इंटरनेट मानक

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Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

"जानने का अधिकार, जीने का अधिकार"
Mazdoor Kisan Shakti Sangathan
"The Right to Information, The Right to Live"

"पुराने को छोड नये के तरफ"
Jawaharlal Nehru
"Step Out From the Old to the New"

IS 1592 (2003): Asbestos Cement Pressure Pipes and Joints - [CED 53: Cement Matrix Products]

"ज्ञान से एक नये भारत का निर्माण"
Satyanarayan Gangaram Pitroda
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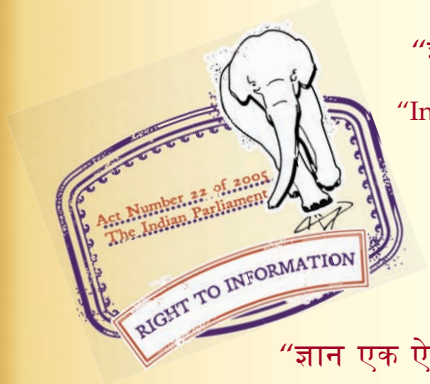

"ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है"
Bhartṛhari—Nītiśatakam
"Knowledge is such a treasure which cannot be stolen"

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भारतीय मानक

एस्बेस्टॉस सीमेंट के दाब पाइप और जोड़ — विशिष्टि

(चौथा पुनरीक्षण)

Indian Standard

ASBESTOS CEMENT PRESSURE PIPES AND JOINTS — SPECIFICATION

(Fourth Revision)

ICS 23.040.50; 91.100.40

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

October 2003

Price Group 6

FOREWORD

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

Asbestos cement pressure pipes are being used in this country for more than 60 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, 1980 and in 1989. 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 the 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 were included and addition of ground silica or pozzolana to replace ordinary Portland cement in the manufacture was permitted.

This revision is being brought out to incorporate the experience gained in use of this standard. Though the earlier version was also largely based on the corresponding ISO Standard, namely, ISO 160 : 1980 'Asbestos cement pressure pipes and joints', in this revision the provisions have been further aligned with the corresponding provisions in ISO 160 : 1980. However, care has been taken to retain or modify/improve upon some of the provisions in the context of our country. Some of the provisions such as detailed composition of pipes, data on thickness requirements of pipes, marking details, provisions regarding joint, etc, given in much detail in the third revision of the standard have been retained. In this standard Class 5, Class 5 TP and Class 10 TP has been deleted for all sizes and Class 10 have been eliminated for size 200 mm and above, considering field problems. The methods of test of these pipes have been given in a separate standard, namely, IS 5913 : 2003 'Methods of test for asbestos cement products'.

This standard covers all requirements of asbestos cement pressure 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)*'. Guidance for laying of Asbestos Cement Pressure pipes may be obtained from IS 6530 : 1972 'Code of practice for laying of asbestos cement pressure pipes'.

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.

The composition of the Committee responsible for the formulation of this standard is given in Annex D.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 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 AND JOINTS — SPECIFICATION

(Fourth Revision)

1 SCOPE

This standard covers requirements relating to plain ended asbestos cement pipes and joints intended for use under pressure; it defines certain conditions of manufacture, classification, characteristics and acceptance tests applicable to these products.

NOTE — Asbestos cement building pipes and pipe fittings, gutters and gutter fittings and roofing fittings are covered by IS 1626. Asbestos cement pipes and fittings for sewerage and drainage are covered by IS 6908 'Specification for asbestos cement pipes and fittings for sewerage and drainage *(first revision)*'.

2 REFERENCES

The standards listed in Annex A contain provisions which through reference in this text constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated in Annex A.

3 PIPES

3.1 Composition

Asbestos cement pressure pipes shall be made from a thorough and homogeneous mixture of asbestos fibre and 33 grade ordinary Portland cement conforming to IS 269 or 43 grade ordinary Portland cement conforming to IS 8112 or 53 grade ordinary Portland cement conforming to IS 12269 or rapid hardening Portland cement conforming to IS 8041 or Portland slag cement conforming to IS 455 or Portland Pozzolana cement conforming to either IS 1489 (Part 1) or IS 1489 (Part 2) or sulphate resisting Portand cement conforming to IS 12330.

NOTES

1 Addition 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 or IS 3812. When ground silica is used the pipes shall be autoclaved.

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 Classification

3.2.1 *Pipes of Nominal Diameter Up to 1 000* mm

Pipes of nominal diameter up to 1 000 are classified according to the works hydraulic test pressure given in Table 1.

Table 1 Classification

Sl No.	Classes	Works Hydraulic Test Pressure, TP (MPa)
(1)	(2)	(3)
i)	10	1.0
ii)	15	1.5
iii)	20	2.0
iv)	25	2.5

NOTES

1 Pipes of class 12, 18, 24, 30, 35 and 36 corresponding to works hydraulic test pressure of 1.2, 1.8, 2.4, 3.0, 3.5 and 3.6 MPa respectively may also be manufactured. In such cases, detailed dimensions shall be arrived at between the manufacturer and the purchaser.

2 For pipes of nominal diameter from 600 mm to 1 000 mm, the procedure given in **3.2.2** may also be used.

The classification given in Table 1 is based on the work hydraulic test pressure. The hydraulic working pressure shall not be more than 50 percent of the works hydraulic test pressure. The total hydraulic working pressure inclusive of calculated maximum surge pressure (irrespective of installation of surge protection devices) shall not exceed 75 percent of works hydraulic test pressure.

The purchaser's representative; who is qualified to judge the conditions of laying and operational suitability of the pipes, must decide the class of pipe to be used, in relation to the hydraulic working pressure and other conditions of laying and of operation he has determined.

For choosing the class of pressure pipes subject to external loads, *see* Indian Standard 'Guidelines for selection of asbestos cement pipes subject to external load with and without internal pressure (*under preparation*)'.

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

Table 2 Pressure Relationship

(*Clause* 3.2.1)

Sl No.	Nominal Diameters	$\frac{BP}{TP}$	$\frac{BP}{WP}$
(1)	(2)	(3)	(4)
i)	From 50 to 100	2	4
ii)	From 125 to 200	1.75	3.5
iii)	From 250 to 1 000	1.5	3

NOTE — Pipes of nominal diameter above 1 000 mm and up to 2 500 mm may also be manufactured with the data on the above parameters to be as mutually agreed to between the manufacturer and the purchaser.

3.2.2 *Pipes of Nominal Diameter Exceeding 1 000* mm

Pipes of nominal diameter exceeding 1 000 mm are not classified in the same way as defined in **3.2.1**. They are designed to suit the specific requirements of any particular pipeline.

The purchaser's representative, who is qualified to judge the conditions of laying and operational suitability of the pipes, shall provide the manufacturer with all required data for the design of a suitable pipe. The design shall take into account the crushing loads for pipes of nominal diameter greater than 600 mm in accordance with the recommendations given in Indian Standard 'Guidelines for selection of asbestos cement pipes subject to external loads with or without internal pressure (*under preparation*)' and shall be subject to the approval of the purchaser's representative.

For relationship between *BP* and *TP*, and relationship between *BP* and *WP*, *see* Note under Table 2.

3.3 General Appearance and Finish

The internal surface shall be regular and smooth. The pipes may be coated internally and/or externally with a suitable coating, if required by the purchaser's representative.

The part of the pipe where the rubber joining rings are located shall satisfy the tolerances on the external diameter as defined in **3.4.1.4** (a), for a length appropriate to the type of joint adopted and shall be free from irregularities, which could effect the water tightness.

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

3.4 Characteristics

3.4.1 *Geometrical Characteristics*

3.4.1.1 *Nominal diameter*

The nominal diameter of the pipes corresponds to the internal diameter expressed in millimetres, tolerances excluded. The series of nominal diameters is given in Table 3.

Table 3 Nominal Diameter

All dimensions in millimetres.

50	400
60	450
80	500
100	600
125	700
150	750
200	800
250	850
300	900
350	1 000

NOTE — The pipes of nominal diameter above 1 000 mm may also be manufactured, if required with mutual agreement between the manufacturer and the user.

3.4.1.2 *Thickness of wall and external diameter*

The thickness of wall and external diameters of asbestos cement pressure pipes shall be as per Table 4.

3.4.1.3 *Length*

The nominal length of the pipes refers to the length measured between the extremities for pipes with plain ends. It shall not be less than 3 m for pipes with a nominal diameter equal to or less than 200 mm; and not less than 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 0.5 m (*see also* **5.2.4**).

3.4.1.4 *Tolerances*

a) *External diameter of finished ends*

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

Nominal Diameter mm	*Tolerances* mm
50 to 300	± 0.6
350 to 500	± 0.8
600 to 700	± 1.0
750 to 1000	± 1.5

NOTE — Such tolerances for sizes above 1 000 mm would be as agreed to between the manufacturer and the user.

Table 4 Classification and Dimensions of Asbestos Cement Pressure Pipes

(*Clause* 3.4.1.2)

All dimensions are in millimetres.

Sl No.	Nominal Diameter	Class 10		Class 15		Class 20		Class 25	
		Thickness	External Diameter	Thickness	External Diameter	Thickness	External Diameter	Thickness	External Diameter
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1	50	9.5	69.0	9.5	69.0	11.0	71.5	13.5	76.5
2	60	9.5	79.0	9.5	79.0	11.0	81.5	13.5	86.5
3	80	9.5	99.5	9.5	99.5	11.0	101.5	13.5	106.5
4	100	9.5	120.0	10.0	121.0	13.5	126.5	16.5	132.5
5	125	9.5	145.0	11.0	147.0	14.0	152.5	17.5	159.5
6	150	9.5	171.0	13.0	176.5	16.5	183.0	21.0	191.0
7	200	–	–	16.5	233.5	22.0	242.5	27.5	253.5
8	250	–	–	17.0	284.5	23.0	294.5	28.5	305.5
9	300	–	–	20.0	340.5	27.0	352.5	34.5	366.5
10	350	–	–	21.0	392.0	27.5	405.0	35.0	419.0
11	400	–	–	24.0	448.0	32.0	463.0	39.5	478.0
12	450	–	–	26.5	498.0	35.5	515.0	44.0	532.0
13	500	–	–	29.0	554.5	39.0	572.5	48.5	591.5
14	600	–	–	35.0	665.5	46.0	686.5	58.0	710.5
15	700	–	–	38.0	769.0	51.5	795.0	65.5	823.0
16	750	–	–	40.5	824.0	55.0	853.0	70.0	882.0
17	800	–	–	43.5	880.0	59.0	910.0	75.0	941.0
18	850	–	–	46.0	935.0	62.5	967.0	79.5	1 000.0
19	900	–	–	48.5	990.0	66.0	1 024.0	84.0	1 059.0
20	1 000	–	–	54.0	1 101.0	73.5	1 138.0	93.5	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 1 000 mm for Classes 15 to 25, the barrel thickness shall not be less than the thickness mentioned above. The same may be verified from bursting test pieces.

3 For pipes of nominal diameter above 1 000 mm data/details shall be as agreed to between the manufacturer and the purchaser.

b) *Regularity of the internal diameter (Roundness — 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, 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):

$$2.5 + 0.01\,d$$

where

d = Nominal diameter[1],

If required, the regularity of the internal diameter of pipes 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 ±1mm. None of the six measured diameters shall be smaller than that allowed by application of the above formula.

c) *Nominal thickness of the wall*

On jointing surfaces at the pipe ends, the lower deviations of the tolerances are as follows:

Nominal Thickness (mm)	*Tolerance* (mm)
Up to and including 10	–1.0
Over 10 up to and including 20	–1.5
Over 20 up to and including 30	–2.0
Over 30 up to and including 60	–3.0
Over 60 up to and including 90	–3.5
Over 90	–4.0

NOTES

1 Plus tolerance shall be free.

2 For pipes of 50 and 60 mm diameter, the above tolerances are allowable provided that the variation of the internal diameter resulting from their application does not exceed –5 mm.

3 The thickness at any point along the barrel of the pipe should be not less than that obtained by application of the tolerances given above.

4 The average thickness of the samples from the lot shall not be less than the nominal thickness and not more than 10 percent of the pipes samples should have negative tolerance.

d) *Nominal length*

The tolerances on nominal length shall be as follows:

For all lengths: $^{+50}_{-20}$ mm

[1] Or the manufacturing diameter, if different from the nominal diameter.

e) *Straightness (Optional test)*

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

Nominal Diameter	*Maximum Deviation*	
mm	*f* mm	*j* mm
50 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.

3.4.2 *Physical Characteristics*

When tested in accordance with **3.5**(a)(1) (compulsory test for all pipes), the pipes shall show no fissure, leakage or sweating.

3.4.3 *Mechanical Characteristics*

3.4.3.1 *Bursting*

When tested in accordance with **3.5**(a)(2), the pipes shall have a minimum unit bursting strength of 22 N/mm² except that for diameters exceeding 1 200 mm this strength may be reduced by not more than 20 percent by agreement between the manufacturer and the purchaser provided that the safety factors specified in Indian Standard 'Guidelines for selection of asbestos cement pipes subject to external loads with or without internal pressure (*under preparation*)' for large diameter pipes are maintained (*see* **3.2.2**).

3.4.3.2 *Crushing*

When tested in accordance with **3.5**(a)(3), the pipes shall have a minimum unit transverse crushing strength of 44 N/mm² except that for diameters exceeding 1 200 mm this strength may be reduced by not more than 20 percent by agreement between the manufacturer and the purchaser provided that the safety factors specified in Indian Standard 'Guidelines for selection of asbestos cement pipes subject to external load with and without internal pressure (*under preparation*)' for large diameter pipes are maintained.

3.4.3.3 *Bending*

When tested as prescribed in **3.5**(a)(4) (test limited to pipes with a nominal diameter less than or equal to 150 mm), the pipes shall have a minimum unit bending strength of 24.5 N/mm².

NOTES

1 Mechanical characteristics may be expressed in ultimate loads; however, the unit strength determined by the tests prescribed in **3.5**(a)(2), **3.5**(a)(3) and **3.5**(a)(4) should be not less than those indicated in **3.4.3.1**, **3.4.3.2** and **3.4.3.3** respectively.

2 Tests on non-immersed specimens may be specified, in which case the following values shall apply:

a) Minimum unit bursting strength : 24 N/mm²

b) Minimum unit transverse crushing strength : 48.5 N/mm²

c) Minimum unit bending strength : 27 N/mm²

NOTE — The bursting and crushing strength may be reduced by not more than 20 percent in the case of diameters exceeding 1 200 mm.

3.5 Tests

The acceptance tests shall be carried out at the manufacturer's works on pipes, coated or otherwise, sufficiently matured. The number of tests shall be as specified in IS 7639.

a) *Compulsory tests*

1) Works hydraulic pressure tightness test on all pipes (for method of test *see* IS 5913).

When nominal diameters exceed 1 000 mm, this test may be replaced by a suitable method of control as agreed to between the purchaser and the manufacturer.

2) Hydraulic pressure bursting test for all diameters (for method of test *see* IS 5913 *and* for number of samples *see* IS 7639).

3) Transverse crushing test for all diameters (for method of test *see* IS 5913 and for number of samples *see* IS 7639).

4) Longitudinal bending test (for method of test *see* IS 5913 and for number of samples *see* IS 7639). Test limited to pipes of 150 mm diameter and less.

b) *Optional tests at purchaser's request*

1) Hydraulic pressure bursting non-immersed test to be done at random at the purchasers' store (for method of test *see* IS 5913 and for number of samples *see* IS 7639).

2) Line test to be done as per **11.6** of IS 6530 on 100 m length of laid pipeline for at least each size ordered above 5 000 m. This is to be done at random at factory of origin.

3.6 Marking

3.6.1 Each pipe shall be legibly and indelibly marked with the following information:

a) Indication of the source of manufacture;

b) Date of manufacture and batch number;

c) Nominal diameter;

d) Class of pipe; and

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

3.6.2 *BIS Certification Marking*

Each pipe may also be marked with the Standard Mark.

3.6.2.1 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 details of conditions, under which a licence for the use of Standard Mark may be granted to manufacturers or producers, may be obtained from the Bureau of Indian Standards.

4 JOINTS

4.1 Types and Material

4.1.1 Two types of joints are normally provided with asbestos cement pressure pipes and they are (a) asbestos cement coupling with rubber sealing rings, and (b) cast iron detachable joints with rubber sealing rings and bolts and nuts.

4.1.2 Asbestos cement pressure pipes shall be joined with asbestos cement coupling with rubber sealing rings. However, in case of breakage in running pipeline or special cases of maintenance or construction joints or jointing of specials the cast iron detachable joints with rubber sealing rings and bolts and nuts can also be used.

4.1.3 The composition of asbestos cement couplings shall conform to **3.1**. The dimensions and weight of these couplings shall be as given in Annex B. The tolerances on the internal diameters shall be as given in Annex B. The assembled joint shall be flexible and capable of withstanding the specified hydraulic pressure (*see* **3.2** and **3.4.2**) 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.

4.1.3.1 Sealing rings used shall be of rubber of a type suitable for use with the liquid to be conveyed and shall conform to IS 5382, unless otherwise agreed to between the purchaser and the manufacturer. They shall also be suitable for use with the type of jointing device selected. If the pipes are to be used to convey potable water, the rings shall not affect its suitability for human consumption.

4.1.4 The cast iron detachable joints shall conform to IS 8794.

4.2 Characteristics

4.2.1 *Geometrical Characteristics*

4.2.1.1 *Dimensions*

The dimensions of the asbestos cement coupling shall be as given in Annex B. The shape of all parts including the rubber rings, shall be determined by the manufacturer of the pipes.

The joints, when mounted and put under pressure, shall ensure the permanent tightness of the pipeline against both leakage and infiltration.

4.2.2 *Sealing Characteristics*

The assembled joints, when tested at the factory, shall

be capable of withstanding the specified hydraulic test pressure [*see* **3.5**(a)(1)] of the pipes on which they are to be used, even when the pipes are set at the maximum angular deviation recommended by the manufacturer.

4.3 Marking

Each joint coupling shall be legibly and indelibly marked with the following information:

a) Indication of the source of manufacture,

b) Batch number,

c) Nominal diameter,

d) Class of coupling, and

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

5 INSPECTION AND ACCEPTANCE

Enquiries and orders shall specify whether or not acceptance tests are required and, if so, which tests. Otherwise, the purchaser is presumed not to require acceptance tests (*see* Annex C).

5.1 Inspection of Each Item of the Consignment

5.1.1 The required physical characteristics (*see* **3.4.2**) of the pipes shall be verified on each item of the consignment. The internal hydraulic pressure tightness test [*see* **3.5**(a)(1)] shall be carried out by the manufacturer; the purchaser, if he so desires, may be present while the tests are being carried out (*see also* **5.2.2**).

5.1.2 The required general appearance and finish (*see* **3.3**), the geometrical characteristics (*see* **3.4.1**[1]) and **4.2.1**) and the marking (*see* **3.6** and **4.3**) may be verified on each item of the consignment (*see* **C-4**).

5.1.3 The pipes and joints which do not satisfy the requirements when inspected as in **5.1.2** may be rejected.

5.2 Inspection by Sampling

5.2.1 The required sealing characteristics of the joints (*see* **4.2.2**) and mechanical characteristics of the pipes (*see* **3.4.3**) shall be verified, if requested, by sampling.

5.2.2 If the purchaser does not witness the compulsory internal hydraulic pressure tightness test (*see* **5.1.1**), he may, for checking purpose and after giving notice, ask for an additional internal hydraulic pressure tightness test [*see* **3.5**(a)(1)] to be carried out, but only on a number of pipes selected in accordance with the procedure of inspection by sampling (*see* **5.2.1** and IS 7639). In this instance, the pressure defining the class shall be maintained for 5 min.

5.2.3 The procedure described in IS 7639 applied for sampling, inspection and acceptance. Each inspection lot shall include only items of the same diameter and of the same class.

For diameters exceeding 1 000 mm an agreement between the purchaser and the manufacturer shall be made.

5.2.4 *Length*

At least 90 percent of the pipes supplied shall be of the standard length (subject to the tolerances given in **3.4.1.4**(d); the remainder shall not be less than 2 m in length. However, the total length of the pipes supplied shall be not less than the length ordered. The short length pipes shall also be tested as per the normal length pipes.

The required number of additional joints because of supply of short length pipes shall be supplied by the manufacturer without extra cost.

6 SPECIAL APPLICATIONS

When the pipes are intended for conveyance of particularly aggressive waters or to be laid in particularly aggressive grounds, the nature of these waters and grounds shall be specified before hand to the manufacturer, who may suggest appropriate material or treatment.

7 SAFETY RULE SHEET

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

[1] The checks on the regularity of the internal diameter and on the straightness [*see* **3.4.1.4**(b) and (e)] should be carried out only when specified in the order.

ANNEX A

(*Clause* 2)

LIST OF REFERRED INDIAN STANDARDS

IS No.	*Title*	*IS No.*	*Title*
269 : 1989	Specification for 33 Grade ordinary Portland cement (*fourth revision*)	7639 : 1975	Methods of sampling for asbestos cement products
455 : 1989	Specification for Portland slag cement (*fourth revision*)	8041 : 1990	Specification for rapid hardening Portland cement (*second revision*)
1344 : 1981	Specification for calcined clay Pozzolana (*second revision*)	8112 : 1989	Specification for 43 grade ordinary Portland cement (*first revision*)
1489	Specification for Portland Pozzolana cement:	8794 : 1988	Specification for cast iron detachable joints for use with asbestos cement pressure pipes (*first revision*)
(Part 1) : 1991	Fly ash based (*third revision*)		
(Part 2) : 1991	Calcined clay based (*third revision*)	11769 (Part 1) : 1987	Guidelines for safe use of products containing asbestos: Part 1 Asbestos cement products
3812 : 1981	Specification for fly ash for use as Pozzolana and admixture (*first revision*)	12081 (Part 2) : 1987	Recommendations for pictorial warning signs and precautionary notices for asbestos and products containing asbestos: Part 2 Asbestos and its products
5382 : 1985	Specification for rubber sealing rings for gas mains, water mains and sewers (*first revision*)		
5913 : 2003	Methods of test for asbestos cement products (*second revision*)	12269 : 1987	Specification for 53 grade ordinary Portland cement
6530 : 1972	Code of practice for laying of asbestos cement pressure pipes	12330 : 1988	Specification for sulphate resisting Portland cement

ANNEX B

(*Clauses* 4.1.3 *and* 4.2)

DIMENSIONS AND WEIGHT OF AC COUPLINGS

Sl No.	*Diameter/ Class*	*Internal Diameter* mm	*Thickness* mm	*Outer Diameter* mm	*Length* mm	*Weight* kg/piece
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	50/10,15	73.0	16.5	106.0	160	1.36
2	50/20	75.5	18.0	111.5	160	1.54
3	50/25	80.5	20.5	121.5	160	1.88
4	60/10,15	83.0	16.0	115.0	160	1.46
5	60/20	85.5	18.0	121.5	160	1.71
6	60/25	90.5	20.5	131.5	160	2.07
7	80/10,15	103.5	16.5	136.5	160	1.81
8	80/20	105.5	18.0	141.5	160	2.03
9	80/25	110.5	20.5	151.5	160	2.44
10	100/10	124.0	16.5	157.0	160	2.13
11	100/15	125.0	17.0	159.0	160	2.21
12	100/20	130.5	20.5	171.5	160	2.81
13	100/25	136.5	23.5	183.5	160	3.39
14	125/10	149.0	16.5	182.0	160	2.50
15	125/15	151.0	18.0	187.0	160	2.77
16	125/20	156.5	21.0	198.5	160	3.37
17	125/25	163.5	24.5	212.5	160	4.14
18	150/10	175.0	16.5	208.0	160	2.90
19	150/15	180.5	20.0	220.5	160	3.64
20	150/20	187.0	23.5	234.0	160	4.46
21	150/25	195.0	28.0	251.0	160	5.58
22	200/15	237.5	23.5	284.5	180	6.20
23	200/20	246.5	29.0	304.5	180	8.02
24	200/25	257.5	34.5	326.5	180	10.05
25	250/15	288.5	24.0	336.5	180	7.57
26	250/20	298.5	30.0	358.5	180	9.87
27	250/25	309.5	36.5	380.5	180	12.21
28	300/15	344.5	27.0	398.5	180	10.08
29	300/20	356.5	34.0	424.5	180	13.24
30	300/25	370.5	41.5	453.5	180	16.97
31	350/15	396.0	29.5	455.0	180	12.57
32	350/20	409.0	36.0	481.0	180	15.95
33	350/25	423.0	43.5	510.0	180	20.10

34	400/15	452.0	32.5	517.0	220	19.21
35	400/20	467.0	40.5	548.0	220	26.83
36	400/25	482.0	48.0	578.0	220	30.73
37	450/15	502.0	35.0	572.0	220	22.88
38	450/20	519.0	44.0	607.0	220	29.98
39	450/25	536.0	52.5	641.0	220	37.26
40	500/15	558.5	37.5	633.5	220	27.15
41	500/20	576.5	47.5	671.5	220	35.80
42	500/25	595.5	57.0	709.5	220	44.77
43	600/15	669.5	43.5	756.5	220	37.53
44	600/20	690.5	54.5	799.5	220	48.91
45	600/25	714.5	66.5	847.5	220	62.35
46	700/15	773.0	45.5	864.0	220	45.01
47	700/20	799.0	58.5	916.0	220	60.34
48	700/25	827.0	72.5	972.0	220	78.19
49	750/15	828.0	48.0	924.0	220	50.76
50	750/20	857.0	62.5	982.0	220	69.05
51	750/25	886.0	77.0	1040.0	220	88.83
52	800/15	884.0	51.0	986.0	220	57.49
53	800/20	914.0	66.0	1 046.0	220	77.64
54	800/25	945.0	81.5	1 108.0	220	100.13
55	850/15	939.0	53.5	1 046.0	220	63.96
56	850/20	971.0	69.5	1 110.0	220	86.74
57	850/25	1004.0	86.0	1 176.0	220	112.12
58	900/15	994.0	56.0	1 106.0	220	70.77
59	900/20	1 028.0	73.0	1 174.0	220	96.33
60	900/25	1 063.0	90.5	1 244.0	220	124.78
61	1 000/15	1 105.0	61.5	1 228.0	220	86.19
62	1 000/20	1 142.0	80.0	1 302.0	220	117.02
63	1 000/25	1 181.0	99.5	1 380.0	220	152.13

TOLERANCES

The tolerances on dimensions and weight of AC couplings shall be as follows:

Internal diameter (up to 600 mm dia)	$^{+1.0}_{-0}$	mm
Internal diameter (700 mm and above)	$^{+1.5}_{-0}$	mm
Outer diameter	$^{+6.0}_{-0}$	mm
Length	$^{+3}_{-0}$	mm
Thickness	$^{+3}_{-0}$	mm
Weight	$^{+5}_{-0}$	percent

NOTES

1 Internal diameter : Average internal diameter of 3 places.

2 Thickness : Average thickness of 3 places (at other than groove section).

3 Weight : Weight per piece in kg.

ANNEX C

(*Clauses* 5 *and* 5.1.2)

ACCEPTANCE TESTS

C-1 CARRYING OUT OF TESTS

Unless agreed otherwise, the purchaser shall inform the manufacturer, when ordering, which tests (*see* **3.5**) are required. The tests shall be carried out on a date fixed by agreement.

For the internal hydraulic pressure tightness test [*see* **3.5**(a)(1)], the purchaser shall observe the needs of the manufacturing programme.

C-2 ACCESS TO THE WORKS

The purchaser shall have access to the place of testing and to the stocks, for the sole purpose of inspecting and testing the materials which he has ordered, at any time, agreed with the manufacturer.

C-3 COSTS OF TESTING

The following tests only should be carried out at the expense of the manufacturer:

a) Compulsory tests;

b) Optional tests called for when the order is placed; and

c) Optional tests asked for after ordering and resulting in rejection of the lot.

By agreement between the manufacturer and the purchaser when ordering, additional tests may be carried out at the purchaser's expense, at the works or in an independent laboratory designated by agreement. The manufacturer should have the right to be represented.

C-4 INSPECTION OF 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 (*see* **5.1.2**) 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 (*see* **5.1.3**).

C-5 PERIOD FOR TESTING

All tests shall be completed before delivery of the consignment and at the latest 4 weeks after the date of sampling.

C-6 MANUFACTURER'S CERTIFICATE

C-6.1 Orders with Acceptance Tests

If a purchaser or his representative is not present at all or part of the test, the manufacturer shall supply the purchaser with a certificate that the pipes and joints satisfied the tests he was unable to witness.

C-6.2 Orders Without Acceptance Tests

For orders without acceptance tests, the manufacturer is considered to have discharged his obligations on completion of delivery provided that the pipes have passed the internal hydraulic pressure tightness test [*see* **3.5**(a)(1)] and comply with the requirements specified in **5.1.1**, **5.1.2** and **5.2.1**.

C-7 DRAFTING ORDERS

The purchaser's representative is qualified to judge the conditions of installation and use of the pipes. Therefore, the following advice is given solely as guidance when drafting the order.

C-7.1 Fluid Conveyed

Because of the special requirements (particularly as regards the rings of the joints) which may arise if certain fluids are to be conveyed, it is necessary that the nature of the fluid be stated before hand to the manufacturer.

If necessary, the conditions of test for resistance to chemical agents should be, for each case, the subject of special technical directions.

C-7.2 Length

It is recommended that those pipe lengths be selected which best suit the installation and soil conditions.

ANNEX D

(Foreword)

COMMITTEE COMPOSITION

Cement Matrix Products Sectional Committee, CED 53

Organization	*Representative(s)*
Gammon India Limited, Mumbai	SHRI S. A. REDDI (***Chairman***)
All India A.C. Pipe Manufacturers' Association, Secunderabad	SHRI N. KISHAN REDDY SHRI P. S. KALANI (*Alternate*)
Central Building Research Institute, Roorkee	DR B. K. RAO DR S. K. AGARWAL (*Alternate*)
Central Pollution Control Board, Delhi	REPRESENTATIVE
Central Public Works Department, New Delhi	SHRI P. SUBRAMANIAN SHRI K. P. ABRAHAM (*Alternate*)
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Engineer-in-Chief's Branch, New Delhi	SHRI MAHENDRA PRASAD SHRI P. K. GUPTA (*Alternate*)
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Fly Ash Mission, Department of Science & Technology, New Delhi	DR VIMAL KUMAR SHRI MUKESH MATHUR (*Alternate*)
Gujarat Ambuja Cement Ltd, Ahmedabad	SHRI J. P. DESAI SHRI B. K. JAGETIYA (*Alternate*)
Housing & Urban Development Corporation Ltd, New Delhi	SHRI V. SURESH SHRI S. K. TANEJA (*Alternate*)
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Indian Toxicology Research Centre, Lucknow	DR Q. REHMAN
Ministry of Environment and Forest, New Delhi	REPRESENTATIVE
Municipal Corporation of Delhi, New Delhi	SUPERINTENDING ENGINEER (PLANNING) EXECUTIVE ENGINEER (PLANNING) (*Alternate*)
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Spun Pipes Manufacturer's Association of Maharashtra, Nanded	SHRI C. Y. GAVHANE SHRI D. N. JOSHI (*Alternate*)
Structural Engieering Research Centre (CSIR), Chennai	SHRI N. P. RAJAMANE DR M. NEELAMEGAM (*Alternate*)
Tamil Nadu Water Supply & Drainage Board, Chennai	SHRI S. HARIRAMASAMY
The Indian Hume Pipe Company Limited, Mumbai	SHRI P. D. KELKAR SHRI P. R. C. NAIR (*Alternate*)
BIS Directorate General	SHRI S. K. JAIN, Director and Head (CED) [Representing Director General (*Ex-officio*)]

Member Secretary
SHRI J. C. ARORA
Director (CED), BIS

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Fibre Reinforced Cement Products Subcommittee , CED 53:1

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Sri Venkateswara Pipes Limited, Secunderabad	SHRI N. KISHAN REDDY SHRI N. K. SURERSHAN REDDY (*Alternate*)
Tamil Nadu Water Supply & Drainage Board, Chennai	REPRESENTATIVE
In personal capacity (*F-12, Naraina Vihar, New Delhi*)	SHRI Y. R. TANEJA

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