भारतीय मानक **IS 1536 : 2023**

Indian Standard

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

(पाँचवा पुनरीक्षण)

Centrifugally Cast (Spun) Iron Pressure Pipes for Water, Gas and Sewage — Specification

(Fifth Revision)

ICS 77.140.80, 23.040.10

भारतीय मानक ब्यूरो
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Pig Iron and Cast Iron Sectional Committee, MTD 06

FOREWORD

This Indian Standard (Fifth Revision) 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, 1989 and 2001. While reviewing this standard, in view of the experience gained, the committee has decided to revise it by incorporating the following modifications:

a) Amendments issued have been incorporated;
b) The lead joint pipes have been withdrawn as exposure to lead is detrimental to health;
c) The sizes ranges from 700 mm to 1 000 mm of centrifugally cast iron pipes with screwed on flanges have been introduced;
d) The maximum size reduced from 1 050 mm to 1 000 mm of the centrifugally cast iron pipes with sockets and spigots;
e) The hydrostatic test pressure increased from 1.6 MPa to 2.0 MPa of centrifugally cast iron pipes with screwed on flanges for size ranges from 350 mm to 600 mm;
f) Tolerances on bolt diameter from 34 mm to 37 mm of flanged drillings have been introduced;
g) The requirement of hardness value have been changed to 230 HBW; and
h) Class A screwed on flanged pipes have been reintroduced.

The composition of the committee responsible for formulation of this standard is listed in Annex D.

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 or analysis, shall be rounded off in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*)’. The number of significant places retained in the rounded off value should be same as that of the specified value in this standard.

Indian Standard

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

(Fifth 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 (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 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

The standards listed in Annex C contain provisions which through reference in this text, constitute provision 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 listed in Annex C.

3 DEFINITIONS

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

3.1 Pipe — Casting of uniform bore, straight in axis, having 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:

a) glands and bolts for mechanical flexible joints; and

b) 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.

3.4.1 *Puddle Flange* — A flange fixed on the body of pipe at any angle. The thickness and outer diameter is varied as per requirements.

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-On 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 = $100 \left(\frac{A_1 - A_2}{A_1 + A_2} \right)$

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, class C, class D or class E may be derived after allowing corresponding increases of thickness of 30 percent, 40 percent or 50 percent respectively.

4.2 Centrifugally cast pipes with screwed on flanges to this standard shall be of class A and class B. For special uses class C, class D or class 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 HBW.

6.3 Pipes centrifugally cast shall be heat treated in order to achieve the necessary mechanical properties and to relieve casting stresses. Pipes cast under controlled cooling conditions need not be heat treated.

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 repaired 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 mm^2 area can be categorized as salvageable. 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 push-on joint which are generally followed in this country are given in this standard. Details of standard flanged joint are 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).

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 1 000 and shall conform to the requirement of Table 5.

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 gasket materials 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:

Sl No.	*Size Range (DN)*	*Batch Size*
(1)	(2)	(3)
i)	80 to 300	200 pipes
ii)	350 to 600	100 pipes
iii)	700 to 1 000	50 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 A 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 (Part 1):

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

Sl No.	*Nominal Diameter*	*Modulus of Rupture, Min* MPa
(1)	(2)	(3)
i)	Up to and including 300 mm	390

b) Tensile test for pipes

Sl No.	*Type of Mould*	*Nominal Diameter*	*Tensile Strength, Min* MPa
(1)	(2)	(3)	(4)
i)	For pipes centrifugally cast in metal moulds	Over 300 mm and upto 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 two additional tests shall be made on test pieces 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 Table 1 and Table 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. For flanged pipes of 700 mm to 1 000 mm, test pressure shall be as agreed to between manufacturer and purchaser.

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.

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 and 1 000 mm.

The range of nominal diameter DN for screwed on flanges will be 80, 100, 125, 150, 200, 250, 300, 350, 400, 450, 500, 600, 700, 750, 800, 900, 1 000 mm.

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

a) Socket and spigot pipes: 3.0, 3.5, 3.66, 4, 4.5, 5, 5.5 and 6 m; and

b) Flanged pipes: 2.75, 3, 4, 4.5, 5, 5.25 and 5.5 m.

13.2.1 Lengths other than specified in **13.2** may also be supplied on mutual agreement between the manufacturer and purchaser.

13.3 Dimensions for socket and spigot of pipes are given in Table 4.

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

13.5 Dimensions of socket and spigot pipes are given in Table 6 for class LA, class A and class B.

13.6 Dimensions of uncoated flanges and barrel of flanged pipes centrifugally cast with screwed flanges are given in Table 7.

14 TOLERANCE

14.1 Tolerances on Barrel Diameter and Socket Dimensions

Tolerances on barrel diameter and socket dimensions shall be as per Table 3:

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

Sl No.	Class	Hydrostatic Test Pressure for Works, Mpa	
		Up to DN[1)] 600 (Including)	DN[1)] 700 and Above
(1)	(2)	(3)	(4)
i)	LA	3.5	1.5
ii)	A	3.5	2.0
iii)	B and Above	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)

Sl No.	Class	Hydrostatic Test Pressure for Works, Mpa	
		Upto 300 DN[1)]	350 - 600 DN[1)]
(1)	(2)	(3)	(4)
i)	A	2.0	1.6
ii)	B and above	2.5	2.0

[1)] DN — Nominal diameter.

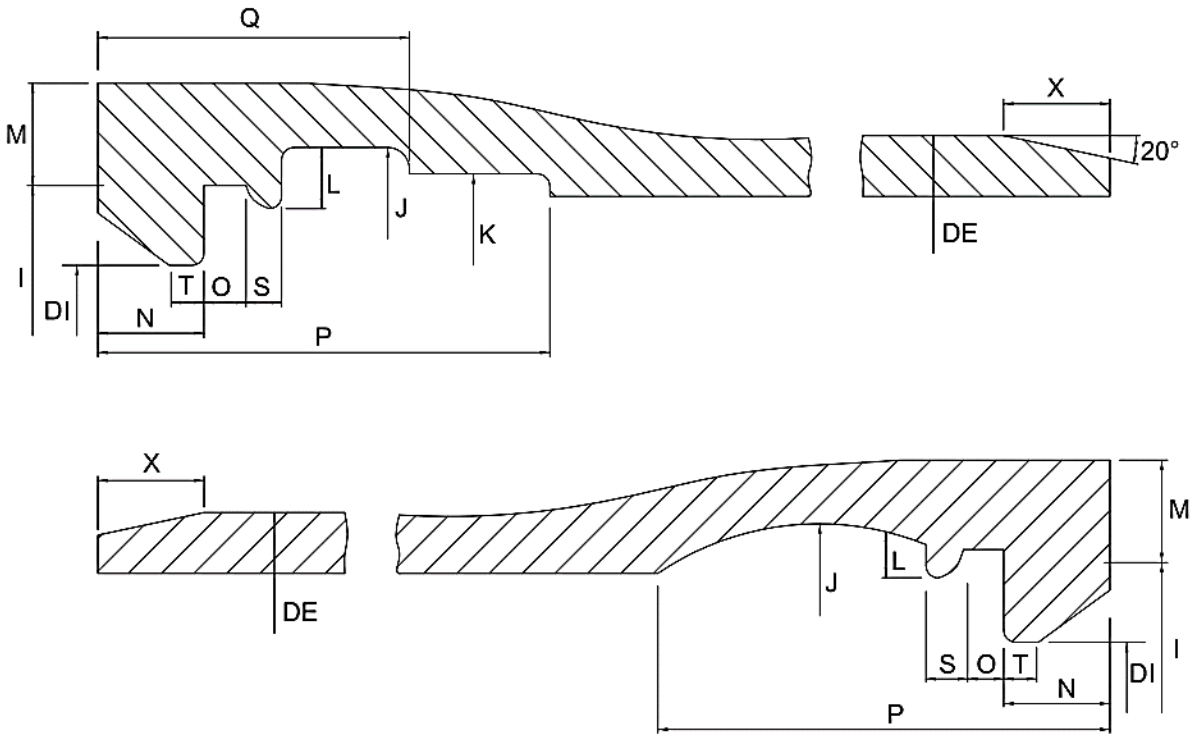
Table 3 Tolerances on Barrel Diameter and Socket Dimensions

(*Clause* 14.1)

Sl No.	Nominal Diameter	Tolerance on Socket Dimensions, mm							
	DN	DI	I	J	K	P	Q	O	DE
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
i)	80 to 200	± 1.50	+ 2.0 - 1.0	+ 1.5 - 0.5	± 2.0	+ 5.0 - 15.0	± 3.0	± 0.5	± 2.0
ii)	250 to 300	± 1.50	+ 2.0 - 1.25	+ 1.5 - 1.0	± 2.5	+ 5.0 - 10.0	± 3.0	± 0.5	± 2.25
iii)	350 to 450	± 1.50	+ 2.0 - 1.5	+ 2.0 - 1.0	± 3.0	± 10.0	± 4.0	± 0.5	± 2.25
iv)	500 to 600	± 1.75	+ 2.0 - 1.75	+ 2.0 - 1.0	± 3.5	± 10.0	± 4.0	± 0.5	± 2.25
v)	700 to 800	± 2.5	+ 3.0 - 2.0	+ 2.5 - 1.5	± 4.0	± 10.0	± 5.0	± 0.5	± 2.75
vi)	900 to 1 000	± 3.0	+ 4.0 - 3.0	+ 2.5 - 2.0	± 5.0	± 10.0	± 6.0	± 0.5	± 3.25

Table 4 Dimensions of Socket and Spigot of Pipes

(*Clause* 13.3)



All dimensions in millimetres.

Sl No.	Nominal Diameter	Barrel		Socket											
	DN	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)	(16)
i)	80	95	9	99	89	52	121	116	102	12	5.5	5	4	3	10.8
ii)	100	115	9	119	92	52	141	136	122	12	5.5	5	4	3	11.3
iii)	125	141	9	145	94	52	167	162	148	12	5.5	5	4	3	12.0
iv)	150	167	9	171	94	52	193	188	174	12	5.5	5	4	3	12.7
v)	200	219	9	223	102	60	248	242	226	15	6.5	6	5	3.5	14.0
vi)	250	271	9	275.5	106	62	299	296	278	15	6 5	6	5	3.5	15.4
vii)	300	323	9	328	110	67	355	351	331	17	8.0	7	5	4	16.7
viii)	350	375	14	380.5	110	67	407	403	383	17	8.0	7	5	4	18.1
ix)	400	426	14	431.5	112	74	461	454	435	19	9.0	8	5	4.5	19.4
x)	450	477	14	482.5	112	74	512	508	485	19	9.0	8	5	4.5	20.8
xi)	500	529	14	535	117	81	567	563	538	21	10.0	9	5	5	22.1
xii)	600	632	14	638	125	86	673	669	642	21	10.0	10	5	5	23.8
xiii)	700	735	15	742.5	138	88	780	774	745	21	11.0	10	5	5	25.0
xiv)	750	787	15	795	143	91	834	827	797	21	11.0	10	5	5	27.0
xv)	800	839	15	846.5	143	91	886	879	850	22	11.0	10	6	5	28.0
xvi)	900	942	15	949.5	143	91	989	985	953	22	12.0	11	6	6	28.0
xvii)	1 000	1 045	19	1 052	143	91	1 092	1 088	1 056	22	12.0	1 1	6	6	30.0

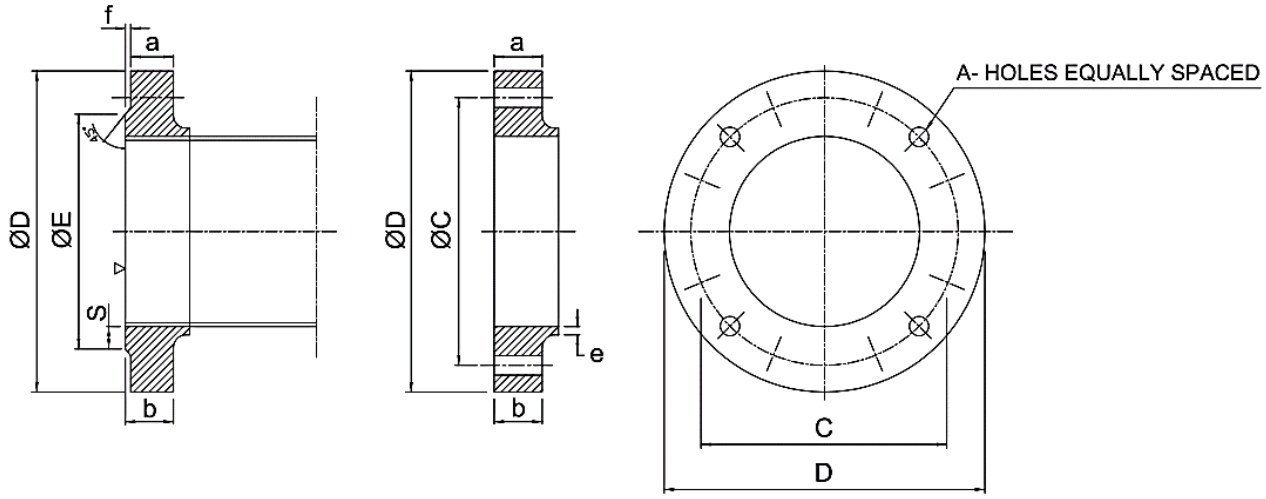
NOTES

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

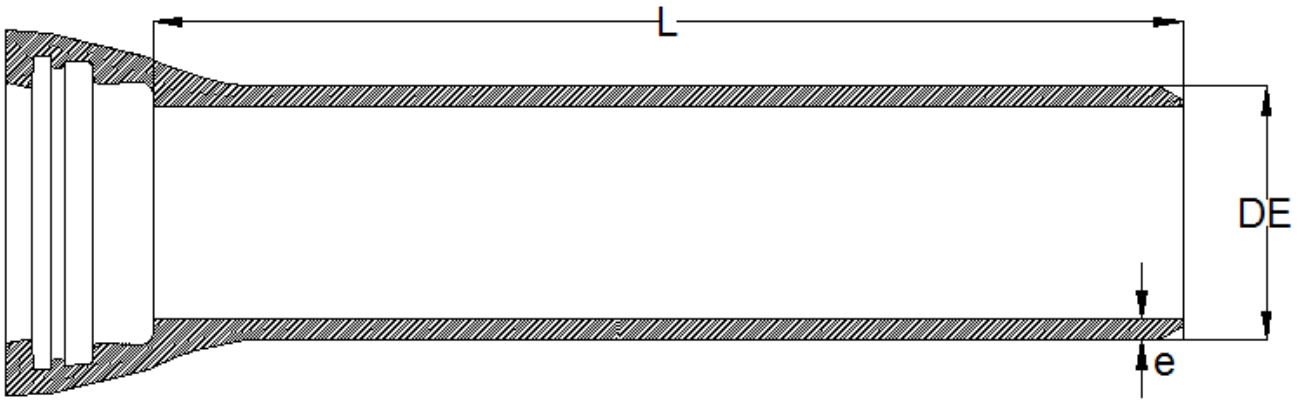
(*Clause* 13.4)



All dimensions in millimetres

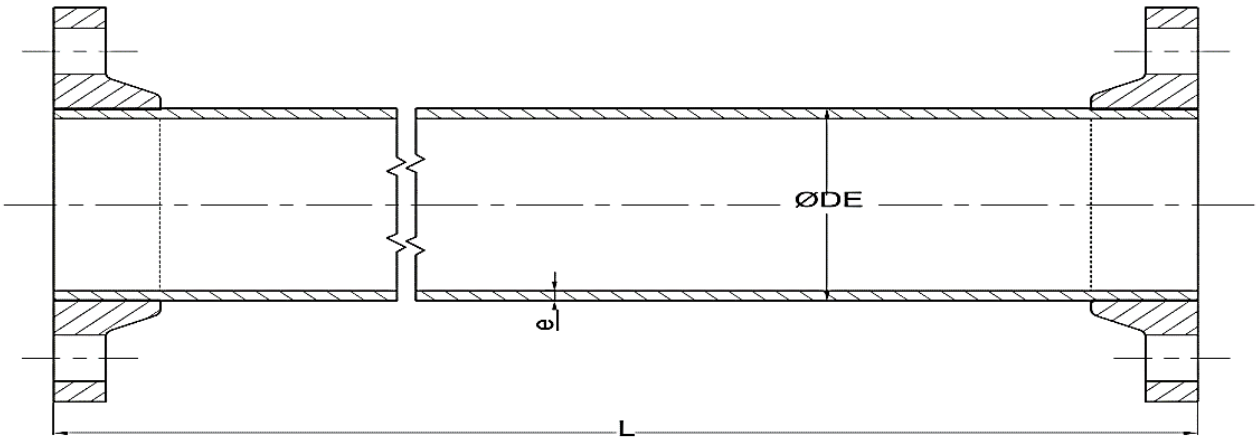
Sl No.	Nominal Diameter	Dimension								Holes		
	DN mm	c	D	E	b	a	r	f	s	Number	Diameter	Diameter of Bolts
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
i)	80	160	200	132	21.0	42	6	3	17	4	19	16
ii)	100	180	220	156	22.0	44	6	3	18	8	19	16
iii)	125	210	250	184	22.5	45	6	3	19	8	19	16
iv)	150	240	285	211	23.0	46	6	3	20	8	23	20
v)	200	295	340	266	24.5	49	6	3	22	8	23	20
vi)	250	350	395	319	26.0	52	6	3	24	12	23	20
vii)	300	400	445	370	27.5	55	8	4	26	12	23	20
viii)	350	460	505	429	29.0	58	8	4	28	16	23	20
ix)	400	515	565	480	30.0	61	8	4	30	16	28	24
x)	450	565	615	527	31.5	64	8	4	32	20	28	24
xi)	500	620	670	582	33.0	67	8	4	34	20	28	24
xii)	600	725	780	682	36.0	70	8	5	38	20	31	27
xiii)	700	840	895	794	38.5	73	9	5	40	24	31	27
xiv)	750	900	960	857	40.0	76	9	5	40	24	31	27
xv)	800	950	1 015	901	41.5	79	9	5	42	24	34	30
xvi)	900	1 050	1 115	1 001	44.0	82	9	5	44	28	34	30
xvii)	1 000	1 160	1 230	1 112	47.0	85	9	5	46	28	37	33

Table 6 Dimensions of Socket and Spigot Pipes — Class LA, Class A and Class B
(*Clause* 13.5)



Sl No.	Nominal Diameter	Barrel Dimensions			
	DN mm	*DE* mm	$e = \frac{10}{12}(7 + 0.02\ DN)$ *Class LA* mm	$e = \frac{11}{12}(7 + 0.02\ DN)$ *Class A* mm	$e = (7 + 0.02\ DN)$ *Class B* mm
(1)	(2)	(3)	(4)	(5)	(6)
i)	80	95	7.2	7.9	8.6
ii)	100	115	7.5	8.3	9.0
iii)	125	141	7.9	8.7	9.5
iv)	150	167	8.3	9.2	10.0
v)	200	219	9.2	10.1	11.0
vi)	250	271	10.0	11.0	12.0
vii)	300	323	10.8	11.9	13.0
viii)	350	375	11.7	12.8	14.0
ix)	400	426	12.5	13.8	15.0
x)	450	477	13.3	14.7	16.0
xi)	500	529	14.2	15.6	17.0
xii)	600	632	15.8	17.4	19.0
xiii)	700	735	17.5	19.3	21.0
xiv)	750	787	18.3	20.2	22.0
xv)	800	839	19.2	21.1	23.0
xvi)	900	942	20.8	22.9	25.0
xvii)	1 000	1 045	22.5	24.8	27.0

Table 7 Flanged Pipe Centrifugally Cast with Screwed Flange — Class A and B
(*Clause* 13.6)



All dimensions in millimetres

Sl No.	DN mm	*DE* mm	$e = \frac{11}{12}$ (7 + 0.02 DN) *Class A* mm	e = (7 + 0.02 DN) *Class B* mm
(1)	(2)	(3)	(4)	(5)
i)	80	98	7.9	8.6
ii)	100	118	8.3	9.0
iii)	125	144	8.7	9.5
iv)	150	170	9.2	10.0
v)	200	222	10.1	11.0
vi)	250	274	11.0	12.0
vii)	300	326	11.9	13.0
viii)	350	378	12.8	14.0
ix)	400	429	13.8	15.0
x)	450	480	14.7	16.0
xi)	500	532	15.6	17.0
xii)	600	635	17.4	19.0
xiii)	700	738	19.3	21.0
xiv)	750	790	20.2	22.0
xv)	800	842	21.1	23.0
xvi)	900	945	22.9	25.0
xvii)	1 000	1 048	24.8	27.0

14.2.1 Tolerance on Ovality

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:

Sl No.	*Nominal Diameter DN*	*Allowable Difference Between Minor Axis and DE, Min* mm
(1)	(2)	(3)
i)	80 to 300	1.00
ii)	350 to 600	1.75
iii)	700	2.00
iv)	750 to 800	2.40
v)	900 to 1 000	3.50

14.3 Tolerance on Thickness

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

Sl No.	*Dimensions*	*Tolerance* mm
(1)	(2)	(3)
i)	Wall thickness	$-(1 + 0.05\ e)$[1)]
ii)	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:

Sl No.	*Type of Joints*	*Tolerance* mm
(1)	(2)	(3)
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:

Sl No.	*Specified Length*	*Decrease in Length*
(1)	(2)	(3)
i)	Up to 4 m	0.5 m, 1 m
ii)	Over 4 m	0.5 m, 1 m, 1.5 m, 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 (fn) in mm shall not be greater than 1.25 times the length 'L' in metres of the pipe, thus:

$$fn < 1.25\ L$$

14.6 Flanges

Tolerances for the various dimensions of flanges shall be as given in Table 7, Table 8, Table 9 and Table 10.

Table 8 Tolerance 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
Tolerance on D	± 4.5			+ 5.5, - 2.5				+ 6.5, - 3.5					+ 7.5, - 4.0				

Table 9 Tolerance on Raised Face Height (*f*)
(*Clause* 14.6)

Sl No.	Height of Raised Face (f)	Tolerance
(1)	(2)	(3)
i)	3	+ 1.5, - 2.0
ii)	4	+ 2.0, - 3.0
iii)	5	+ 2.5, - 4.0

Table 10 Tolerance on Thickness on Flange
(*Clause* 14.6)

Sl No.	Type of Flange	Tolerance
(1)	(2)	(3)
i)	Screwed on flanges	$\pm$ (2.0 + 0.05 b)

Table 11 Tolerance on Flange Drilling
(*Clause* 14.6)

Sl No.	Dimension	Bolt Hole Diameter, mm	
		Dia 19 to Dia 31	Dia 34 to Dia 37
(1)	(2)	(3)	(4)
i)	Bolt hole diameter, d	+ 2, - 0	+ 3, - 0
ii)	Pitch circle diameter, C	$\pm$ 2	$\pm$ 2.8
iii)	Centre to centre of adjacent bolt holes	$\pm$ 2	$\pm$ 2.8

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 lined 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 and internal lining as required by the purchaser.

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

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 manufacturer's 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:

a) Manufacturer's name, initials or identification mark;
b) The nominal diameter;
c) Class reference; and
d) The last two digits of the year of manufacture.

17.1.1 Marking may be done:

a) On the socket faces of pipe centrifugally cast in metal mould; or
b) 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.

17.3 The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provision of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the product may be marked with the Standard Mark.

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:

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

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 ring 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:

Sl No. (1)	*Thickness of Pipes* (mm) (2)	*Diameter of Test Bar* (mm) (3)	*Radius of Curvature* (*Min*) (4)
i)	Up to 13	9	32
ii)	Over 13 and up to 17	10	32
iii)	Over 17	14	32

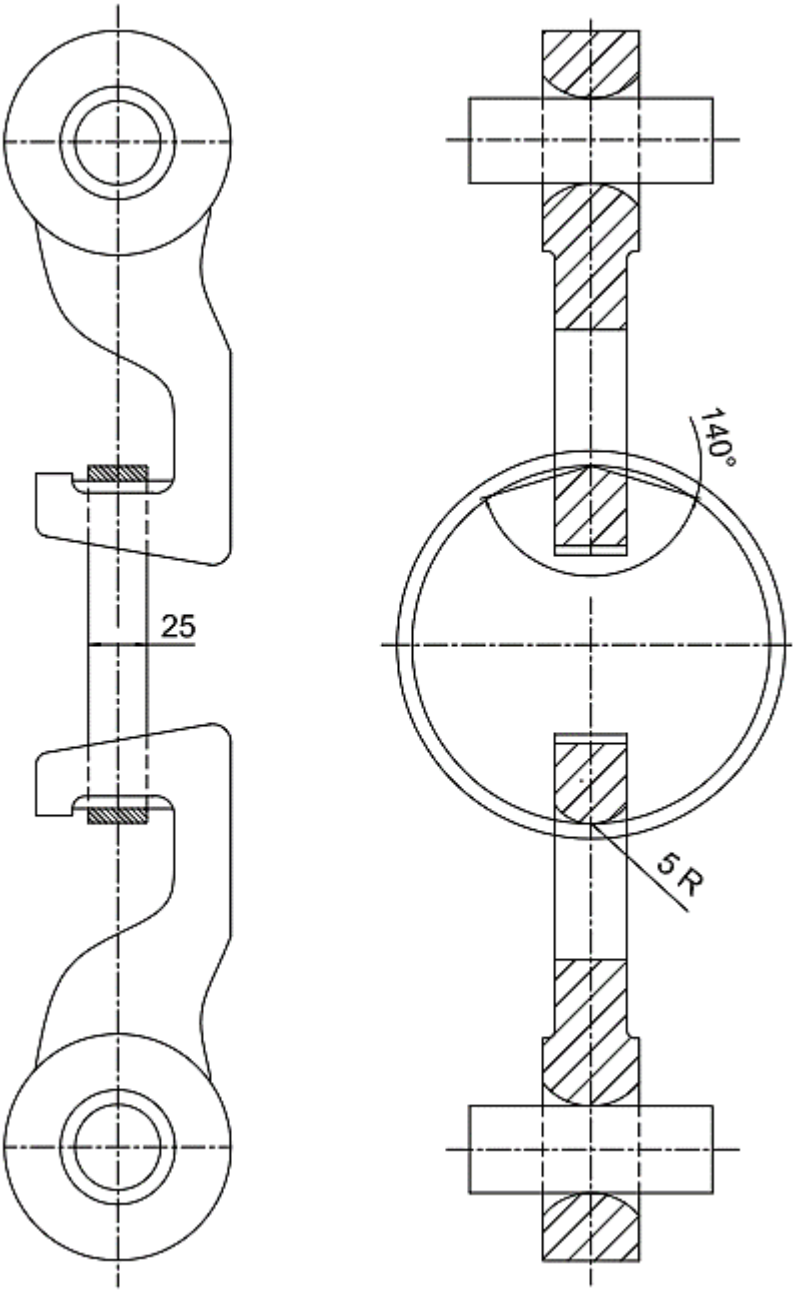


FIG. 1 RING TEST FOR PIPES CENTRIFUGALLY CAST IN METAL MOULDS

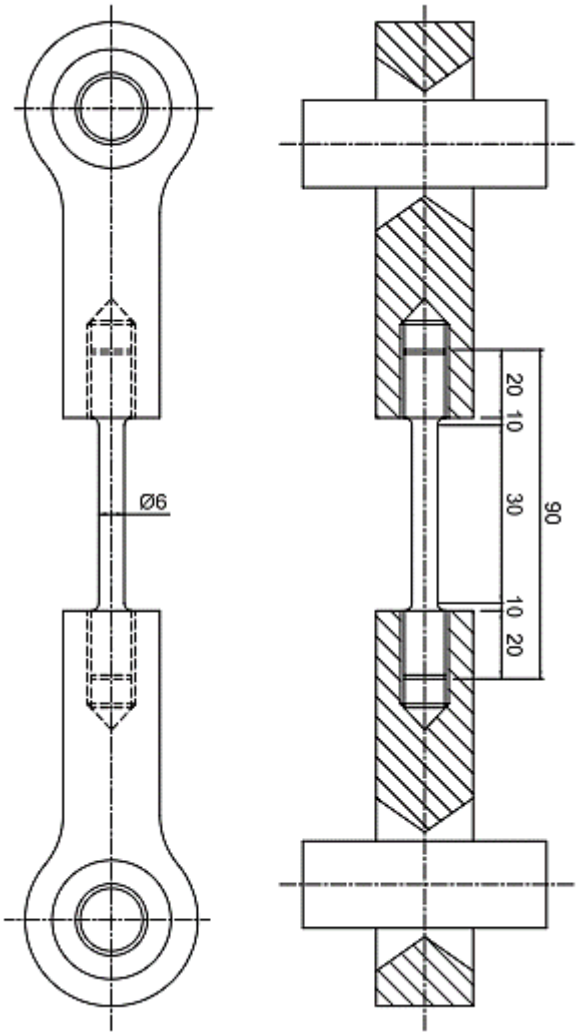


FIG. 2 TENSILE TESTS ON BARS FOR PIPES CENTRIFUGALLY CAST IN METAL ON RESIN SAND MOULD

ANNEX B

[*Clause* 12.2 (*Note*)]

HYDROSTATIC TEST PRESSURE AND HYDRAULIC WORKING PRESSURE

Sl No.	Nominal Diameter DN	Description	Suggested Maximum Hydrostatic Site Test Pressure in MPa	Suggested Maximum Hydraulic Working Pressure (Inclusive of Surge) in MPa
(1)	(2)	(3)	(4)	(5)
i)	80 to 600	Spigot and socket spun pipes class LA	1.6	1.0
ii)	80 to 600	Spigot and socket spun pipes class A	2.0	1.25
iii)	80 to 600	Spigot and socket spun pipes class B	2.5	1.6
iv)	700 to 1 000	Spigot and socket spun pipes class LA	1.5	1.0
v)	700 to 1 000	Spigot and socket spun pipes class A	2.0	1.2
vi)	700 to 1 000	Spigot and socket spun pipes class B	2.5	1.5
vii)	80 to 300	Flanged pipes, class A	2.0	1.6
viii)	80 to 300	Flanged pipes, class B	2.5	1.6
ix)	350 to 600	Flanged pipes, class A	1.6	1.2
x)	350 to 600	Flanged pipes, class B	2.0	1.6

ANNEX C
(*Clause* 2)

LIST OF REFERENCES

IS No.	*Title*	*IS No.*	*Title*
IS 638 : 1979	Specification for sheet rubber jointing and rubber insertion jointing (*second revision*)		Specification for materials (*second revision*)
IS 1387 : 1993	General requirements for the supply of metallurgical materials (*second revision*)	IS 11606 : 1986	Methods for sampling of cast iron pipes and fittings
IS 1500 (Part 1) : 2019/ISO 6506-1 : 2014	Metallic materials — Brinell hardness test: Part 1 Test method (*fifth revision*)	IS 12820 : 2004	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 (*first revision*)
IS 1608 (Part 1) : 2022/ISO 6892-1 : 2019	Metallic materials — Tensile testing: Part 1 Method of test at room temperature (*fifth revision*)	IS 13382 : 2018	Cast iron specials for mechanical and push-on flexible joints for pressure pipes for water, gas and sewage — Specification (*second revision*)
IS 5382 : 2018/ISO 4633 : 2015	Rubber seals — Joint rings for water supply, drainage and sewerage pipelines —		

ANNEX D
(*Foreword*)

COMMITTEE COMPOSITION

Pig Iron and Cast Iron Sectional Committee, MTD 06

Organization	*Representative(s)*
Metal and Steel Factory, Kolkata	SHRI A. K. HAZRA **(*Chairperson*)**
Central Public Works Department, New Delhi	SHRI SEETARAMA RAO MANTRALA SHRI CHANDRA SHEKHAR AZAD (*Alternate*)
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Member Secretary
SHRI RONGALI TIRUMALA RAO
SCIENTIST 'D'/JOINT DIRECTOR
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