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(Reaffirmed 1997)

भारतीय मानक

जलमल तथा निकास कार्यों के लिए एस्बेस्टॉस पाइपों और फिटिंगों की विशिष्टि

(पहला पुनरीक्षण)

Indian Standard

ASBESTOS-CEMENT PIPES AND FITTINGS FOR SEWERAGE AND DRAINAGE — SPECIFICATION

(First Revision)

UDC 621·643·2 [666·961] : 628·245

BUREAU OF INDIAN STANDARDS
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NEW DELHI 110002

April 1991

Price Group 3

FOREWORD

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

Different types of asbestos cement pipes have been in use in this country for over 50 years and considerable experience is available in regard to their use as water supply pressure mains and building pipes, gutters and fittings for conveying rain-water, sullage from the buildings to the drainage and sewerage system. This standard lays down the requirements of asbestos cement pipes and fittings for sewerage and drainage. When the pipes are intended for conveyance of particularly aggressive residual waters or to be laid in particularly aggressive grounds, the nature of these waters and grounds shall be specified beforehand to the manufacturer who may suggest appropriate material or treatment.

This standard was first published in 1975. This revision has been prepared with a view to modify some of the requirements in the light of experience gained in the use of this standard. The major changes in this revision include modification in the class and minimum ultimate crushing load for pipes, changes in the requirements for straightness, transverse crushing strength and longitudinal bending strength and modification in tolerances on dimensions and in respect of criteria for acceptance, sampling and marking. In this revision the requirements for fittings have been aligned to a great extent with the requirements of ISO Standard. Hydraulic pressure test, longitudinal bending strength and acid resistance test for pipes have been made optional in this revision. The word "Non-pressure" appearing in the title of the earlier version of standard has been omitted in this revision to align the title with the international practice.

In revising this standard due weightage has been given to international co-ordination among the standards and practices prevailing in different countries in addition to relating it to the practices in the field in this country. This has been done by deriving assistance from ISO 881 : 1980 'Asbestos-cement pipes, joints and fittings for sewerage and drainage'.

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

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

Indian Standard

ASBESTOS-CEMENT PIPES AND FITTINGS FOR SEWERAGE AND DRAINAGE — SPECIFICATION

(First Revision)

1 SCOPE

This standard covers the requirements for asbestos-cement pipes and fittings suitable for use with gravity flow at atmospheric pressure, intended for sewerage and drainage applications.

2 REFERENCES

The Indian Standards listed below are necessary adjuncts to this standard.

IS No.	*Title*
269 : 1989	33 grade, ordinary Portland cement (*fourth revision*)
455 : 1989	Portland slag cement (*fourth revision*)
1489 : 1976	Portland pozzolana cement (*second revision*)
5382 : 1985	Rubber sealing rings for gas mains, water mains and sewers (*first revision*)
5913 : 1989	Methods of test for asbestos cement products (*first revision*)
7639 : 1975	Methods of sampling of asbestos cement products
8794 : 1988	Cast iron detachable joints for use with asbestos cement pressure pipes (*first revision*)
11769 (Part 1) : 1986	Guidelines for safe use of products containing asbestos: Part 1 Asbestos cement products
12081 (Part 2) : 1987	Recommendations for pictorial warning signs and precautionary notices for asbestos and products containing asbestos: Part 2 Asbestos and its products

3 PIPES

3.1 Composition

The pipes shall be made from a thorough and homogeneous mixture of clean asbestos fibre, 33 grade ordinary Portland cement conforming to IS 269 : 1989 or Portland slag cement conforming to IS 455 : 1989 or Portland pozzolana cement conforming to IS 1489 : 1976, and water. Addition of siliceous filler is also permissible. The mixture shall be free from any other loading and organic fibres or any materials liable to cause deterioration in the quality of pipes.

3.2 General Appearance and Finish

3.2.1 The pipes shall be seamless, compact and homogeneous. Their internal surface shall be regular and smooth. If required by the purchaser, the pipes may be coated internally and/or externally with a suitable coating but their internal surface shall remain regular and smooth. The finished pipes shall be capable of being easily cut or drilled.

3.2.2 The internal face between the branch and the parent pipe of junctions shall have a flush and fair finish.

3.3 Classification

The pipes shall be classified according to their crushing strength as given in Table 1. The ultimate loads of the three classes are based on a load per unit area of

60 kN/m² for class 1
90 kN/m² for class 2
120 kN/m² for class 3

provided that no crushing load at rupture is less than 15 kN/m.

NOTE — The load per unit area is the crushing load per metre length of pipe divided by the nominal diameter of the pipe in metres.

3.4 Dimensions and Geometrical Characteristics

3.4.1 The size designation of pipes shall be according to their nominal internal diameter expressed in mm, tolerance not being taken into account. The range of standard nominal internal diameters shall be as given in Table 1.

3.4.2 *Thickness*

The nominal thickness of the pipes is the thickness of the barrel of the pipe, excluding the machined ends.

NOTES

1 Standard nominal thicknesses of the pipes are not specified in this standard, and the nominal thickness shall conform to the values stated in the manufacturer's catalogue.

2 The thickness of the barrel of the pipes may be verified from test pieces sampled from transverse crushing test.

3 Where pipe ends are not machined, the thickness of the barrel of the pipes shall be measured at a distance not less than 100 mm from the ends.

Table 1 Classification of Pipes

(*Clauses* 3.3, 3.4.1 *and* 3.5.2)

Nominal Diameter	Minimum Ultimate Crushing Load		
	Class 1	Class 2	Class 3
(1)	(2)	(3)	(4)
mm	kN/m	kN/m	kN/m
100	15·0	15·0	15·0
125	15·0	15·0	15·0
150	15·0	15·0	17·5
200	15·0	17·5	25·0
250	15·0	22·5	30·0
300	17·5	27·5	35·0
350	21·5	31·5	41·5
400	23·5	36·5	48·5
450	26·5	40·0	53·5
500	30·0	45·0	60·0
600	36·5	53·5	71·5
700	41·5	63·5	83·5
750	45·0	67·5	90·0
800	48·5	71·5	96·5
850	51·0	76·5	102·0
900	53·5	81·5	108·5
1 000	60·0	90·0	120·0

NOTES

1 Nominal diameters and classes other than those specified in this table may also be manufactured; but in such cases the detailed dimensions shall be arrived at by mutual agreement between the purchaser and the manufacturer.

2 The choice of class of pipe is determined by the pipeline design engineer who alone is qualified to judge the conditions of installation, laying and operation of the pipes. However, it is recommended that a class be selected such that, taking into account all the loads and the bedding adopted, the pipes in use give a factor of safety at crushing of at least 1·3.

3 Occasional internal pressures are admissible provided that an adequate factor of safety be maintained in relation to the hydrostatic test pressure given in **3.5.1** and **4.5.1**.

4 750 mm and 850 mm nominal diameter pipes are considered as non-preferred sizes.

3.4.3 *Length*

The nominal length of the pipes shall correspond to the length measured between the extremities for pipes with plain ends and to the effective length for socketed pipes. It should preferably be not less than:

a) 3 m for pipes with a nominal diameter equal to or less than 200 mm, and

b) 4 m for pipes with a nominal diameter exceeding 200 mm.

In special cases shorter pipes may be specified. The nominal length should preferably be a multiple of 0·50 m.

3.4.4 *Dimensional Tolerances*

The permissible deviations from the manufacturer's stated thickness of the walls, the manufacturer's stated external diameter and the nominal length shall be not greater than those specified in Table 2.

Table 2 Permissible Deviations on Sizes

Thickness	Permissible Deviations		
	On Thickness Excluding Machined Ends	On External Diameter at Finished Ends	On Nominal Length
(1)	(2)	(3)	(4)
mm	mm	mm	mm
Up to and including 10	−1·5	±1·0 for 100 to 700 mm nominal diameter and ±1·5 for 750 to 1 000 mm nominal diameter	+50 −20 for 100 to 300 mm nominal diameter and +50 −40 for nominal diameter greater than 300 mm
Over 10, up to and including 20	−2·0		
Over 20, up to and including 30	−2·5		
Over 30, up to and including 60	−3·0		
Over 60, up to and including 90	−3·5		
Over 90	−4·0		

NOTES

1 Upper deviations on thickness at unmachined surface are free.

2 External diameter at the ends of the pipes, where jointing rings are located, shall be declared by the manufacturers.

3.4.5 *Regularity of the Internal Diameter* (*Optional Test*)

If required, the regularity of the internal diameter of pipes of nominal diameter up to 500 mm may be checked by means of a sphere or a disc, of a material unaffected by water, passing freely in the pipe. The disc shall be kept perpendicular to the axis of the pipe. The diameter of the sphere or the disc shall be less than the nominal diameter of the pipe by the following value, expressed in millimetres (rounded to the nearest millimetre):

$$2{\cdot}5 + 0{\cdot}01\,d$$

where d is the nominal diameter, expressed in millimetres. If required, the regularity of the internal diameter of pipes of nominal diameter exceeding 500 mm shall be checked by measuring at each end of the pipe three diameters at an angle of about 60° between them, with an accuracy of ±1 mm. None of the six measured diameters shall be smaller than that allowed by application of the above formula.

3.4.6 *Straightness* (*Optional Test*)

When pipes are tested for straightness in accordance with appropriate method given in IS 5913 : 1989, the deviation from straightness,

expressed in millimteres, shall not exceed the following limits:

	mm f	mm j
a) For nominal bore of 100 mm to 150 mm inclusive	5·5 l	6·5 l
b) For nominal bore of 200 mm to 400 mm inclusive	4·5 l	5·5 l
c) For nominal bore of 450 mm and above	3·0 l	4·0 l

where l = nominal length of the pipe in metres.

3.5 Physical, Mechanical and Chemical Characteristics

3.5.1 *Hydraulic Pressure Test (Optional Test)*

When tested in accordance with the method given in IS 5913 : 1989 to a pressure 0·25 MPa, the pipes shall not show any fissure, leakage or sweating on their outside surface.

3.5.2 *Transverse Crushing Strength*

When tested in accordance with the method given in IS 5913 : 1989, the pipe shall not fracture below the appropriate transverse crushing loads for the diameter and class as given in Table 1, and shall have a minimum transverse crushing stress of 33 N/mm².

3.5.3 *Longitudinal Bending Strength (Optional Test)*

When tested in accordance with the method given in IS 5913 : 1989, pipes of 100, 125 and 150 mm nominal diameter shall not fracture below the following total bending loads:

100 mm	2·8 kN
125 mm	4·2 kN
150 mm	6·0 kN

3.5.4 *Acid Resistance Test (Optional Test)*

When tested in accordance with the method given in IS 5913 : 1989, the material of the pipes shall be such that the amount of acetic acid neutralized shall not exceed 0·100 g/cm².

4 FITTINGS

4.1 Composition

The fittings shall comply with the composition requirements of **3.1**. Epoxy resin or other suitable material may be used for jointing the individual pieces of fabricated fittings.

4.2 General Appearance and Finish

The fittings shall comply with the requirements of **3.2**.

4.3 Classification and Types

The fittings when installed in the pipeline and, if necessary, surrounded with lean concrete, shall be of equivalent strength to that of the adjacent pipes. The basic types of fittings are bends, angle junctions, equal or unequal tees, double sockets, sleeves and saddles.

4.4 Dimensions and Geometrical Characteristics

4.4.1 The main dimensions shall be as specified in the manufacturers' catalogue.

4.4.2 *Nominal Diameter*

The series of nominal diameters of the fittings shall correspond to the nominal diameters of the pipes as given in **3.4.1**.

4.4.3 *Thickness*

The thickness of the barrel of the fitting shall be at least equal to that specified by the manufacturer for the corresponding pipe.

4.4.4 *Tolerances*

4.4.4.1 Variation of the internal diameter shall be same as for the corresponding pipes.

4.4.4.2 Tolerance on the nominal thickness of the fittings shall be as follows:

Upper deviation : Free
Lower deviation : —1·5 mm

NOTE — Tolerances on fittings manufactured from pipes shall correspond to these of the pipes of the same wall thickness (*see* **3.4.4**).

4.5 Physical, Mechanical and Chemical Characteristics

4.5.1 *Hydraulic Pressure Test (Optional Test)*

When tested in accordance with the method given in IS 5913 : 1989 to a pressure of 0·25 MPa, the fittings shall not show any fissure, leakage or sweating on their outside surface.

4.5.2 *Transverse Crushing Strength (Optional Test)*

When tested in accordance with the method given in IS 5913 : 1989, fittings shall not fracture or show any crack under a load less than 90 percent of the total load stated for the pipes of corresponding class and diameter, this load being calculated in relation to the length of the axis of the fitting actually loaded.

No minimum transverse crushing stress is required for fittings.

4.5.3 *Acid Resistance Test (Optional Test)*

When tested in accordance with the method given in IS 5913 : 1989, the material of the fittings shall be such that the amount of acetic acid neutralized shall not exceed 0·100 g/cm².

5 JOINTS

5.1 Two types of joints are normally provided with asbestos cement pipes and they are:

a) Asbestos cement couplings with rubber sealing rings, and

b) Cast iron detachable joints with rubber sealing rings and bolts and nuts.

5.2 The composition of asbestos cement coupling shall conform to **3.1** and the cast iron detachable joints shall conform to IS 8794 : 1988.

5.3 Rubber rings used in jointing shall comply with the requirements of IS 5382 : 1985 unless otherwise agreed between the purchaser and the manufacturer. They shall also be suitable for use with the type of jointing device selected.

5.4 The assembled joint shall be capable of withstanding an internal hydrostatic pressure of 0·25 MPa when tested in accordance with the method given in IS 5913 : 1989, even when the pipes are set at the maximum angular deviation stated by the manufacturer of the joint.

6 INDEPENDENT TESTING

6.1 If the purchaser or his representative requires independent tests, the samples shall be taken before or immediately after delivery at the option of the purchaser or his representative and the tests shall be carried out in accordance with this standard on the written instruction of the purchaser or his representative.

7 CRITERIA FOR ACCEPTANCE

7.1 Inspection of Each Item of Consignment

7.1.1 *Finish, Marking, Dimensions and Tolerances*

The finish, the marking, the dimensions and the tolerance on pipes, fittings and joints may be verified on each item of the consignment.

In order to reduce the duration and the costs of the acceptance operations in practice, the inspection of the characteristics made on each item of the consignment map, at the purchaser's request, be replaced by an inspection by sampling. In this case, if the inspection results tend toward the rejection of the lot, the manufacturer may ask for 100 percent inspection on all items of the consignment with regard to the failing characteristics.

7.1.2 *Length Delivery Tolerances*

At least 85 percent of the pipes supplied should be of nominal length (subject to the tolerances given in **3.4.4**). The remainder may be shorter but not less than 2 m. The required number of additional joints, because of supply of short length pipes, shall be supplied by the manufacturer without any extra cost.

7.1.3 Works hydraulic pressure tightness test in accordance wish **3.5.1** and **4.5.1** shall be carried out by the manufacturer. The purchaser, if he so desires, may be present or depute a representative to be present while the tests are being carried out.

7.1.4 The pipes and fittings which do not satisfy the above requirements shall be rejected.

7.2 Inspection by Sampling

7.2.1 The tests indicated in **3.5** and **4.5** shall be conducted on samples of pipes and fittings selected as in **9**.

8 MANUFACTURER'S CERTIFICATE

8.1 The manufacturer shall satisfy himself that the pipes and fittings conform to the requirements of this standard and, if required, shall furnish a certificate to this effect to the purchaser or his representative clearly stating the class of the pipes and fitttings.

9 SAMPLING

9.1 The sampling, inspection and acceptance shall be in accordance with IS 7639 : 1975. Each inspection lot should include only items of the same diameter and the same class. Unless otherwise agreed to between the manufacturer and the purchaser, the maximum and minimum inspection lots shall be as follows:

a) 800 and 200 pipes respectively for diameters up to 100 mm,

b) 400 and 100 pipes respectively for diameters from 125 to 250 mm, and

c) 200 and 100 pipes respectively for diameters of 300 mm and above.

10 MARKING

10.1 The pipes and fittings shall be legibly and indelibly marked with the following information:

a) Manufacturer's name or trade-mark, if any;

b) Date of manufacture;

c) Nominal diameter;

d) Class of pipe and fittings; and

e) Pictorial warning sign as given in IS 12081 (Part 2) : 1987.

10.1.1 Each pipe and fitting may also be marked with the Standard Mark.

11 SAFETY RULES SHEET

11.1 All delivery of asbestos cement pipes and fittings by the manufacturers shall be accompanied by safety rules sheet as given in IS 11769 (Part 1) : 1987.

ANNEX A
(*Foreword*)

COMPOSITION OF TECHNICAL COMMITTEE

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