IS 6163 (1978): Specification for Centrifugally Cast (Spun) Iron Low Pressure Pipes for Water, Gas and Sewaage [MTD 6: Cast Iron and Spun Iron]

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Indian Standard

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

(First Revision)

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BUREAU OF INDIAN STANDARDS
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NEW DELHI 110002

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Indian Standard

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

(First Revision)

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Indian Standard

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

(First Revision)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Indian Standards Institution on 24 April 1978, after the draft finalized by the Cast Iron and Malleable Cast Iron Sectional Committee had been approved by the Structural and Metals Division Council.

0.2 This standard was first published in 1971 covering sizes up to 200 mm nominal diameter. At present, in our country, various types of large diameter low pressure pipes, for example, prestressed concrete and asbestos cement pipes, are available for working pressures 0·6 MPa and 1·75 MPa in the range 80 to 750 mm nominal diameter. It is, therefore, felt that pipes of Class LA specified in IS : 1536-1976* (sizes beyond 200 mm nominal diameter) which are being used for low working pressures are overdesigned and are no longer economical. A considerable amount of metal can be saved if low pressure cast iron pipes are made available in the large diameter range. In view of the above, it has been decided to revise this standard incorporating the pipes with nominal diameter up to 750 mm.

0.3 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 : 2-1960†. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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1. SCOPE

1.1 This standard covers the requirements for centrifugally cast (spun) iron low pressure pipes, known as LP pipes, for conveyance of water, gas and sewage, manufactured in metal or sand moulds.

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*Specification for centrifugally cast (spun) iron pressure pipes for water, gas and sewage (*second revision*).

†Rules for rounding off numerical values (*revised*).

1.2 This standard is applicable to cast iron pipes having spigots and sockets as specified in this standard, and also to pipes with other types of joints particularly rubber joints. In case of rubber joints the inner profile of the socket end of the pipe shall depend on the type of rubber joint ensuring that the overall dimensions are maintained for reasons of safety and interchangeability.

2. SUPPLY OF MATERIAL

2.1 The general requirements relating to the supply of the material shall be as laid down in IS : 1387-1967*.

3. MANUFACTURE

3.1 The metal used for the manufacture of pipes shall be good quality cast iron. It shall be prepared at the discretion of the manufacturer in a cupola or an active mixer or other suitable furnace.

3.2 The pipes shall be stripped with all precautions necessary to avoid warping or shrinkage defects. The pipes shall be free from defects other than any unavoidable surface imperfections which result from the method of manufacture and which do not affect the serviceability of the pipes. By agreement between the purchaser and the manufacturer minor defects may be rectified.

3.3 The pipes shall be such that they could be cut, drilled or machined. Pipes shall be accepted provided the hardness of the external unmachined surface does not exceed Brinell hardness of 230 *HB*.

3.3.1 Spun pipes shall be subjected to heat treatment, if necessary, to ensure that the Brinell hardness does not exceed the limit specified.

3.3.2 In case of rubber joints, the spigot ends shall be suitably chamfered for smooth entry of pipe in the socket fitted with the rubber gasket.

4. MECHANICAL TESTS

4.0 Mechanical tests shall be carried out during manufacture. Test for every four hours of production shall be conducted. The result obtained shall be taken to represent all the pipes of all sizes made during that period.

4.1 Tests — Two test pieces obtained by cutting rings or bars from the spigot end of two pipes selected for testing, when tested in accordance

*General requirements for the supply of metallurgical materials (*first revision*).

with the methods specified in Appendix A, shall satisfy the following requirements:

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

Nominal Diameter	*Modulus of Rupture, Min* MPa (kgf/mm^2)
Up to and including 300 mm	390 (40)

b) Tensile test

Type of Mould	*Nominal Diameter*	*Tensile Strength, Min* MPa (kgf/mm^2)
1) For pipes centrifugally cast in metal moulds	Over 300 mm and up to and including 600 mm	200 (20)
	Over 600 mm	180 (18)
2) For pipes centrifugally cast in sand moulds	All diameters	180 (18)

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

5. BRINELL HARDNESS TEST

5.1 For checking the Brinell hardness specified in **3.3** the test shall be carried out on the test rings or bars cut from the pipes used for tests under **4.1**, in accordance with IS : 1789-1961*. The test shall be carried out by applying either a load of 3 000 kg to a ball of 10 mm diameter for 15 seconds, or a load of 750 kg to a ball of 5 mm diameter for 10 seconds.

6. RETESTS

6.1 If any test piece representing a lot fails in the first instance, 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.

7. HYDROSTATIC TEST

7.1 For hydrostatic test, all pipes shall be kept under pressure for a minimum of 15 seconds; they may be struck moderately with a 700-g hammer. They shall withstand the pressure test without showing any

*Method for Brinell hardness test for grey cast iron.

leakage, sweating or other defect of any kind. As far as possible the hydrostatic test shall be conducted before coating the pipes.

7.2 Works Test Requirements — All pipes shall withstand hydrostatic test pressures specified under col 2 of Table 1.

TABLE 1 HYDROSTATIC TEST PRESSURES FOR CENTRIFUGALLY CAST SOCKET AND SPIGOT LOW PRESSURE PIPES

Class	Hydrostatic Test Pressure at Works MPa (kgf/cm²)	Maximum Hydrostatic Test Pressure After Installation MPa (kgf/cm²)
(1)	(2)	(3)
LP	1·75 (17·5)	0·60 (6·0)

NOTE — It is left to the option of the manufacturer to test the pipes at higher test pressure at works than that specified above.

8. SIZES

8.1 The dimensions of pipes, sockets and spigots shall conform to the sizes specified in Tables 2 and 3.

9. TOLERANCE

9.1 Tolerance on External Diameter of the Barrel, the Internal Diameter of the Socket and the Depth of the Socket — The tolerance for lead jointing shall be as follows:

Dimension	*Nominal Diameter DN*	*Tolerance* mm
a) External diameter of barrel (*DE*)	All diameters	$\pm \frac{1}{2} f = \pm (4{\cdot}5 + 0{\cdot}001\,5\,DN)$
b) Internal diameter of socket (*DI*)	All diameters	$\pm \frac{1}{2} f = \pm (3 + 0{\cdot}001\,DN)$
c) Depth of socket (*P*)	Up to and including 600 mm	± 5
	Over 600 mm	± 10

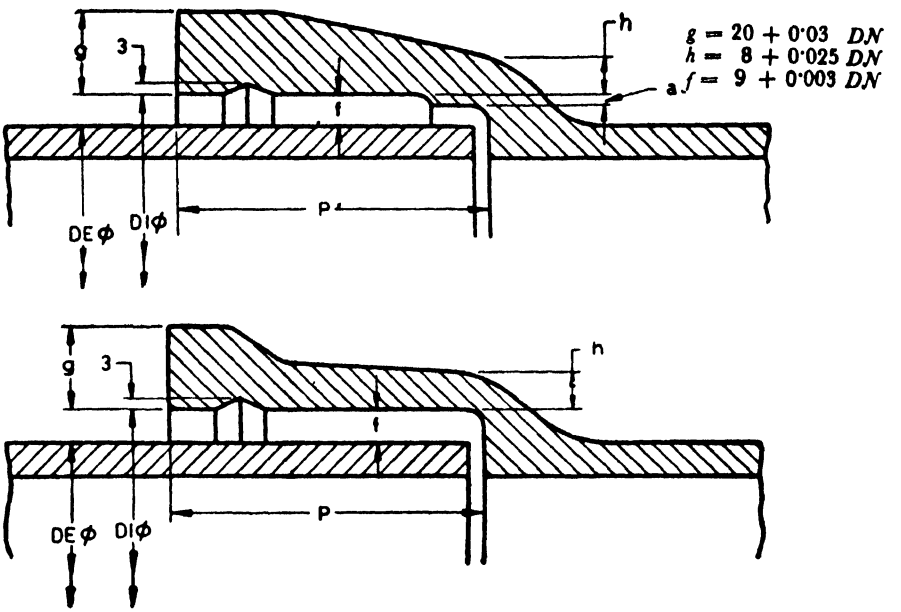
NOTE 1 — '*f*' is the caulking space of the joint in millimetres and is equal to $9 + 0{\cdot}003\,DN$.

NOTE 2 — The jointing tolerances applicable to rubber joints (mechanical or push-in joints) shall be as specified by their manufacturers and shall be within the tolerances specified above.

TABLE 2 DIMENSIONS OF SOCKETS AND SPIGOTS OF LOW PRESSURE PIPES (LEAD JOINT)

(*Clause* 8.1)

All dimensions in millimetres.



Nominal Diameter	Barrel	Socket					Joint Thickness
DN	*DE*	*DI*	*P*	*g**	*h**	*a*	*f*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
80	98	116	84	22·5	10	3	9
100	118	137	88	23	10·5	3	9·5
125	144	163	91	24	11	3	9·5
150	170	189	94	24·5	12	3	9·5
200	222	241	100	26	13	3	9·5
250	274	294	103	27·5	14·5	3·5	10
300	326	346	105	29	15·5	3·5	10
350	378	398	107	30·5	17	3·5	10
400	429	449	110	32	18	3·5	10
450	480	501	112	33·5	19	3·5	10·5
500	532	553	115	35	20·5	3·5	10·5
600	635	657	120	38	23	3·5	11
700	738	760	122	41	25·5	3·5	11
750	790	813	123	42·5	27	4	11·5

*Dimensional figures *g* and *h* do not affect interchangeability, they only indicate minimum permissible thicknesses.

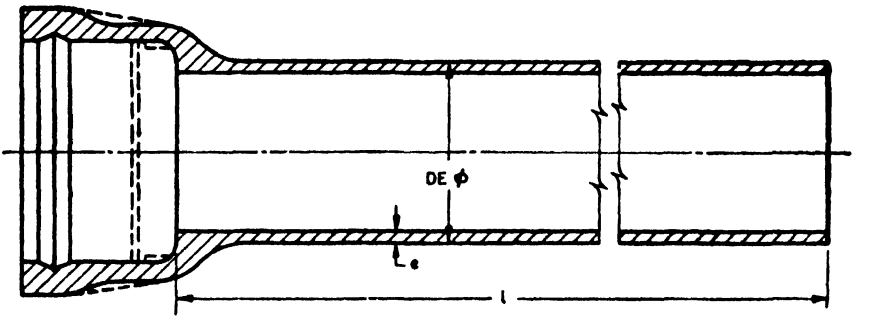
TABLE 3 DIMENSIONS OF SOCKET AND SPIGOT LOW PRESSURE PIPES — CLASS LP

(*Clause* 8.1)

$e = 7/12 (7 + 0{\cdot}02\ DN)$ for 80 mm to 300 mm *DN*

$e = 7{\cdot}5/12 (7 + 0{\cdot}02\ DN)$ for 350 mm to 450 mm *DN*

$e = 8/12 (7 + 0{\cdot}02\ DN)$ for 500 mm to 750 mm *DN*



Nominal Diameter (*DN*)	Barrel		Mass per Metre (Approx)	Mass of Socket (Approx)	Total Mass for One Working Length, *l*, in Metres			
	DE	*e*			3·66	4·00	4·88	5·5
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
mm	mm	mm	kg	kg	kg	kg	kg	kg
80	98	4·9	10·25	5·5	43	46·5	55·5	62
100	118	5·1	12·94	7·1	54	59	70	78
125	144	5·4	16·82	9·2	71	76	91	102
150	170	5·7	21·04	11·5	88·5	96	114	127
200	222	6·5	31·48	16·8	132	143	170	190
250	274	7·0	42·00	22·9	177	191	228	254
300	326	7·6	54·27	29·8	228	247	295	328
350	378	8·8	72·20	37·5	302	326	390	434·6
400	429	9·4	87·70	46·3	367	397	474	529
450	480	10·0	105·70	56·0	443	479	572	637
500	532	11·4	132·20	66·0	550	595	711	793
600	635	12·6	175·80	89·3	733	792	947	1 056
700	738	14·0	226·60	116·8	946	1 023	1 223	1 383
750	790	14·6	253·40	131·7	1 059	1 145	1 368	1 526

NOTE — Efforts should be made by the manufacturers to supply pipes in multiples of 0·5 m length starting from 3 m onwards.

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

9.2 Tolerance on Thickness — The tolerance on the wall thickness of pipes shall be as follows:

Dimension	*Tolerance*, mm
Wall thickness	$-(1 + 0{\cdot}05\,e)$*

where e is thickness of the wall in millimetres.

9.3 Tolerance on Length — The tolerances on length of pipes shall be as follows:

Type of Casting	*Tolerance*, mm
Socket and spigot, and plain ended pipes	± 25

Of 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:

Specified Length, m	*Decrease in Length*, m
Up to 4	0·5, 1
Over 4	0·5, 1, 1·5, 2

9.4 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 fm in millimetres shall not be greater than 1·25 times the length l in metres of this pipe, thus $fm \leq 1{\cdot}25\,l$.

9.4.1 Alternatively, the following method of test may be adopted for the permissible deviation from the straight line:

'When the barrel ends of pipe (excluding the socket and taper portion) are jointed by means of a thread in tension, at place where it is concave to the maximum extent, should not have a gap more than fm between the pipe and thread where fm in mm is 1·25 times the measured length of pipe in m.'

10. MASS

10.1 The standard mass of uncoated pipes shall be those given in Table 3. The masses have been calculated, for the lengths generally used, by taking into account in each case the mass of socket fixed arbitrarily as a proportion of the mass of the pipe barrel. For this purpose the density of cast iron has been taken as 7·15 kg/dm³.

*No limit for the plus tolerances is specified.

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

10.1.2 If mutually agreed upon, pipes of a heavier mass than the maximum may be accepted, provided they comply in every other respect with the requirements of this standard.

11. COATING

11.1 Each pipe shall be coated as given under **11.2** to **11.7**.

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

11.3 Except when otherwise agreed to between the purchaser and the manufacturer, all pipes shall be coated externally and internally with the same material, the pipes being heated prior to total immersion in a bath containing a uniformly heated composition having a tar or other suitable base.

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

11.5 In all instances where the coating material has a tar or similar base, it shall be smooth and tenacious and hard enough not to flow when exposed to a temperature of 77°C but not so brittle at a temperature of 0°C as to chip off when scribed lightly with a penknife.

11.6 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 odour whatsoever to the potable water after sterilization and suitable washing of the mains.

11.7 In the case of pipes (wholly or partially coated) which are imperfectly coated or where the coating does not set or conform to the required quality, the coating shall be removed and the pipes recoated.

12. MARKING

12.1 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;

d) Mass of pipe;

e) The number of this Indian Standard; and

f) The last two digits of the year of manufacture.

AMENDMENT NO. 1 JANUARY 1989
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IS : 6163 - 1978 SPECIFICATION FOR CENTRIFUGALLY CAST (SPUN) IRON LOW PRESSURE PIPES FOR WATER, GAS AND SEWAGE

(First Revision)

[*Page* 10, *clause* **12.1** (e)] — Delete.

(SMDC9)

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12.1.1 Marking may be done:

a) on the socket faces of pipe centrifugally cast in metal mould, and

b) on the outside of the socket or on the barrel of pipe centrifugally cast in sand mould.

12.2 By agreement between the purchaser and the manufacturer, pipes complying with the requirements of this standard shall, after inspection, be legibly marked with an acceptance mark.

12.2.1 The pipes may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

APPENDIX A

(*Clause* 4.1)

MECHANICAL TESTS

A-1. RING TESTS FOR PIPES CENTRIFUGALLY CAST IN METAL MOULDS

A-1.1 Rings of approximately 25 mm width shall be cut from pipes and tested on a suitable machine. They shall be supported on two knife edges diametrically opposed and the load applied from the inside at these points (*see* Fig. 1).

A-1.1.1 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

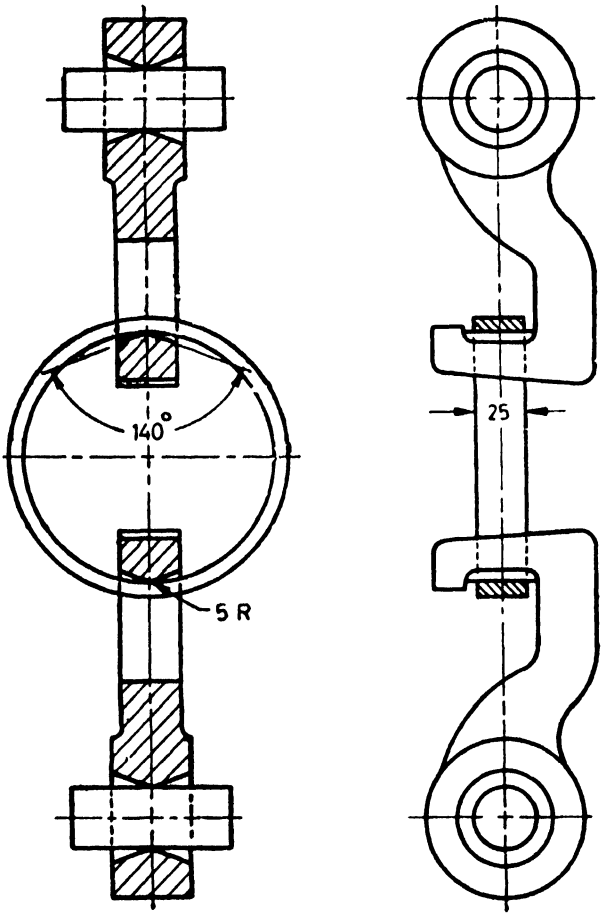
R = modulus of rupture of the ring in MPa,

P = breaking load in N,

D = external diameter of the ring in mm,

e = thickness of the wall of the ring in mm, and

b = breadth of the ring in mm.



All dimensions in millimetres.

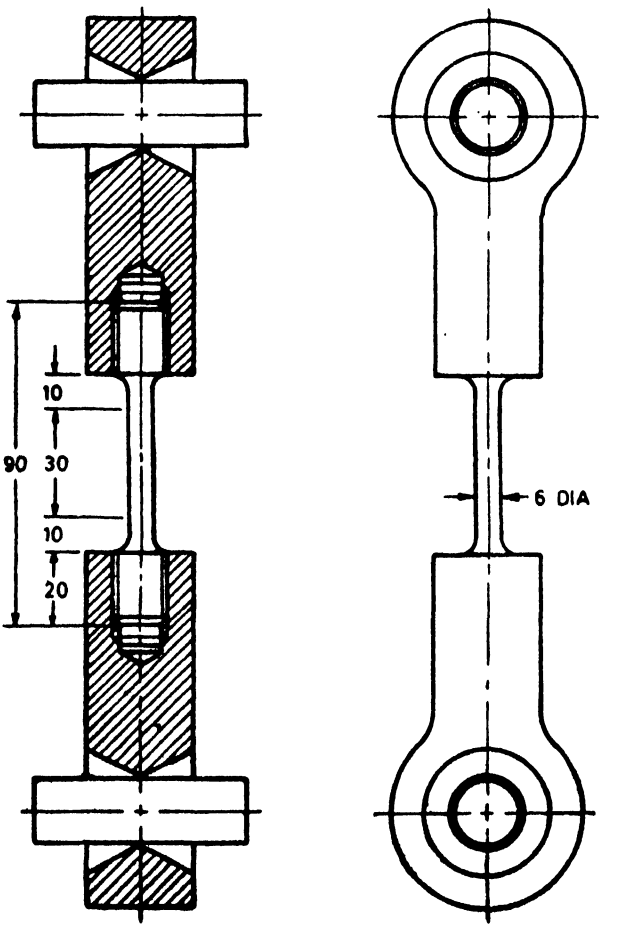
FIG. 1 RING TEST

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

A-2.1 The tensile test bars cut from the pipes are about 90 mm long, and have a 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. Figure 2 shows one satisfactory design.

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

Thickness of Pipe	*Diameter of Test Bar*	*Radius of Curvature, Min*
(1)	(2)	(3)
mm	mm	mm
Up to 13	9	32
Over 13 and up to 17	10	32
Over 17	14	32



All dimensions in millimetres.

FIG. 2 TENSILE TEST SPECIMEN

(*Continued from page* 2)

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