but less than 3 m	All diameters	± 2.5
Flanged pipes of 3 m and over in length	All diameters	± 3.0

TABLE 4. TOLERANCES ON STANDARD MASS

Type of casting	Tolerance
Pipes	$\pm 5\%$
Standard fittings, except as stated below	$\pm 8\%$
Standard bends and fittings with more than one branch, and non-standard fittings	$\pm 12\%$

11.2 The masses shown in the Tables 12, 15 to 24 inclusive and 26 to 28 inclusive, are applicable to castings with sockets for lead-caulked joints in accordance with Table 9. When applying the tolerances shown in Table 4, account shall be taken of the masses of sockets of other types of joints.

11.3 Each pipe of nominal internal diameter of 150 mm or over and each fitting of nominal mass of 100 kg or over shall be weighed individually. Pipes of nominal internal diameter of less than 150 mm and fittings of nominal mass less than 100 kg need not be weighed individually, unless otherwise specified by the purchaser on his enquiry and order.

11.4 The maximum mass of a casting shall be within the tolerances specified in Table 4 but castings having a greater mass than the maximum shall be deemed to comply with this standard provided that they do so in all other respects.

12. QUALITY CONTROL

The manufacturer shall provide, and test, ring and bar test pieces to enable the quality of the pipes to be controlled and shall keep records of all such tests made; such records shall be available for inspection by the purchaser or his representative.

The pieces for ring and bar tests shall be selected in such a manner that they are representative of the pipes or fittings being manufactured.

13. SELECTION OF TEST PIECES BY THE PURCHASER

13.1 If stated on the enquiry and subsequent order that the purchaser wishes to witness ring and bar tests in respect of the pipes to that order, the pieces may be selected by the purchaser or his representative.

For the purposes of approving and selecting test pieces, the pipes to that order shall be arbitrarily divided into batches of 100. Any pipes remaining after dividing into batches of 100 should be considered as a batch. Where the total order is less than 100, then the order shall be considered as a batch. A batch may contain pipes of any of the sizes up to and including 300 mm. Alternatively, a batch may contain pipes of any of the sizes over 300 mm.

The two ranges may not be both represented in the same batch.

13.2 One test piece shall be taken from each batch, and, where the batch contains more than one size of pipes, the test piece selected shall be regarded as representative of all the sizes in the batch.

13.3 The test pieces shall be cut from the spigot ends of the selected pipes. Each test piece shall be marked and the manufacturer shall provide facilities to enable the purchaser to relate each test piece to the batch of pipes from which it was taken.

The test pieces shall be in accordance with Clause 14.

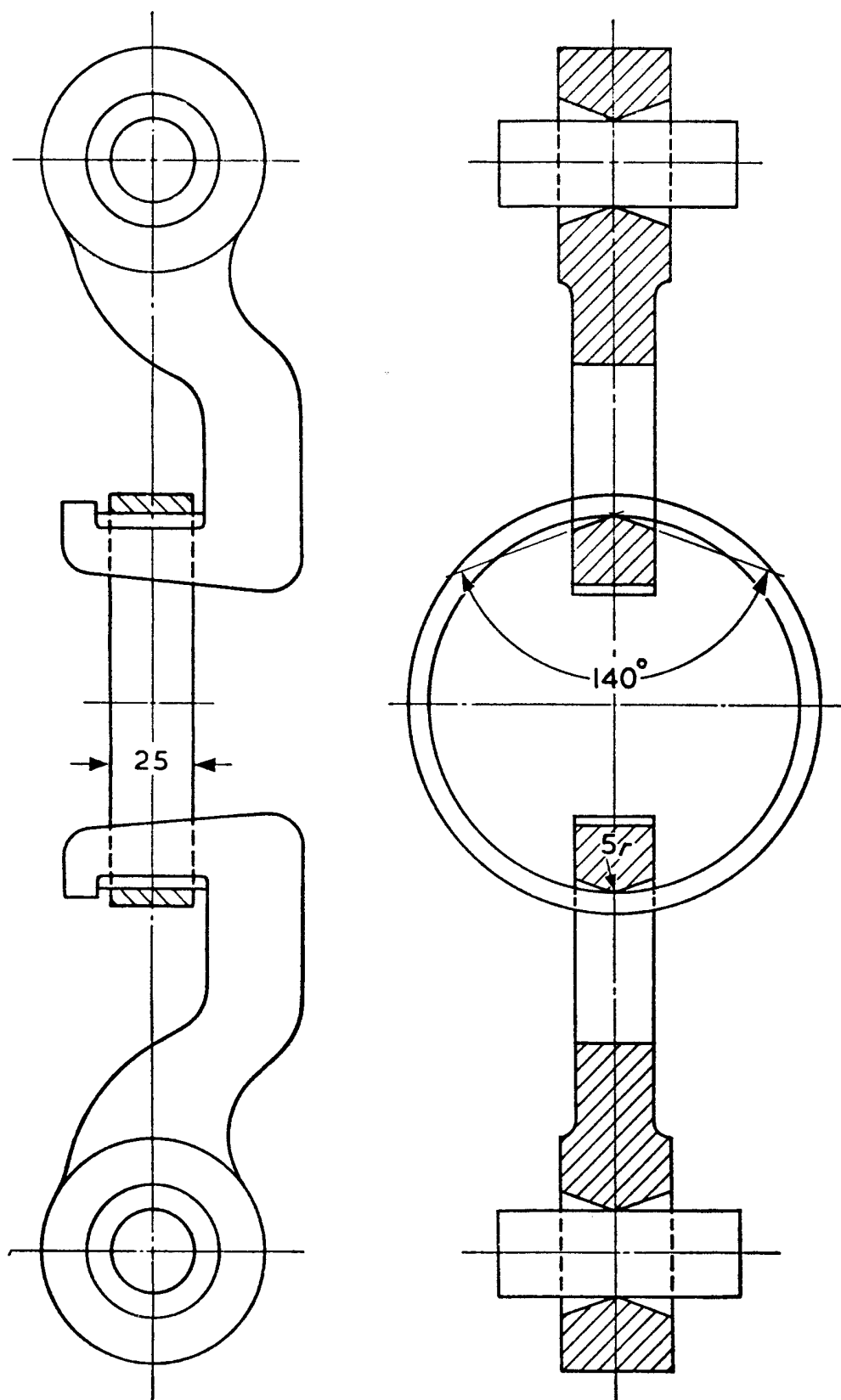
13.4 If the test piece representing any batch does not pass the test, two further tests shall be made on test pieces selected by the purchaser or his representative from two other pipes from the same batch. Should either of these additional test pieces fail to pass the test, then that batch of pipes shall be deemed not to comply with this British Standard.

14. MECHANICAL TESTS

14.1 Pipes centrifugally cast in metal moulds

14.1.1 *Tensile test for pipes of up to and including 300 mm nominal internal diameter.* The test piece shall consist of a ring of approximately 25 mm width and shall be tested on a suitable machine.

The ring shall be supported on two knife edges diametrically opposed and the load applied from the inside at these points (see Fig. 1).



Dimensions in millimetres

Fig. 1. Ring type test piece between test machine knife edges

The bending strength modulus of the ring shall be calculated from the breaking load using the following formula:

$$R = \frac{3 P (D - e)}{\pi b e^2}$$

As amended
Oct., 1981

where R = bending strength modulus of the ring, in N/mm²;
 P = breaking load, in N;
 D = external diameter of ring, in mm;
 e = thickness of wall of the ring, in mm;
 b = breadth of the ring, in mm.

14.1.2 Tensile test for pipes of over 300 mm nominal internal diameter. The test piece shall consist of a bar cut from the pipe. It shall be approximately 90 mm long and have a diameter of approximately 6 mm. The dimension may vary according to the thickness of the pipe. The ends of the test piece shall be prepared to fit the testing machine, and a typical satisfactory design is shown in Fig. 2.

14.1.3 Brinell hardness test. A sample taken from each of the test pieces after testing shall be submitted to a Brinell hardness test. The test shall consist of applying 3000 kgf to a ball of 10 mm diameter or 750 kgf to a ball of 5 mm diameter in accordance with BS 240 Part 1† except that the period of application of the load shall be 15 ± 1 seconds.

14.1.4 Test results. The results of the tensile and hardness tests carried out on pipes centrifugally cast in metal moulds shall be in accordance with the requirements given in Table 5.

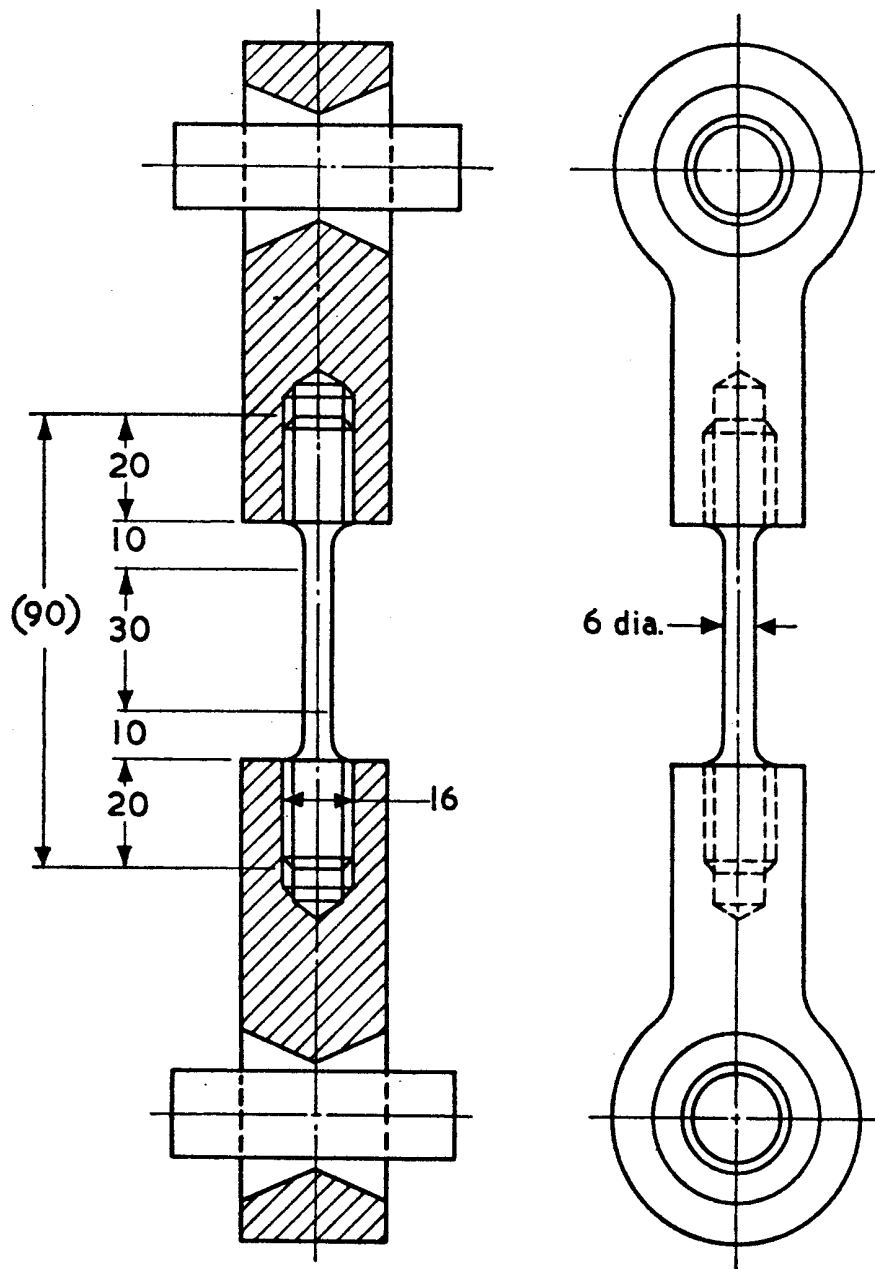
As amended
Oct., 1981

TABLE 5. RESULTS FOR THE TENSILE AND HARDNESS TESTS
(Pipes centrifugally cast in metal moulds)

Nominal internal diameter	Type of test piece	Minimum tensile strength	Hardness max.
Up to and including 300 mm	Test ring	N/mm ² 400 (modulus)	230 HB
Over 300 mm up to and including 600 mm	Machined test bar	200	230 HB
Over 600 mm	Machined test bar	180	230 HB

NOTE. The manufacturer and the purchaser may agree to replace the tensile test on a machined test bar by a ring test and they should further agree on the test conditions.

† BS 240, 'Method for Brinell hardness test', Part 1, 'Testing of metals'.



Dimensions in millimetres

Fig. 2. Bar type test piece in typical mounting

14.1.5 All pipes from which the rings or bars have been cut shall be accepted by the purchaser as complete lengths provided that the requirements of this specification have been met.

14.2 Pipes centrifugally cast in sand moulds

14.2.1 The test piece shall consist of a bar cut from a pipe and shall be in accordance with the requirements specified in 14.1.2.

14.2.2 Brinell hardness test. A sample taken from each of the test pieces after testing shall be submitted to a Brinell hardness test. The test shall consist of applying 3000 kgf to a ball of 10 mm diameter or 750 kgf to a ball of 5 mm diameter in accordance with BS 240 Part 1* except that the period of application of the load shall be 15 ± 1 seconds.

14.2.3 Test results. The results of the tensile and hardness test carried out on pipes centrifugally cast in sand moulds shall be in accordance with the requirements given in Table 6.

As amended
Oct., 1981

TABLE 6. RESULTS FOR THE TENSILE AND HARDNESS TESTS
(Pipes centrifugally cast in sand moulds)

Nominal internal diameter	Type of tensile test	Minimum tensile strength	Hardness max.
All sizes up to and including 700 mm	Machined test bar	N/mm ² 180	215 HB

NOTE. The manufacturer and the purchaser may agree to replace the tensile test on a machined test bar by a ring test and they should further agree on the test conditions.

14.2.4 All pipes from which the bars have been cut shall be accepted by the purchaser as complete lengths provided that the requirements of this specification have been met.

14.3 Sand cast pipes and fittings†

14.3.1 Tensile test. Tensile tests shall be made for sand cast pipes and fittings for all nominal diameters on bars cast from the same metal as used in the castings. The tensile test bars shall be properly moulded and free from defects and shall be either unmachined or machined to give a diameter of approximately 20–25 mm. The ends shall be prepared by the manufacturer to fit the testing machine. Fig. 3 shows a typical satisfactory design.

14.3.2 Brinell hardness test. A sample taken from each of the test pieces, after testing, shall be submitted to a Brinell hardness test carried out on the parallel portion of the test piece. The test shall consist of applying 3000 kgf to a ball of 10 mm diameter or 750 kgf to a ball of 5 mm diameter in accordance with BS 240 Part 1* except that the period of application of the load shall be 15 ± 1 seconds.

* BS 240, 'Method for Brinell hardness test', Part 1, 'Testing of metals'.

† For the purposes of this standard, screwed flanges for pipes in accordance with Table 13 shall be considered as fittings.