

इंटरनेट

मानक

Disclosure to Promote the Right To Information

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

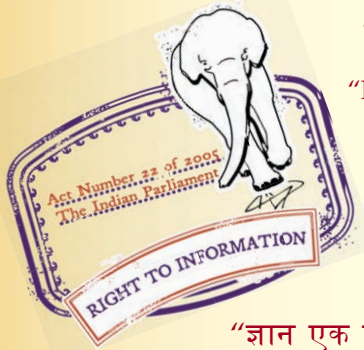
“The Right to Information, The Right to Live”

“पुराने को छोड़ नये के तरफ”

Jawaharlal Nehru

“Step Out From the Old to the New”

IS 2712 (1998): Gaskets and packings - compressed asbestos fibre jointing [MED 30: Gaskets and Packing]



“ज्ञान से एक नये भारत का निर्माण”

Satyanarayan Gangaram Pitroda

“Invent a New India Using Knowledge”



“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

BLANK PAGE



भारतीय मानक

गैस्कट तथा पैकिंग — संपीडित ऐस्बसटस

रेशा जोड़ — विशिष्टि

(तीसरा पुनरीक्षण)

Indian Standard

**GASKETS AND PACKINGS — COMPRESSED
ASBESTOS FIBRE JOINTING —
SPECIFICATION**

(Third Revision)

ICS 21.140

© BIS 1998

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

FOREWORD

This Indian Standard (Third Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Gaskets and Packings Sectional Committee had been approved by the Light Mechanical Engineering Division Council.

This standard was originally published in 1965, which was subsequently revised in 1971 and 1979. In view of further experience gained in the country in this field, the committee responsible for the preparation of this standard felt the necessity for its revision. Its third revision has been taken up with a view to incorporate the loss on ignition test as well as to include the Amendments No. 1, 2 and 3 issued earlier. This specification in the past attempted to classify compressed asbestos fibre jointings into different grades depending entirely upon the properties such as density, loss on ignition and tensile strength. Although these factors have a very close relationship, it was not easy to define the suitability of a particular type of jointing on the basis of these properties alone. As performance in actual service for extended period is an important factor, it was considered necessary to introduce a laboratory test for this purpose. The stress relaxation test has, for this reason, been introduced for compressed asbestos fibre jointings for high and medium services.

The specification has also been revised to include a degree of compressed asbestos fibre jointings for acid services. The gradation system has also been revised to give prominence to the contained fluids with the suffix indicating superiority. In the revised gradation, the alphabet is used to indicate a general classification of the fluid and a numerical suffix to give some idea of the temperature and pressure parameters for which the material will be suitable in a steam service with standard flat face flanges, that is,

W/1 — Up to 510°C and pressure of 6.4 MPa

W/2 — Up to 350°C and pressure of 4.0 MPa

W/3 — Up to 250°C and pressure of 2.0 MPa

It must be appreciated that with some modification to flanges like flange face even greater pressure can be contained by the same materials. The actual temperature and pressure for use of the jointing with oils, acids, other chemicals or gases will depend on the type of the fluid, the pH value or perhaps the destructive action of the fluid at ruling temperature. Standard codes of practice and manufacturers' recommendations should be worked to.

In the preparation of this revision, considerable assistance has been derived from the following standards:

DIN 3754-1968 Blatt 1	It Platten [Deutchen Normen/ausschen (DNA)]
G/Misc 81/C-1969	Asbestos, Directorate General of Supplies and Disposals, Govt of India
BS 1832-1991	Specification for compressed asbestos fibre jointing, British Standards Institution
ASTM D-1170-62T	Specification for non-metallic gasket materials for general, automotive and aeronautical purpose

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

GASKETS AND PACKINGS — COMPRESSED ASBESTOS FIBRE JOINTING — SPECIFICATION

(*Third Revision*)

1 SCOPE

This standard covers the general requirements and tests for compressed asbestos fibre jointing sheets, suitable for use with water, steam, oils, acids, alkalies and other chemicals.

1.1 This standard does not cover reinforced compressed asbestos fibre jointing sheets because the effects of the wire gauze reinforcement may nullify the results of tests to assess the properties of the materials. The same materials may, however, be supplied with wire gauze reinforcement by an arrangement between the purchaser and the manufacturer, for such applications where a reinforced jointing sheet is required.

2 REFERENCES

The following standards contain provisions which through reference in this text, constitute provision 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 below:

IS No.	Title
4905 : 1968	Methods for random sampling
6210 : 1979	Method of test for stress relaxation of gasket material (<i>first revision</i>)

3 GRADES

Compressed asbestos fibre jointing sheets shall be classified as follows:

Grade	Application
W/1	Water, steam and for some chemical — High service conditions.
W/2	Water, steam and for some chemical — Medium service conditions.
W/3	Water, steam and for some chemical — Low service conditions.
O/1	Oils — High service conditions.

Grade

Application

O/2	Oils — Medium and nominal service conditions.
A/1	Acids — Highly corrosive.

4 DIMENSIONS

The length, width and tolerances of the compressed asbestos fibre jointing sheet shall be as agreed to between the manufacturer and the purchaser.

4.1 The recommended nominal thickness of the compressed asbestos fibre jointing sheets are 0.4, 0.5, 0.75, 1.0, 1.5, 2.0 and 3.0 mm. Other thickness between 0.25 and 6 mm may be made as agreed to between the manufacturer and the purchaser.

4.2 The maximum variation *A* of any sheet from the nominal thickness and the maximum permissible variation *B* in thickness between any two points not more than 250 mm apart shall be as given below:

Nominal Thickness (mm)	Variation	
	A (mm)	B (mm)
Up to and including 0.5	± 0.05	0.05
Over 0.5, up to and including 1.0	± 0.10	0.10
Over 1.0, up to and including 2.0	± 0.15	0.10
Over 2.0, up to and including 3.0	± 0.20	0.15
Over 3.0, up to and including 4.0	± 0.30	0.20
Over 4.0	± 0.40	0.20

5 CONSTRUCTION

The sheets shall consist mainly of well opened asbestos fibres, and inorganic fillers thoroughly mixed with elastomers as binding materials.

5.1 Compressed asbestos fibre jointing sheets shall be generally manufactured in the three methods of construction as given below:

- a) Solid run, that is, not plied in any manner;
- b) Plied, that is, plied grain with grain; and
- c) Cross-plied, that is, plied with grain in successive layers at right angles.

5.2 The tensile strength of non-plyed sheets and sheets plyed grain with grain differ considerably in the longitudinal and transverse directions.

6 WORKMANSHIP

The compressed asbestos fibre jointing sheets shall be of uniform texture, smooth on both sides and free from irregularities.

6.1 When agreed to between the purchaser and the manufacturer or supplier, one or both surface shall be treated with graphite or other acceptable release agent to prevent adhesion to flange faces.

7 SAMPLING

Unless otherwise agreed to between the purchaser and the manufacturer, the sampling plan and criteria for conformity as given in Annex A shall be followed.

8 TESTS

8.1 Conditioning

All specimen shall be conditioned as described in Annex B before testing.

8.2 Dimensions

The thickness shall be measured by a dead-weight micrometer. The thickness shall conform to the permissible variations specified in 4.2.

8.3 Density

A test piece of 100 mm × 100 mm shall be weighed correctly to 0.1 g and its dimensions ascertained according to 4.1 and 8.2. The mass of test piece in grams divided by its volume in cubic centimetres gives the density which shall be between 1.7 and 2.2 g/cm³.

8.4 Flexibility After Accelerated Ageing

This test will be done as per agreement between manufacturer and purchaser. A sample of material shall be tested by the method described in Annex C and shall show no visual signs of cracking.

8.5 Compressibility and Recovery Test

The compressibility and recovery shall be determined by the method described in Annex D.

8.5.1 Compressed asbestos fibre jointing sheets of 1.5 mm and above thickness shall be subjected to this test. In case of other thicknesses the test pieces shall be cut from 1.5 mm thick jointing guaranteed by the manufacturer to be of equivalent quality.

8.5.2 A minimum of three test specimens shall be subjected to this test and results averaged. Compressibility of the material shall be minimum 6 percent and maximum 14 percent. The recovery shall be minimum 40 percent.

8.6 Stress Relaxation

Compressed asbestos fibre jointing grades W/1, W/2, O/1, and O/2 shall be tested for resistance to creep at high temperatures. The apparatus to be used, preparation of test piece and method of test shall be as described in IS 6210.

8.6.1 In case of order for 1.5 mm thick jointing sheets, the test piece shall be cut from the material under supply. In case of orders for other thickness, the test piece shall be cut from 1.5 mm thick jointing guaranteed by the manufacturers to be of equivalent quality.

8.6.2 The residual stress determined shall not be less than:

- a) 23 MPa (MN/m² or N/mm²) for grades W/1 and O/1, and
- b) 17.5 MPa (MN/m² or N/mm²) for grades W/2 and O/2.

8.7 Oil Absorption

Compressed asbestos fibre jointing of grades O/1 and O/2 shall be tested for oil absorption, that is the increase in mass and thickness is determined by the method described in Annex E.

8.7.1 Unless otherwise agreed between the purchaser and the manufacturer, two liquids shall be used for the tests, that is:

- a) Oil No. 3, a high volume increase oil of the following characteristics:
 - Aniline point 69.5 ± 1°C
 - Kinematic viscosity 31.9 to 34.1 cSt (measured at 37.8°C)
 - Flash point 162.7°C
- b) Fuel B, a mixture of 75 parts by volume of pure iso-octane and 25 parts by volume of pure toluene.

8.7.2 The percentage increase in thickness and mass shall not exceed the values given below:

- a) Oil No. 3
5 h at 150° ± 2°C

Grade	Percentage Increase in			
	Thickness		Mass	
O/1	25	Max	20	Max
O/2	35	Max	30	Max

- b) Fuel B
5 h at 20 to 30°C

Grade	Percentage Increase in			
	Thickness		Mass	
O/1	20	Max	20	Max
O/2	30	Max	30	Max

8.8 Water Absorption

Compressed asbestos fibre jointings of grades W/1, W/2, O/1 and O/2 shall be tested in water in accordance with the method described in Annex F.

8.8.1 The percentage increase in mass shall not exceed 10 percent.

8.9 Resistance to Acids

Compressed asbestos fibre jointing of grade A/1 shall be tested for increase in thickness (swelling) and tensile strength after immersion in acids by the methods described in Annex G.

8.9.1 In case of order for 1.5 mm thick jointing sheet, the test pieces required shall be cut from the material under supply. In case of orders for other thicknesses, the test pieces shall be cut from 1.5 mm thick jointing guaranteed by the manufacturer to be of equivalent quality.

8.9.2 The acids to be used for tests are:

- 96 percent sulphuric acid,
- 95 percent nitric acid,
- 50 percent nitric acid, and
- 65 percent sulphuric acid.

8.9.2.1 The percentage increase in thickness checked by the method described in Annex G shall not exceed:

- a) 12 percent after immersion in 50 percent nitric acid for one hour at 65°C,
- b) 20 percent after immersion in 95 percent nitric acid for 18 h at room temperature,
- c) 8 percent after immersion in 96 percent sulphuric acid for 18 h at room temperature, and
- d) 20 percent after immersion in 65 percent sulphuric acid for 48 h at room temperature.

8.9.2.2 After the above tests, there shall be no separation of plies, if the jointing is of plied construction.

8.9.3 Six samples of 1.5 mm thick jointing shall also be prepared, immersed in acids and tested for tensile strength in accordance with the method described in Annex G.

8.9.3.1 The average results of three tests shall not be less than:

- a) 5.5 MPa (MN/m²) after immersion in 95 percent nitric acid for 48 h, and
- b) 16.5 MPa (MN/m²) after immersion in 96 percent sulphuric acid for 48 h.

8.10 Tensile Strength

The tensile strength shall be determined by the method described in Annex H.

8.10.1 The tensile strength shall not fall below:

Grade	Thickness	Tensile Strength
W/1, O/1, A/1	0.4 up to and including 1 mm	18.0 MPa
	Above 1 mm	24.0 MPa
W/2, O/2	0.4 up to and including 1 mm	9.0 MPa
	Above 1 mm	12.8 MPa
W/3	All thicknesses	6.7 MPa

8.11 Loss on Ignition

The loss on ignition shall be 28 percent (*Max*) and shall be determined by the method described in Annex J.

9 MARKING

9.1 Asbestos jointing shall be marked with the grade, month and year of manufacture and manufacturer's name on each sheet. The marking of grades shall be such that it may be readily identified on a piece of 300 mm × 300 mm cut from any position of the sheet.

9.2 BIS Certification Marking

The product may also be marked with the Standard Mark.

9.2.1 The use of the Standard Mark is governed by the provisions of *Bureau of Indian Standards Act, 1986* and the Rules and Regulation made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

10 PACKING

Asbestos jointing may be supplied flat, suitably packed to prevent damage; or may be supplied in rolls.

ANNEX A

(Clause 7)

SCALE OF SAMPLING AND CRITERIA FOR CONFORMITY

A-1 SCALE OF SAMPLING

A-1.1 Lot

In any consignment all the pieces or rolls of asbestos jointings of same grade and dimensions manufactured under essentially similar conditions of production shall be grouped together to constitute a lot.

A-1.2 For ascertaining the conformity of the lot to the requirements of this specification tests shall be carried out from each lot separately. The number of rolls or pieces to be selected at random for this purpose shall be according to column 1 and 2 of Table 1. To ensure randomness of selection, IS 4905 may be used.

Table 1 Sample Size and Criteria for Conformity
(Clauses A-1.2, A-2.1, A-2.2 and A-2.3)

No. of Rolls or Pieces in the Lot	For Dimensions		Sample Size for Tensile Strength, Compression Test, Density and Other Characteristics
	Sample Size	Permissible Defects ¹⁾	
(1)	(2)	(3)	(4)
Up to 15	2	0	2
16 to 25	3	0	2
26 to 50	5	0	2
51 to 100	8	0	2
101 and above	13	1	3

¹⁾ This ensures that lots containing 2.5 percent or less defective will be accepted most of the items.

A-2 NUMBER OF TESTS AND CRITERIA FOR CONFORMITY

A-2.1 The rolls or the pieces of asbestos jointings selected according to A-1.2 shall be examined for dimensions. If the number of rolls or pieces found not in conformity with the specified requirements is less than or equal to the corresponding number given in col 3 of Table 1, the lot shall be declared conforming to the requirements for dimensions.

A-2.2 In case of those lots which have been found satisfactory according to A-2.1, a number of pieces or rolls equivalent to the sample size indicated in col 4 of Table 1 shall be selected and subjected to the tests for tensile strength, compression test, density and other characteristics. The lot shall be declared conforming to the above requirements if all the test specimens satisfy the relevant requirements.

A-2.3 Should any sample fail to comply with the requirements of any test indicated in col 4 of Table 1, double the number of samples shall be selected from the same batch for retest and each of them shall comply with the requirements of that test.

ANNEX B

(Clause 8.1)

METHOD OF CONDITIONING

B-1 The specimen shall be conditioned in an oven at $100 \pm 2^\circ\text{C}$ for one hour and allowed to cool to $27 \pm 2^\circ\text{C}$ for at least one hour in a desiccator containing

anhydrous calcium chloride.

B-2 Sulphuric acid shall not be used in the desiccator for compressed asbestos fibre jointings.

ANNEX C

(Clause 8.4)

METHOD OF TEST FOR FLEXIBILITY AFTER ACCELERATED AGEING

C-1 Test piece 100 mm long, 25 mm wide shall be cut from each sheet in such a manner that the longest axis is at right angles to the grain. The test pieces shall then be placed in an air-oven maintained at a temperature of $70 \pm 1^\circ\text{C}$. The test pieces in the oven shall be stationary, free from stress, freely exposed to

outside air or light. The total volume of the test pieces shall not exceed 10 percent of the air space of the oven. Provision shall be made from a slow circulation of air through the oven and care shall be taken that the moving air is heated to the temperature of the oven before coming into contact with the test pieces. The

test pieces shall be subjected to this treatment for 168 h and then allowed to cool to room temperature in a desiccator on removal of the test pieces from the desiccator, bend slowly through an angle of 180°

round a mandrel having a diameter equal to 12 times the thickness of the jointing sheet.

C-2 The test shall be carried out at room temperature.

ANNEX D

(Clause 8.5)

METHOD OF CARRYING OUT COMPRESSIBILITY AND RECOVERY TESTS

D-1 The test shall be made in a suitable compression testing machine in which the load is applied through an axial loading device similar to that shown in Fig. 1. The cylindrical indenter 25 ± 0.2 mm in diameter shall be made of steel with a tensile strength of not less than 620 MPa (MN/m^2). Both ends of this indenter shall be ground accurately parallel to each other as also shall be the loading faces of the platens.

The thickness of the test piece, at different stages of the test, shall be measured by means of two dial indicators, graduated in hundredths of a millimetre, which together with the indicator shall be rigidly attached to the upper loading platen. The spindles of the dial indicator shall rest on the lower platen.

It is essential that the dial indicators do not indicate any relative movement between the top and bottom platens during the application of full force 15.6 kN through the indenter without a test piece in position, in order to check that there is no distortion in the apparatus.

The test pieces shall be cut for each test. The size of each test piece shall be 50 mm x 50 mm and conditioned as specified in 8.1. After cooling, measure the thickness of each test piece (*T*). Place one test piece between the indenter and the bottom platen and load initially to 1 kN (equivalent to a stress of 2.0 MPa). This preload shall be maintained for 15 s and note the

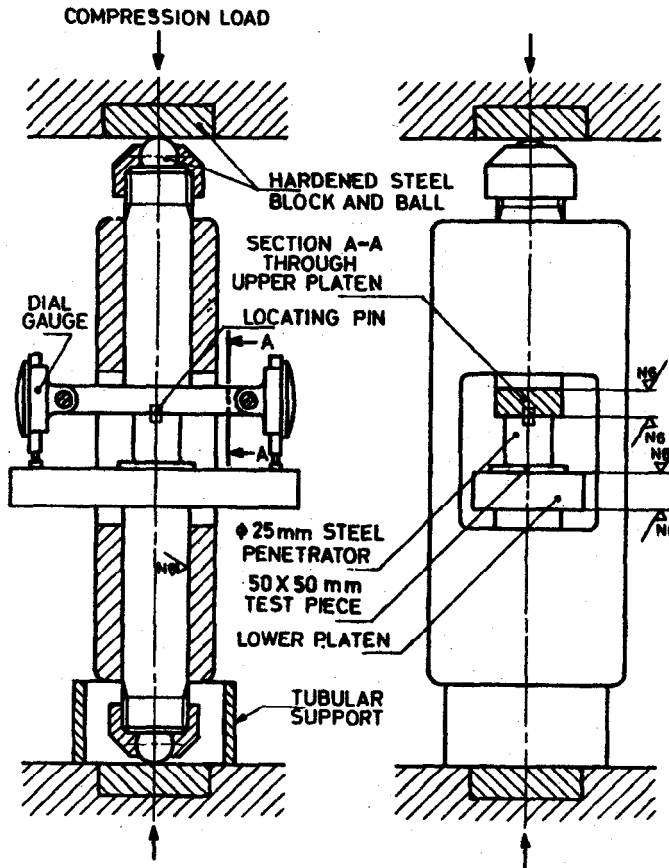


FIG. 1 AXIAL LOADING SHACKLE FOR COMPRESSION TEST

average reading on the dial indicator to obtain the thickness under preload (T_1).

Raise the load in 1 min to 15.6 kN, maintain this load for a further 30 s and note the average reading on the dial indicators to obtain the thickness under the major load (T_2). The major load shall, then be removed and the preload of 1 kN maintained for 1 min and the reading of the dial indicator noted (T_3). The compressibility shall be calculated as follows:

$$\text{Compressibility, percent} = \frac{T_1 - T_2}{T_1} \times 100$$

$$\text{Recovery, percent} = \frac{T_3 - T_2}{T_1 - T_2} \times 100$$

Repeat the test for the other two test pieces. The average of the test results obtained on the three test pieces shall be the percentage compressibility and recovery of the material respectively.

ANNEX E

(Clause 8.7)

METHOD OF TEST FOR OIL ABSORPTION

E-1 The test shall be carried out on six test pieces; three for immersion in Oil No. 3 and three in Fuel B, described in 8.7.1. The test pieces shall be cleanly cut to size 50 mm × 50 mm. The test pieces may vary in dimensions by ± 0.15 mm and conditioned as described in 8.1.

E-1.1 Weigh each test piece in air to the nearest milligram M_1 . Determine the thickness (T_1) of each test piece by taking a sufficient number of readings to provide a reliable average value. Place three test pieces in a test tube having an outside diameter of 38 mm and an overall length of 300 ml of the test liquid. Glass beads shall be used in the liquid as a bumper and to separate the specimens. After treating three test pieces in Oil No. 3 for 5 h at 150 ± 2°C and the other three in Fuel B for 5 h at 20 to 30°C, remove the test piece from the test liquids.

Test pieces that have been treated in Oil No. 3 for 5 h at 150°C, shall be cooled to room temperature by

transferring the test pieces to a cool clean portion of the same test liquid for 30 to 60 min. Dip the specimens quickly into acetone, blot lightly with filter paper free of lint and foreign material. Place immediately in a tared, stoppered weighing bottle and determine the mass after test M_2 . Measure thickness of each test piece as before to obtain a reliable average (T_2).

E-2 Percentage increase in mass

$$= \frac{M_2 - M_1}{M_1} \times 100$$

Percentage increase in thickness

$$= \frac{T_2 - T_1}{T_1} \times 100$$

NOTE — These tests should only be done for material of thickness of 0.75 mm up to and including 3 mm owing to practical difficulty of making satisfactory and reliable measurements.

ANNEX F

(Clause 8.8)

METHOD OF TEST FOR WATER ABSORPTION

F-1 A test piece of size 50 mm × 50 mm shall be clearly cut from the sheet conditioned as described in 8.1. Weigh the specimen in the air M_1 . Immerse the test piece in distilled water at a temperature of 20 to 30°C for 48 h. At the end of that period, withdraw the test

piece from the water and wipe off all surplus water with filter paper and weigh again M_2 .

F-2 Percentage increase in mass = $\frac{M_2 - M_1}{M_1} \times 100$

ANNEX G

(Clauses 8.9 and 8.9.2.1)

TEST FOR RESISTANCE TO ACIDS

G-1 SWELL TEST

G-1.1 Three test pieces each of size 50 mm × 50 mm × 1.5 mm shall be clearly cut from the sheet and conditioned as described in 8.1. Determine the thickness of each piece by taking a sufficient number of readings to provide a reliable average value T_1 .

G-1.2 Immerse the test pieces in acids as follows:

- One piece in 50 percent nitric acid for one hour at a temperature of $65 \pm 1^\circ\text{C}$.
- The second test piece in 95 percent nitric acid for 18 h at 21 to 30°C (room temperature).
- The third test piece in 96 percent sulphuric acid for 18 h at 21 to 30°C (room temperature).

G-1.3 Remove the test pieces from the acids at the end of the test periods and rinse in cold running water. Surface dry the test pieces between sheets of blotting paper. Measure the thickness T_2 .

G-1.4 Percentage increase in thickness

$$= \frac{T_2 - T_1}{T_1} \times 100$$

G-2 LOSS IN STRENGTH

G-2.1 Six test pieces of size 200 mm long and 25 mm wide shall be clearly cut from the sheet 1.5 mm thick (preferably with a die punch) in such a manner that the longest axis is at right angles to the grain and conditioned as described in 8.1. Immediately on removal from the desiccator, the thickness of each piece shall be measured with a micrometer in about four places within 50 mm on both sides of the centre. The smallest dimension shall be taken as the thickness. After measurement three test pieces shall be immersed in 95 percent nitric acid and the other three test pieces in 96 percent sulphuric acid. The test pieces shall be kept in these acids for 48 h at 20 to 30°C (room temperature). Surface dry the test pieces between sheets of blotting paper. Each test piece shall then be gripped between the jaws of a suitable tensile testing machine. The distance between the jaws being not less than 100 mm. The rate of transverse of the moving jaw shall be 300 ± 25 mm per minute. In case the test piece breaks at the jaw, the reading should not be taken into consideration.

G-2.2 The tensile strength should be determined as:

$$\frac{\text{Breaking load}}{\text{Area of cross section of the test piece}}$$

ANNEX H

(Clause 8.10)

METHOD FOR DETERMINING TENSILE STRENGTH

H-1 The test shall be carried out on 8 test pieces. Each test piece shall be 200 mm long and 25 mm wide. The test pieces shall be cut from the sheet (preferably with a die punch) in such a manner that the longest axis is at right angles to the grain. The test pieces should have clean and uniform cut edges. Samples with dents, uneven cut and any other deformity shall be discarded. The test pieces shall be conditioned as described in 8.1.

H-1.1 Immediately on removal from the desiccator, the thickness of each piece shall be measured with a micrometer in about four places within 50 mm on both

sides of the centre. The smallest dimension shall be taken as the thickness. After measurement each test piece shall be gripped between the jaws of a suitable tensile testing machine, the distance between the jaws being not less than 100 mm. The rate of transverse of the moving jaw shall be 300 ± 25 mm per minute. In case the test piece breaks at the jaws, the reading should not be taken into consideration.

H-2 The tensile strength should be determined as:

$$\frac{\text{Breaking load}}{\text{Area of cross section of the test piece}}$$

ANNEX J

(Clause 8.11)

METHOD FOR DETERMINING OF LOSS ON IGNITION

J-1 The test pieces of approximately 2 g are conditioned in an oven at 100°C for one hour and after cooling in a desiccator containing anhydrous calcium chloride at room temperature, weighed accurately. The test pieces are then placed in an oven at 850°C for 30 min and then cooled to room temperature in a desiccator.

J-2 The loss on ignition is calculated as follows:

$$L = \frac{W_1 - W_2}{W_1} \times 100$$

where

L = loss on ignition, percent;

W_1 = weight of test piece after conditioning; and

W_2 = weight of test piece after ignition.

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act, 1986* to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Copyright

BIS has the copyright of all its publications. No part of these publications may be reproduced in any form without the prior permission in writing of BIS. This does not preclude the free use, in the course of implementing the standard, of necessary details, such as symbols and sizes, type or grade designations. Enquiries relating to copyright be addressed to the Director (Publications), BIS.

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Handbook' and 'Standards: Monthly Additions'.

This Indian Standard has been developed from Doc : No. LMD 19 (0034).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110 002
Telephones : 323 01 31, 323 33 75, 323 94 02

Telegrams : Manaksanstha
(Common to all offices)

Regional Offices :

Telephone

Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg
NEW DELHI 110 002

{ 323 76 17
323 38 41

Eastern : 1/14 C. I.T. Scheme VII M, V. I. P. Road, Maniktola
CALCUTTA 700 054

{ 337 84 99, 337 85 61
337 86 26, 337 91 20

Northern : SCO 335-336, Sector 34-A, CHANDIGARH 160 022

{ 60 38 43
60 20 25

Southern : C. I. T. Campus, IV Cross Road, CHENNAI 600 113

{ 235 02 16, 235 04 42
235 15 19, 235 23 15

Western : Manakalaya, E9 MIDC, Marol, Andheri (East)
MUMBAI 400 093

{ 832 92 95, 832 78 58
832 78 91, 832 78 92

Branches : AHMADABAD. BANGALORE. BHOPAL. BHUBANESHWAR. COIMBATORE.
FARIDABAD. GHAZIABAD. GUWAHATI. HYDERABAD. JAIPUR. KANPUR.
LUCKNOW. NAGPUR. PATNA. PUNE. THIRUVANANTHAPURAM.