Indian Standard

ASBESTOS CEMENT PRESSURE PIPES — SPECIFICATION

(Third Revision)

भारतीय मानक

एस्बेस्टास सीमेंट के दाब पाइप — विशिष्टि

(तीसरा पुनरीक्षण)

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FOREWORD

This Indian Standard (Third Revision) was adopted by the Bureau of Indian Standards on 11 May 1989, after the draft finalized by the Cement and Concrete Sectional Committee had been approved by the Civil Engineering Division Council.

Asbestos cement pressure pipes are being used in this country for more than 50 years and considerable experience is available in regard to their use, over ground and underground, for water supply pressure mains.

This standard was originally published in 1960 and subsequently revised in 1970 and 1980. The Sectional Committee decided to revise the standard further in the light of experience gained in its use. In the first revision, standard dimensions for three classes of pipes (Class 5, 10 and 15) of diameter 80 to 200 mm only were given. In the second revision, detailed dimensions for pipes of class 20 and 25 were included, in addition to covering pipes of diameter 80 to 600 mm for all the five classes of pipes. In this revision, dimensions for pipes of diameter 700 to 1 000 mm and two new classes of pipes, that is, Class 5 TP and Class 10 TP for diameter 700 to 1 000 mm have been included.

Addition of ground silica or pozzolana to replace ordinary Portland cement in the manufacture has been permitted in this specification in the case of autoclaved pipes.

This standard covers all requirements of asbestos cement presssure pipes manufactured in the country for local consumption as well as for export. Necessary guidance regarding the selection of asbestos cement pressure pipes may be obtained from Indian Standard 'Guidelines for selection of asbestos cement pipes subject to external loads with or without internal pressure (*under preparation*)'.

In the formulation of 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.

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

Indian Standard

ASBESTOS CEMENT PRESSURE PIPES SPECIFICATION

(Third Revision)

1 SCOPE

1.1 This standard covers the requirements for manufacture, classification, dimensions, tests and acceptance criteria for asbestos cement pressure pipes of Class 5, 10, 15, 20, 25, 5 TP and 10 TP (*see* **4.1**).

2 REFERENCES

2.1 The Indian Standards listed in Annex A are necessary adjuncts to this standard.

3 MATERIAL

3.1 Composition

Asbestos cement pressure pipes shall be made from a thorough and homogeneous mixture of ordinary Portland cement conforming to IS 269 : 1976, rapid hardening Portland cement conforming to IS 8041 : 1978, Portland slag cement conforming to IS 455 : 1976 or Portland pozzolana cement conforming to IS 1489 : 1976 and asbestos fibre.

NOTES

1 Addition of ground silica or pozzolana (up to a maximum of 40 percent by mass) to replace ordinary Portland cement is permissible in case of autoclaved pipes. Pozzolana used shall conform to IS 1344 : 1981 or IS 3812 : 1981.

2 Addition of fibres other than asbestos, inorganic and/or organic, found technically suitable for the manufacture and performance of pipes (up to a maximum of 5 percent by mass) is permissible.

3.2 Physical Properties

3.2.1 *Hydraulic Bursting Stress*

The unit bursting stress arrived at from hydraulic bursting test (*see* **7.3**) shall be not less than 20 N/mm² for sizes up to and including 300 mm dia and 22 N/mm² for sizes 350 mm dia and above.

3.2.2 *Transverse Crushing Stress*

The unit transverse crushing stress arrived at from transverse crushing test (*see* **7.3**) shall not be less than 44 N/mm².

3.2.3 *Longitudinal Bending Stress*

The unit longitudinal bending stress arrived at from longitudinal bending test (*see* **7.3**) shall be not less than 24·5 N/mm². However, this test requirement shall be satisfied only in case of pipes of diameter 150 mm and less. This test may be conducted with mutual agreement between the purchaser and the manufacturer.

4 CLASSIFICATION

4.1 The pipes shall be classified with respect to the works hydraulic test pressure as given in Table 1.

Table 1 Classification of Asbestos Cement Pressure Pipes

Class	Works Hydraulic Test Pressure (TP)
	MPa
5	0·5
10	1·0
15	1·5
20	2·0
25	2·5
5 TP	0·5
10 TP	1·0

NOTES

1 Class 5 TP and 10 TP pipes are recommended for use where the pipeline is not subjected to any external load other than a normal backfill load of maximum 1·25 m. Such classes of pipes shall be manufactured only for nominal diameter 700 mm and above.

2 Pipes of Class 6, 12, 18 and 24 corresponding to works hydraulic test pressure of 0·6, 1·2, 1·8 and 2·4 MPa respectively may also be manufactured. In such cases, detailed dimensions shall be arrived at between the supplier and the purchaser.

4.2 The classification given in Table 1 is based on the works hydraulic test pressure. The hydraulic working pressure shall normally be not more than (a) 50 percent of the pressure defining the class of pipes for diameter up to 500 mm, and (b) 60 percent for dia 600 mm and above.

4.2.1 The purchaser shall decide on the class of pipe to be used and other conditions of operation, taking note of the conditions of laying and operation of the pipes.

4.2.2 The relationship between the bursting pressure (BP) and the works hydraulic test pressure (TP) and the relationship between the bursting pressure (BP) and the normal hydraulic working pressure (WP) shall be not less than the values given in Table 2.

5 DIMENSIONS AND TOLERANCES

5.1 Nominal Diameter

5.1.1 Size designation of pipes shall be according to their nominal diameters. The nominal diameter of the pipes corresponds to the internal diameter (bore), tolerances not being taken into account.

Table 2 Relationship Between Bursting Pressure (BP), Works Hydraulic Test Pressure (TP) and the Normal Hydraulic Working Pressure (WP)

(*Clause* 4.2.2)

Nominal Diameter mm (1)	BP/TP (2)	BP/WP (3)
80 and 100	2	4
125 to 200	1·75	3·5
250 to 500	1·5	3·0
600 to 1 000	1·5	2·5

5.1.2 The nominal diameters of pipes in mm shall be as follows:

80	200	400	700	900
100	250	450	750*	1 000
125	300	500	800	
150	350	600	850*	

NOTE — Pipes of nominal diameter larger than 1 000 mm may also be manufactured; in such case, detailed dimensions may be arrived at between the supplier and the purchaser.

5.1.3 *Tolerances on the Diameter*

5.1.3.1 *Tolerances on external diameter at pipe end*

Tolerances on the external diameter at 100 mm from ends shall be as follows:

Nominal Diameter mm	*Tolerances* mm
80 to 300	± 0·6
350 to 500	± 0·8
600 to 700	± 1·0
750 to 1 000	± 1·5

5.1.3.2 *Regularity of internal diameter (optional test)*

If required, the regularity of the internal diameter of pipes of diameter less than or equal to 500 mm shall be checked by means of a sphere or a disc, of a material unaffected by water which shall pass 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 internal diameter of the pipe by the following:

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

where

d = nominal diameter of pipe in mm.

If required, the regularity of internal diameter of pipes of diameter greater than 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 the application of the above formula.

*Non-preferred size.

5.2 Thickness

5.2.1 The nominal thicknesses of different classes and diameters of pipes shall be in accordance with Tables 3 and 4.

5.2.2 *Tolerances on the Thickness of the Wall*

The tolerance on thickness shall be as follows (*see also* Note 2 under Table 3):

Nominal Thickness (mm)	*Tolerance* (mm)
Up to and including 10	− 1·5
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

NOTE — Plus tolerance shall be free.

5.2.3 The thickness shall be measured near the jointing surface of the pipe ends. The thickness at any point along the barrel of the pipe shall be not less than that obtained by the application of tolerances given in **5.2.2** to the nominal thickness (*see also* Note 2 under Table 3). For the purpose of measuring thickness at any point, measurement shall be made on the pieces obtained from hydraulic bursting test and transverse crushing test.

5.3 Nominal Length

The nominal length of pipes for all diameters shall be 3, 4 or 5 m. In special cases, shorter pipes may be specified. The nominal length shall preferably be a multiple of 0·5 m (*see also* **10.1.2**).

5.3.1 *Tolerances on the Nominal Length*

The tolerance on the length shall be $^{+\ 50}_{-\ 20}$ mm for diameters less than or equal to 300 mm and $^{+\ 50}_{-\ 40}$ mm for nominal diameters greater than 300 mm.

5.3.2 The aggregate length of pipes supplied shall be not less than the aggregate nominal length ordered and shall include the complete requirements of joints for the ordered length if the joints (*see* **8**) are ordered for.

5.4 Straightness (Optional Test)

5.4.1 The deviation in straightness determined by straightness test for pipes in accordance with IS 5913 : 1989 shall not exceed the following:

Nominal Diameter mm	*Maximum Deviation* mm	
	f	*j*
80 to 150	5·5 *l*	6·5 *l*
200 to 400	4·5 *l*	5·5 *l*
450 to 1 000	3·0 *l*	4·0 *l*

NOTE — *l* is the length of the pipe in metres.

Table 3 Classification and Dimensions of Asbestos Cement Pressure Pipes

(*Clauses* 5.2.1, 5.2.2, 5.2.3 *and* 5.5)

Sl No.	Nom Dia	Class 5		Class 10		Class 15		Class 20		Class 25	
		Thick-ness	External Diameter	Thick-ness	External Diameter	Thick-ness	External Diameter	Thick-ness	External Diameter	Thick ness	External Diameter
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
1	80	9·5	99·5	9·5	99·5	9·5	99·5	11·0	101·5	13·5	106·5
2	100	9·5	120·0	9·5	120·0	10·0	121·0	13·5	126·5	16·5	132·5
3	125	9·5	145·0	9·5	145·0	11·0	147·0	14·0	152·5	17·5	159·5
4	150	9·5	171·0	9·5	171·0	13·0	176·5	16·5	183·0	21·0	191·0
5	200	9·5	221·0	11·5	225·0	16·5	233·5	22.0	242·5	27·5	253·5
6	250	9·5	271·0	12·0	276·5	17·0	284·5	23·0	294·5	28·5	305·5
7	300	9·5	322·5	14·0	328·5	20·0	340·5	27·0	352·5	34·5	366·5
8	350	14·5	379·5	14·5	379·5	21·0	392·0	27·5	405·0	35·0	419·0
9	400	16·0	432·0	16·0	432 0	24·0	448·0	32·0	463·0	39·5	478·0
10	450	17·5	482 0	17·5	482·0	26·5	498·0	35·5	515·0	44·0	532·0
11	500	19·5	536·5	19·5	536·5	29·0	554·5	39·0	572·5	48·5	591·5
12	600	23·5	643·5	23·5	643·5	35·0	665·5	46·0	686·5	58·0	710·5
13	700	33·0	761·0	33·0	761·0	37·0	769·0	50·0	795·0	64·0	823·0
14	750	34·0	813·0	34·0	813·0	39·5	824·0	54·0	853·0	68·5	882 0
15	800	35·0	865·0	35·0	865·0	42·5	880·0	57·5	910·0	73·0	941·0
16	850	37·0	919·0	37·0	919·0	45·0	935·0	61·0	967·0	77·5	1 000·0
17	900	39·0	973·0	39·0	973·0	47·5	990·0	64·5	1 024·0	82·0	1 059·0
18	1 000	43·5	1 082·0	43·5	1 082·0	53·0	1 101·0	71·5	1 138·0	91·0	1 177·0

NOTES

1 External diameters at finished ends of the pipes specified in the table are already in practical use and are specified for the purpose of interchangeability. Due to inherent characteristics of the manufacturing process and common moulds for all classes, external diameter may not be equal to internal diameter plus twice the thickness in all cases.

2 For nominal diameters 700 to 1000 mm for classes 5 to 25, the barrel thickness shall be not less than the thickness mentioned above. The same may be verified from bursting test pieces.

Table 4 Classification and Dimensions of Asbestos Cement Pressure Pipes

(*Clauses* 5.2.1 *and* 5.5)

Sl No.	Nom Dia	Class 5 TP		Class 10 TP	
	mm	Thickness	External Dia	Thickness	External Dia
		mm	mm	mm	mm
(1)	(2)	(3)	(4)	(5)	(6)
1	700	24·5	744	24·5	744
2	750	26·0	797	26·0	797
3	800	28·0	851	28·0	851
4	850	29·5	904	29·5	904
5	900	31·5	958	31·5	958
6	1 000	34·5	1 064	34·5	1 064

NOTE — Class 5 TP and 10 TP pipes are recommended for use where the pipeline is not subjected to any external load other than a normal backfill load of maximum 1·25 m.

5.5 The dimensions of asbestos cement pressure pipes of different classification as given in **4** and different nominal diameters as given in **5.1** shall be as given in Tables 3 and 4.

6 FINISH

6.1 All internal surfaces of the pipes should be regular and smooth.

6.2 The shape of the finished ends should be fixed by the manufacturer to suit the type of joint used.

7 TESTS

7.1 The works hydraulic pressure tightness test shall be performed on all the pipes (compulsory test).

7.2 Works Hydraulic Pressure Tightness Test

The pipes shall show no fissure, leakage or sweating on the outside surface when tested in accordance with the method described in IS 5913 : 1989 to the works hydraulic test pressure given in Table 1.

7.3 Test shall be conducted to check the physical properties mentioned in **3.2.1** to **3.2.3** in accordance with method described in IS 5913 : 1989.

8 JOINTS

8.1 Two types of joints are normally provided with asbestos cement pressure 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.

8.2 The composition of asbestos cement couplings shall conform to **3.1** and the cast iron detachable joints shall conform to IS 8794 : 1978.

8.3 Rubber rings used in jointing shall comply with the requirements of IS 5382 : 1985. If the pipes are to be used for conveying drinking water, the rings shall not affect the quality of water.

8.4 The dimensions of asbestos cement couplings shall be as given by the manufacturer. The tolerances on the internal diameter shall be as agreed to with the manufacturer taking into account the tolerances on the rings and pipes.

8.5 The assembled joints shall be flexible and capable of withstanding the specified hydraulic pressure (*see* **4.1** and **7.2**) of the pipes on which they are to be used when the pipes are set at the maximum permissible angular deviation indicated by the manufacturer.

8.5.1 The number of joints which are to be tested shall be as agreed to between the purchaser and manufacturer subject to **12**.

9 INDEPENDENT TESTING

9.1 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.

10 CRITERIA FOR ACCEPTANCE

10.1 Inspection of Each Item of Consignment

10.1.1 *Finish, Marking, Dimensions and Tolerances*

The finish (*see* **6**), the marking (*see* **13**), the dimensions and the tolerance on pipes and joints (*see* **5** and **8.4**) may be verified on each item of the consignment.

In order to reduce the duration and the cost of the acceptance operations in practice, the inspection of characteristics made on each item of the consignment may, 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.

10.1.2 *Length Delivery Tolerances*

At least 90 percent of the pipes supplied should be of the nominal length (subject to the tolerances given in **5.3.1**). The remainder may be shorter by not more than 1 m in case of pipes of 3 m nominal length and by not more than 2 m in case of pipes of 4 and 5 m nominal length, The required number of additional joints because of supply of short length pipes, shall be supplied by the manufacturer without any extra cost.

10.1.3 The works hydraulic pressure tightness test in accordance with **7.2** should be carried out by the manufacturer on all the pipes (*see* **7.1**) as a part of the manufacturing programme. The purchaser, if he so desires, may be present or depute a representative to be present while the tests are being carried out (*see also* **10.2.2**).

10.1.4 The pipes which do not satisfy the above requirements shall be rejected.

10.2 Inspection by Sampling

10.2.1 The tests indicated in **3.2.1** to **3.2.3** shall be conducted on samples of pressure pipes selected as in **12**.

10.2.2 If the purchaser does not witness the hydraulic pressure tightness test, which the manufacturer carried out on all pipes as given in **10.1.3**, he may, for checking purposes and after giving notice, ask for additional hydraulic pressure tightness test (*see* **7.2**) on only samples of pipes selected as given in **12**.

11 MANUFACTURER'S CERTIFICATE

11.1 The manufacturer shall satisfy himself that the pipes 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 and the diameter of the pipe.

12 SAMPLING

12.1 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 of 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.

13 MARKING

13.1 Each pipe 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

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

14 SAFETY RULES SHEET

14.1 All delivery of asbestos cement pipes shall be accompanied by a safety rules sheet as given in IS 11769 (Part 1) : 1987.

ANNEX A
(*Clause* 2.1)
LIST OF REFERRED INDIAN STANDARDS

IS No.	*Title*
IS 269 : 1976	Ordinary and low heat Portland cement (*third revision*)
IS 455 : 1976	Portland slag cement
IS 1344 : 1981	Calcined clay pozzolana (*second revision*)
IS 1489 : 1976	Portland-pozzolana cement (*second revision*)
IS 3812 : 1981	Fly ash for use as pozzolana and admixture (*first revision*)
IS 5913 : 1989	Methods of test for asbestos cement products (*first revision*)
IS 5382 : 1985	Rubber sealing rings for gas mains, water mains and sewers (*first revision*)
IS 7639 : 1975	Methods of sampling of asbestos cement products
IS 8041 : 1978	Rapid hardening Portland cement (*first revision*)
IS 8794 : 1978	Cast iron detachable joints for use with asbestos cement pressure pipes
IS 11769 (Part 1) : 1987	Guidelines for safe use of products containing asbestos : Part 1 Asbestos cement products
IS 12081 (Part 2) : 1987	Recommendations for pictorial warning signs and precautionary notices for asbestos and products containing asbestos: Part 2 Asbestos and its products

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

'**12.1** The sampling, inspection and acceptance shall be in accordance with IS 7639 : 1975. Each inspection lot shall include only items of the same diameter and of the same class.'

(CED 53)

Reprography Unit, BIS, New Delhi India

AMENDMENT NO. 2 APRIL 1995
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IS 1592 : 1989 ASBESTOS CEMENT PRESSURE PIPES — SPECIFICATION

(Third Revision)

(*Second cover page, foreword, para* 3) — Delete the entire para.

(*Page* 1, *clause* 3.1) — Substitute the following for existing clause:

'3.1 Composition

Asbestos cement pressure pipes shall be made from a thorough and homogenous mixture of 33 grade ordinary Portland cement conforming to IS 269 : 1989 or 43 grade ordinary Portland cement conforming to IS 8112 : 1989 or 53 grade ordinary Portland cement or rapid hardening Portland cement conforming to IS 8041 : 1990 or Portland slag cement conforming to IS 455 : 1989 or Portland pozzolana cement conforming to either IS 1489 (Part 1) : 1991 or IS 1489 (Part 2) : 1991 and asbestos fibre.'

(*Page* 1, *clause* 3.1, *Note* 1) — Substitute the following for the existing note:

'1 Additions of ground silica or pozzolana (up to a maximum of 40 percent by mass) to replace ordinary Portland cement is permissible. When pozzolana is used it shall conform to grade 1 of IS 1344:1981 or IS 3812:1981. When ground silica is used, the pipes shall be autoclaved.'

(*Page* 5, *Annex* A) :

i) Substitute 'IS 269 : 1989 Ordinary Portland cement, 33 grade — Specification (*fourth revision*)' *for* 'IS 269 : 1976 Ordinary and low heat Portland cement (*third revision*)'.

ii) Substitute 'IS 455 : 1989 Portland slag cement — Specification (*fourth revision*)' *for* 'IS 455 : 1976 Portland slag cement'.

iii) Substitute the following for 'IS 1489 : 1976 Portland-pozzolana cement (*second revision*)':

'IS 1489 (Part 1) : 1991 Portland-pozzolana cement — Specification: Part 1 Fly ash based (*third revision*)

IS 1489 (Part 2) : 1991 Portland-pozzolana cement — Specification : Part 2 Calcined clay based *(third revision)*'.

iv) Add the following after 'IS 8041 : 1978 Rapid hardening Portland cement *(first revision)*':

'IS 8112 : 1989 43 grade ordinary Portland cement — Specification *(first revision)*'.

v) Add the following at the end:

'IS 12269 : 1987 Specification for 53 grade ordinary Portland cement'.

(CED 53)

Reprography Unit, BIS, New Delhi, India