

इंटरनेट

मानक

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Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

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“पुराने को छोड़ नये के तरफ”

Jawaharlal Nehru

“Step Out From the Old to the New”

IS 1536 (2001): Centrifugally cast (spun) iron pressure pipes for water, gas and sewage [MTD 6: Pig iron and Cast Iron]



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Satyanarayan Gangaram Pitroda

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“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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भारतीय मानक

जल, गैस एवं मल जल के लिए अपकेन्द्री
ढलवां (स्पन) लोहे के दाब पाइप — विशिष्टि
(चौथा पुनरीक्षण)

Indian Standard

CENTRIFUGALLY CAST (SPUN) IRON PRESSURE
PIPES FOR WATER, GAS AND SEWAGE —
SPECIFICATION

(Fourth Revision)

First Reprint JULY 2005
(Including Amendments No. 1 and 2)

ICS 23.040.10

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Pig Iron and Cast Iron Sectional Committee, had been approved by the Metallurgical Engineering Division Council.

This standard was first published in 1960 and subsequently revised in 1967, 1976 and 1989. While reviewing this standard, in view of the experience gained, the Committee has decided to revise it incorporating the following modifications:

- a) Amendments issued have been incorporated.
- b) Definition of various terms have been incorporated.
- c) A clause on type of joints and inter-connection has been incorporated.
- d) Tolerance on barrel diameter and socket dimensions (push-on joints) have been modified.
- e) A general clause on Quality Assurance System has been incorporated.

In the preparation of this standard due consideration has been given to the manufacturing and trade practices followed in the country in this field and assistance has been derived from the following International Specifications:

ISO 13 : 1978 Grey iron pipes, special castings and grey iron parts for pressure main lines; issued by the International Organization for Standardization (ISO).

BS : 4622 Specification for grey iron pipes and fittings, issued by the British Standards Institution (BSI).

The composition of the committee responsible for formulation of this standard is given in Annex C.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

**AMENDMENT NO. 2 DECEMBER 2003
TO
IS 1536 : 2001 CENTRIFUGALLY CAST (SPUN) IRON
PRESSURE PIPES FOR WATER, GAS AND
SEWAGE — SPECIFICATION**

(Fourth Revision)

[*Page 4, clause 11.2(a)*] — Substitute the following for the existing:

‘a) Ring test (for pipes centrifugally cast in metal moulds)’

[*Page 4, clause 11.2(b)*] — Substitute the following for the existing:

‘b) Tensile test for pipes’

**AMENDMENT NO. 1 MAY 2002
TO
IS 1536 : 2001 CENTRIFUGALLY CAST (SPUN)
IRON PRESSURE PIPES FOR WATER, GAS AND
SEWAGE — SPECIFICATION**

(Fourth Revision)

(*Page 2, clause 6.3*) — Insert the following sentence in the end of the clause:

‘Pipes cast under controlled cooling conditions need not be heat treated’.

(MTD 6)

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AMENDMENT NO. 2 DECEMBER 2003
TO
IS 1536 : 2001 CENTRIFUGALLY CAST (SPUN) IRON
PRESSURE PIPES FOR WATER, GAS AND
SEWAGE — SPECIFICATION

(*Fourth Revision*)

[*Page 4, clause 11.2(a)*] — Substitute the following for the existing:

‘a) Ring test (for pipes centrifugally cast in metal moulds)’

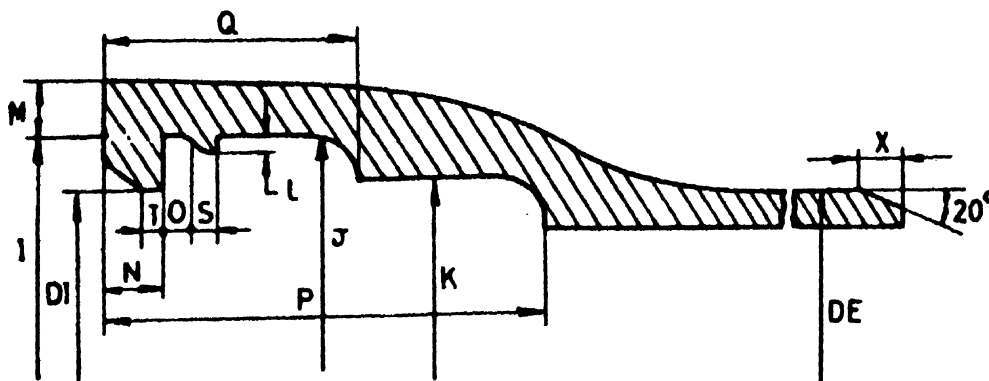
[*Page 4, clause 11.2(b)*] — Substitute the following for the existing:

‘b) Tensile test for pipes’

(*Page 5, Table under clause 14.2, col 1*) — Substitute ‘900-1 050’ for ‘900-1 600’.

(*Page 5, table under clause 14.2, col 9*) — Delete and renumber col ‘10’ as col ‘9’.

(*Page 7, table 4*) — Substitute the following figure for the existing upper figure:



(MTD 6)

AMENDMENT NO. 3 JULY 2008
TO
IS 1536 : 2001 CENTRIFUGALLY CAST (SPUN) IRON
PRESSURE PIPES FOR WATER, GAS AND
SEWAGE — SPECIFICATION

(Fourth Revision)

(Page 5, clause 13.2) — Add the following new clause **13.2.1**:

‘13.2.1 Length other than specified in 13.2 may also be supplied on mutual agreement between the manufacturer and the purchaser.’

(Page 5, clause 13.5, line 1) — Delete ‘and mass’.

(Page 5, clause 13.6, line 1) — Delete ‘and mass’.

(Page 5, clause 13.6, Note) — Substitute the following for the existing:

‘NOTE — Mass for sockets, pipe barrels and flanges are calculated on the basis of the density of cast iron as 7 15 kg/dm³.’

(Page 9, Table 6, col 5 to 12) — Delete alongwith their column headings.

(Page 10, Table 7, col 5 to 12) — Delete alongwith their column headings.

(Page 11, Table 8, col 5 to 12) — Delete alongwith their column headings.

(Page 12, Table 9, col 4 to 12) — Delete alongwith their column headings.

(Page 13, clause 14.7) — Delete.

(Page 13, clause 15.1.2, line 3) — Insert ‘lined’ between ‘and’ and ‘internally’.

Amend No. 3 to IS 1536 : 2001

(Page 13, clause 15.1.2) — Add the following at the end of last sentence:

‘and internal lining as required by the purchaser.’

[Page 14, clause 17.1(d)] — Delete.

(MTD 6)

AMENDMENT NO. 4 JUNE 2010
TO
IS 1536 : 2001 CENTRIFUGALLY CAST (SPUN) IRON
PRESSURE PIPES FOR WATER, GAS AND SEWAGE —
SPECIFICATION

(Fourth Revision)

(Page 4, clause 12.1, last sentence) — Substitute the following for the existing:

‘Testing may preferably be carried out on uncoated pipes.’

(Page 5, clause 13.5, line 1) — Delete ‘uncoated’.

(MTD 6)

Reprography Unit, BIS, New Delhi, India

Indian Standard

CENTRIFUGALLY CAST (SPUN) IRON PRESSURE PIPES FOR WATER, GAS AND SEWAGE — SPECIFICATION (*Fourth Revision*)

1 SCOPE

1.1 This standard covers the requirements for centrifugally cast (spun) iron pipes for pressure main lines for water, gas and sewage, manufactured in metal (lined or unlined) or sand lined moulds. By sand it is to be understood, sand or mineral based materials used in foundry trade irrespective of the type of bonding agents.

1.2 This standard is applicable to cast iron pipes having socket/spigot (both lead caulked or push on flexible) or flanges as specified in this standard. Increasing use is being made of various forms of Mechanical and or differently designed 'Push-on' flexible joints, it is not possible to include such joints in this standard without restricting their future development. This standard is also applicable to such mechanical and push-on joints, apart from what is specified in the Standard, whose the inner profile of socket end and spigot end of the pipe shall depend on the type of rubber gasket ensuring that the overall dimensions are maintained for reasons of safety and interchangeability.

NOTE — The word "push-on flexible joint" have been referred as "push-on joint" hence forth in this standard.

2 REFERENCES

2.1 The following Indian Standards contain provisions, which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

<i>IS No.</i>	<i>Title</i>
538 : 1979	Sheet rubber jointing and rubber insertion jointing
1387 : 1993	General requirements for the supply of metallurgical materials (<i>second revision</i>)
1608 : 1995	Mechanical testing of metals — Tensile testing (<i>second revision</i>)

*IS No.**Title*

5382 : 1985	Rubber sealing ring for gas mains, water mains and sewers (<i>first revision</i>)
11606 : 1986	Method of sampling of cast iron pipes and fittings
12820 : 1989	Dimensional requirements of rubber gaskets for mechanical joints and push-on joints for use with cast iron pipes and fittings for carrying water, gas and sewage — Specification
13382 : 1992	Cast iron specials for mechanical and push-on flexible joints for pressure pipe lines for water, gas and sewage

3 DEFINITIONS

For the purpose of this standard, the following definitions shall apply.

3.1 Pipe

Casting of uniform bore, straight in axis, having either socket, spigot or flanged ends, except for flanged-sockets, flanged-spigots and collars which are classified as fittings.

3.2 Fittings

Casting other than a pipe which allows pipeline deviation, change of direction or bore. In addition flanged-sockets, flanged-spigots and collars are also classified as fittings.

3.3 Accessory

Any item other than a pipe or fitting which is used in a pipeline, such as :

- glands and bolts for mechanical flexible joints
- glands, bolts and locking rings or segments for restrained joints

NOTE — Valves and hydrants of all types are not covered by the term accessory.

3.4 Flange

Flat circular end of a pipe or fitting, extending perpendicular to its axis, with bolt holes equally spaced on a circle.

NOTE — A flange may be fixed (for example integrally cast, threaded-on or adjustable; an adjustable flange comprises a ring, in one or several parts bolted together, which bears on an end joint hub and can be freely rotated around the pipe axis before jointing.

3.5 Collar; Coupling — Connecting piece used to join together the spigots of mating pipes or fittings.

3.6 Spigot — Male end of a pipe.

3.7 Socket — Female end of a pipe to make the joint with the spigot of an adjacent component.

3.8 Gasket — Sealing component of a joint.

3.9 Joint — Connection between the ends of pipes in which a gasket is used to effect a seal.

3.10 Flexible Joint — A connection between individual pipes that provide angular deflection or axial movement, or a combination of both, in service without impairing the efficiency of the connection.

3.11 Push-in Flexible Joint — A flexible joint in which an elastomeric gasket is located in the socket and the joint assembly is effected by entering the spigot through the gasket into the socket.

3.12 Flanged Joint — Joint between two flanged ends.

3.13 Nominal Size DN — Numerical designation of size which is common to all components in a piping system. It is a convenient round number for reference purposes and is only loosely related to manufacturing dimensions.

3.14 Nominal Pressure PN — A numerical designation expressed by a number which is used for reference purposes. All components of the same nominal size DN designated by the same PN number have compatible mating dimensions.

3.15 Length — Effective length of a pipe, as shown on the drawings.

NOTE — For flanged pipes the effective length is equal to the overall length and is noted L. For socketed pipes the effective length is equal to the overall length minus the spigot insertion depth.

3.16 Ovality — Out of roundness of a pipe section; it is equal to $100 \left(\frac{A_1 - A_2}{A_1 + A_2} \right)$ where A_1 , is the maximum axis and A_2 the minimum axis of the pipe cross-section.

3.17 Deviation on Length — Amount by which the design length may differ from the standardized length of a pipe.

4 CLASSIFICATION

4.1 Pipes have been classified in this standard as LA, A and B according to their thickness. Class LA pipes

have been taken as the basis for evolving the series of pipes. Class A allows a 10 percent increase in thickness over class LA. Class B allows a 20 percent increase in thickness over Class LA.

4.1.1 For special uses, Classes C, D or E may be derived after allowing corresponding increases of thickness of 30, 40 or 50 percent respectively.

4.2 Centrifugally Cast Pipes with screwed on Flanges to this standard shall be of Class 'B' only. For special uses Class C, D or E may be made available under mutual agreement between manufacturer and customer.

5 SUPPLY OF MATERIAL

5.1 The general requirements relating to the supply of the material are laid down in IS 1387.

6 MANUFACTURE

6.1 The metal used for the manufacture for pipes shall be of good quality commensurate with the mechanical requirement laid down in 11. It shall be manufactured by any method at the discretion of the manufacturer provided that the requirements defined in this standard are complied with.

6.2 The pipes shall be such that they could be cut, drilled or machined. In case of dispute the pipes may be accepted provided hardness measured on the external unmachined surface does not exceed 230 HBS.

6.3 Pipes centrifugally cast shall be heat treated in order to achieve the necessary mechanical properties and to relieve casting stresses.

6.3.1 If necessary, the pipes may be subjected to reheat treatment to ensure that Brinell hardness does not exceed the specified value and the specified mechanical properties are satisfied.

7 SURFACE CONDITION AND REPAIRS

7.1 The pipes shall be stripped with all precautions to avoid warping or shrinkage defects, detrimental to their good quality. The pipes shall be sound and free from defects and surface imperfections which could impair their compliance with the requirements of this standard. Pipes showing small imperfections which result from the method of manufacture, and which do not affect their serviceability, shall not be rejected on that account alone. Minor defects arising out of manufacturing process may be rectified with the consent of the purchaser.

7.2 Repairing of defects by soldering or application of epoxy putty may be carried out to such minor defects provided that the repair pipes comply with all the requirements of 7.3.

7.3 When necessary, pipes may be repaired to remove

surface imperfections and localized defects which do not affect the entire wall thickness, provided that the repaired pipes comply with all the requirement of 11 and 12 of this standard.

7.4 Only minor defects up to 100 mm² area can be categorized as salvagible. Section thickness of such defects should be less than 15 percent of nominal wall thickness.

8 TYPE OF JOINTS AND INTER-CONNECTION

8.1 General

Joint designs for socket and spigot pipe suitable for lead joint and push-on joint which are generally followed in this country are given in this standard. Details of standard flanged joint is also given in this standard.

8.2 This standard does not restrict the use of other type of joints or future development of other joints as long as over all dimensions are maintained for reasons of safety and interchangeability.

8.3 Push-on Joint

In case of push-on flexible joints, the spigot ends shall be suitably chamfered or rounded off for smooth entry of pipe in the socket fitted with the rubber gasket.

8.4 Flexible Joints

Pipes with flexible joints shall conform to 13.3 of this standard for their spigot external diameters DE and their tolerances. This offers the possibility of interconnection between components equipped with different types of flexible joints.

NOTE — For interconnection with existing pipelines which may have external diameters not in compliance with 13.3, the manufacturer's guidance will be followed as to the appropriate means of interconnection (for example adapters).

8.4.1 For high pressure mains, over working pressure 1.6. MPa suitable flexible joint may be preferred where the joint is restrained against axial movement.

8.5 Flanged Joints

The dimensions and tolerances of the screwed on flanges of pipes shall comply with details given in 13.4. This ensures interconnection between all flanged components (pipes, fittings, valves...) of the same DN and PN and adequate joint performance.

8.5.1 In case of cast iron pipes with screwed on flanges the flanges shall be at right angle to the axis of the pipe machined on face. The bolt holes shall be cored or drilled.

8.5.2 The bolt hole circle shall be concentric with the bore and holes of the two flanges of the pipe shall be correctly aligned.

8.5.3 The cast iron pipes 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.

8.5.4 Alternative types of sealing compound, for pipes used for other duties, such as, carrying industrial effluents, chemicals and town gas; shall be compatible and shall be the subject of agreement between the manufacturer and the purchaser.

8.5.5 For screwed on flanged pipes, the method of screwing and the exact form of thread are left to the discretion of the manufacturer in view of the fact that flanges are never removed after screwing on the barrels of the pipes.

8.5.6 The range of Cast iron pipe having screwed on flanges shall be up to and including DN 600 and shall conform to the requirement of Tables 5 and 9.

8.6 Materials in Contact with Potable Water

8.6.1 When used under the conditions for which they are to be subjected, in permanent or in temporary contact with water intended for human consumption, Cast iron pipes and their joints shall not deteriorate the quality of water or should not impart any taste or odour.

9 RUBBER GASKETS

9.1 Rubber gaskets for use with push-on-joints shall conform to IS 5382.

9.2 The dimension of rubber gaskets, for use with push-on joint as per this standard, shall conform to IS 12820.

9.3 Rubber gaskets for use with flanged joints shall conform to IS 638.

10 SAMPLING

10.1 Sampling criteria for various tests, unless specified in the standard, shall be as laid down in IS 11606.

10.2 The mechanical acceptance tests shall be carried out on cast iron pipes grouped in batches as follows.

Each batch shall be made up of pipes cast successively as follows:

<i>Size Range (DN)</i>	<i>Batch Size</i>
80-300	200 pipes
350-600	100 pipes
700-1 000	50 pipes
Above 1 050	25 pipes

11 MECHANICAL TESTS

11.1 General

Mechanical tests shall be carried out, during manufacture. Tests for every four hours of production shall be conducted. However, for pipes 700 DN and above manufactured by controlled cooled process, at least one tensile test for every 25 pipes or part thereof produced during the day shall be conducted. The result obtained shall be taken to represent all the pipes of all sizes made during that period.

11.2 Ring Test and Tensile Test

The ring test shall be conducted for pipes for sizes up to and including 300 mm as per the details given in Annex A¹⁾. For sizes beyond 300 mm bar tests are to be conducted. Test one test piece obtained by cutting rings or bars from the spigot end of one pipe selected for testing except for pipes manufactured under controlled cooled process described in 11.1. For sizes beyond 300 mm, tensile test shall be conducted as per the details given in IS 1608.

- a) Ring test (for pipes centrifugally cast in metals and moulds)

<i>Nominal Diameter</i>	<i>Modulus of Rupture, Min MPa</i>
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Up to and including 300 mm	390
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- b) Tensile test for pipes over 300 mm

<i>Type of Mould</i>	<i>Nominal Diameter</i>	<i>Tensile Strength Min, MPa</i>
i) For pipes centrifugally cast in metal moulds	Over 300 mm and up to and including 600 mm	200
	Over 600 mm	180
ii) For pipes centrifugally cast in sand lined moulds	All diameters	180
NOTE — For pipes of Class-C and above minimum tensile should be 180 MPa.		

11.2.1 All pipes from which rings or bars have been cut for quality checks shall be accepted by the purchaser as complete lengths.

11.3 Brinell Hardness Test

For checking the Brinell hardness specified in 6.2 the test shall be carried out on the test ring or bars cut from the pipes used for tests under 11.2 in accordance with IS 1500.

11.4 Retest

If test piece representing a lot fails in the first instance

¹⁾ For further details of Ring test and Tensile test refer to Annex A.

two additional tests shall be made on test pieces selected from two other pipes from the same lot. If both the test results satisfy the specified requirements, the lot shall be accepted. Should either of these additional test pieces fail, the lot shall be deemed as not complying with this standard.

11.4.1 In the event of lot not found conforming to this standard, the same may be re-offered for inspection after reheat treatment.

12 HYDROSTATIC TEST

12.1 Pipes shall be tested hydrostatically at the pressure specified in Tables 1 and 2, as appropriate. To perform the test, the pressure shall be applied internally and shall be steadily maintained for a period of minimum 10 s. The pipes shall withstand the pressure test and shall not show any sign of leakage, sweating or other defects. As far as possible the hydrostatic test shall be conducted before coating the pipes.

12.2 Works Test Requirements — Socket and spigot pipes shall withstand test pressures specified in Table 1. Flanged pipes shall withstand hydrostatic test pressures specified in Table 2.

NOTE — Suggested maximum pressure (inclusive of surge) and maximum hydrostatic test pressure after installation for socket and spigot pipes and flanged pipes are given in Annex B for information.

12.2.1 When pipes are required for higher test pressures, test pressures are subject to special agreement between the purchaser and the manufacturer.

Table 1 Hydrostatic Test Pressure for Centrifugally Cast Socket and Spigot Pipes (Clauses 12.1 and 12.2)

Class	Hydrostatic Test Pressure for Works, MPa	
	Up to DN 600 ¹⁾ (Including)	DN 700 and Above
(1)	(2)	(3)
LA	3.5	1.5
A	3.5	2.0
B	3.5	2.5

¹⁾ DN — Nominal diameter.

Table 2 Hydrostatic Test Pressure for Centrifugally Cast Pipes with Screwed on Flanges (Clauses 12.1 and 12.2)

Class	Hydrostatic Test Pressure for Works, MPa	
	Up to 300 DN	350 to 600 DN ¹⁾
(1)	(2)	(3)
B	2.5	1.6

¹⁾ DN — Nominal diameter.

13 SIZES AND DIMENSIONS

13.1 The range of nominal diameter, DN, of pipes and flanges followed in this standard is as follows :

80, 100, 125, 150, 200, 250, 300, 350, 400, 450, 500, 600, 700, 750, 800, 900, 1 000 and 1 050 mm.

The range of nominal diameter DN for screwed on flanges will be 80, 100, 125, 150, 200, 250, 300, 350, 400, 450, 500 and 600 mm.

13.2 Working lengths "L" of socket and spigot pipes and for flanged pipes followed in this standard are as follows :

- Socket and spigot pipes : 3.0, 3.5, 3.66, 4, 4.5, 5, 5.5 and 6 m;
- Flanged pipes : 2.75, 3, 4, 4.5, 5, 5.25 and 5.5 m.

13.3 Dimensions for socket and spigot of pipes for lead joint and for push-on joint irrespective of class are given in Tables 3 and 4 respectively.

13.4 Dimensions of screwed flanges of pipes and standard flange drilling of flanged pipes are given in Table 5.

13.5 Dimensions and mass of uncoated socket and barrel of both the lead joint and push-on joint pipes are given in Tables 6, 7 and 8 for Class LA, A and B

respectively.

13.6 Dimensions and mass of uncoated flanges and barrel of flanged pipes (Class B) centrifugally cast with screwed flanges are given in Table 9.

NOTE — Mass for sockets, pipe barrels and flanges as given in Tables 6 to 9 are calculated on the basis of the density of cast iron as 7.15 kg/dm³.

14 TOLERANCE

14.1 Tolerance on Barrel Diameter and Socket Dimensions Suitable for (Lead Joint)

The tolerances shall be as follows :

Dimensions	Nominal Diameter DN	Tolerances mm
a) External diameter of barrel (DE)	All diameters	$\pm 1/2 f = \pm (4.5 + 0.0015 DN)$
b) Internal diameter of socket (DI)	All diameters	$\pm 1/3 f = \pm (3 + 0.001 DN)$
c) Depth of socket (P)	Up to and including DN 600 Over DN 600 up to and including 1 050	± 5 ± 10

NOTE — 'f' is the caulking space of the joint in mm and is equal to $(9 + 0.003 DN)$.

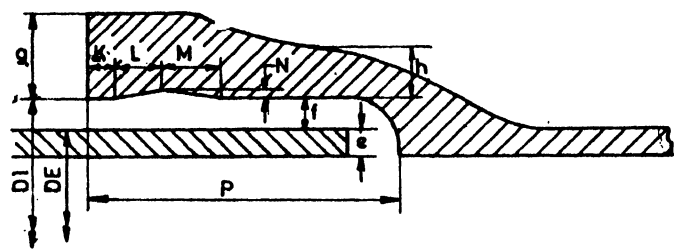
14.1.1 The maximum or minimum jointing space resulting from these tolerances is such that the jointing of the pipes and fittings is not adversely affected.

14.2 Tolerances on Barrel Diameter and Socket Dimensions (Push-on Joints)

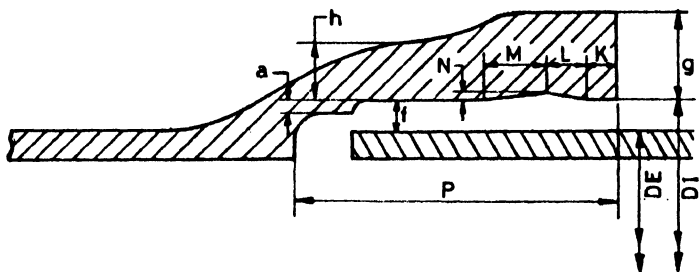
Tolerances on barrel diameter and socket dimensions (push-on joints) shall be as follows:

Nominal Diameters	Tolerances on Socket, mm								
	DI	I	J	K	P	Q	O	N	DE
DN	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
80-200	± 1.50	$+2.0$ -1.0	$+1.5$ -0.5	± 2.0	$+5.0$ -15.0	± 3.0	± 0.5	± 1.0	± 2.0
250-300	± 1.50	$+2.0$ -1.25	$+1.5$ -1.0	± 2.5	$+5.0$ -10.0	± 3.0	± 0.5	± 1.0	± 2.25
350-450	± 1.50	$+2.0$ -1.5	$+2.0$ -1.0	± 3.0	± 10.0	± 4.0	± 0.5	± 1.0	± 2.25
500-600	± 1.75	$+2.0$ -1.75	$+2.0$ -1.0	± 3.5	± 10.0	± 4.0	± 0.5	± 1.0	± 2.25
700-800	± 2.5	$+3.0$ -2.0	$+2.5$ -1.5	± 4.0	± 10.0	± 5.0	± 0.5	± 1.0	± 2.75
900-1 600	± 3.0	$+4.0$ -3.0	$+2.5$ -2.0	± 5.0	± 10.0	± 6.0	± 0.5	± 1.0	± 3.25

Table 3 Dimensions of Sockets and Spigots of Pipes (Lead Joint)
(Clause 13.3)



$a = 3 + 0.001 \text{ DN}$
 $g = 20 + 0.03 \text{ DN}$
 $h = 8 + 0.025 \text{ DN}$
 $f = 9 + 0.003 \text{ DN}$



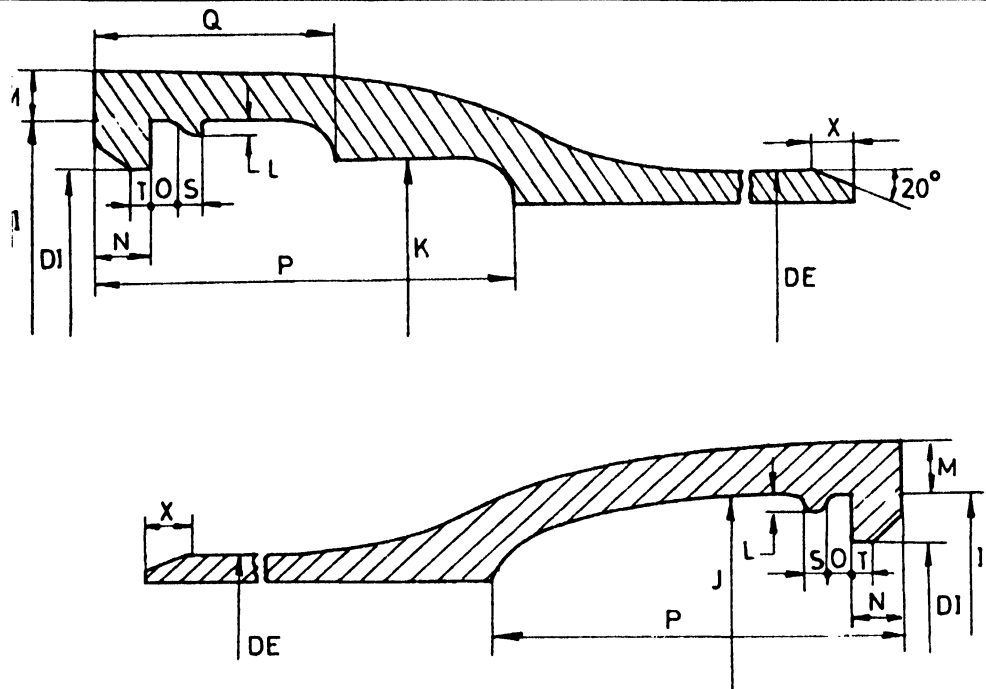
All dimensions in millimetres.

Nominal Diameter	Barrel	Socket Dimensions									Joint Thickness
DN mm	DE	DI	P	<i>g</i> Min	<i>h</i> Min	<i>a</i> (optional)	K	L	M	N	<i>f</i>
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
80	98	116	84	22.5	10.0	3.0	8.5	9	14	3	9.0
100	118	137	88	23.0	10.5	3.0	8.5	9	14	3	9.5
125	144	163	91	24.0	11.0	3.0	8.5	9	14	3	9.5
150	170	189	94	24.5	12.0	3.0	8.5	11	16	3	9.5
200	222	241	100	26.0	13.0	3.0	8.5	12	17	3	9.5
250	274	294	103	27.5	14.5	3.5	8.5	14	18	3	10.0
300	326	346	105	29.0	15.5	3.5	8.5	14	18	3	10.0
350	378	398	107	30.5	17.0	3.5	8.5	14	19	3	10.0
400	429	449	110	32.0	18.0	3.5	8.5	15	20	3	10.0
450	480	501	112	33.5	19.0	3.5	8.5	18	22	3	10.5
500	532	553	115	35.0	20.5	3.5	8.5	20	24	3	10.5
600	635	657	120	38.0	23.0	3.5	8.5	22	25	3	11.0
700	738	760	122	41.0	25.5	3.5	8.5	24	26	3	11.0
750	790	813	123	42.5	27.0	4.0	8.5	25	28	3	11.5
800	842	865	125	44.0	28.0	4.0	8.5	25	28	3	11.5
900	945	968	128	47.0	30.5	4.0	8.5	27	30	3	11.5
1 000	1 048	1 072	128	50.0	33.0	4.0	8.5	28	32	3	12.0
1 050	1 124	1 143	128	52.0	36.0	5.0	8.5	28	32	3	12.0

NOTES

- 1 Dimensions K, L, M and N are for guidance only.
- 2 Dimensions figures 'g' and 'K' do not effect interchangeability, they only indicate minimum permissible thickness.
- 3 For alternate design $L = M$.

Table 4 Dimensions of Sockets and Spigots of Pipes for Push-on Joints
(Clause 13.3)



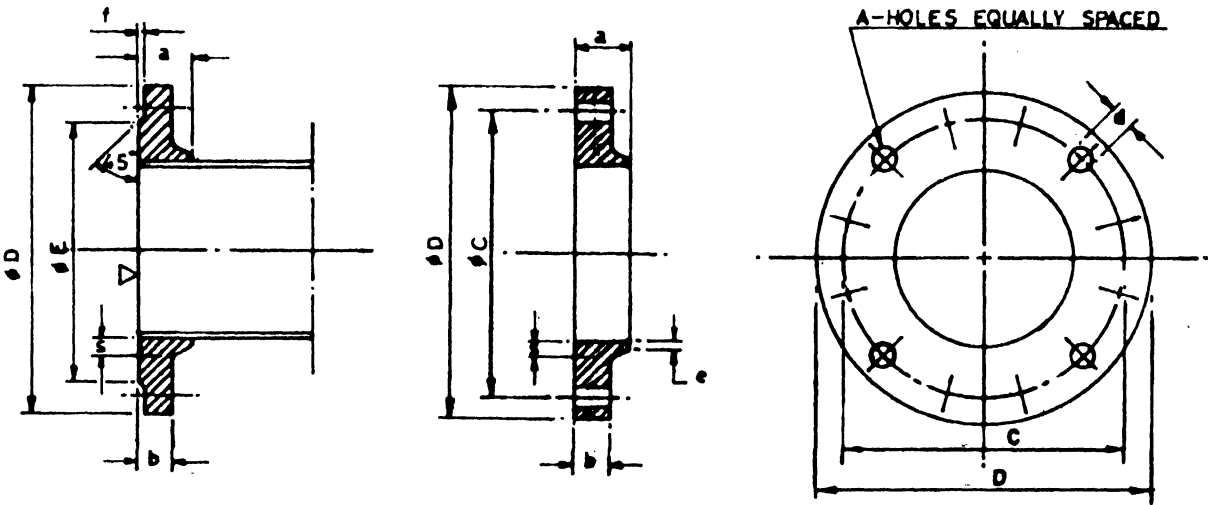
All dimensions in millimetres.

Nominal Diameter	Barrel		Socket											
	DE	X Min	DI	P	Q	I	J	K	N Min	O	S	T	L	M Min
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
80	95	9	99	89	52	121	116	102	12	5.5	5	4	3	10.8
100	115	9	119	92	52	141	136	122	12	5.5	5	4	3	11.3
125	141	9	145	94	52	167	162	148	12	5.5	5	4	3	12.0
150	167	9	171	94	52	193	188	174	12	5.5	5	4	3	12.7
200	219	9	223	102	60	248	242	226	15	6.5	6	5	3.5	14.0
250	271	9	275.5	106	62	299	296	278	15	6.5	6	5	3.5	15.4
300	323	9	328	110	67	355	351	331	17	8.0	7	5	4	16.7
350	375	14	380.5	110	67	407	403	383	17	8.0	7	5	4	18.1
400	426	14	431.5	112	74	461	454	435	19	9.0	8	5	4.5	19.4
450	477	14	482.5	112	74	512	508	485	19	9.0	8	5	4.5	20.8
500	529	14	535	117	81	567	563	538	21	10.0	9	5	5	22.1
600	632	14	638	125	86	673	669	642	21	10.0	10	5	5	20.8
700	735	15	742.5	138	88	780	774	745	21	11.0	10	5	5	25.0
750	787	15	795	143	91	834	827	797	21	11.0	10	5	5	27.0
800	839	15	846.5	143	91	886	879	850	22	11.0	10	6	5	28.0
900	942	15	949.5	143	91	989	985	953	22	12.0	11	6	6	28.0
1 000	1 045	19	1 052	143	91	1 092	1 088	1 056	22	12.0	11	6	6	30.0
1 050	1 118	19	1 125	143	91	1 165	1 161	1 134	23	12.0	11	6	6	32.0

NOTES

- 1 Dimensions S, T and L are for guidance only.
- 2 For nominal diameters DN 600 and above the sockets may be without centering ring as in the alternative sketch given above.

Table 5 Dimensions of Screwed Flanges of Pipes and Standard Flange Drilling of Flanged Pipes
(Clause 13.4)

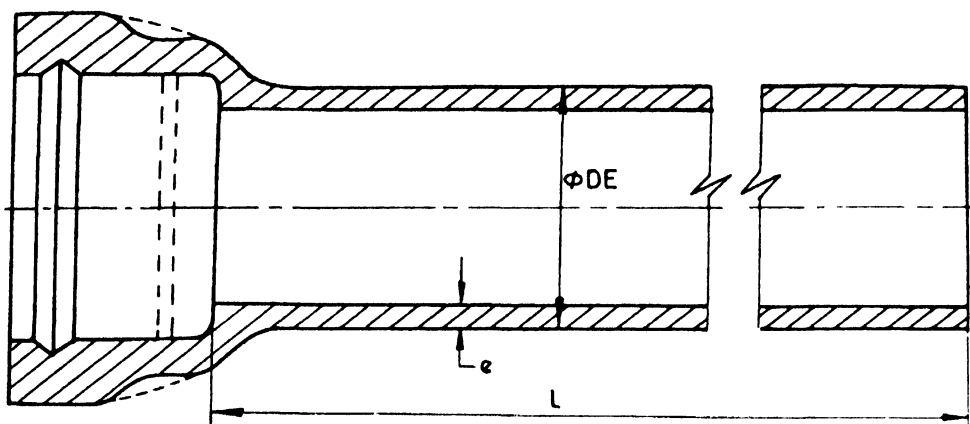


All dimensions in millimetres.

Nominal Diameter	Dimension								Holes		
DN mm	<i>c</i>	<i>D</i>	<i>E</i>	<i>b</i>	<i>a</i>	<i>r</i>	<i>f</i>	<i>s</i>	Number	Diameter	Diameter of Bolts
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
80	160	200	132	21.0	42	6	3	17	4	19	16
100	180	220	156	22.0	44	6	3	18	8	19	16
125	210	250	184	22.5	45	6	3	19	8	19	16
150	240	285	211	23.0	46	6	3	20	8	23	20
200	295	340	266	24.5	49	6	3	22	8	23	20
250	350	395	319	26.0	52	6	3	24	12	23	20
300	400	445	370	27.5	55	8	4	26	12	23	20
350	460	505	429	29.0	58	8	4	28	16	23	20
400	515	565	480	30.0	61	8	4	30	16	28	24
450	565	615	527	31.5	64	8	4	32	20	28	24
500	620	670	582	33.0	67	8	4	34	20	28	24
600	725	780	682	36.0	70	8	5	38	20	31	27

Table 6 Socket and Spigot Pipes — Class LA
(Clause 13.5)

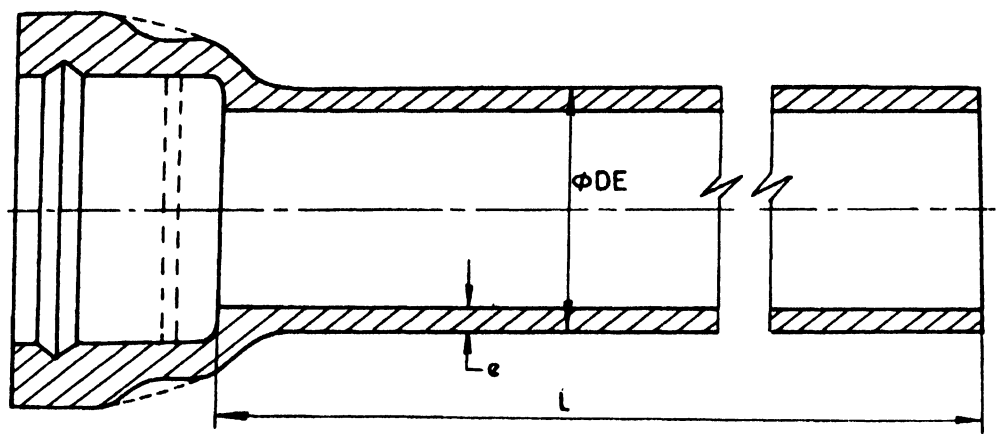
$$e = 10/12 (7 + 0.02 \text{ DN })$$



Nominal Diameter	Barrel					Total Mass for One Working Length in kg					
DN mm	DE Lead Joint mm	DE Push-on Joint mm	e mm	Mass for One Metre kg	Socket Mass kg	3.66 m	4 m	4.5 m	5 m	5.5 m	6 m
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
80	98	95	7.2	14.7	5.5	59	64	—	79	—	—
100	118	115	7.5	18.6	7.1	75	82	91	100	109	119
125	144	141	7.9	24.2	9.2	98	106	118	130	142	154
150	170	167	8.3	30.1	11.5	122	132	147	162	177	192
200	222	219	9.2	44.0	16.5	178	193	215	237	259	281
250	274	271	10.0	59.3	22.9	240	260	290	319	349	379
300	326	323	10.8	76.5	29.8	310	336	374	412	450	489
350	378	375	11.7	96.3	37.5	390	423	471	519	567	615
400	429	426	12.5	116.9	46.3	474	514	572	631	690	748
450	480	477	13.3	141.0	56.0	572	620	690	761	832	902
500	532	529	14.2	165.2	66.0	671	727	809	892	974	1 057
600	635	632	15.8	219.8	89.3	894	968	1 078	1 188	1 298	1 408
700	738	735	17.5	283.2	116.8	1 153	1 250	1 391	1 538	1 675	1 816
750	790	787	18.3	317.2	131.7	1 293	1 400	1 559	1 718	1 876	2 035
800	842	839	19.2	354.9	147.8	1 447	1 567	1 745	1 922	2 100	2 277
900	945	942	20.8	431.8	182.6	1 763	1 910	2 126	2 342	2 558	2 773
1 000	1 048	1 045	22.5	518.3	222.3	2 119	2 295	2 555	2 814	3 073	3 392
1 050	1 124	1 118	23.6	583.4	309.6	2 445	2 643	2 935	3 227	3 518	3 810

Table 7 Socket and Spigot Pipes — Class A
(Clause 13.5)

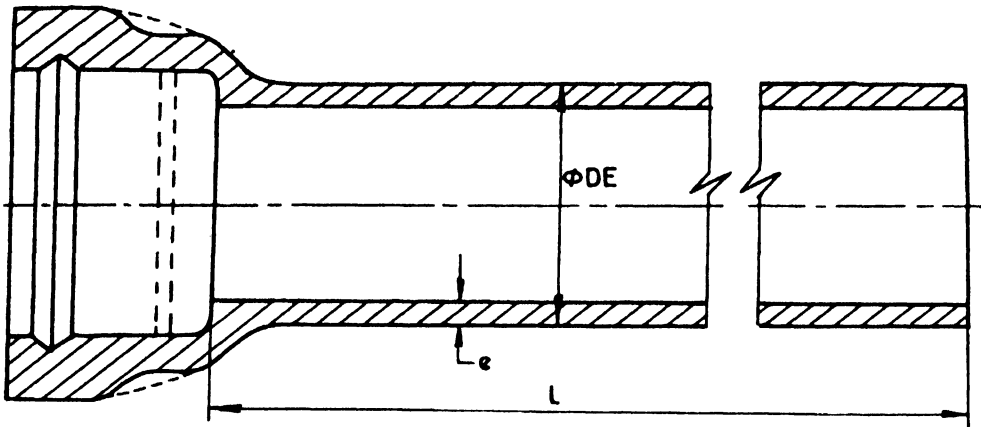
$e = 11/12 (7 + 0.02 \text{ DN })$



Nominal Diameter	Barrel				Socket Mass kg	Total Mass for One Working Length in kg					
	DE Lead Joint mm	DE Push-on Joint mm	e mm	Mass for One Metre kg		3.66 m	4 m	4.5 m	5 m	5.5 m	6 m
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
80	98	95	7.9	16.0	5.5	64	70	78	86	—	—
100	118	115	8.3	20.5	7.1	82	89	99	109	120	130
125	144	141	8.7	26.4	9.2	106	115	128	141	155	168
150	170	167	9.2	33.2	11.5	133	144	161	178	194	211
200	222	219	10.1	48.1	16.5	193	209	233	257	281	305
250	274	271	11.0	65.0	22.9	261	283	315	348	380	413
300	326	323	11.9	84.0	29.8	337	366	408	450	492	534
350	378	375	12.8	105.0	37.5	422	458	510	563	615	668
400	429	426	13.8	128.7	46.3	517	561	625	690	754	819
450	480	477	14.7	156.0	56.0	627	680	758	836	914	992
500	532	529	15.6	181.0	66.0	728	790	880	971	1 061	1 152
600	635	632	17.4	241.4	89.3	973	1 055	1 176	1 296	1 417	1 544
700	738	735	19.3	311.6	116.8	1 257	1 363	1 519	1 675	1 830	1 986
750	790	787	20.2	348.9	131.7	1 409	1 527	1 702	1 876	2 051	2 225
800	842	839	21.1	389.1	147.8	1 572	1 704	1 899	2 093	2 288	2 482
900	945	942	22.9	474.3	182.6	1 918	2 080	2 317	2 554	2 791	3 028
1 000	1 048	1 045	24.8	570.0	222.3	2 308	2 502	2 787	3 072	3 357	3 642
1 050	1 124	1 118	26.0	641.2	309.6	2 656	2 874	3 195	3 516	3 836	4 157

Table 8 Socket and Spigot Pipes — Class B
(Clause 13.5)

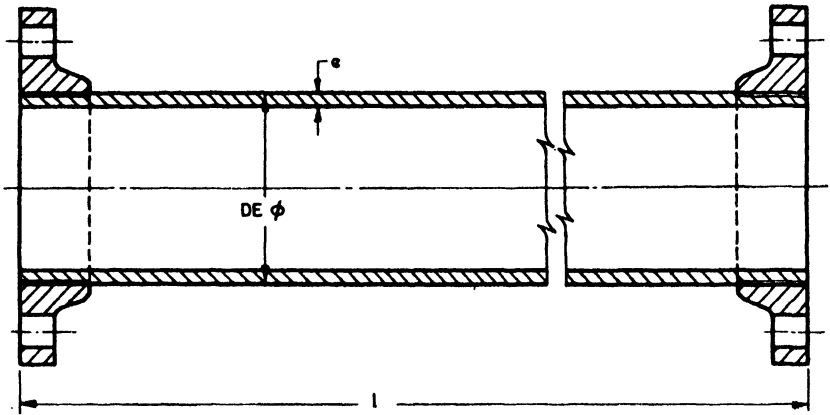
$e = 7 + 0.02 \text{ DN}$



Nominal Diameter	Barrel					Total Mass for One Working Length in kg					
DN mm	DE Lead Joint mm	DE Push-on Joint mm	e mm	Mass for One Metre kg	Socket Mass kg	3.66 m	4 m	4.5 m	5 m	5.5 m	6 m
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
80	98	95	8.6	17.3	5.5	69	74	83	92	—	—
100	118	115	9.0	22.0	7.1	88	95	106	117	128	139
125	144	141	9.5	28.7	9.2	114	124	138	153	167	181
150	170	167	10.0	35.9	11.5	143	155	173	191	209	227
200	222	219	11.0	52.1	16.8	207	225	251	278	304	329
250	274	271	12.0	70.6	22.9	281	305	341	376	411	447
300	326	323	13.0	91.4	29.8	364	395	441	487	533	578
350	378	375	14.0	114.5	37.5	457	495	553	610	667	725
400	429	426	15.0	139.5	46.3	557	604	674	744	814	883
450	480	477	16.0	169.0	56.0	675	732	816	901	986	1 070
500	532	529	17.0	196.7	66.0	786	853	951	1 049	1 148	1 246
600	635	632	19.0	262.9	89.3	1 052	1 141	1 272	1 404	1 535	1 667
700	738	735	21.0	338.2	116.8	1 355	1 470	1 639	1 808	1 977	2 146
750	790	787	22.0	380.6	131.7	1 525	1 644	1 844	2 029	2 225	2 415
800	842	839	23.0	423.1	147.8	1 696	1 840	2 052	2 263	2 475	2 686
900	945	942	25.0	516.6	182.6	2 073	2 249	2 507	2 766	3 024	3 282
1 000	1 048	1 045	27.0	619.2	222.3	2 489	2 699	3 009	3 318	3 621	3 938
1 050	1 124	1 118	29.0	713.3	309.6	2 920	3 163	3 519	3 876	4 233	4 589

Table 9 Flanged Pipe Centrifugally Cast with Screwed Flange — Class B
(Clause 13.6)

$e = 7 + 0.02 \text{ DN}$



DN	DE	e	Mass for One Metre	Mass for One Flange	Total Mass for One Working Length L in kg						
mm	mm	mm	kg	kg	2.75 m	3 m	4 m	4.5 m	5 m	5.25 m	5.5 m
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
80	98	8.6	17.3	4.3	56	60	78	86	95	99	104
100	118	9.0	22.0	5.0	70	76	98	109	120	126	131
125	144	9.5	28.7	6.6	92	99	128	142	157	164	171
150	170	10.0	35.9	8.2	115	124	160	178	196	205	214
200	222	11.0	52.1	11.4	166	179	231	257	283	296	309
250	274	12.0	70.6	14.7	224	241	312	347	382	405	418
300	326	13.0	91.4	18.6	289	311	403	448	484	517	540
350	378	14.0	114.5	21.2	357	386	500	558	615	644	672
400	429	15.0	139.5	27.3	438	473	613	682	752	787	822
450	480	16.0	169.0	32.6	530	572	741	826	910	952	983
500	532	17.0	196.7	38.1	617	666	863	961	1 060	1 109	1 158
600	635	19.0	262.9	52.4	828	893.5	1 156	1 288	1 419	1 485	1 551
700	738	21.0	338.2	71.9	1 074	1 158	1 497	1 666	1 835	1 919	2 004
750	790	22.0	380.6	84.4	1 216	1 311	1 691	1 882	2 072	2 167	2 262
800	842	23.0	423.1	96.9	1 357	1 463	1 886	2 098	2 309	2 415	2 521
900	945	25.0	516.6	113.5	1 645	1 777	2 293	2 552	2 810	2 939	3 068
1 000	1 048	27.0	619.2	134.0	1 971	2 126	2 745	3 054	3 364	3 519	3 674
1 050	1 124	29.0	713.3	169.9	2 301	2 480	3 193	3 550	3 906	4 085	4 263

14.2.1 Tolerance on Ovality (Push-on Joint)

In case of oval spigot ends (DE) the minor axis is permitted to be less than the minimum allowable diameter by value given below provided the mean diameter DE measured by circumferential tape comes within the minimum allowable dimensions of DE (Table 4) after applying tolerance:

<i>Nominal Diameter DN</i>	<i>Allowable Difference Between Minor Axis and DE, Min mm</i>
80-300	1.0
350-600	1.75
700	2.00
750-800	2.4
900-1 000	3.5

14.3 Tolerance on Thickness

The tolerance on the pipe wall thickness "e" shall be as follows:

<i>Dimensions</i>	<i>Tolerance mm</i>
Wall thickness	$-(1 + 0.05 e)^{1)}$
Flange thickness	$\pm (2 + 0.05 b)$

where

e = thickness of the pipe wall in mm, and
 b = thickness of the flange in mm.

¹⁾ No limit for the plus tolerance is specified.

14.4 Tolerance on Length

The tolerance on length of pipes shall be as follows:

<i>Type of Casting</i>	<i>Tolerance mm</i>
a) Socket and spigot and plain ended pipes	± 100
b) Flanged pipes	± 10

14.4.1 On the total number of socket and spigot pipes

to be supplied in each diameter, the manufacturer may supply up to 10 percent in lengths shorter than the specified length as follows:

<i>Specified Length</i>	<i>Decrease in Length</i>
Up to 4 m	0.5, 1 m
Over 4 m	0.5, 1, 1.5, 2 m

14.5 Permissible Deviation from a Straight Line

The pipes shall be straight. When rolled along two gantries separated by approximately two-thirds the length of the pipe to be checked, the maximum deviation from a straight line in mm shall not be greater than 1.25 times the length 'L' in metres of the pipe, thus

$$f_n < 1.25 L$$

14.6 Flanges

Tolerances for the various dimensions of flanges shall be as given in Tables 10, 11, 12 and 13.

14.7 Tolerance on Mass

14.7.1 The permissible tolerances on standard mass of pipe shall be ± 5 percent.

14.7.2 The pipes of the heavier mass than the maximum shall be accepted provided they comply in every other respect with the requirements of this standard.

15 COATING

15.1 Each pipe shall be coated in accordance with **15.1.1** to **15.1.5**.

15.1.1 Coating shall not be applied to any pipe unless its surfaces are clean, dry and free from rust.

15.1.2 Unless otherwise agreed between the purchaser and the manufacturer all pipes shall be coated externally and internally with the same material by dipping in a tar or suitable base bath. The pipes may be either preheated before dipping or the bath may be uniformly heated. Alternatively, if mutually agreed between the purchaser and the manufacturer, the pipes may be coated by spraying or brush painting.

15.1.3 The coating material shall set rapidly with good adherence and shall not scale off.

Table 10 Tolerances on the External Diameter 'D'

(Clause 14.6)

DN	80	100	125	150	200	250	300	350	400	450	500	600	700	750	800	900	1 000 and 1 050
Tolerance on D	± 4.5			$+5.5, -2.5$				$+6.5, -3.5$					$+7.5, -4.0$				

Table 11 Tolerances on Raised Face Height (*f*)
(Clause 14.6)

Height of Raised Face (<i>f</i>)	Tolerance
3	+1.5, -2.0
4	+2, -3.0
5	+2.5, -4.0

Table 12 Tolerances on Thickness on Flange
(Clause 14.6)

Type of Flange	Tolerance
Screwed on flanges	$\pm(2 + 0.05 b)$

Table 13 Tolerances on Flange Drilling
(Clause 14.6)

Dimension	Bolt Hole Diameter
	Dia 19 to Dia 31
	Tolerance
Bolt hole diameter, <i>d</i>	+ 2 - 0
Pitch circle diameter, <i>C</i>	± 2
Centre to centre of adjacent bolt holes	± 2

15.1.4 Coating test shall be conducted on a sample piece cut from the pipe having a sample area not less than 10 sq cm.

15.1.5 Where the coating material has a bitumen or similar base, it shall be smooth and tenacious and hard enough not to flow when exposed to a temperature of 65°C for five minutes but not so brittle at a temperature of 0°C as to chip off when scribed lightly with a penknife.

15.1.6 When the pipes are to be used for conveying potable water the inside coating shall not contain any constituent soluble in such water or any ingredient which could impart any taste or whatsoever to the potable water after sterilization and suitable washing of the mains.

15.2 Pipes with or without sockets and flanges which are imperfectly coated or where the coating does not set or conform to the required quality, specified in 15.1.1 to 15.1.5 the coating shall be removed and the pipes/flanges recoated.

16 QUALITY ASSURANCE

16.1 General

The manufacturer shall demonstrate the conformity of his products with this standard by controlling the manufacturing process and carrying out the various tests.

16.2 Quality Assurance System

The manufacturer shall control the quality of his products during their manufacture by a system of process control in order to comply with the technical requirements of this standard. Wherever possible, statistical sampling techniques should be used.

16.3 If the purchaser desires to inspect pipes at the manufacturers plant, the purchaser shall so specify on the purchase order.

17 MARKING

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

- Manufacturer's name, initials or identification mark;
- The nominal diameter;
- Class reference;
- Mass of pipe; and
- The last two digits of the year of manufacture.

17.1.1 Marking may be done :

- on the socket faces of pipe centrifugally cast in metal mould, and
- on the outside of the socket or on the barrel of pipe centrifugally cast in sand mould.

17.2 Any other marks required by the purchaser may be painted on.

ANNEX A
(Clause 11.2)

MECHANICAL TESTS

A-1 RING TEST FOR PIPES CENTRIFUGALLY CAST IN METAL MOULDS

A-1.1 On pipes of up to and including 300 mm nominal diameter, rings of approximately 25 mm width shall be tested on a suitable machine. The rings shall be supported on two knife edges diametrically opposed and the load applied from the inside at these points (see Fig. 1).

A-1.2 The modulus of rupture of the ring shall be calculated from the breaking load by the following formula :

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

where

- R = modulus of rupture of the ring in MPa,
- P = breaking load in newtons,
- D = external dia of the ring in mm,
- e = wall thickness of the ring in mm, and
- b = breadth of the rin mm.

A-2 TENSILE TESTS ON BARS FOR PIPES CENTRIFUGALLY CAST IN METAL OR RESIN SAND MOULDS

A-2.1 The tensile test bars cut from the pipes are about 90 mm long, and have diameter of about 6 mm which may vary with the thickness of the pipe. The ends are prepared so as to fit the testing machine (see Fig. 2).

NOTE — If agreed to between the purchaser and the manufacturer the dimensions of the test bars shall be as follows :

Thickness of Pipes	Diameter of Test Bar	Radius of Curvature (Min)
mm	mm	mm
Up to 13	9	32
Over 13 and up to 17	10	32
Over 17	14	32

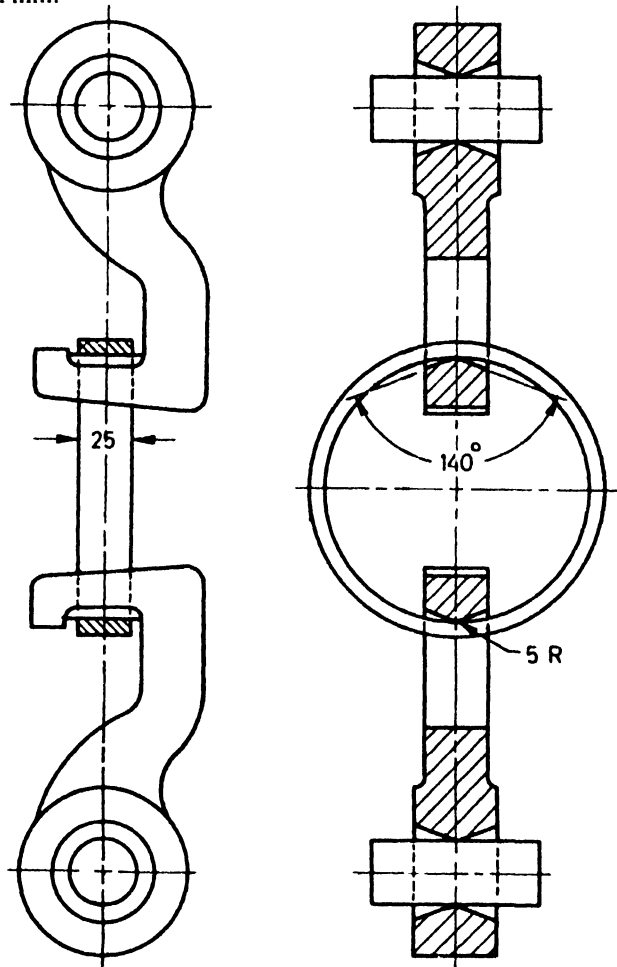
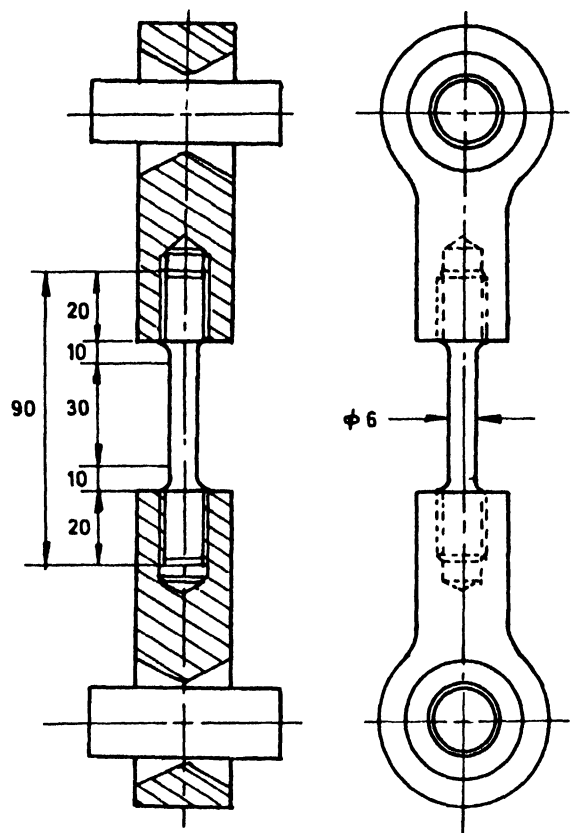


FIG. 1 RING TEST FOR PIPES CENTRIFUGALLY CAST IN METAL MOULDS



All dimensions in millimetres.

FIG. 2 TENSILE TESTS ON BARS FOR PIPES CENTRIFUGALLY CAST IN METAL ON RESIN SAND MOULD

ANNEX B

[Clause 12.2 (Note)]

HYDROSTATIC TEST PRESSURE AND HYDRAULIC WORKING PRESSURE

<i>Nominal Diameter DN</i>	<i>Description</i>	<i>Suggested Maximum Hydrostatic Site Test Pressure in MPa</i>	<i>Suggested Maximum Hydraulic Working Pressure (Inclusive of Surge) in MPa</i>
(1)	(2)	(3)	(4)
80-600	Spigot and socket spun pipes Class LA	1.6	1.0
80-600	Spigot and socket spun pipes Class A	2.0	1.25
80-600	Spigot and socket spun pipes Class B	2.5	1.6
700-1 050	Spigot and socket spun pipes Class LA	1.5	1.0
700-1 050	Spigot and socket spun pipes Class A	2.0	1.2
700-1 050	Spigot and socket spun pipes Class B	2.5	1.5
80-300	Flanged pipes, Class B	2.5	1.6
350-600	Flanged pipes, Class B	2.0	1.6

ANNEX C (Foreword)

COMMITTEE COMPOSITION

Pig Iron and Cast Iron Sectional Committee, MTD 6

<i>Chairman</i>	<i>Representing</i>
DR P. N. BHAGWATI	Bhagwati Spherocast Ltd, Ahmedabad
<i>Members</i>	
SHRI B. D. GHOSH SHRI R. N. GUIN (Alternate)	Development Commissioner for Iron and Steels, Kolkata
SHRI V. PRAKASH SHRI N. K. KAUSHAL (Alternate)	Directorate General of Supplies and Disposals, New Delhi
SHRI S. B. SENGUPTA SHRI V. M. RALLI (Alternate)	Electrosteel Castings Ltd, Kolkata
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(Continued on page 19)

(Continued from page 18)

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