Indian Standard
SPECIFICATION FOR PRECAST CONCRETE PIPES (WITH AND WITHOUT REINFORCEMENT)
(Third Revision)

Second Reprint AUGUST 1997

UDC 621.643.2 [666.972]

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Indian Standard

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0. FOREWORD

0.1 This Indian Standard (Third Revision) was adopted by the Bureau of Indian Standards on 15 November 1988, after the draft finalized by the Cement and Concrete Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 Reinforced cement concrete pipes are widely used for water mains, sewers, culverts and in irrigation. When used for carrying highly acidic sewage or industrial wastes, necessary precautions shall have to be taken against chemical attack and corrosion. This standard lays down the requirements of quality and dimensions of concrete pipes to serve as guidance to the manufacturers and users in producing and obtaining concrete pipes of suitable quality. Guidance regarding laying of concrete pipes is given in IS : 783-1985[1].

0.3 This standard was first published in 1956 and subsequently revised in 1961 and 1971. The present revision has been taken up with a view to incorporating the modifications found necessary as a result of experience gained with the use of this standard. The title of the standard has been modified as 'Specification for precast concrete pipes (with and without reinforcement)'.

0.3.1 This revision incorporates a number of changes, the most important of them being:

a) Allowing the use of cements conforming to IS : 8041-1978[2], IS : 8043-1978[3] and IS : 8112-1976[4] for the manufacture of concrete pipes;

b) Allowing the use of wire fabric conforming to IS : 1566-1982[5], deformed bars and wires conforming to IS : 1786-1985[1] and structural steel bars conforming to IS : 226-1975[2] for manufacture of concrete pipes;

c) Class NP4 pipes given in the earlier standard have been deleted and class NP3 pipes of the earlier standard have been re-designated as class NP4 after incorporating a new class, medium-duty non-pressure pipes which have been designated as class NP3. The table for the earlier class NP3 pipes, which in this revision have been re-designated as class NP4, has been modified so as to make it suitable for railway loading also and additional sizes have been included. Longitudinal and spiral reinforcement for different classes of pipes and three edge bearing test load of class NP2 pipes have also been modified in this revision. Reinforcement to be provided in socket of different classes of pipes for rubber ring joint have also been included in this revision;

d) Inclusion of details for spigot and socket ends for all the classes of pipes and details of flush type joints for the non-pressurepipes;

e) Inclusion of figures illustrating some typical arrangements of reinforcement in socket;

f) Deletion of sand bearing test and bursting test from this standard. Bursting test has been replaced by splitting tensile strength test of concrete cylinders for pressure pipes;

g) Modification in the length of pipes allowing the manufacturer to declare the effective length which shall be between 1·0 and 4·0 m;

h) Modification in different design requirements of the pipes;

j) Inclusion of larger diameter pipes for all classes of pipes except for class NP1 and P1;

[1]Code of practice for laying of concrete pipes (*first revision*).

[2]Specification for rapid hardening Portland cement (*first revision*).

[3]Specification for hydrophobic Portland cement (*first revision*).

[4]Specification for 43 grade ordinary Portland cement.

[5]Specification for hard-drawn steel wire fabric for concrete reinforcement (*second revision*).

[1]Specification for high strength deformed steel bars and wires for concrete reinforcement (*third revision*).

[2]Specification for structural steel (standard quality) (*fifth revision*).

k) Inclusion of a clause on repair of pipes; and

m) Modification in sampling and inspection of pipes.

0.3.2 In order to accommodate the existing moulds used by the manufacturers for manufacturing class NP3 pipes given in the earlier standard, the diameters of class NP3 and NP4 pipes in this revision have been given as nominal internal diameters. The actual internal diameters of these pipes are, therefore, to be declared by the manufacturers. However, the manufacturers should gradually change their moulds as it has been desired that after 1995, these nominal internal diameters should be treated as actual internal diameters with tolerances specified in this standard and such moulds should be made suitable for manufacturing pipes with flexible rubber ring joints.

0.4 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[1]. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

[1]Rules for rounding off numerical values (*revised*).

1. SCOPE

1.1 This standard covers the requirements for reinforced and unreinforced precast cement concrete pipes, of both pressure and non-pressure varieties used for water mains, sewers, culverts and irrigation.

1.2 Prestressed concrete pipes and pipes with non-circular section are not covered by this standard.

2. TERMINOLOGY

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

2.1 Working Pressure — It is the maximum sustained internal pressure excluding abnormal conditions such as surge (water hammer), to which the pipeline may be subjected when in use.

2.2 Site Test Pressure — It is the pressure to be applied to the pipeline or sections thereof, after laying, to test its strength and watertightness.

NOTE — The site test pressure to be imposed will have to be determined when placing orders for pipes and fittings. In general, this pressure should not be less than the maximum pipelines operating pressure plus the calculated surge pressure but in no case should exceed the hydrostatic test pressure.

2.3 Hydrostatic Test Pressure — It is the maximum pressure which the pipe can withstand without any leakage when tested for hydrostatic pressure in accordance with this standard and IS : 3597-1985[1].

2.4 Surge (Water Hammer) Pressure — It is the pressure which is produced by a change of velocity of the moving stream and becomes maximum when there is a sudden stoppage which may be caused by the closing of a valve or by shutting down a pump station.

3. CLASSIFICATION

3.1 For the purpose of this standard, concrete pipes shall be classified as under:

Class	*Description*	*Conditions Where Normally Used*
NP1	Unreinforced concrete non-pressure pipes	For drainage and irrigation use, above ground or in shallow trenches
NP2	Reinforced concrete, light-duty, non-pressure pipes	For drainage and irrigation use, for culverts carrying light traffic
NP3	Reinforced concrete, medium-duty, non-pressure pipes	For drainage and irrigation use for culverts carrying medium traffic
NP4	Reinforced concrete, heavy-duty, non-pressure pipes	For drainage and irrigation use, for culvert carrying heavy traffic, such as, railway loading
P1	Reinforced concrete pressure pipes tested to a hydrostatic pressure of 0·2 MPa (20 m head)	For use on gravity mains, the site test pressure not exceeding two-thirds of the hydrostatic test pressure
P2	Reinforced concrete pressure pipes tested to a hydrostatic pressure of 0·4 MPa (40 m head)	For use on pumping mains, the site test pressure not exceeding half of the hydrostatic test pressure
P3	Reinforced concrete pressure pipes tested to a hydrostatic pressure of 0·6 MPa (60 m head)	do

NOTE — The uses are only by way of recommendations as a general guidance and the exact usage shall be decided by the engineer-in-charge.

3.2 Unreinforced and reinforced concrete non-pressure pipes shall be capable of withstanding a test pressure of 0·07 MPa (7 m head).

[1]Methods of test for concrete pipes (*first revision*).

4. MATERIALS

4.1 For precast concrete pipes, materials complying with the requirements given in **4.2** to **4.6** shall be used.

4.2 Cement — Cement used for the manufacture of unreinforced and reinforced concrete pipes shall conform to IS : 269-1976[1] or IS : 455-1976[2] or IS : 1489-1976[3] or IS : 8041-1978[4] or IS : 8043-1978[5] or IS : 8112-1976[6].

NOTE — The use of pozzolana as an admixture to Portland cement is not permitted. Unless otherwise specified by the purchaser, the type of cement to be used is left to the discretion of the manufacturer.

4.3 Aggregates — Aggregates used for the manufacture of unreinforced and reinforced concrete pipes shall conform to IS : 383-1970[7]. The maximum size of aggregate should not exceed one third the thickness of the pipe or 20 mm, whichever is smaller.

4.4 Reinforcement — Reinforcement used for the manufacture of the reinforced concrete pipes shall be mild steel Grade 1 or medium tensile steel bars conforming to IS : 432 (Part 1)-1982[8] or hard-drawn steel wire conforming to IS : 432 (Part 2)-1982[9] or structural steel (standard quality) bars conforming to IS : 226-1975[10]. Where soft grade wire is used, it shall conform to IS : 280-1978[11].

NOTE — Wire fabric conforming to IS : 1566-1982[12] or deformed bars and wires conforming to IS : 1786-1985[13] may also be used.

4.5 Concrete or Mortar — Concrete used for the manufacture of unreinforced and reinforced concrete pipes and collars shall conform to IS : 456-1978[14].

[1]Specification for ordinary and low heat Portland cement (*third revision*).

[2]Specification for Portland slag cement (*third revision*).

[3]Specification for Portland pozzolana cement (*second revision*).

[4]Specification for rapid hardening Portland cement (*first revision*).

[5]Specification for hydrophobic Portland cement (*first revision*).

[6]Specification for 43 grade ordinary Portland cement (*first revision*).

[7]Specification for coarse and fine aggregates from natural sources for concrete (*second revision*).

[8]Specification for mild steel and medium tensile steel bars and hard-drawn steel wires for concrete reinforcement: Part 1 Mild steel and medium tensile steel bars (*third revision*).

[9]Specification for mild steel and medium tensile steel bars and hard-drawn steel wires for concrete reinforcement: Part 2 Hard-drawn steel wire (*third revision*).

[10]Specification for structural steel (standard quality) (*fifth revision*).

[11]Spectification for mild steel wire for general engineering purposes (*third revision*).

[12]Specification for hard-drawn steel wire fabric for concrete reinforcement (*second revision*).

[13]Specification for high strength deformed steel bars and wires for concrete reinforcement (*third revision*).

[14]Code of practice for plain and reinforced concrete (*third revision*).

4.5.1 The concrete for non-pressure pipes shall have a minimum cement content of 360 kg/m^3 and a minimum compressive strength of 20 N/mm^2 at 28 days. If mortar is used, it shall have a minimum cement content of 450 kg/m^3 and a compressive strength not less than 20 N/mm^2 at 28 days. The concrete for pressure pipes shall have a minimum cement content of 450 kg/m^3 and a minimum compressive strength of 25 N/mm^2 at 28 days. If mortar is used, it shall have a minimum cement content of 600 kg/m^3 and a compressive strength not less than 25 N/mm^2 at 28 days.

Where the process of manufacture is such that the strength of concrete or mortar in the pipe differs from that given by tests on cubes, the two may be related by a suitable conversion factor. If the purchaser requires evidence of this factor, he shall ask for it before placing the order. The conversion factor for 28 days compressive strength for spun concrete may be taken as 1·25 in the absence of any data.

4.5.2 For pressure pipes splitting tensile strength of concrete cylinders at 28 days, when tested in accordance with IS : 5816-970[1], shall be 2·5 N/mm^2.

4.5.3 Compressive strength tests shall be conducted on 15 cm cubes in accordance with the relevant requirements of IS : 456-1978[2] and IS : 516-1959[3].

4.5.4 The manufacturer shall give a certificate indicating the quantity of cement in the concrete mix.

4.6 Rubber Ring — Rubber ring chords used in pipe joints shall conform to Type 1A of IS : 5382-1967[4].

5. DESIGN

5.1 General — Reinforced concrete pipes either spun or cast shall be designed such that the maximum tensile stress in the circumferential steel due to specified hydrostatic test pressure does not exceed the limit of 125 N/mm^2 in the case of mild steel rods, 140 N/mm^2 in the case of hard-drawn steel wires and high strength deformed steel bars and wires.

5.1.1 The barrel thickness shall be such that under the specified hydrostatic test pressure, the maximum tensile stress in concrete, when considered as effective to take stress along with the tensile reinforcement, shall not exceed 2 N/mm^2 but the wall thickness shall be not less than those given in Tables 1 to 7 subject to 7.2(c).

[1]Method of test for splitting tensile strength of concrete cylinders.

[2]Code of practice for plain and reinforced concrete (*third revision*).

[3]Methods of test for strength of concrete.

[4]Specification for rubber sealing rings for gas mains, water mains and sewers.

5.1.2 Pipes of length above 3 m and up to 4 m may be supplied by agreement between the user and the supplier and for such pipes, the quantity of reinforcement shall be modified as below:

Longitudinal reinforcement — Reinforced cement concrete pipes of lengths up to 4 m may be accepted if the longitudinal reinforcement is increased in proportion to the square of length compared with what is used for 3 m length as specified in Tables 2 to 7.

For '*L*' (in metre) length of pipe, longitudinal reinforcement shall be $\frac{L^2}{3^2}$ times the longitudinal reinforcement used for 3 m long pipes.

5.1.3 Longitudinal reinforcement shall be provided to ensure rigidity and correct location of cages (grids) longitudinally and to limit the effects of transverse cracking. Minimum longitudinal reinforcement shall be as given in Table 2 to 7.

5.2 Reinforcement — The reinforcement in the reinforced concrete pipe shall extend throughout the length of the pipe and shall be so designed that it may be readily placed and maintained to designed shape and in the proper position within the pipe mould during the manufacturing process. The circumferential and longitudinal reinforcement shall be adequate to satisfy the requirements specified under **5.1**.

5.2.1 The pitch of circumferential reinforcement shall be not more than the following:

a) 200 mm for pipes of nominal internal diameter 80 to 150 mm,

b) 150 mm for pipes of nominal internal diameter 200 to 350 mm, and

c) 100 mm for pipes of nominal internal diameter 400 mm and above.

The pitch shall also be not less than the maximum size of aggregate plus the diameter of the reinforcement bar used.

5.2.2 The quantity and disposition of steel in pipes may be decided by mutual agreement between the purchaser and the supplier; however, it shall be proved by calculations and tests that the quality of the pipes conforms to all the requirements specified in the standard. In the absence of calculations and tests, the reinforcement given in Tables 2 to 7 shall be used as minimum reinforcement.

5.2.3 If so required by the purchaser, the manufacturer shall give a certificate indicating the details relating to quality, quantity and dispersion of steel in the pipes as well as the clear cover to the steel provided in the pipe.

5.3 Ends of Pipes — The ends of concrete pipes shall be suitable for flush (*see* Fig. 1), collar (*see* Fig. 2), socket and spigot, roll on joints or confined gasket joints. Dimensions of collars shall be according to details given in Tables 1 and 2. The reinforcement for the collars shall be as given in Table 2. The ends of collar reinforcement shall have a full ring at both ends and the longitudinal reinforcement shall be proportional to the length of the collar. Dimensions of spigot and socket for unreinforced concrete pipes shall be as given in Table 8. Dimensions of spigot and socket for rubber ring roll on jointed pipes shall be as given in Tables 9 to 13. Reinforcement in socket of rubber ring jointed pipes shall be as given in Table 14.

NOTE 1 — Bends, junctions and specials for concrete pipes covered under this standard shall conform to the requirements of IS : 7322-1985[1].

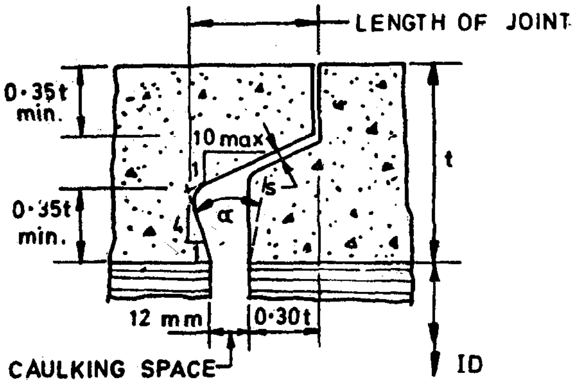
NOTE 2 — All the joints in pressure pipes shall be flexible rubber ring joints by the end of the year 1990.

NOTE 3 — Some typical arrangements of reinforcement in socket are illustrated in Fig. 3 and 4.

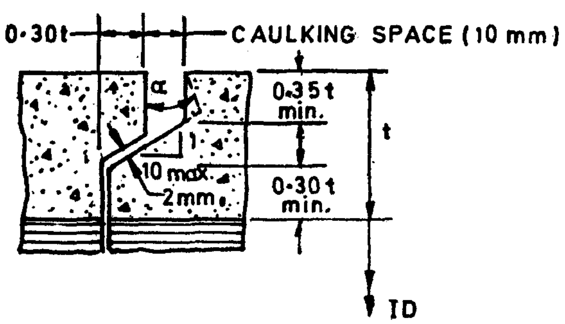
5.3.1 The pipe joints shall be capable of withstanding the same pressures as the pipe.

NOTE — The requirement of **5.3.1** does not imply that the collar shall also be tested for the test pressure for pipes specified in **3.1**, **3.2** and **9.2**.

[1]Specification for specials for steel cylinder reinforced concrete pipes (*first revision*).



1A Internal Flush Joints



1B External Flush Joints

t = wall thickness

s = 0·002 of internal diameter or 2 mm, *Min*

α = included angle not more than 25°

ID = internal diameter

FIG. 1 DETAILS OF FLUSH JOINTS

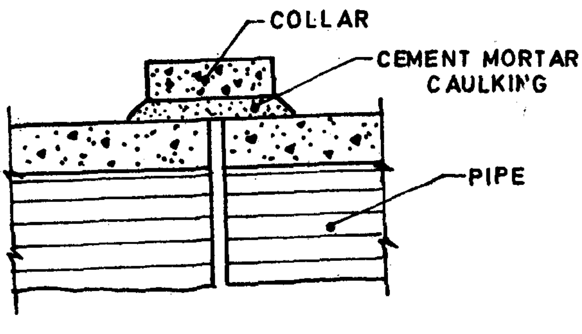
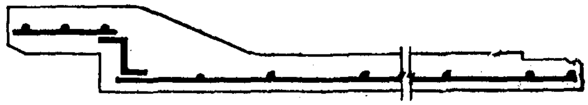


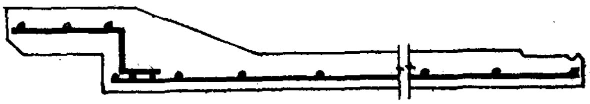
FIG. 2 COLLAR JOINT (RIGID)



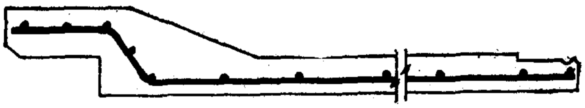
NOTE — No. of Z bars : Minimum half the number of longitudinals.

Maximum equal to number of longitudinals.

3A Socket Cage Connected to Barrel Cage by Means of Z Bars

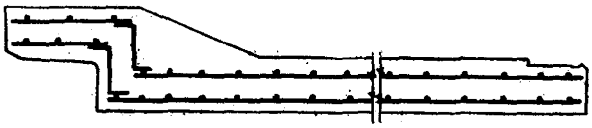


3B Socket Cage Longitudinals Suitably Bent for Connecting to Barrel Cage



3C Cage Made of Continuous Longitudinals

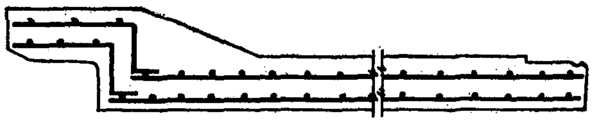
FIG. 3 TYPICAL ARRANGEMENTS OF REINFORCEMENT IN SOCKET FOR SINGLE CAGE



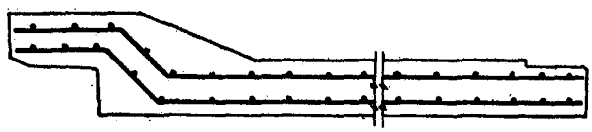
NOTE — No. of Z bars : Minimum half the number of longitudinals.

Maximum equal to number of longitudinals.

4A Socket Cage Connected to Barrel Cage by Means of Z Bars



4B Socket Cage Longitudinals Suitably Bent for Connecting to Barrel Cage



4C Cage Made of Continuous Longitudinals

FIG. 4 TYPICAL ARRANGEMENTS OF REINFORCEMENT IN SOCKET FOR DOUBLE CAGE (USE SUITABLE TYPE OF SPACERS)

TABLE 1 DESIGN AND STRENGTH TEST REQUIREMENTS OF CONCRETE PIPES OF CLASS NP1 — UNREINFORCED NON-PRESSURE PIPES

(*Clauses* 5.1.1, 5.3 *and* 7.1)

Internal Diameter of Pipes	Barrel Wall Thickness	Collar Dimensions		Minimum Length of Collar	Strength Test Requirement for Three Edge Bearing Test, Ultimate Load
		Minimum Caulking Space	Minimum Thickness		
(1)	(2)	(3)	(4)	(5)	(6)
mm	mm	mm	mm	mm	kN/linear metre
80	25	13	25	150	15·3
100	25	13	25	150	15·3
150	25	13	25	150	15·3
200	25	13	25	150	16·4
225	25	13	25	150	16·4
250	25	13	25	150	16·4
300	30	16	30	150	17·6
350	32	16	32	150	18·4
400	32	16	32	150	18·8
450	35	19	35	200	21·9

TABLE 2 DESIGN AND STRENGTH TEST REQUIREMENTS OF CONCRETE PIPES OF CLASS NP2 — REINFORCED CONCRETE, LIGHT-DUTY, NON-PRESSURE PIPES

(*Clauses* 5.1.1, 5.1.2, 5.1.3, 5.2.2, 5.3, 6.3.2 *and* 7.1)

Internal Diameter of Pipes		Barrel Wall Thickness	Collar Dimensions			Reinforcements				Strength Test Requirements for Three Edge Bearing Test	
						Longitudinal, Mild Steel or Hard-Drawn Steel		Spirals, Hard-Drawn Steel			
Nominal	Actual		Minimum Caulking	Mini mum Thickness	Minimum Length			For pipe	For collar	Load to Produce 0·25 mm Crack	Ultimate Load
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
mm	mm	mm	mm	mm	mm	*Min* number	kg/linear metre	kg/linear metre	kg/No.	kN/linear metre	kN/linear metre
80	80	25	13	25	150	6	0·33	0·10	0·13	10·05	15·08
100	100	25	13	25	150	6	0·33	0·12	0·14	10·05	15·08
150	150	25	13	25	150	6	0·33	0·24	0·19	10·79	16·19
200	200	25	13	25	150	6	0·33	0·38	0·22	11·77	17·66
225	225	25	13	25	150	6	0·33	0·46	0·24	12·26	18·39
250	250	25	13	25	150	6	0·33	0·58	0·26	12·55	18·83
300	300	30	16	30	150	8	0·78	0·79	0·71	13·48	20·22
350	350	32	16	32	150	8	0·78	1·13	0·79	14·46	21·69
400	400	32	16	32	150	8	0·78	1·49	0·88	15·45	23·18
450	450	35	19	35	200	8	0·78	1·97	1·48	16·18	24·27
500	500	35	19	35	200	8	0·78	2·46	1·61	17·16	25·74
600	590	45	19	40	200	8	0·78	3·47	1·89	18·88	28·32
700	680	50	19	40	200	8	1·22	4·60	2·27	20·35	30·53
800	790	50	19	45	200	8	1·22	6·71	2·71	21·57	32·36
900	890	55	19	50	200	8	1·22	9·25	3·26	22·80	34·20
1 000	990	60	19	55	200	8	1·76	10·69	3·64	24·27	36·41
1 100	1 090	65	19	60	200	8	1·76	12·74	4·06	25·50	38·25
1 200	1 190	70	19	65	200	8	1·76	15·47	4·52	26·97	40·46
1 400	1 400	75	19	75	200	12	2·64	20·57	5·68	29·42	44·13
1 600	1 600	80	19	80	200	8+8	3·52	25·40	7·20	32·12	48·18
1 800	1 800	90	19	90	200	8+8	3·52	32·74	11·11	35·06	52·59
2 000	2 000	100	19	100	200	12+12	5·28	45·14	14·00	37·76	56·64
2 200	2 200	110	19	110	200	12+12	5·28	56·37	17·00	40·21	60·32

NOTE 1 — If mild steel is used for spiral reinforcement, the weight specified under col 9 and 10 shall be increased to 140/125.

NOTE 2 — Soft grade mild steel wire for spirals may be used for pipes of internal diameters 80 mm, 100 mm and 150 mm only, by increasing weight to 140/84.

NOTE 3 — The longitudinal reinforcement given in this table is valid for pipes up to 2 m effective length for internal diameter of pipe up to 250 mm and up to 3 m effective length for higher diameter pipes.

TABLE 3 DESIGN AND STRENGTH TEST REQUIREMENTS OF CONCRETE PIPES OF CLASS NP3 — REINFORCED CONCRETE, MEDIUM-DUTY, NON-PRESSURE PIPES

(*Clauses* 5.1.1, 5.1.2, 5.1.3, 5.2.2, 6.3.2 *and* 7.1)

Nominal Internal Diameter of Pipes	Barrel Wall Thickness	Reinforcements: Longitudinal, Mild Steel or Hard-Drawn Steel		Reinforcements: Spiral, Hard-Drawn Steel	Strength Test Requirements for Three Edge Bearing Test: Load to Produce 0·25 mm Crack	Strength Test Requirements for Three Edge Bearing Test: Ultimate Load
(1)	(2)	(3)	(4)	(5)	(6)	(7)
mm	mm	*Min* number	kg/linear metre	kg/linear metre	kN/linear metre	kN/linear metre
80	25	6	0·33	0·15	13·00	19·50
100	25	6	0·33	0·22	13·00	19·50
150	25	6	0·33	0·46	13·70	20·55
200	30	6	0·33	0·81	14·50	21·75
225	30	6	0·33	1·03	14·80	22·20
250	30	6	0·33	1·24	15·00	22·50
300	40	8	0·78	1·80	15·50	23·25
350	75	8	0·78	2·95	16·77	25·16
400	75	8	0·78	3·30	19·16	28·74
450	75	8	0·78	3·79	21·56	32·34
500	75	8	0·78	4·82	23·95	35·93
600	85	6+6	1·18	7·01	28·74	43·11
700	85	6+6	1·18	10·27	33·53	50·30
800	95	6+6	2·66	13·04	38·32	57·48
900	100	6+6	2·66	18·30	43·11	64·67
1 000	115	6+6	2·66	21·52	47·90	71·85
1 100	115	6+6	2·66	27·99	52·69	79·00
1 200	120	8+8	3·55	33·57	57·48	86·22
1 400	135	8+8	3·55	46·21	67·06	100·60
1 600	140	8+8	3·55	65·40	76·64	114·96
1 800	150	12+12	9·36	87·10	86·22	129·33
2 000	170	12+12	9·36	97·90	95·80	143·70
2 200	185	12+12	9·36	113·30	105·38	158·07
2 400	200	12+12	14·88	146·61	114·96	172·44
2 600	215	12+12	14·88	175·76	124·54	186·81

NOTE 1 — The actual internal diameter is to be declared by the manufacturer and the tolerance is to be applied on the declared diameter (*see also* 0.3.2).

NOTE 2 — Minimum thickness and minimum length of collars shall be the same as that for the next higher size available in NP2 class pipes corresponding to the calculated inner diameter of collars.

NOTE 3 — The longitudinal reinforcement given in this table is valid for pipes up to 2 m effective length for internal diameter of pipe up to 250 mm and up to 3 m effective length for higher diameter pipes.

NOTE 4 — Concrete for pipes above 1 800 mm nominal diameter shall have a minimum compressive strength of 35 N/mm² at 28 days and a minimum cement content of 400 kg/m³.

NOTE 5 — If mild steel is used for spiral reinforcement, the weight specified in col 5 shall be increased to 140/125.

TABLE 4 DESIGN AND STRENGTH TEST REQUIREMENTS OF CONCRETE PIPES OF CLASS NP4 — REINFORCED CONCRETE, HEAVY-DUTY, NON-PRESSURE PIPES

(*Clauses* 5.1.1, 5.1.2, 5.1.3, 5.2.2, 6.3.2 *and* 7.1)

Under Review

TABLE 5 DESIGN AND STRENGTH TEST REQUIREMENTS OF CONCRETE PIPES OF CLASS P1 — REINFORCED CONCRETE PRESSURE PIPES SAFE FOR 0·2 MPa PRESSURE TEST

(*Clauses* 5.1.1, 5.1.2, 5.1.3, 5.2.2, 6.3.2 *and* 7.1)

Internal Diameter of Pipes	Barrel Wall Thickness	Reinforcements		
		Longitudinal, Mild Steel or Hard-Drawn Steel		Spiral, Hard-Drawn Steel
(1)	(2)	(3)	(4)	(5)
mm	mm	*Min* number	kg/linear metre	kg/linear metre
80	25	6	0·33	0·15
100	25	6	0·33	0·22
150	25	6	0·33	0·46
200	25	6	0·33	0·79
225	25	6	0·33	1·00
250	25	6	0·33	1·22
300	30	8	0·78	1·75
350	32	8	0·78	2·37
400	32	8	0·78	3·05
450	35	8	0·78	3·86
500	35	8	0·78	4·72
600	40	8	0·78	6·79
700	40	8	1·22	9·15
800	45	8	1·22	11·94
900	50	8	1·22	15·12
1 000	55	8	1·76	18·64
1 100	60	8	1·76	22·88
1 200	65	8	1·76	26·82

NOTE 1 — Strength requirements for pressure pipes shall be the same as for NP2 class pipes.

NOTE 2 — If mild steel is used for spiral reinforcement, the weight specified under col 5 shall be increased to 140/125.

NOTE 3 — Soft grade mild steel wire for spirals may be used for pipes of internal diameters 80 mm, 100 mm and 150 mm only, by increasing weight to 140/84.

NOTE 4 — The longitudinal reinforcement given in this table is valid for pipes up to 2 m effective length for internal diameter of pipe up to 250 mm and up to 3 m effective length for higher diameter pipes.

TABLE 6 DESIGN AND STRENGTH TEST REQUIREMENTS OF CONCRETE PIPES OF CLASS P2 — REINFORCED CONCRETE PRESSURE PIPES SAFE FOR 0·4 MPa PRESSURE TEST

(*Clauses* 5.1.1, 5.1.2, 5.1.3, 5.2.2, 6.3.2 *and* 7.1)

Internal Diameter of Pipes	Barrel Wall Thickness	Reinforcements		
		Longitudinal, Mild Steel or Hard-Drawn Steel		Spiral, Hard-Drawn Steel
(1)	(2)	(3)	(4)	(5)
mm	mm	*Min* number	kg/linear metre	kg/linear metre
80	25	6	0·33	0·29
100	25	6	0·33	0·45
150	25	6	0·33	0·93
200	30	6	0·33	1·63
225	30	6	0·33	2·03
250	30	6	0·33	2·47
300	40	8	0·78	3·61
350	45	8	0·78	4·88
400	50	8	0·78	6.36
450	50	8	0·78	7·96
500	55	8	0·78	9·80
600	65	8	1·76	14·10
700	70	8	1·76	21·90
800	80	6+6	2·66	28·54
900	90	6+6	2·66	35·92
1 000	100	6+6	2·66	43·48

NOTE 1 — Strength requirements for pressure pipes shall be the same as for NP2 class pipes.

NOTE 2 — If mild steel is used for spiral reinforcement, the weight specified under col 5 shall be increased to 140/125.

NOTE 3 — Soft grade mild steel wire for spirals may be used for pipes of internal diameters 80 mm, 100 mm and 150 mm only, by increasing weight to 140/84.

NOTE 4 — The longitudinal reinforcement given in this table is valid for pipes up to 2 m effective length for internal diameter of pipe up to 250 mm and up to 3 m effective length for higher diameter pipes.

TABLE 7 DESIGN AND STRENGTH TEST REQUIREMENTS OF CONCRETE PIPES OF CLASS P3 — REINFORCED CONCRETE PIPES SAFE FOR 0·6 MPa PRESSURE TEST

(*Clauses* 5.1.1, 5.1.2, 5.1.3, 5.2.2, 6.3.2 *and* 7.1)

Internal Diameter of Pipes	Barrel Wall Thickness	Reinforcements		
		Longitudinal, Mild Steel or Hard-Drawn Steel		Spiral, Hard-Drawn Steel
(1)	(2)	(3)	(4)	(5)
mm	mm	*Min* number	kg/linear metre	kg/linear metre
80	25	6	0·33	0·45
100	25	6	0·33	0·66
150	25	6	0·33	1·39
200	35	6	0·33	2·49
225	35	6	0·33	3·10
250	35	6	0·33	3·78
300	45	8	0·78	5·49
350	55	8	0·78	7·52
400	60	8	0·78	9·78
450	70	8	0·78	13·06
500	75	8	0·78	15·96
600	90	6+6	2·66	22·63
700	105	6+6	2·66	30·82
800	120	6+6	2·66	39·46

NOTE 1 — Strength requirements for pressure pipes shall be the same as for NP2 class pipes.

NOTE 2 — If mild steel is used for spiral reinforcement, the weight specified under col 5 shall be increased to 140/125.

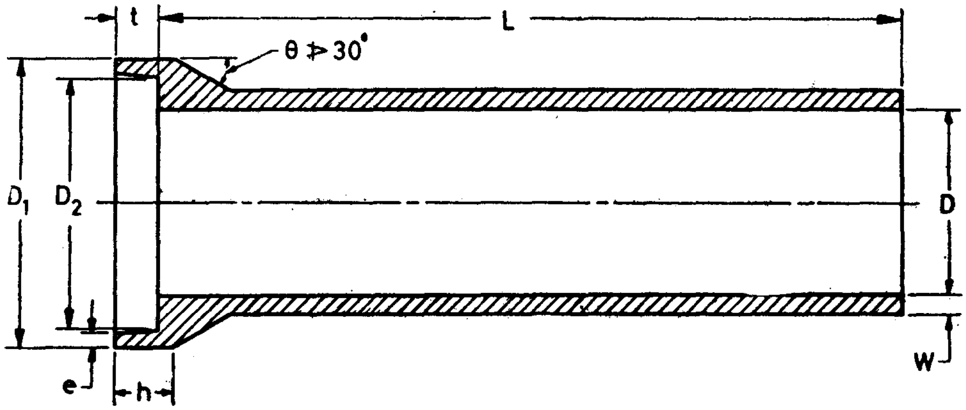
NOTE 3 — Soft grade mild steel wire for spirals may be used for pipes of internal diameters 80 mm, 100 mm and 150 mm only, by increasing weight to 140/84.

NOTE 4 — The longitudinal reinforcement given in this table is valid for pipes up to 2 m effective length for internal diameter of pipe up to 250 mm and up to 3 m effective length for higher diameter pipes.

TABLE 8 SPIGOT AND SOCKET DIMENSIONS OF NP1 CLASS PIPES

(*Clause* 5.3)

All dimensions in millimetres.

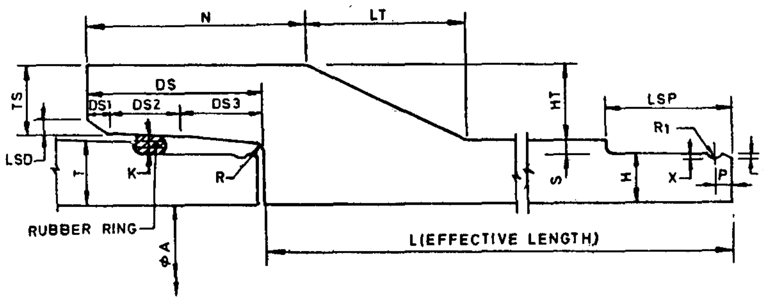


D	*W*	D_1	D_2	*e*	*h*	*t*
(1)	(2)	(3)	(4)	(5)	(6)	(7)
80	25	206	156	22	60	45
100	25	226	176	22	60	45
150	25	276	226	22	65	50
250	25	376	326	22	70	55
300	30	452	392	26	75	60
350	32	510	446	28	80	65
400	32	560	496	28	80	65
450	35	628	558	31	85	70

TABLE 9 SPIGOT AND SOCKET DIMENSIONS OF NP2 AND P1 CLASS PIPES (RUBBER RING ROLL ON JOINT)

(*Clauses* 5.3 *and* 7.2)

All dimensions in millimetres.



Pipe Diameter *A*	Rubber Ring Chord Diameter	Rubber Ring Internal Diameter	*T*	*TS*	*DS*	*DS1*	*DS2*	*DS3*	*R*	*LSD*	*K*	*N*	*LT*	*HT*	*LSP*	*P*	*S*	*H*	*X*	*W*	R_1
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
80	11	102	25	32·5	70	8	28	34	3	5·5	6.5	95	84	34	50	7	5·5	19·5	1	1	5·5
100	11	120	25	32·5	70	8	28	34	3	5·5	6.5	95	84	34	50	7	5·5	19·5	1	1	5·5
150	11	170	25	32·5	70	8	28	34	3	5·5	6.5	95	84	34	50	7	5·5	19·5	1	1	5·5
200	11	215	25	32·5	70	8	28	34	3	5·5	6.5	95	84	34	50	7	5·5	19·5	1	1	5·5
225	11	225	25	32·5	70	8	28	34	3	5·5	6.5	95	84	34	50	7	5·5	19·5	1	1	5·5
250	11	250	25	32·5	70	8	28	34	3	5·5	6.5	95	84	34	50	7	5·5	19·5	1	1	5·5
300	12	315	30	35	77	9	31	37	3	6	7	107	92	37	55	7.5	6	24	1	1	6
350	12	360	32	37	77	9	31	37	3	6	7	109	96	39	55	7.5	6	26	1	1	6
400	12	400	32	37	77	9	31	37	3	6	7	109	96	39	55	7.5	6	26	1	1	6
450	12	450	35	40	77	9	31	37	3	6	7	112	104	42	55	7.5	6	29	1	1	6
500	12	500	35	40	77	9	31	37	3	6	7	112	104	42	55	7.5	6	29	1	1	6
600	16	590	40	44	102	12	42	48	6	9	9·5	132	106	47	72	10	7·5	32·5	2	2	8
700	16	680	40	44	102	12	42	48	6	9	9·5	132	106	47	72	10	7·5	32·5	2	2	8
800	20	785	45	49	128	15	52	61	6	11	11·5	162	117	52	90	12·5	9·5	35·5	2	2	10
900	20	875	50	56	128	15	52	61	6	11	11·5	165	133	59	90	12·5	9·5	40·5	2	2	10
1 000	22	980	55	60	141	17	57	67	8	12	13·5	169	137	64	99	14	10·5	44·5	2	2	11
1 100	22	1 070	60	65	141	17	57	67	8	12	13·5	171	148	69	99	14	10·5	49·5	2	2	11
1 200	22	1 170	65	71	141	17	57	67	8	12	13·5	173	161	75	99	14	10·5	54·5	2	2	11
1 400	22	1 370	75	82	141	17	57	67	8	12	13·5	179	184	86	99	14	10·5	64·5	2	2	11
1 600	25	1 560	80	87	165	20	67	78	8	15	15	205	195	91	100	15	12	68	2·5	2·5	12
1 800	25	1 780	90	99	165	20	67	78	8	15	15	210	221	103	100	15	12	78	2·5	2·5	12
2 000	25	1 935	100	109	165	20	67	78	8	15	15	215	242	113	100	15	12	88	2·5	2·5	12
2 200	25	2 130	110	119	165	20	67	78	8	15	15	220	264	123	100	15	12	98	2·5	2·5	12

NOTE 1 — Corners to be rounded off.

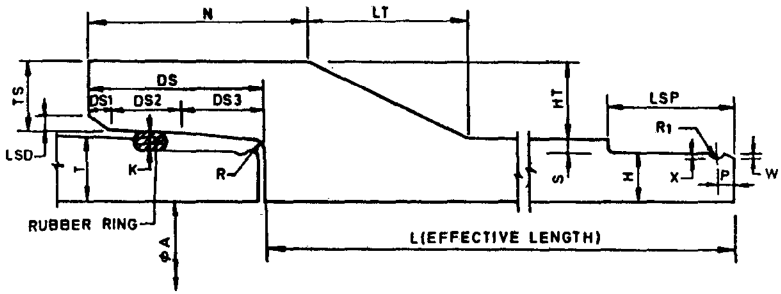
NOTE 2 — The dimensions *TS, T, H, S, HT* and *K* shall conform to the values given in this table as these are critical dimensions. Other dimensions are for guidance only. The following tolerances shall apply on the critical dimensions:

Dimensions	*Tolerances*
T and *HT*	Same as that of wall thickness given in 7.2.
TS and *H*	Half the tolerance on wall thickness given in 7.2.
K and *S*	±0·25 mm for dimensions up to and including 10 mm, and ±0·5 mm for dimensions above 10 mm, 1÷1.

TABLE 10 SPIGOT AND SOCKET DIMENSIONS OF NP3 AND NP4 CLASS PIPES (RUBBER RING ROLL ON JOINT) FROM 80 TO 900 mm DIAMETER

(*Clauses* 5.3 *and* 7.2)

All dimensions in millimetres.



Pipe Diameter *A*	Rubber Ring Chord Diameter	Rubber Ring Internal Diameter	*T*	*TS*	*DS*	*DS1*	*DS2*	*DS3*	*R*	*LSD*	*K*	*N*	*LT*	*HT*	*LSP*	*P*	*S*	*H*	*X*	*W*	R_1
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
80	11	102	25	32·5	70	8	28	34	3	5·5	6·5	95	84	34	50	7	5·5	19·5	1	1	5·5
100	11	120	25	32·5	70	8	28	34	3	5·5	6·5	95	84	34	50	7	5·5	19·5	1	1	5·5
150	11	170	25	32·5	70	8	28	34	3	5·5	6·5	95	84	34	50	7	5·5	19·5	1	1	5·5
200	11	230	30	38	83	11	38	34	5	6·5	6·5	113	97	39·5	50	7	5·5	24·5	1	1	5·5
225	11	255	30	38	83	11	38	34	5	6·5	6·5	113	97	39·5	50	7	5·5	24·5	1	1	5·5
250	11	275	30	38	83	11	38	34	5	6·5	6·5	113	97	39·5	50	7	5·5	24·5	1	1	5·5
300	12	340	40	51	90	12	42	36	6	7	7	130	130	53	55	7·5	6	34	1	1	6
350	16	435	75	75	120	16	56	48	8	10	10	158	135	78	72	10	8	67	2	2	8
400	16	480	75	75	120	16	56	48	8	10	10	158	135	78	72	10	8	67	2	2	8
450	16	525	75	75	120	16	56	48	8	10	10	158	135	78	72	10	8	67	2	2	8
500	16	570	75	75	150	16	56	48	8	10	10	158	135	78	72	10	8	67	2	2	8
600	20	675	85	85	150	20	70	60	10	12	12	193	153	88·5	90	12	10	75	2	2	10
700	20	765	85	85	150	20	70	60	10	12	12	193	153	88·5	90	12	10	75	2	2	10
800	20	875	95	95	150	20	70	60	10	12	12	197	171	98·5	90	12	10	85	2	2	10
900	20	970	100	100	150	20	70	60	10	12	12	200	180	103·5	90	12	10	90	2	2	10

Note 1 — Corners to be rounded off.

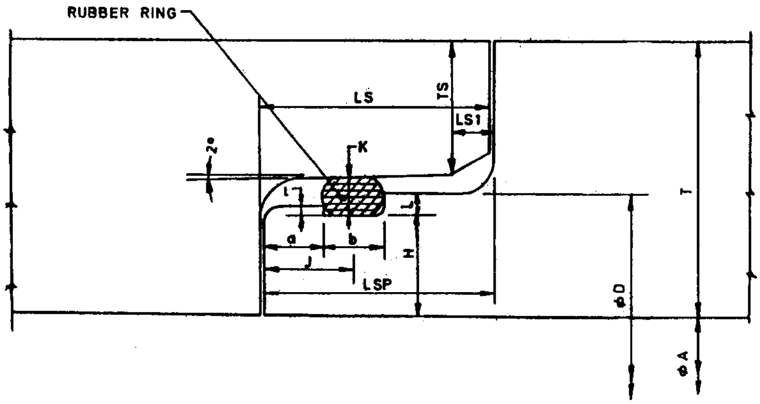
Note 2 — The dimensions *TS*, *T*, *H*, *S*, *HT* and *K* shall conform to the values given in this table as these are critical dimensions. Other dimensions are for guidance only. The following tolerances shall apply on the critical dimensions:

Dimensions	*Tolerances*
T and *HT*	Same as that of wall thickness given in 7.2.
TS and *H*	Half the tolerance on wall thickness given in 7.2.
K and *S*	±0·25 mm for dimensions up to and including 10 mm, and ± 0·5 mm for dimensions above 10 mm.

TABLE 11 SPIGOT AND SOCKET DIMENSIONS OF NP3 AND NP4 CLASS PIPES FROM 1 000 TO 2 600 mm DIAMETER (RUBBER RING CONFINED JOINT)

(*Clauses* 5.3 *and* 7.2)

All dimensions in millimetres.



Pipe Diameter *A*	Rubber Ring Chord Diameter	Rubber Ring Internal Diameter	*T*	*TS*	*LS*	*LS1*	*K*	*LSP*	*a*	*b*	*J*	*H*	*l*	*L*	Diameter *D*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
1 000	20	920	115	58	114	20	13	114	25	28	39	42	4	9	1 102
1 100	20	1 003	115	58	114	20	13	114	25	28	39	42	4	9	1 202
1 200	20	1 095	120	60·5	114	20	13	114	25	28	39	44·5	4	9	1 307
1 400	25	1 275	135	67·5	114	20	16	114	25	35	42·5	50	4	10	1 520
1 600	25	1 445	140	72·5	114	25	16	114	25	35	42·5	50	4	10	1 720
1 800	25	1 620	150	77·5	114	25	16	114	25	35	42·5	55	4	10	1 930
2 000	25	1 810	170	87·5	114	25	16	114	25	35	42·5	65	4	10	2 150
2 200	25	1 995	185	95	114	25	16	114	25	35	42·5	72·5	4	10	2 365
2 400	25	2 180	200	102·5	114	25	16	114	25	35	42·5	80	4	10	2 580
2 600	25	2 360	215	110	114	25	16	114	25	35	42·5	87·5	4	10	2 795

Note 1 — Corners to be rounded off.

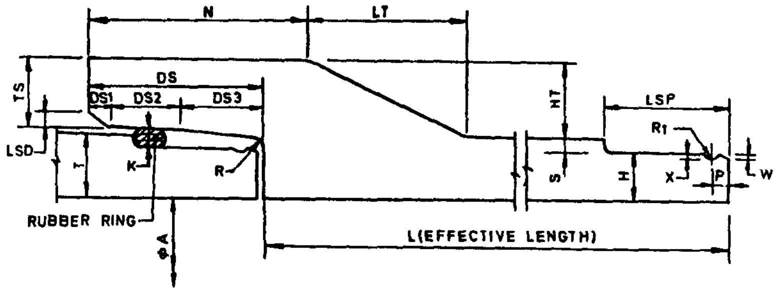
Note 2 — The dimensions *T*, *TS*, *H*, *L*, *K* and *b* shall conform to the values given in this table as these are critical dimensions. Other dimensions are for guidance only. The following tolerances shall apply on the critical dimensions:

Dimensions	*Tolerances*
T	Same as that of wall thickness given in 7.2.
H and *TS*	Half the tolerances on wall thickness given in 7.2.
K and *L*	±0·5 mm.
b	±1 mm for 28 mm and ±1·5 mm for 35 mm.

TABLE 12 SPIGOT AND SOCKET DIMENSIONS OF P2 CLASS PIPES (RUBBER RING ON JOINT)

(*Clauses* 5.3 and 7.2)

All dimensions in millimetres.



Pipe Diameter *A*	Rubber Ring Chord Diameter	Rubber Ring Internal Diameter	*T*	*TS*	*DS*	*DS1*	*DS2*	*DS3*	*R*	*LSD*	*K*	*N*	*LT*	*HT*	*LSP*	*P*	*S*	*H*	*X*	*W*	R_1
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
80	11	102	25	32·5	70	8	28	34	3	5·5	6·5	95	84	34	50	7	5·5	19·5	1	1	5·5
100	11	120	25	32·5	70	8	28	34	3	5·5	6·5	95	84	34	50	7	5·5	19·5	1	1	5·5
150	11	170	25	32·5	70	8	28	34	3	5·5	6·5	95	84	34	50	7	5·5	19·5	1	1	5·5
200	11	230	30	38	83	11	38	34	5	6.5	6·5	113	97	39·5	50	7	5·5	24·5	1	1	5·5
225	11	255	30	38	83	11	38	34	5	6·5	6·5	113	97	39·5	50	7	5·5	24·5	1	1	5·5
250	11	275	30	38	83	11	38	34	5	6·5	6·5	113	97	39·5	50	7	5·5	24·5	1	1	5·5
300	12	340	40	51	90	12	42	36	6	7	7	130	130	53	55	7·5	6	34	1	1	6
350	12	400	45	57	90	12	42	36	6	7	7	135	145	59	55	7·5	6	39	1	1	6
400	12	450	50	61	90	12	42	36	6	7	7	140	155	63	55	7·5	6	44	1	1	6
450	12	500	50	61	90	12	42	36	6	7	7	140	155	63	55	7·5	6	44	1	1	6
500	12	525	55	67	90	12	42	36	6	7	7	145	170	69	55	7·5	6	49	1	1	6
600	16	640	65	79	120	16	56	48	8	10	9·5	185	185	82	72	10	7·5	57·5	2	2	8
700	16	740	70	84	120	16	56	48	8	10	9·5	190	195	87	72	10	7·5	62·5	2	2	8
800	20	845	80	96	150	20	70	60	10	12	12	230	225	100	90	12·5	9·5	70·5	2	2	10
900	20	970	90	108	150	20	70	60	10	12	12	240	250	112	90	12·5	9·5	80·5	2	2	10
1 000	22	1 060	100	120	165	22	77	66	11	13	13	265	265	124	99	14	10·5	89·5	2	2	11

NOTE 1 — Corners to be rounded off.

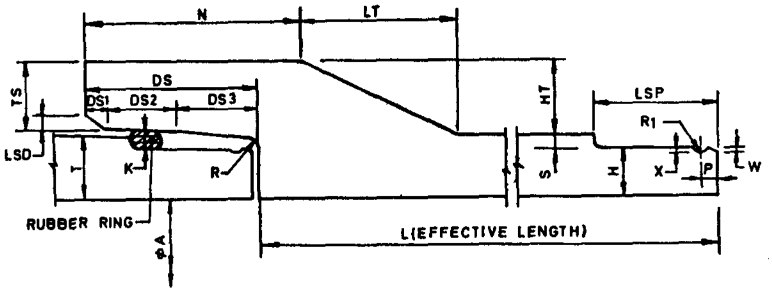
NOTE 2 — The dimensions *TS*, *T*, *H*, *S*, *HT* and *K* shall conform to the values given in this table as these are critical dimensions. Other dimensions are for guidance only. The following tolerances shall apply on the critical dimensions:

Dimensions	*Tolerances*
T and *HT*	Same as that of wall thickness given in 7.2.
TS and *H*	Half the tolerance on wall thickness given in 7.2.
K and *S*	±0·05 mm for dimensions up to and including 10 mm, and ±0·3 mm for dimensions above 10 mm.

TABLE 13 SPIGOT AND SOCKET DIMENSIONS OF P3 CLASS PIPES (RUBBER RING ROLL ON JOINT)

(*Clauses* 5.3 *and* 7.2)

All dimensions in millimeters.



Pipe Diameter A	Rubber Ring Chord Diameter	Rubber Ring Internal Diameter	*T*	*TS*	*DS*	*DS1*	*DS2*	*DS3*	*R*	*LSD*	*K*	*N*	*LT*	*HT*	*LSP*	*P*	*S*	*H*	*X*	*W*	*R1*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
80	11	102	25	32·5	70	8	28	34	3	5·5	6·5	95	84	34	50	7	5·5	19·5	1	1	5·5
100	11	120	25	32·5	70	8	28	34	3	5·5	6·5	95	84	34	50	7	5·5	19·5	1	1	5·5
150	11	170	25	32·5	70	8	28	34	3	5·5	6·5	95	84	34	50	7	5·5	19·5	1	1	5·5
200	11	230	35	45	83	11	38	34	5	6·5	6·5	120	115	46·5	50	7	5·5	29·5	1	1	5·5
225	11	255	35	45	83	11	38	34	5	6·5	6·5	120	115	46·5	50	7	5·5	29·5	1	1	5·5
250	11	275	35	45	83	11	38	34	5	6·5	6·5	120	115	46·5	50	7	5·5	29·5	1	1	5·5
300	12	340	45	60	90	12	42	36	6	7	7	135	150	62	55	7·5	6	39	1	1	6
350	12	400	55	75	90	12	42	36	6	7	7	145	190	77	55	7·5	6	49	1	1	6
400	12	450	60	80	90	12	42	36	6	7	7	150	200	82	55	7·5	6	54	1	1	6
450	12	525	70	95	90	12	42	36	6	7	7	160	240	97	55	7·5	6	64	1	1	6
500	12	570	75	100	90	12	42	36	6	7	7	165	250	102	55	7·5	6	69	1	1	6
600	16	680	90	120	120	16	56	48	8	10	9·5	190	275	123	72	10	7·5	82·5	2	2	8
700	16	805	105	140	120	16	56	48	8	0	9·5	200	320	143	72	10	7·5	97·5	2	2	8
800	20	915	120	160	150	20	70	60	10	12	12	240	365	164	90	12·5	9·5	110·5	2	2	10

NOTE 1 — Corners to be rounded off.

NOTE 2 — The dimensions *TS, T, H, S, HT* and *K* shall conform to the values given in this table as these are critical dimensions. Other dimensions are for guidance only. The following tolerances shall apply on the critical dimensions:

Dimensions	*Tolerances*
T and *HT*	Same as that of wall thickness given in **7.2**.
TS and *H*	Half the tolerance on wall thickness given in **7.2**.
K and *S*	±0·15 mm for dimensions up to and including 10 mm, and ±0·3 mm for dimensions above 10 mm.

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TABLE 14 WEIGHT OF SPIRALS (HARD-DRAWN STEEL) IN SOCKET OF R/R JOINT RCC PIPES OF DIFFERENT CLASSES (kg/NUMBER)

(*Clause* 5.3)

Internal Diameter of Pipes (mm)	NP2 Class	NP3 Class	NP4 Class	P1 Class	P2 Class	P3 Class
(1)	(2)	(3)	(4)	(5)	(6)	(7)
80	0·08	0·08	0·08	0·08	0·08	0·08
100	0·09	0·09	0·09	0·09	0·09	0·09
150	0·12	0·12	0·12	0·12	0·12	0·15
200	0·14	0·14	0·21	0·14	0·21	0·35
225	0·15	0·15	0·26	0·15	0·26	0·43
250	0·16	0·16	0·31	0·16	0·31	0·51
300	0·45	0·45	0·53	0·45	0·53	0·84
350	0·51	0·64	0·64	0·51	0·74	1·24
400	0·56	0·71	0·71	0·56	0·99	1·66
450	0·63	0·76	0·76	0·63	1·23	2·26
500	0·68	0·87	1·08	0·68	1·57	2·85
600	0·81	1·00	2·12	1·52	2·88	4·74
700	0·92	2·16	3·02	1·79	3·96	6·79
800	1·14	2·87	4·67	2·04	6·28	9·99
900	1·50	4·06	6·03	2·63	8·29	—
1 000	1·91	—	—	3·33	1·29	—
1 100	2·34	—	—	4·08	—	—
1 200	2·80	—	—	4·90	—	—
1 400	3·82	—	—	—	—	—
1 600	5·64	—	—	—	—	—
1 800	7·25	—	—	—	—	—
2 000	11·78	—	—	—	—	—
2 200	12·88	—	—	—	—	—

NOTE 1 — Longitudinal reinforcement shall be proportional to the length of socket cage as given in Tables 2 to 7.

NOTE 2 — If mild steel is used for spiral reinforcement, the weight specified above shall be increased to 140/125.

5.4 Cover — The minimum clear cover for reinforcement in pipes and collars shall be as given below:

	Minimum Clear Cover mm
a) Barrel thickness	
1) Up to and including 25 mm	6
2) Over 25 mm and up to and including 30 mm	8
3) Over 30 mm and up to and including 75 mm	10
4) Over 75 mm	15
b) At spigot steps	4
c) At end of longitudinals	5

NOTE — An effective means shall be provided for maintaining the reinforcement in position and for ensuring correct cover during manufacture of the unit. Spacers for this purpose shall be of rustproof material or of steel protected against corrosion.

6. MANUFACTURE

6.1 General — The methods of manufacture shall be such that the form and dimensions of the finished pipe are accurate within the limits specified in this standard. The surfaces and edges of the pipes shall be well defined and true, and their ends shall be square with the longitudinal axis.

6.2 Concrete Mixing — Concrete shall be mixed in a mechanical mixer.

6.2.1 Mixing shall be continued until there is a uniform distribution of the materials and the mass is uniform in colour and consistency, but in no case shall the mixing be done for less than two minutes.

6.2.2 Water-cement ratio shall be less than 0·5.

6.2.3 The concrete shall be placed before setting has commenced. It should be ensured that the concrete is not dropped freely so as to cause segregation. The concrete shall be consolidated by spinning, vibrating, spinning combined with vibrations, or other appropriate mechanical means.

6.3 Reinforcement Cages — Reinforcement cages for pipes shall extend throughout the pipe barrel. The cages shall consist of spirals or rings and straights of hard-drawn steel wire or mild steel rod and may be circular. Circular cages and longitudinal reinforcement shall be placed symmetrically with respect to the thickness of the pipe wall. The spirals shall end in a complete ring at both the ends of a pipe.

6.3.1 Pipes having barrel thickness above 75 mm shall have double reinforcement cage and the amount of steel in the outer cage shall be 75 percent of the mass of the inner cage whilst the total shall conform to the requirements specified in the relevant tables of this standard. The total longitudinal steel per pipe shall be as given in the relevant tables of the standard but the distribution shall be such that the round shape of the cage is not disturbed.

6.3.2 Diagonal reinforcement may be provided in pipes for which the cages are not welded so as to help in binding the cage securely. It shall, however, be ensured that the clear cover for any reinforcement is not below the limits specified in **5.4**. If diagonal reinforcement is provided, it shall be considered as part of the longitudinal reinforcement given in Tables 2 to 7.

6.3.3 Single reinforcement cage shall be located near the inner surface of the pipe with adequate clear cover.

6.4 Curing

6.4.1 *Water Curing* — Pipes manufactured in compliance with this standard shall be water cured for a period of not less than 2 weeks in case of pipes made from ordinary Portland cement or Portland slag cement or Portland pozzolana cement or hydrophobic Portland cement, and not less than 1 week in case of pipes made from rapid-hardening Portland cement or 43 grade ordinary Portland cement. Pipes may be water cured by immersing in water, covering with water-saturated material or by a system of perforated pipes, mechanical sprinklers, porous hose, or by any other approved method that will keep the pipe moist during the specified curing period. In the case of large pipe projecting partly above the water level, the projected portion shall be kept wet by any suitable means.

6.4.2 *Steam Curing* — Steam curing of concrete pipes may be permitted provided the requirements of pressure and non-pressure steam curing are fulfilled and the pipes conform to the requirements of this specification.

6.4.3 The manufacturer may, at his option, combine the methods described in **6.4.1** and **6.4.2** as long as the specified strength is attained.

7. DIMENSIONS

7.1 Pipes — The internal diameter, wall thickness, length and thickness of collar of pipes, the minimum reinforcements and strength test requirements for different classes of pipes (*see* **3.1**), shall be as specified in Tables 1 to 7. The manufacturer shall inform the purchaser of the effective length of spigot and socket, and flush jointed pipes that he is able to supply. For collar jointed pipes, effective length shall be 2 m up to 250 mm nominal diameter pipes and 2·5, 3·0, 3·5 or 4·0 m for pipes above 250 mm nominal diameter.

NOTE — Pipes of internal diameter, wall thickness and length of barrel and collar other than those specified in 7.1 may be supplied by mutual agreement between the purchaser and the supplier. In such case, the design of pipes submitted to the purchaser shall include all standard details as covered in Tables 1 to 7.

7.2 Tolerances — The following tolerances shall be permitted:

Dimensions	*Tolerances*
a) Overall length	±1 percent of standard length
b) Internal diameter of pipes or socket:	
1) Up to and including 300 mm	±3 mm
2) Over 300 mm and up to and including 600 mm	±5 mm
3) Over 600 mm and up to and including 1 200 mm	±7 mm
4) Over 1 200 mm	±10 mm
c) Wall thickness:	
1) Up to and including 30 mm	±2 mm
2) Over 30 mm and up to and including 50 mm	±3 mm
3) Over 50 mm and up to and including 65 mm	±4 mm
4) Over 65 mm and up to and including 80 mm	±5 mm
5) Over 80 mm and up to and including 95 mm	±6 mm
6) Over 95 mm	±7 mm

NOTE — In case of pipes with flexible rubber ring joints, the tolerance on thickness near the ends will have to be reduced. Near the rubber ring joints, the tolerance on thickness shall be as given in Tables 9 to 13.

8. WORKMANSHIP AND FINISH

8.1 Finish — Pipes shall be straight and free from cracks except that craze cracks may be permitted. The ends of the pipes shall be square with their longitudinal axis so that when placed in a straight line in the trench, no opening between ends in contact shall exceed 3 mm in pipes up to 600 mm diameter (inclusive), and 6 mm in pipes larger than 600 mm diameter.

8.1.1 The outside and inside surfaces of the pipes shall be smooth, dense and hard, and shall not be coated with cement wash or other preparation unless otherwise agreed to between the purchaser and the manufacturer or the supplier. For better bond, inner surface of the collar may be finished rough.

8.1.2 The pipes shall be free from defects resulting from imperfect grading of the aggregate, mixing or moulding.

8.1.3 Pipes shall be free from local dents or bulges greater than 3·0 mm in depth and extending over a length in any direction greater than twice the thickness of barrel.

8.1.4 Pipes may be repaired, if necessary, because of accidental injury during manufacture or handling and shall be accepted if in the opinion of the purchaser, the repairs are sound and appropriately finished and cured, and the repaired pipe conforms to the requirements of this specification.

8.2 Deviation from Straight — The deviation from straight in any pipe throughout its effective length, tested by means of a rigid straight edge parallel to the longitudinal axis of the pipe shall not exceed, for all diameters, 3 mm for every metre run.

9. TESTS

9.1 Test Specimens — All pipes for testing purposes shall be selected at random from the stock of the manufacturer and shall be such as would not otherwise be rejected under this standard.

9.1.1 During manufacture, tests on concrete shall be carried out as detailed in IS : 456-1978[1]. The manufacturer shall supply, when required to do so by the purchaser or his representative, the results of compressive tests of concrete cubes (*see* **4.5.1**) and split tensile tests of concrete cylinders (*see* **4.5.2**) made from the concrete used for the pipes. The manufacturer shall supply cylinders or cubes for test purposes required by the purchaser, and such cylinders or cubes shall withstand the tests prescribed in **4.5.1** and **4.5.2**. Every pressure pipe shall be tested by the manufacturer for the hydrostatic test pressure (*see* **3.1**). For non-pressure pipes, 2 percent of the pipes shall be tested for hydrostatic test pressure.

[1]Code of practice for plain and reinforced concrete (*third revision*).

9.2 The specimens of pipes selected in accordance with **9.1** and subjected to the following tests in the given sequence shall withstand the design loads:

a) Hydrostatic test, as described in IS : 3597-1985[1];

b) Three-edge bearing test as described in IS : 3597-1985[1]; and

c) Absorption test, as described in IS : 3597-1985[1].

9.2.1 The manufacturer shall regularly carry out absorption tests on specimens corresponding to the pipe manufactured and shall provide sufficient proof to the purchaser that the pipes supplied satisfy the absorption test. If, however, the purchaser desires to have absorption test carried out on any sample, the same may be done on mutually agreed terms.

9.2.2 The absorption test when conducted in accordance with the method described in **6** of IS : 3597-1985[1], shall satisfy the following requirements:

a) Absorption in the first 10 minutes shall not exceed 2·5 percent of the dry mass, and

b) Total absorption at the end of 24 hours shall not exceed 6·5 percent of the dry mass.

10. SAMPLING AND INSPECTION

10.1 Scale of Sampling

10.1.1 *Lot* — In any consignment, all the pipes of same class, same size and belonging to the same mix of concrete shall be grouped together to constitute a lot.

10.1.2 For ascertaining the conformity of the material to the requirements of this specification, samples shall be tested from each lot separately.

10.1.3 The number of pipes to be selected from the lot shall depend on the size of the lot and shall be according to Table 15.

TABLE 15 SCALE OF SAMPLING AND PERMISSIBLE NUMBER OF DEFECTIVES

No. of Pipes in the Lot	For Requirements Under 7 and 8		Sample Size for Tests Under 9.2 (Excluding Ultimate Load Test)
	Sample Size	Permissible Number of Defectives	
(1)	(2)	(3)	(4)
Up to 50	8	0	2
51 to 100	13	1	3
101 to 300	20	2	5
301 to 500	32	3	7
501 and above	50	5	10

[1]Methods of tests for concrete pipes (*first revision*).

10.1.3.1 These pipes shall be selected at random. In order to ensure the randomness of selection, procedures given in IS : 4905-1968[1] may be followed.

10.2 Number of Tests and Criteria for Conformity

10.2.1 All the pipes selected according to **10.1.3** shall be inspected for dimensional requirements (*see* **7**), finish (*see* **8.1**) and deviation from straight (*see* **8.2**). A pipe failing to satisfy one or more of these requirements shall be considered as defective.

10.2.1.1 The lot shall be declared as conforming to these requirements if the number of defectives found in the sample does not exceed the number of defectives given in col 3 of Table 15.

10.2.2 The lot having found satisfactory shall be further subjected to the tests given under **9.2** except ultimate load test. For this purpose, the number of pipes given in col 4 of Table 15 shall be selected from the lot. These pipes shall be selected from those that have satisfied the requirements given in **10.2.1**. For ultimate load test, the number of pipes to be checked shall be according to mutual agreement between the purchaser and the manufacturer. However, ultimate load test shall not be done for a lot size of 20 pipes or less.

[1]Methods of random sampling.

10.2.2.1 The lot shall be declared as conforming to the requirements of this specification if there is no failure under **10.2.2**.

11. MARKING

11.1 The following information shall be clearly marked on each pipe:

a) Name of manufacturer or his registered trade-mark or both,

b) Class and size of pipe, and

c) Date of manufacture.

The above information shall be clearly marked on outside only for pipes up to and including 350 mm internal diameter, and both outside and inside for pipes above 350 mm internal diameter.

11.1.1 Each pipe may also be marked with the Standard Mark.

NOTE — The use of the Standard Mark is governed by the provisions of the Bureau of Indian Standards Act, 1986 and the Rules and Regulations made thereunder. The Standard 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 BIS and operated by the producer. Standard marked products are also continuously checked by BIS for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

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Printed at Simco Printing Press, Delhi, India

AMENDMENT NO. 1 JANUARY 1991
TO
IS 458 : 1988 SPECIFICATION FOR PRECAST CONCRETE PIPES (WITH AND WITHOUT REINFORCEMENT)

(Third Revision)

(*Page* 2, *clause* **0.3.2**) — Insert the following new clause after **0.3.2**:

'**0.3.3** Because of increase in barrel wall thickness of class NP2 pipes of internal diameter 600 mm to 1 200 mm, both nominal and actual internal diameters have been specified for class NP2 pipes in order to accommodate the existing moulds. As it has been desired that all non-pressure pipes should have flexible rubber ring joints after 1995, the manufacturers should gradually change their moulds suitable for manufacturing such pipes and atfer 1995 nominal internal diameters should be treated as actual internal diameters.'

(*Page* 3, *clause* **4.5.2**, *line* 3) — Insert the words 'not less than' after the words 'shall be'.

(*Page* 3, *clause* **4.6**) — Substitute 'Type 2 of IS 5382 : 1985' *for* 'Type 1 A of IS 5382 : 1967'.

(*Page* 3, *foot-note No.* 4) — Insert '(*second revision*)' at the end.

(CED 2)

Printed at Simco Printing Press, Delhi, India

AMENDMENT NO. 2 APRIL 1991
TO
IS 458:1988 SPECIFICATION FOR PRECAST CONCRETE PIPES (WITH AND WITHOUT REINFORCEMENT)
(*Third Revision*)

[*Page* 1, *clause* 0.3.1 (c)] - Substitute the following for the existing matter:

'c) In this revision a new classification of pipes has been followed. In respect of strength test, the new classes compare with the old classification as follows:

Class NP1	Same as class NP1 of earlier standard
Class NP2	Equivalent to class NP2 of earlier standard
Class NP3	New class introduced in this revision
Class NP4	Equivalent to class NP3 and NP4 of earlier standard
Class P1,P2 and P3	Same as class P1,P2 and P3 of earlier standard

Longitudinal and spiral reinforcement for different classes of pipes and three edge bearing test load of class NP2 pipes have been modified in this revision. Reinforcement to be provided in socket of different classes of pipes for rubber ring joint have also been included. Pipes suitable for railway loading are not included in this standard at present and this might be included at a later stage. The present class NP4 pipes shall not be used for railway loading.'

(*Page* 2, *clause* 1.1) - Insert the following at the end:

'The requirements for collars are also covered by this standard.

NOTE - In addition to the requirements specified specifically for the collars, the requirements given in the following clauses shall also apply for collars:

4.2, 4.3, 4.4, 4.5, 4.5.1, 4.5.3, 4.5.4, 6.1, 6.2, 6.2.1, 6.2.2, 6.3, 6.3.1, 6.4,7.2, 8.1, 8.1.1, 8.1.2, 8.1.3, 8.1.4, 11.1 and 11.1.1.'

(*Page* 2, *clause* 3.1) - Delete 'such as, railway loading' from line 16 and 17 of column 3 of the informal table.

Gr. 1

(*Page* 3, *clause* **4.3**) - Substitute the following for the existing clause:

'**4.3 Aggregates** - Aggregates used for manufacture of unreinforced and reinforced concrete pipes shall conform to 3 of IS 383:1970[7]. The maximum size of aggregate should not exceed one third the thickness of the pipe or 20 mm, whichever is smaller for pipes above 250 mm internal diameter. But for pipes of internal diameter 80 to 250 mm the maximum size of aggregate should be 10 mm.

> NOTE - It is preferable to have the size and grading of aggregates conforming to IS 383:1970[7]. It is also preferable that materials finer this 75 micron IS Sieve is restricted to 3.0 percent by mass.'

(*Page* 4, *clause* **5.2**) - Insert the following as a new para:

For non-welded cages spiral reinforcement of the same diameter shall be closely spaced at the end of the pipe for a length of 150 mm to minimize damage during handling. The spacing of such end spirals shall not exceed 50 mm or half the pitch whichever is less. Such spiral reinforcement at ends shall be part of the total spiral reinforcement specified in different tables.'

(*Page* 4, *clause* **5.2.2**) - Insert 'subject to the requirements of **5.2.2.1**.' at the end and insert a new clause **5.2.2.1** as folows:

'**5.2.2.1** Tolerances given in IS 432(Part 1):1982[2], IS 432(Part 2):1982[3], IS 226:1975[4] and IS 1786:1985[5] shall be applied to the minimum mass of longitudinal reinforcement specified in different tables. Total mass of longitudinal reinforcement shall be calculated taking into account the clear cover provided at each end of the pipe.

> NOTE - For longitudinal reinforcement conforming to IS 432 (Part 2): 1982[3], tolerance, on mass shall be calculated from the diameter tolerance.

(*Page* 4, *Footnote*) - Insert the following new footnotes:

'[2]Specification for mild steel and medium tensile steel bars and hard-drawn steel wire for concrete reinforcement Part 1 Mild steel and medium tensile steel bars (*third revision*).

[3]Specification for mild steel and medium tensile steel bars and hard-drawn steel wire for concrete reinforcement Part 2 Hard-drawn steel wire (*third revision*)

[4]Specification for structural steel (standard quality) (*fifth revision*).

[5]Specification for high strength deformed steel bars and wires for concrete reinforcement (*third revision*).'

(*Page* 4, *clause* 5.3, *second, third* and *fourth sentence*) - Substitute the following for the existing sentences:

'Dimensions of collars shall be according to details given in Tables 1, 15 and 16. The reinforcement for the collars shall be as given in Table 15 and 16. The ends of collar reinforcement shall have a full ring at both ends.'

(*Page* 7, *Table* 2) -

1) Delete col (4), (5), (6) and (10)

2) Substitute '0.59' for '0.33' in col (8)

3) Substitute '0.16' for '0.10' and '0.18' for '0.12' in Sl No 1 and 2 respectively of col (9)

4) Substitute '12 or 8+8' for '8+8' in Sl No 20 and 21 of col (7)

5) Substitute '2.5 m' for '2 m' in Note 3.

6) Insert the following new Note:

> 'NOTE - Total mass of longitudinal reinforcement shall be calculated by multiplying the values given in column 8 by the length of the pipe and then deducting for the cover length provided at the two ends.'

(*Page* 8, *Table* 3) -

1) Substitute '0.59' for '0.33' in col (4)

2) Substitute '0.16' for '0.15' in Sl No 1 of col (5)

3) Substitute '8 or 6+6' for '6+6' in Sl No 12, 13 and 14 of col (3)

4) Substitute '2.5 m' for '2 m' in Note 3

5) Delete Note 2 and renumber the subsequent Notes.

6) Delete 'and a minimum cement content of 400 kg/m^3' from Note 4.

7) Insert the following new Note:

'NOTE – Total mass of longitudinal reinforcement shall be calculated by multiplying the values given in col 4 by the length of the pipe and then deducting for the cover length provided at the two ends.'

(*Page* 9, *Table* 4) – Insert the following as Table 4:

'TABLE 4 : DESIGN AND STRENGTH TEST REQUIREMENTS OF CONCRETE PIPES OF CLASS NP4 – REINFORCED CONCRETE, HEAVY-DUTY, NON-PRESSURE PIPES
(*Clauses* 5.1.1, 5.1.2 5.1.3, 5.2.2, 6.3.2, *and* 7.1)

NOMINAL INTERNAL DIAMETER OF PIPES	BARREL WALL THICKNESS	REINFORCEMENTS: Longitudinal, Mild steel or Hard-Drawn Steel		REINFORCEMENTS: Spiral, Hard-drawn Steel	STRENGTH TEST REQUIREMENTS FOR THREE EDGE BEARING TEST: Load to Produce 0.25 mm Crack	STRENGTH TEST REQUIREMENTS FOR THREE EDGE BEARING TEST: Ultimate Load
(1)	(2)	(3)	(4)	(5)	(6)	(7)
mm	mm	*Min* Number	kg/linear metre	kg/linear metre	kN/linear metre	kN/linear metre
80	25	6	0.59	0.24	22.1	33.15
100	25	6	0.59	0.36	22.1	33.15
150	25	6	0.59	0.74	23.3	34.95
200	30	6	0.59	1.30	24.6	36.9
225	30	6	0.59	1.64	25.2	37.8
250	30	6	0.59	1.98	25.5	38.25
300	40	8	0.78	2.71	26.4	39.6
350	75	8	0.78	3.14	29.8	44.7
400	75	8	0.78	3.52	33.9	50.9
450	75	8	0.78	3.88	36.9	55.3
500	75	8	0.78	5.96	40.0	61.2
600	85	8 or 6+6	2.34	9.63	46.3	69.4
700	85	8 or 6+6	3.44	14.33	52.2	78.3
800	95	8 or 6+6	3.44	21.20	59.3	89.1
900	100	6+6	3.44	27.13	66.3	99.4
1000	115	8+8	6.04	35.48	72.6	108.9
1100	115	8+8	6.04	43.76	80.4	120.6
1200	120	8+8	6.04	53.07	88.3	132.4
1400	135	8+8	9.36	77.62	104.2	156.4
1600	140	12+12	9.36	108.97	119.6	179.5
1800	150	12+12	14.88	150.22	135.3	203.0
2000	170	12+12	14.88	151.79	135.3	203.0
2200	185	12+12	14.88	160.90	142.2	213.3
2400	200	12+12	14.88	216.96	155.0	232.5
2600	215	12+12	14.88	258.93	166.7	250.0

NOTE 1 – The actual internal diameter is to be declared by the manufacturer and tolerance is to be applied on the declared diameter (*see* also 0.3.2)

NOTE 2 – The longitudinal reinforcement given in this table is valid for pipes up to 2.5 m effective length for internal dia of pipe up to 250 mm and 3 m effective length for higher diameter pipes.

NOTE 3 – Concrete for pipes above 1800 mm nominal diameter shall have a minimum compressive strength of 35 N/mm² at 28 days.

NOTE 4 - If mild steel is used for spiral reinforcement the weight specified in col 5 shall be increased by a factor 140/125.

NOTE 5 - Total mass of longitudinal reinforcement shall be calculated by multiplying the values given in col 4 by the length of the pipe and then deducting for the cover length provided at the two ends.'

(*Page* 9, *Table* **5**) -

1) Substitute '0.59' for '0.33' in col (4)

2) Substitute '0.16' for '0.15' in Sl No 1 of col (5)

3) Substitute '2.5 m' for '2 m' in Note 4

4) Insert the following new Note:

'NOTE - Total mass of longitudinal reinforcement shall be calculated by multiplying the values given in col 4 by the length of the pipe and then deducting for the cover cover length provided at the two ends.'

(*Page* 10, *Table* **6**) -

1) Substitute '0.59' for '0.33' in col (4)

2) Substitute '8 or 6+6' for '6+6' in Sl No 14 and 15 of col (3)

3) Substitute '2.5 m' for '2 m' in Note 4

4) Insert the following new Note:

'NOTE - Total mass of longitudinal reinforcement shall be calculated by multiplying the values given in column 4 by the length of the pipe and then deducting for the cover length provided at the two ends.'

(*Page* 11, *Table* **7**) -

1) Substitute '0.59' for '0.33' in col (4)

2) Substitute '8 or 6+6' for '6+6' in Sl No 12 of col (3)

3) Substitute '2.5 m' for '2 m' in Note 4

4) Insert the following new Note:

'NOTE - Total mass of longitudinal reinforcement shall be calculated by multiplying the values given in col 4 by the length of the pipe and then deducting for the cover length provided at the two ends.'

(*Page* 13, *Table* **9**, *Note* 2) - Substitute the following for the existing note:

'NOTE 2 - The dimensions *DS2*, *DS3*, *LSP*, *TS*, *T*, *H*, *S*, *HT* and *K* shall conform to the values given in this table as these are critical dimensions. Other dimensions are for guidance only. The following tolerances shall apply on the critical dimensions:

Dimensions	*Tolerances*
DS2, *DS3* & *LSP*	The tolerances shall be as given below:

Chord Dia-meter mm	*Toler-ence for DS2* mm	*Toler-ence for DS3* mm	*Toler-ence for LSP* mm
11	± 2	±3	± 4
12	± 2	± 3	± 4
16	± 2.5	± 3.5	± 5
20	± 3	± 4	± 5.5
22	± 3.5	± 4.5	± 6
25	± 4	± 5	± 7

T and *HT*	Same as that of wall thickness given in **7.2**
TS and *H*	Half the tolerance on wall thickness given in **7.2**
K and *S*	The tolerances shall be as given below:

Chord Diameter mm	*Tolerance* for *K* mm	*Tolerance* for *S* mm
11	± 1.25	± 0.75
12	± 1.25	± 0.75
16	± 2.00	± 1.25
20	± 2.25	± 1.50
22	± 2.75	± 1.50
25	± 3.25	± 2.00'

(*Page* 14, *Table* **10**, *Note* 2) - Substitute the following for the existing Note :

'NOTE 2 - The dimensions *DS2*, *DS3*, *LSP*, *TS*, *T*, *H*, *S*, *HT* and *K* shall conform to the values given in this table as these are critical dimensions. Other dimensions are for guidance only. The following tolerances shall apply on the critical dimensions:

Dimensions	*Tolerances*
DS2, DS3 & LSP	The tolerances shall be as given below:

Chord Diameter mm	*Tolerance for DS2,* mm	*Tolerance for DS3,* mm	*Tolerance for LSP,* mm
11	± 2	± 3	± 4
12	± 2	± 3	± 4
16	± 2.5	± 3.5	± 5
20	± 3	± 4	± 5.5
22	± 3.5	± 4.5	± 6
25	± 4	± 5	± 7

T and *HT*	Same as that of wall thickness given in **7.2**
TS and *H*	Half the tolerance on wall thickness given in **7.2**
K and *S*	The tolerances shall be as given below:

Chord Diameter mm	*Tolerance for K* mm	*Tolerance for S* mm
11	± 1.25	± 0.75
12	± 1.25	± 0.75
16	± 2.00	± 1.25
20	± 2.25	± 1.50

(*Page* 15, *Table* **11**, *Note* **2**) – Substitute the following for the existing note:

'NOTE 2 – The dimensions *LS*, *LSP*, *T*, *TS*, *H*, *L*, *K* and *b* shall conform to the values given in this table as these are critical dimensions. Other dimensions are for guidance only. The following tolerances shall apply on the critical dimensions:

Dimensions	*Tolerances*
LS & *LSP*	± 7 mm
T	Same as that of wall thickness given in **7.2**

H and *TS*	Half the tolerance on wall thickness given in **7.2**
L	± 0.5 mm
b	± 1 mm for 28 mm and ± 1.5 mm for 35 mm
K	± 1.75 mm for 20 mm rubber ring chord diameter and ± 2.5 mm for 25 mm rubber ring chord diameter.

(*Page* 16, *Table* **12**, *Note* **2**) - Substitute the following for the existing Note:

'NOTE 2 - The dimensions *DS2, DS3, LSP, TS, T, H, S, HT* and *K* shall conform to the values given in this table as these are critical dimensions. Other dimensions are for guidance only. The following tolerances shall apply on the critical dimensions:

Dimensions — *Tolerances*

DS2, DS3, LSP — The tolerances shall be as given below:

Chord Diameter mm	*Tolerance for DS2* mm	*Tolerance for DS3* mm	*Tolerance for LSP* mm
11	± 2	± 3	± 4
12	± 2	± 3	± 4
16	± 2.5	± 3.5	± 5
20	± 3	± 4	± 5.5
22	± 3.5	± 4.5	± 6
25	± 4	± 5	± 7

T and *HT* — Same as that of wall thickness given in **7.2**

TS and *H* — Half the tolerance on wall thickness given in **7.2**

K and *S* — The tolerances shall be as given below:

Chord Diameter mm	*Tolerance for K* mm	*Tolerance for S* mm
11	± 1.25	± 0.75
12	± 1.25	± 0.75
16	± 2.00	± 1.25
20	± 2.25	± 1.50
22	± 2.75	± 1.50'

(*Page* 17, *Table* **13**, *Note* **2**) - Substitute the following for the existing note:

'NOTE 2 - The dimensions *DS2, DS3, LSP, TS, T, H, S, HT* and *K* shall conform to the values given in this table as these are critical dimensions. Other dimensions are for guidance only. The following tolerances shall apply on the critical dimensions:

Dimensions	*Tolerances*
DS2, DS3 & *LSP*	The tolerances shall be as given below:

Chord Diameter mm	*Tolerance for DS2* mm	*Tolerance for DS3* mm	*Tolerance for LSP* mm
11	± 2	± 3	± 4
12	± 2	± 3	± 4
16	± 2.5	± 3.5	± 5
20	± 3	± 4	± 5.5
22	± 3.5	± 4.5	± 6
25	± 4	± 5	± 7

T and *HT*	Same as that of wall thickness given in **7.2**
TS and *H*	Half the tolerance on wall thickness given in **7.2**
K and *S*	The tolerances shall be as given below:

Chord Diameter mm	*Tolerance for K* mm	*Tolerance for S* mm
11	± 1.25	± 0.75
12	± 1.25	± 0.75
16	± 2.00	± 1.25
20	± 2.25	± 1.50'

(*Page* 19, *Table* 14) - Insert the following new tables after table 14:

'TABLE 15 DESIGN REQUIREMENTS OF REINFORCED CONCRETE COLLARS FOR PIPES OF CLASS NP2
(*Clause* 5.3)

NOMINAL INTERNAL DIAMETER OF PIPE	COLLAR DIMENSIONS			REINFORCEMENTS		
	Min Caulking Space	*Min* Thick-ness	*Min* Len-gth	Longitudinal, Mild Steel or Hard-drawn Steel		Sprial, Hard-drawn Steel
				Min. nos.	Weight	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
mm.	mm.	mm.	mm.		kg per collar	kg per collar
80	13	25	150	6	0.08	0.07
100	13	25	150	6	0.08	0.08
150	13	25	150	6	0.08	0.10
200	13	25	150	6	0.08	0.12
225	13	25	150	6	0.08	0.14
250	13	25	150	6	0.08	0.16
300	16	30	150	8	0.11	0.22
350	16	32	150	8	0.11	0.25
400	16	32	150	8	0.11	0.27
450	19	35	200	8	0.15	0.40
500	19	35	200	8	0.15	0.60
600	19	40	200	8	0.15	0.70
700	19	40	200	8	0.23	1.05
800	19	45	200	8	0.23	1.85
900	19	50	200	8	0.23	2.05
1000	19	55	200	8	0.33	2.25
1100	19	60	200	8	0.33	3.09
1200	19	65	200	8	0.33	4.11
1400	19	75	200	12	0.50	5.08
1600	19	80	200	12 or 8+8	0.67	6.55
1800	19	90	200	12 or 8+8	0.67	9.00
2000	19	100	200	12+12	1.00	12.15
2200	19	110	200	12+12	1.00	13.30

NOTE 1 - If mild steel is used for spiral reinforcement the weight specified in col 7 shall be increased by a factor 140/125.

NOTE 2 - Soft grade mild steel wire for spirals may be used for collars of pipes of internal diameter up to 150 mm only by increasing weight by a factor 140/84.

NOTE 3 - Internal diameter of collar to suit the actual diameter of pipes with minimum caulking space as given in col 2.

TABLE 16 DESIGN REQUIREMENTS OF REINFORCED CONCRETE COLLARS FOR PIPES OF NP3 AND NP4 CLASS
(*Clause* 5.3)

NOMINAL INTERNAL DIAMETER OF PIPE	COLLAR DIMENSIONS			REINFORCEMENTS		
	Min. Caulking Space	*Min.* Thick-ness	*Min.* Len-gth	Longitudinal, Mild Steel or Hard-drawn Steel *Min.* nos.	Weight	Spiral, Hard drawn Steel
(1)	(2)	(3)	(4)	(5)	(6)	(7)
mm.	mm.	mm.	mm.		kg per collar	kg per collar
80	13	25	150	6	0.08	0.07
100	13	25	150	6	0.08	0.08
150	13	25	150	6	0.08	0.10
200	13	25	150	6	0.08	0.12
225	13	25	150	6	0.08	0.14
250	13	25	150	6	0.08	0.16
300	16	30	150	8	0.11	0.22
350	19	35	200	8	0.15	0.40
400	19	35	200	8	0.15	0.50
450	19	35	200	8	0.15	0.60
500	19	40	200	8	0.15	0.70
600	19	40	200	8	0.23	1.05
700	19	45	200	8	0.23	1.85
800	19	50	200	8	0.23	2.05
900	19	55	200	8	0.33	2.25
1000	19	60	200	8	0.33	3.09
1100	19	65	200	8	0.33	4.11
1200	19	75	200	12	0.50	5.08
1400	19	80	200	12 or 8+8	0.67	6.55
1600	19	90	200	12 or 8+8	0.67	9.00
1800	19	100	200	12+12	1.00	12.15
2000	19	110	200	12+12	1.00	13.30

NOTE 1 - Collars for sizes 2200 mm and above shall be made out of mild steel plate of 6 mm thickness, steel conforming to IS 226:1975 with outside painted.

NOTE 2 - If mild steel is used for spiral reinforcement, the weight specified in col 7 shall be increased by a factor 140/125.

NOTE 3 - Soft grade mild steel wire for spirals may be used for collars of pipes of internal diameter up to 150 mm only by increasing weight by a factor 140/84.'

(*Page* 20, *Clause* **6.2.2**) - Delete and renumber **6.2.3** as **6.2.2**

(*Page* 20, *Clause* **6.3.1**, *First sentence*)

1) Substitute the following for the first sentence:

'Pipes having barrel thickness 100 mm and above shall have double reinforcement cage and the amount of spiral steel in the outer cage shall be 75 percent of the mass of spiral steel in the inner cage, whilst the total shall conform to the requirements specified in the relevant tables of this standard.

The mass of longitudinals in the outer cage and inner cage should be the same, that is equal to half the total mass of longitudinals specified in the relevant tables.

2) Insert the following Note below the clause:

'NOTE - It is preferable that single reinforcement cage should be located near the inner surface of the pipe with adequate clear cover.'

(*Page* 20, *Clause* **6.3.2**, *Last sentence*) - Substitute the following for the last sentence:

'Diagonal reinforcement is a process requirement and shall not be counted against longitudinal and spiral reinforcement.'

(*Page* 20, *Clause* **6.3.3**) - Delete

(*Page* 20, *Clause* **7.2**) - Delete 'or socket' in 7.2 (b) and substitute the following for 7.2 (c):

'c) Wall thickness:

1) Up to and including 30 mm	+ 2 m - 1 m
2) Over 30 mm and up to and including 50 mm	+ 3 mm - 1.5mm
3) Over 50 mm and up to and including 65 mm	+ 4 mm - 2 mm
4) Over 65 mm and up to and including 80 mm	+ 5 mm - 2.5mm
5) Over 80 mm and up to and including 95 mm	+ 6 mm - 3 mm
6) Over 95 mm	+ 7 mm - 3.5 mm

(*Page* 20, *Clause* **7.1**. *Last sentence*) - Substitute the following for the last sentence:

'For collar jointed pipes effective length shall be 2 m or 2.5 m up to 250 mm nominal diameter pipes and 2.5, 3.0, 3.5 or 4.0 m for pipes above 250 mm nominal diameter.'

(*Page* 21, *clause* **10.1.3** and *Table* **15**) - Substitute 'Table 17' *for* 'Table 15'

(*Page* 22, *Clause* **10.2.1.1** and **10.2.2**) - Substitute 'Table 17' for 'Table 15'

(CED 2)

Printed at Simco Printing Press, Delhi, India

AMENDMENT NO. 3 SEPTEMBER 2001
TO
IS 458:1988 SPECIFICATION FOR PRECAST CONCRETE PIPES (WITH AND WITHOUT REINFORCEMENT)

(Third Revision)

(*Page* 2, *clause* **0.3.1**) — Insert the following at the end :

'n) Inclusion of details of NP3 and NP4 classes of pipes to be manufactured by casting process.'

(*Page* 2, *clause* **0.3.2**) — Delete.

(*Page* 2, *clause* **0.3.3**) (*see also Amendment No.* 1) — Delete.

(*Page* 2, *clause* **3.1**, *informal table, col* 2, *against Class* NP3 *and* NP4) — Insert 'and also unreinforced (in case of pipes manufactured by casting process)' after the word 'reinforced'.

(*Page* 3, *clause* **4.2**) — Insert 'or IS 12269:1987[14]' at the end.

(*Page* 3, *clause* **4.4**, *first sentence*) — Substitute the following for the existing sentence :

'Reinforcement used for the manufacture of reinforced concrete pipes shall conform to mild steel grade 1 or medium tensile steel bars of IS 432 (Part 1) : 1982[8] or hard-drawn steel wire of IS 432 (Part 2) : 1982[9] or structural steel (standard quality) bars of IS 2062:1992[10].'

(*Page* 3, *clause* **4.4**, *Note*) — Substitute the following for the existing Note:

'NOTE — Wire fabric conforming to IS 1566:1982[12] or deformed bars and wires conforming to IS 1786 : 1985[13] or plain hard-drawn steel wire for prestressed concrete conforming to IS 1785 (Part 1) : 1983[15] or IS 1785 (Part 2) : 1983[16] may also be used. For such reinforcement maximum tensile stress shall be as given in **5.1**.'

(*Page* 3, *clause* **4.5**, *first sentence*) — Delete.

(*Page* 3, *footnote* 10) — Substitute the following for the existing footnote:

'[10]Specification for steel for general structural purposes (*fourth revision*).'

(*Page* 3, *footnote* 14) — Delete footnote 14 and insert the following new footnotes :

'[14]Specification for 53 grade ordinary Portland cement.

[15]Specification for plain hard-drawn steel wire for prestressed concrete: Part 1 Cold-drawn stress relieved wire (*second revision*).

[16]Specification for plain hard-drawn steel wire for prestressed concrete: Part 2 As drawn wire (*first revision*).'

(*Page* 3, *clause* **4.5.1**, *para* 1) — Insert the following at the end of the para:

'However in case of pipes manufactured by casting process, concrete shall have minimum compressive strength as indicated in the Tables 3A, 3B, 4A and 4B for the respective classes of pipe.'

(*Page* 3, *clause* **4.6**) — Insert the following new clauses after **4.6**:

'**4.7 Water** — Water used for mixing of concrete and curing of pipes shall conform to **4.3** of IS 456 : 2000[2].

4.8 Chemical Admixtures — The admixtures, where used, shall conform to IS 9103 : 1999[5].'

(*Page* 3, *clause* **5.1.1**) — Substitute the following for the existing clause:

'**5.1.1** The barrel wall thickness shall be such that under the specified hydrostatic test pressure, the maximum tensile stress in concrete, when considered as effective to take stress along with the tensile reinforcement, shall not exceed 2 N/mm^2 for pressure pipes and 1.5 N/ mm^2 for non-pressure pipes. But the wall thickness shall be not less than those given in Tables 1 to 7 subject to **7.2**(c), in case of pipes manufactured by spinning process. For pipes manufactured by casting process, the wall thickness shall be as given in Tables 3A, 3B, 4A and 4B.'

(*Page* 3, *footnotes below clause* **5.1.1**) — Substitute the following footnote 2 for the existing footnote 2 and insert the following new footnote 5:

'[2]Code of practice for plain and reinforced concrete (*fourth revision*).

[5]Specification for admixtures for concrete (*first revision*).'

(*Page* 4, *clause* **5.1.3**) — Insert the following at the end of the clause :

'in case of pipes manufactured by spinning process. For reinforced pipes manufactured by casting process, the minimum longitudinal reinforcement shall be as given in Tables 3B and 4B.'

[*Page* 4, *clause* **5.2.2**, *last sentence* (*see also Amendment No.* 2)] — Substitute the following for the existing last sentence:

'In the absence of calculations and tests, the reinforcement given in Tables 2 to 7 for pipes manufactured with spinning method and in Tables 3B and 4B for pipes manufactured by casting process shall be used as minimum reinforcement subject to the requirements of **5.2.2.1**.'

[*Page* 4, *clause* **5.3**, (*see also Amendment No.* 2)] — Substitute the following for existing clause:

'**5.3** The ends of concrete pipes used for water mains, sewers and irrigation shall be suitable for socket and spigot, roll on joints or confined gasket joints. Dimensions of spigot and socket for rubber ring roll on jointed pipes shall be as given in Tables 8 to 13 for pipes manufactured by spinning process. However, the dimensions of spigot and socket shall be as given in Tables 10A and 10B in case of pipes manufactured by casting process. Reinforcement in socket of rubber ring jointed pipes shall be as given in Table 14. However the ends of concrete pipes used for road culverts may be suitable for flush or collar joints (*see* Fig. 1 and Fig. 2). Dimensions of collars shall be according to details given in Tables 1, 15 and 16. The reinforcement for collars shall be as given in Tables 15 and 16. The ends of collar reinforcement shall have a full ring at both ends.'

(*Page* 4, *clause* **5.3**, *Note* 2) — Delete Note 2 and renumber Note 3 as Note 2.

(*Page* 4, *clause* **5.3.1**) — Insert the following in the beginning:

'Only flexible rubber ring joints shall be used in the joints in (a) all pressure pipes, and (b) all non-pressure pipes except when used for road culverts.'

(*Page* 8, *Table* 3, *col* 1, *heading*) — Delete the word 'Nominal'.

(*Page* 8, *Table* 3, *Note* 1) — Delete.

(*Page* 8, *Table* 3) — Insert the following new Tables after Table 3:

Table 3A Design and Strength Test Requirements of Concrete Pipes of Class NP3 — Unreinforced Concrete, Medium-Duty, Non-Pressure Pipes Made by Casting Process

(*Clauses* 4.5.1, 5.1.1, 5.3 *and* 7.1)

Internal Diameter of Pipes	Barrel Wall Thickness	Strength Test Requirement for Three Edge Bearing Test, Ultimate Load
mm	mm	kN/linear metre
(1)	(2)	(3)
300	50	15.50
350	55	16.77
400	60	19.16
450	65	21.56
500	70	23.95
600	75	28.74
700	85	33.53
800	95	38.32
900	100	43.11
1 000	115	47.90
1 100	120	52.69
1 200	125	57.48
1 400	140	67.06
1 600	165	76.64
1 800	180	86.22

NOTE — Concrete for pipes shall have a minimum compressive strength of 45 N/mm^2 at 28 days.

Table 3B Design and Strength Test Requirements of Concrete Pipes of Class NP3 — Reinforced Concrete, Medium-Duty, Non-Pressure Pipes Made by Casting Process

(*Clauses* 5.1.1, 5.1.2, 5.1.3, 6.3.2 *and* 7.1)

Internal Diameter of Pipes	Barrel Wall Thickness	Reinforcements			Strength Test Requirements for Three Edge Bearing Test	
		Longitudinal, Mild Steel or Hard-Drawn Steel		Spiral Hard-Drawn Steel kg/linear metre	Load to Produce 0.25 mm Crack kN/linear metre	Ultimate Load kN/linear metre
mm	mm	*Min* number	kg/linear metre			
(1)	(2)	(3)	(4)	(5)	(6)	(7)
300	50	8	0.78	1.53	15.50	23.25
350	55	8	0.78	1.58	16.77	25.16
400	60	8	0.78	1.60	19.16	28.74
450	65	8	0.78	1.90	21.56	32.34
500	70	8	0.78	2.00	23.95	35.93
600	75	8 or 6+6	1.18	2.20	28.74	43.11
700	85	8 or 6+6	1.18	4.87	33.53	50.30
800	95	8 or 6+6	2.66	6.87	38.32	57.48
900	100	6+6	2.66	11.55	43.11	64.67
1 000	115	6+6	2.66	15.70	47.90	71.85
1 100	120	6+6	2.66	19.61	52.69	79.00
1 200	125	8+8	3.55	21.25	57.48	86.22
1 400	140	8+8	3.55	30.00	67.06	100.60
1 600	165	8+8	3.55	50.63	76.64	114.96
1 800	180	12+12	9.36	64.19	86.22	129.33
2 000	190	12+12	9.36	83.12	95.80	143.70
2 200	210	12+12	9.36	105.53	105.40	158.07
2 400	225	12+12	14.88	133.30	115.00	172.44

NOTE — Concrete for pipes shall have a minimum compressive strength of 35 N/mm^2 at 28 days.

[*Page* 9, *Table* 4, *col* 1, *heading* (*see also Amendment No.* 2)] : Delete the word 'Nominal'.

(*Page* 9, *Table* 4, *Note* 1) — Delete.

(*Page* 9, *Table* 4) — Insert the following new Tables 4A and 4B after Table 4:

Table 4A Design and Strength Test Requirements of Concrete Pipes of Class NP4 — Unreinforced Concrete, Heavy-Duty, Non-Pressure Pipes Made by Casting Process

(*Clauses* 5.1.1, 5.3 *and* 7.1)

Internal Diameter of Pipes	Barrel Wall Thickness	Strength Test Requirements for Three Edge Bearing Test, Ultimate Load
mm	mm	kN/linear metre
(1)	(2)	(3)
300	50	26.4
350	55	29.8
400	60	33.9
450	65	36.9
500	70	40.0
600	75	46.3
700	85	52.2
800	95	59.3
900	100	66.3
1 000	115	72.6
1 100	125	80.4
1 200	135	88.3
1 400	155	104.2
1 600	180	119.6
1 800	205	135.3

NOTE — Concrete for pipes shall have a minimum compressive strength of 50 N/mm^2 at 28 days.

Table 4B Design and Strength Test Requirements of Concrete Pipes of Class NP4 — Reinforced Concrete, Heavy-Duty, Non-Pressure Pipes Made by Casting Process

(*Clauses* 5.1.1, 5.1.2, 5.1.3, 6.3.2 *and* 7.1)

Internal Diameter of Pipes	Barrel Wall Thickness	Reinforcements			Strength Test Requirements for Three Edge Bearing Test	
		Longitudinal Mild Steel or Hard-Drawn Steel		Spiral Hard-Drawn Steel	Load to Produce 0.25 mm Crack	Ultimate Load
mm	mm	*Min* number	kg/linear metre	kg/linear metre	kN/linear metre	kN/linear metre
(1)	(2)	(3)	(4)	(5)	(6)	(7)
300	50	8	0.78	1.53	26.4	39.6
350	55	8	0.78	1.61	29.8	44.7
400	60	8	0.78	1.97	33.9	50.9
450	65	8	0.78	3.36	36.9	55.3
500	70	8	0.78	5.56	40.0	61.2
600	75	8 or 6+6	2.34	8.50	46.3	69.4
700	85	8 or 6+6	3.44	12.78	52.2	78.3
800	95	8 or 6+6	3.44	16.72	59.3	89.1
900	100	6+6	3.44	20.92	66.3	99.4
1 000	115	8+8	6.04	26.70	72.6	108.9
1 100	120	8+8	6.04	35.60	80.4	120.6
1 200	125	8+8	6.04	42.42	88.3	132.4
1 400	140	8+8	9.36	53.39	104.2	156.4
1 600	165	12+12	9.36	79.92	119.6	179.5
1 800	180	12+12	14.88	85.75	135.3	203.0

NOTE — Concrete for pipes shall have a minimum compressive strength of 35 N/mm² at 28 days.

(*Page* 12, *Table* 8) — Insert the following Note at the end of the Table :

NOTE — The dimensions D_2, h and e shall conform to the values given in this table as these are critical dimensions. The following tolerances shall apply on the critical dimensions :

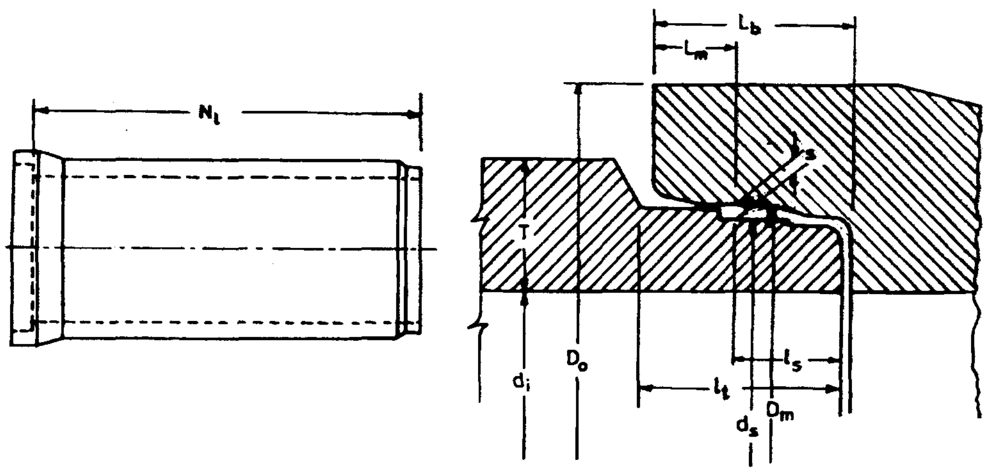
Dimensions	*Tolerances*
D_2	± 3 mm for pipes up to and including 300 mm internal diameter
	± 4 mm for pipes over 300 mm internal diameter.
h	± 3 mm for dimensions up to 60 mm
	± 5 mm for dimensions above 60 mm
e	± 2 mm for dimensions up to 30 mm
	± 3 mm for dimensions above 30 mm

(*Page* 14, *Table* 10) — Insert the following new Tables 10A and 10B after Table 10:

Table 10A Spigot and Socket Dimensions for NP3 Reinforced and Unreinforced and NP4 Reinforced Pipes Made by Vertical Casting Process

(*Clause* 5.3)

All dimensions in millimetres.



d_i	G	R	T	D_o	l_t	L_b	d_s	D_m	L_m	l_s	S
300±4	13	322	50	487±4	112±4	105±2	370.07	386.07	49	50	8.00±1.0
350±5	13	370	55	555±4	112±4	105±2	425.07	441.07	49	50	8.00±1.0
400±5	13	417	60	615±4	112±4	105±2	480.07	496.07	49	50	8.00±1.0
450±5	13	465	65	680±4	112±4	105±2	536.07	552.07	49	50	8.00±1.0
500±5	13	513	70	735±4	112±4	105±2	590.07	606.07	49	50	8.00±1.0
600±5	13	609	75	850±4	112±4	105±2	700.07	716.07	49	50	8.00±1.0
700±7	18	706	85	980±5	141±5	132±3	808.00	830.00	61	65	11.00±1.2
800±7	18	803	95	1 100±5	141±5	132±3	924.00	946.00	61	65	11.00±1.2
900±7	18	901	100	1 215±5	141±5	132±3	1 036.00	1 058.00	61	65	11.00±1.2
1 000±7	18	998	115	1 330±5	141±5	132±3	1 148.00	1 170.00	61	65	11.00±1.2
1 100±7	24	1 097	120	1 520±6	155±6	145±3	1 262.00	1 291.30	72	63	14.65±1.5
1 200±7	24	1 195	125	1 640±6	155±6	145±3	1 372.48	1 401.78	72	63	14.65±1.5
1 400±10	24	1 383	140	1 870±6	155±6	145±3	1 590.91	1 620.21	72	63	14.65±1.5
1 600±10	24	1 578	165	2 100±6	155±6	145±3	1 814.91	1 844.21	72	63	14.65±1.5
1 800±10	24	1 774	180	2 340±6	155±6	145±3	2 040.00	2 069.30	72	63	14.65±1.5

G = diameter of the unstretched rubber chord, hardness 40±5 IRHD stretching 15 percent.

R = inner diameter of the unstretched rubber ring.

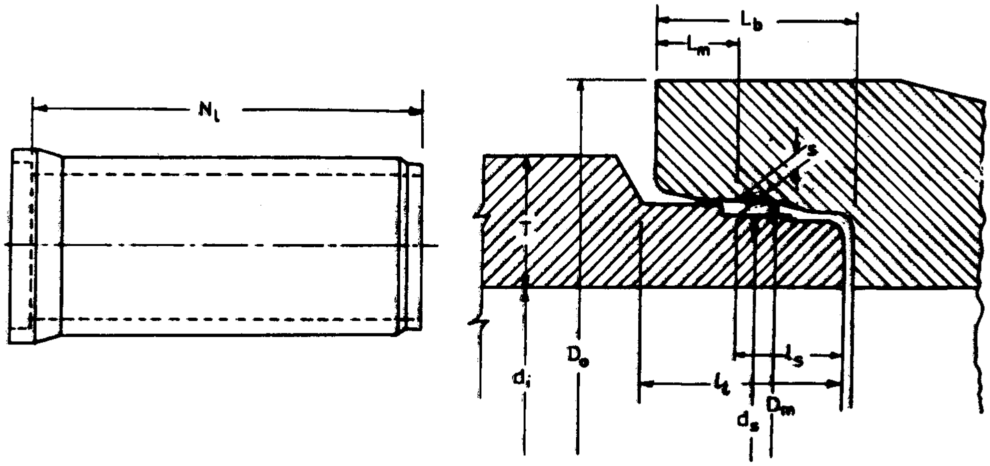
T = minimum wall thickness.

d_s, D_m, L_m and l_s are nominal dimensions.

Table 10B Spigot and Socket Dimensions for NP4 Unreinforced Pipes Made by Casting Process

(*Clause* 5.3)

All dimensions in millimetres.



d_i	G	R	T	D_o	l_t	L_b	d_s	D_m	L_m	l_s	S
300±4	13	322	50	487±4	112±4	105±2	370.07	386.07	49	50	8.00±1.0
350±5	13	370	55	555±4	112±4	105±2	425.07	441.07	49	50	8.00±1.0
400±5	13	417	60	615±4	112±4	105±2	480.07	496.07	49	50	8.00±1.0
450±5	13	465	65	680±4	112±4	105±2	536.07	552.07	49	50	8.00±1.0
500±5	13	513	70	735±4	112±4	105±2	590.07	606.07	49	50	8.00±1.0
600±5	13	609	75	850±4	112±4	105±2	700.07	716.07	49	50	8.00±1.0
700±7	18	706	85	980±5	141±5	132±3	808.00	830.00	61	65	11.00±1.2
800±7	18	803	95	1 100±5	141±5	132±3	924.00	946.00	61	65	11.00±1.2
900±7	18	901	100	1 215±5	141±5	132±3	1 036.00	1 058.00	61	65	11.00±1.2
1 000±7	18	998	115	1 330±5	141±5	132±3	1 148.00	1 170.00	61	65	11.00±1.2
1 100±7	24	1 097	125	1 520±6	155±6	145±3	1 262.00	1 291.30	72	63	14.65±1.5
1 200±7	24	1 195	135	1 640±6	155±6	145±3	1 372.48	1 401.78	72	63	14.65±1.5
1 400±10	24	1 383	155	1 870±6	155±6	145±3	1 590.91	1 620.21	72	63	14.65±1.5
1 600±10	24	1 578	180	2 100±6	155±6	145±3	1 814.91	1 844.21	72	63	14.65±1.5
1 800±10	24	1 774	205	2 340±6	155±6	145±3	2 040.00	2 069.30	72	63	14.65±1.5

G = diameter of the unstretched rubber chord, hardness 40±5 IRHD stretching 15 percent.

R = inner diameter of the unstretched rubber ring.

T = minimum wall thickness.

d_s, D_m, L_m and l_s are nominal dimensions.

(*Amendment No.* 2, *Note* 2 *of Table* 15 *and Note* 3 *of Table* 16) — Substitute the following for the existing Note :

'Soft grade mild steel wire may be used as reinforcement for collars of pipes of nominal internal diameter up to 250 mm only by increasing the weight by a factor 140/84. Where only soft grade mild steel wire is used for making collar cages, the weight of reinforcement shall be total weight of col 6 and 7 multiplied by 140/84. This is allowed as a process requirement.'

(*Amendment No.* 2, *Table* 16, *Note* 1) — Insert the following at the end of Note 1:

'The details of mild steel collars shall be as follows:

Nominal Internal Diameter of Pipe	*Steel Collar Dimensions*		
	Caulking Space, *Min*	Thickness, *Min*	Length, *Min*
mm	mm	mm	mm
2 200	22	6	250
2 400	22	6	250
2 600	22	6	250'

(*Page* 20, *clause* **6.3**, *second and third sentences*) — Substitute the following for the existing sentences: 'The cages shall consist of spirals or circular rings and straights of hard-drawn steel wire or mild steel rod. Reinforcement cages shall be placed symmetrically with respect to the thickness of the pipe wall.'

(*Page* 20, *clause* **6.4.1**, *first sentence*) — Insert the following at the end of first sentence:

'or 53 grade ordinary Portland cement.'

(*Page* 20, *clause* **7.1**):

a) Insert the following at the end of first sentence:

'However, in case of pipes manufactured by casting process, the internal diameter, wall thickness, the minimum reinforcement (in case of reinforced pipes) and strength test requirements for different classes of pipes shall be as given in Tables 3A, 3B, 4A and 4B.'

b) Insert the following at the end of the clause :

'For collar jointed class NP3 and NP4 pipes of nominal internal diameter 900 mm and above, the effective length may also be 1.25 m.'

(*Page* 21, *Note under clause* **7.2**) — Insert the following at the end:

'in case of pipes manufactured by spinning process.'

(*Page* 21, *clause* **8.2**) — Substitute the following for the existing clause :

'**8.2 Deviation from Straight** — The deviation from straight in any pipe throughout its effective length, tested by means of a rigid straight edge as described in IS 3597:1998[1] shall not exceed, for all diameters, 3 mm for every metre run.'

(*Page* 21, *clause* **9.1.1**, *first sentence*) — Substitute the following for the existing sentence :

'During manufacture, tests on compressive strength of concrete cubes shall be done as described in IS 516 : 1959[2]. For pressure pipes splitting tensile strength tests of concrete cylinders shall be carried out as described in IS 5816 : 1999[3].'

(*Page* 21, *footnotes under clause* **9.1.1**) — Substitute the following for the existing footnotes:

'[1]Method of test for concrete pipes (*second revision*).

[2]Method of test for strength of concrete.

[3]Method of test for splitting tensile strength of concrete (*first revision*).'

(*Page* 21, *clause* **9.2**) — Substitute the following for the existing clause :

'**9.2** The specimens of pipes selected in accordance with **9.1** shall be subjected to the following tests in accordance with IS 3597 : 1998[1] :

a) Hydrostatic test,

b) Three-edge bearing test, and
c) Permeability test.'

(*Page* 21, *clauses* **9.2.1** *and* **9.2.2**) — Substitute the following for the existing clauses :

'**9.2.1** Permeability test when conducted in accordance with the method described in IS 3597 : 1998[1], shall satisfy the following requirements. The tests shall be done on outside surface of pipe at two places as shown in Fig. 5.

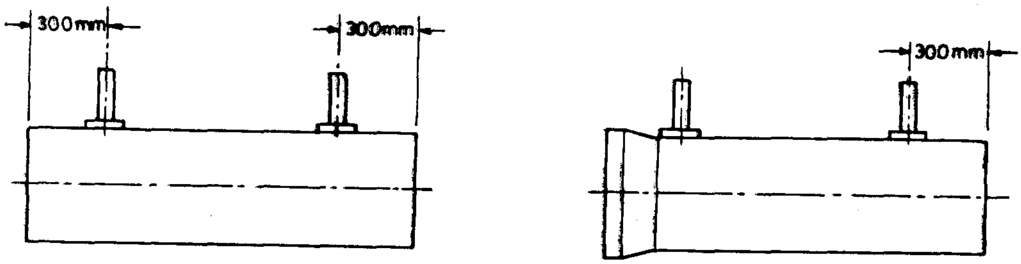


FIG. 5 PERMEABILITY TEST

9.2.1.1 *Initial absorption*

The drop of water level in the stand pipe at the end of 2 h is the initial absorption. This shall not exceed 1.5 cm^3 and the difference in any two readings shall not be more than 0.5 cm^3.

9.2.1.2 *Final permeability*

Fill the water in the stand pipe again up to the mark and take readings at half-hour interval up to 4 h. Absorption in the fourth hour is the final permeability. The average reading of two tests conducted on a pipe shall be expressed in cm^3 and this shall not exceed 0.3 cm^3.'

(*Page* 21, *footnote at the end of the page*) — Substitute the following for the existing footnote:

'[1]Methods of test for concrete pipes (*second revision*).'

(CED 53)

Printed at Prabhat Offset Press, New Delhi-2

AMENDMENT NO. 4 MARCH 2003
TO
IS 458 : 1988 SPECIFICATION FOR PRECAST CONCRETE PIPES (WITH AND WITHOUT REINFORCEMENT)

(Third Revision)

[*Page* 21, *clause* **9.2.1** (*see Amendment No.* 3)] — Substitute the following for the existing:

'**9.2.1** Permeability test when conducted in accordance with the method described in IS 3597 shall meet requirement of final permeability, which shall not exceed 0.3 cm^3.

NOTE – It is recommended that initial absorption should not exceed 2.0 cm^3 and the difference in any two readings during initial absorption should not be more than 0.8 cm^3.

[*Page* 21, *Fig.* 5 (*see Amendment No.* 3)] – Delete.

[*Page* 21, *clause* **9.2.1.1**(*see Amendment No.* 3)] – Delete.

[*Page* 21, *clause* **9.2.1.2**(*see Amendment No.* 3)] – Delete.

[*Page* 3, *clause* **4.7**(*see Amendment No.* 3)] – Substitute the following for the existing:

'**4.7 Water** — Water used for mixing of concrete and curing of pipes shall conform to **5.4** of IS 456 : 2000.'

(CED 53)

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