IS : 9627 - 1980

Indian Standard

SPECIFICATION FOR ASBESTOS CEMENT PRESSURE PIPES (LIGHT DUTY)

(Reaffirmed 1996)

Second Reprint JULY 1990

UDC 621.643.2-986[666.961]

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

Gr 3

February 1981

Indian Standard

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0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 30 October 1980, after the draft finalized by the Cement and Concrete Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 Asbestos cement pressure pipes are being used in this country for a number of years and considerable experience is available in regard to their manufacture and use for water supply.

0.3 There are several manufacturing units in the country manufacturing asbestos cement pressure pipes (light duty) used for water supply. Therefore, the Sectional Committee dealing with this subject decided to evolve an Indian Standard covering the requirements of asbestos cement pressure pipes (light duty) for the benefit of the manufacturers and users.

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

0.5 In the formulation of this standard due weightage has been given to international co-ordination among the standards and practices prevailing in the field in this country.

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

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

1. SCOPE

1.1 This standard covers the requirements for manufacture, classification, dimensions, tests and acceptance criteria for asbestos cement pressure pipes (light duty) of class 5 and class 10 (*see* **3.1**).

2. MATERIAL

2.1 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 to IS : 455-1976‡ or Portland pozzolana cement conforming to IS : 1489-1976§ and asbestos fibre.

NOTE 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.

NOTE 2 — Addition of inorganic fibres (up to a maximum of 5 percent by mass) is permissible.

2.2 Physical Properties

2.2.1 *Hydraulic Bursting Stress* — The unit bursting stress arrived at from hydraulic bursting test (*see* **6.3**) shall not be less than 10 N/mm² for Class 5 pipes and 12·5 N/mm² for Class 10 pipes.

2.2.2 *Transverse Crushing Stress* — The unit transverse crushing stress arrived at from transverse crushing test (*see* **6.3**) shall not be less than 30 N/mm². However this requirement shall be satisfied only in case of pipes of diameter larger than 150 mm.

2.2.3 *Longitudinal Bending Stress* — The unit longitudinal bending stress arrived at from longitudinal bending test (*see* **6.3**) shall not be less than 20 N/mm². However, this requirement shall be satisfied only in case of pipes of diameter 150 mm and less.

3. CLASSIFICATION

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

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

†Specification for rapid hardening Portland cement (*first revision*).

‡Specification for Portland slag cement (*third revision*).

§Specification for Portland pozzolana cement (*second revision*).

TABLE 1 CLASSIFICATION FOR ASBESTOS CEMENT PRESSURE PIPES

(Clauses 3.1 and 3.2)

CLASS	HYDRAULIC TEST PRESSURE N/mm²
(1)	(2)
5	0·5
10	1·0

3.2 The classification given in Table 1 is based on the hydraulic test pressure and the hydraulic working pressure shall normally be not more than 50 percent of the pressure defining the class.

3.2.1 The purchaser's engineer 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.

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

TABLE 2 RELATIONSHIP BETWEEN BURSTING PRESSURE (BP) HYDRAULIC TEST PRESSURE (TP) AND THE NORMAL HYDRAULIC WORKING PRESSURE (WP)

NOMINAL DIAMETER mm	$\frac{BP}{TP}$	$\frac{BP}{WP}$
50 to 100	2	4
125 to 200	1·5	3·0

4. DIMENSIONS AND TOLERANCES

4.1 Nominal Diameter

4.1.1 The 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.

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

50	150
80	200
100	
125	

NOTE — Pipes of nominal diameter larger than 200 mm may also be manufactured; in such case, detailed dimensions may be arrived at by mutual agreement between the supplier and the purchaser.

4.1.3 *Tolerances on the Diameter*

4.1.3.1 *Tolerance on the external diameter* — Tolerance on the external diameter at 100 mm from ends shall be as follows:

Nominal Diameter	*Tolerance*
mm	mm
50 to 200	$\pm$ 0·6

4.1.3.2 *Tolerances on the internal diameter* — The regularity of the internal diameter shall be checked by means of a sphere or a disc of a material unaffected by water, which shall pass freely along 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 internal diameter of the pipe by $(2{\cdot}5 + 0{\cdot}01\ d)$ where d is the internal diameter in millimetres.

4.2 Thickness

4.2.1 The nominal thickness of different classes and diameters of pipes at finished ends shall be in accordance with Table 3.

4.2.2 The thickness shall be measured 25 mm beyond the bevelled ends.

4.2.3 *Tolerances on the Thickness of the Wall*

4.2.3.1 At finished ends, the tolerance shall be as follows:

Nominal Thickness mm	*Tolerance* mm
Up to and including 10	— 1·5
Over 10 up to and including 15	— 2·0

NOTE — Plus tolerance shall be free.

TABLE 3 CLASSIFICATION AND DIMENSIONS OF ASBESTOS CEMENT PRESSURE PIPES

(*Clauses* 4.2.1 *and* 4.5)

Sl No.	Nominal Diameter	Class 5		Class 10	
		Thickness	External Diameter	Thickness	External Diameter
(1)	(2)	(3)	(4)	(5)	(6)
	mm	mm	mm	mm	mm
i)	50	9·5	69·0	9·5	69·0
ii)	80	9·5	99·0	9·5	99·0
iii)	100	9·5	119·0	11·0	122·0
iv)	125	9·5	144·0	11·0	147·0
v)	150	9·5	169·0	11·5	173·0
vi)	200	9·5	219·0	15·0	230·0

4.2.3.2 The tolerances specified in **4.2.3.1** are also subject to the provision that the difference between any two measured diameters shall not be greater than 10 percent of the nominal diameter.

4.2.3.3 On the barrel of the pipe, the thickness at any point shall be not less than that specified subject to the tolerance given under **4.2.3.1**.

4.3 Nominal Length — The nominal length for pipes of all diameters shall be 3 m, 4 m or 5 m.

4.3.1 *Tolerances on Nominal Length*

4.3.1.1 *Tolerances on nominal length* — Except in the case of pipes from which bursting test pieces have been cut, the tolerances on the nominal length shall be $^{+\ 50\ mm}_{-\ 20\ mm}$. In the case of pipes from which bursting test pieces have been cut (not exceeding 1·0 percent in number), pipes of shorter length shall be accepted in accordance with **9.1.2**.

4.3.1.2 The aggregate length of pipes supplied shall not be less than the aggregate nominal length ordered and shall include the complete requirements of joints for the ordered length, if the joints (*see* **7**) are ordered for.

4.4 Straightness

4.4.1 The deviation in straightness determined by straightness test for pipes in accordance with IS : 5913-1970* shall not exceed the following:

Nominal Diameter	*Maximum Deviation*
mm	mm
50	5·5 l
80 to 200	4·5 l

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

4.5 The dimensions of the asbestos cement pressure pipes of different classification as given in **3** and different nominal diameters as given in **4.1** shall be as given in Table 3.

5. FINISH

5.1 All internal surface of the pipes should be regular.

5.2 Since pipes are laid with water jointing rings, the part of the pipes where the rings are located should satisfy the tolerance of the external diameter set out in **4.1.3.1** for length appropriate to the type of joint adopted, and should be free from any local irregularity which could affect the water-tightness.

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

6. TESTS

6.1 The hydraulic pressure-tightness test shall be performed on all the pipes.

6.2 Hydraulic Pressure-Tightness Test — The pipe shall not indicate any loss or visible sweating on the outside surface of the pipe, when the hydraulic test pressure as given in Table 1 is maintained for 30 seconds. The test time may be reduced to 10 seconds without changing the class provided that the internal pressure is increased by 10 percent.

6.3 Tests shall be conducted to check the physical properties mentioned in **2.2.1** to **2.2.3** in accordance with IS : 5913-1970*.

*Methods of test for asbestos cement products.

7. JOINTS

7.1 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.

7.2 The composition of asbestos cement couplings shall conform to **2.1**, and the cast iron of the cast iron detachable joints shall conform to IS : 8794-1978*.

7.3 Rubber rings used in jointing shall comply with the requirements of IS : 5382-1969†. If the pipes are to be used for conveying drinking water, the rings shall not affect the quality of water.

7.4 The dimensions of all parts of joints shall be as given by the manufacturer. The tolerances on the internal diameter shall be agreed to with the manufacturer taking into account the tolerances on the rings and pipes.

7.5 The assembled joints shall be flexible and capable of withstanding the specified hydraulic pressure (*see* **3.1** and **6.2**) 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 of pipes. The permissible angular deviation shall not be less than $\frac{1170}{\text{External diameter in mm}}$ but need not exceed 8°.

7.5.1 The number of joints which are to be tested shall be agreed to between the purchaser and the manufacturer subject to **11**.

8. COST OF TESTING

8.1 When tests are required to be made in addition to the manufacturer's certificate (*see* **10**) in the presence of the purchaser or his representative, this shall be stated in the enquiry and order, and the cost of the tests shall be borne as follows:

a) By the manufacturer in the event of the results showing that the material does not comply with the specification, and

b) By the purchaser in the event of the results showing that the material complies with the specification.

*Specification for cast iron detachable joints for use with asbestos cement pressure pipes.

†Specification for rubber sealing rings for gas mains, water mains and sewers.

9. CRITERIA FOR ACCEPTANCE

9.1 Inspection of Each Item of Consignment

9.1.1 *Finish, Marking, Dimension and Tolerances*

The finish (*see* **5**), the marking (*see* **12**), the dimensions, and the tolerance on pipes and joints (*see* **4** and **7.4**) may be verified on each item of the consignment.

9.1.2 *Length Delivery Tolerances* — At least 90 percent of the pipes supplied should be of the nominal length (subject to the tolerance given in **4.3.1**), out of the maximum 10 percent of the shorter length, one-third could be short up to 1 m and the rest could be short up to 0·5 m (*see* **4.3.1.2**). The required number of additional joints, if any, required to cover the entire length shall also be supplied by the manufacturer without any extra cost.

9.1.3 The hydraulic pressure tightness test in accordance with **6.2** should be carried out by the manufacturer on all the pipes (*see* **6.1**) 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* **9.2.2**).

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

9.2 Inspection by Sampling

9.2.1 The tests indicated in **2.2.1** to **2.2.3** shall be conducted on samples of pressure pipes selected as in **11** (*see* **6.1**).

9.2.2 If the purchaser does not witness the hydraulic pressure tightness test, which the manufacturer carries out on all pipes as given in **9.1.3**, he may, for checking purposes, ask for additional hydraulic pressure tightness test (*see* **6.2**) on only samples of pipes selected as given in **11**.

10. MANUFACTURER'S CERTIFICATE

10.1 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 of the pipe.

11. SAMPLING

11.1 The sampling, inspection and acceptance shall be in accordance with IS : 7639-1975*. Each inspection lot shall include only items of the

*Methods of sampling of asbestos cement products.

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:

800 and 200 pipes respectively for pipes up to 100 mm dia, and

400 and 100 pipes respectively for pipes from 125 to 200 mm diameter.

12. MARKING

12.1 The pipes 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; and

d) Class of pipe with suffix 'LD'.

12.1.1 Each pipe may also be marked with the ISI Certification Mark.

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

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