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भारतीय मानक मसौदा

कॉर्क और सेलुलॉज आधारित संधिकरण सामग्री — विशिष्टि

(पहला पुनरीक्षण)

DRAFT Indian Standard

**CORK AND CELLULOSE BASE JOINTING
MATERIAL — SPECIFICATION**

(First Revision of IS 5569)

ICS 23.100.60

**Gasket and Packing Sectional
Committee, MED 30**

**Last date for receipt of comments
is 23 Dec 2022**

FOREWORD

(Formal clause to be added later)

This standard was first published in 1970.

Major changes in this revision are as follows:

- a) The international classification for standards (ICS) number has been added;
- b) The reference standards have been updated;
- c) Terminologies have been added; and
- d) Editorial corrections have been made as per IS 12.

The cork and cellulose base jointing material covered by this standard is suitable for use at temperatures not exceeding 120°C in systems involving contact with mineral or di-ester type lubricating oil, mineral oil type hydraulic fluid and petroleum fuel. It is not recommended for use with water-based fluids.

The jointing material conforming to this standard is resistant to deleterious attack by mould growth under tropical storage conditions and is suitable for commercial and defence purposes.

The composition of the Committee responsible for the formulation of this standard is given in Annex (*to be added later*).

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 : 2022 'Rules for rounding off numerical values (*second revision*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

DRAFT Indian Standard

**CORK AND CELLULOSE BASE JOINTING
MATERIAL — SPECIFICATION**

(*First Revision*)

1 SCOPE

This standard covers the requirements of compressible sheet, jointing material composed of a mixture of cork granule and cellulosic fibres, from which gaskets can be cut or stamped.

2 REFERENCES

The standards listed below 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 listed below:

<i>IS/ISO No.</i>	<i>Title</i>
IS 1060 (Part 4/Sec 7) : 2018/ ISO 6588 -2 : 2012	Methods of sampling and test for paper and allied products: Part 4 Methods of test for paper board and pulps, Section 7 Determination of <i>pH</i> of aqueous extracts — Hot extraction method
IS 1060 (Part 5/Sec 6) : 2014/ ISO 1924-2 : 2008	Methods of sampling and test for paper and allied products: Part 5 Methods of test for paper and board, Section 6 Determination of tensile properties — Constant rate of elongation method (20 mm/ min)
1070 : 1992	Reagent grade water — Specification (<i>third revision</i>)
1796 : 1986	Specification for glycerine (<i>second revision</i>)
2967 : 1983	Specification for external micrometer (<i>first revision</i>)
4202 : 2022	Method for determination of chloride content of textile materials (<i>first revision</i>)
4203 : 2022	Method for determination of sulphate content of textile materials (<i>first revision</i>)

4420 : 2022	Methods for determination of conductivity of aqueous and organic extracts of textile materials (<i>first revision</i>)
4905 : 2015/ ISO 24153 : 2009	Random sampling and randomization procedures (<i>first revision</i>)

3 TERMINOLOGY

For the purpose of this standard, the following definitions shall apply.

3.1 Cork — A gasket material manufactured from the cork tree. Cork material is typically combined with rubbers to give it greater resistance to chemicals and solvents. Cork is a low compression jointing.

3.2 Cellulosic fibres — Cellulose or cellulosic fibers are fibers made with ethers or esters of cellulose, which can be obtained from the bark, wood or leaves of plants, or from other plant-based material.

3.3 Gasket — Deformable material (or combination of materials) intended to be clamped between flanges to prevent leakage of contained fluid.

3.4 Gelatine — A gelatine is a protein produced by partial hydrolysis of collagen derived from skin, tendons, ligaments, and bones of animals.

4 GRADES

The cork and cellulose base jointing material shall be manufactured in two grades, namely, Grade A and Grade B.

5 MATERIAL AND MANUFACTURE

5.1 Grade A

The finished material shall consist of one or more plies of paper and cork composition impregnated with plasticized gelatine which is subsequently rendered insoluble with formaldehyde. The plasticizer shall be glycerine or a mixture of glycerine and sorbitol containing not more than 50 percent sorbitol. The glycerine shall be of technical grade quality complying with the requirements of IS 1796.

5.2 Grade B

The composition specified in **5.1** may be modified at the discretion of the manufacturer.

5.3 The paper used in the manufacture of the jointing shall not contain mechanical wood pulp. During the manufacture a suitable fungicide shall be incorporated to render the finished material resistant to mould growth. The composition of the fungicide shall be as agreed to between manufacturer and purchaser.

5.4 The material of both Grade A and Grade B types shall be capable of being cut or punched without cracking, tearing, or separation of the plies.

5.5 The jointing material shall be normally supplied in rolls 900 mm or 1 060 mm wide.

6 THICKNESS

6.1 The nominal thicknesses of the cork paper jointing material shall be 0.40, 0.80, 1.60, and 3.20 mm.

6.1.1 The tolerance on thickness shall be as follows:

<i>Sl No.</i>	<i>Thickness</i> <i>mm</i>	<i>Tolerance</i> <i>mm</i>
(1)	(2)	(3)
i)	0.40	+0.08 -0.02
ii)	0.80	+0.18 -0.08
iii)	1.60	+0.18 -0.08
iv)	3.20	±0.25

7 FINISH

The material shall be uniform in texture and colour, and free from obvious defects.

8 SAMPLING

8.1 A batch of material is defined as that length produced in one manufacturing run. The test samples shall be cut from the material adjacent to a cut across the full width of the roll, this cut being at least 3 m distant from either the beginning or the end of the roll.

8.2 Unless otherwise agreed to between the buyer and the seller the sampling plan and the criteria from conformity shall be as given in Annex A.

9 TESTS

9.1 Production Routine Tests — All samples of jointing material when subjected to the following routine tests shall satisfy the requirements given in **9.1.1** to **9.1.6**:

- a) Thickness;
- b) Tensile strength;
- c) Compressibility and compression set;
- d) Oil absorption;
- e) Freedom from corrosive impurities; and
- f) Dimensional stability.

9.1.1 Thickness — The thickness determined at any point shall be within the tolerance as specified in **6.1.1**. A sample shall be conditioned for at least 18 h at $27 \pm 2^\circ\text{C}$ and 65 ± 2 percent relative humidity immediately before determining the thickness. The thickness shall be determined at 10 points evenly distributed across the width of the sheet at right angles to the machine direction of the material. Measurement shall be made to the nearest 0.01 mm using Grade 2 micrometer having an anvil of not less than 10 mm diameter (*see* IS 2967).

9.1.2 Tensile Strength — The tensile strength of the material when determined by the method described in IS 1060 (Part 5/Sec 6) shall be not less than 5 491.72 kPa (56 kgf/cm²) in either the machine or the cross direction.

NOTE —1 kgf/cm² equals 98.066 5 kilopascals (kPa)

9.1.3 Compressibility and Compression Set — The compressibility and compression set of the material when determined as described in Annex B shall be as follows:

Compressibility	25 to 35
Compression set	12.5 percent, <i>Max</i>

9.1.4 Oil Absorption — When the material is tested as described in Annex C, the height to which the oil may rise in any test piece shall be not more than 50 mm.

9.1.5 Freedom from Corrosive Impurities

9.1.5.1 The conductivity of the water extract of material prepared as described in Annex D shall be not greater than 175 $\mu\Omega/\text{cm}$ when determined as described in **8.4** of IS 4420.

9.1.5.2 For material which does not comply with the requirements of **9.1.5.1**, the chloride content of the material shall not exceed 0.17 percent when determined as sodium chloride (NaCl) and the sulphate content shall not exceed 0.15 percent when determined as anhydrous sodium sulphate (Na₂SO₄) when determined as described in **D-3** of Annex D.

9.1.5.3 The pH value of the water extract of the material, determined as described in **D-2** of Annex D, shall be not less than 6 or greater than 8.5.

9.1.6 Dimensional Stability — When tested as described in Annex E, the change in length of the test specimen shall not exceed 1.5 percent in any direction.

9.2 Type Tests

9.2.1 These shall be conducted whenever there is a change in the basic composition of the jointing material and shall constitute:

- a) Flexibility; and
- b) Resistance to mould growth.

9.2.2 Flexibility — The flexibility of the material shall be such that when tested by the method described in Annex F the test pieces shall not crack or separate into layers.

9.2.3 Resistance to Mould Growth (for Grade A Jointing only) — When the material is tested as described in Annex G, there shall be no visible mould growth on any part of the test pieces.

10 MARKING

10.1 A minimum of every 1 000 cm² of the material shall be marked on one side only with the following:

- a) Manufacturer's name or trade-mark;
- b) Thickness; and
- c) Any other marking as specified by the purchaser.

10.2 BIS Certification Marking

The material may also be marked with the Standard Mark.

10.2.1 The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act, 2016* and the Rules and Regulations made thereunder. The details of conditions under which a license for the use of Standard Mark may be granted to the manufacturers or the producers may be obtained from the Bureau of Indian Standards.

11 PACKAGING

Packaging shall be as specified by the purchaser.

ANNEX A*(Clause 8.2)***METHOD OF SAMPLING AND CRITERIA FOR CONFORMITY****A-1 METHOD OF SAMPLING**

A-1.1 Lot — In any consignment all the rolls of paper jointings of the same dimension 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 to be selected at random for this purpose shall be according to column (2) and (3) of Table 1. To ensure the 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)*

Sl No.	No. of Rolls in the Lot	For Dimensions		Sample Size for Tensile Strength, Compressibility and Compression Set	Sample Size for other Characteristics
		Sample Size	Permissible Defectives ¹⁾		
(1)	(2)	(3)	(4)	(5)	(6)
i)	Up to 500	13	1	5	2
ii)	501 to 1 000	20	1	5	3
iii)	1 001 to 3 000	32	2	10	4
iv)	3 001 to 10 000	50	3	10	5
v)	10 001 and above	80	5	15	5

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

A-2 NUMBER OF TESTS AND CRITERIA FOR CONFORMITY

A-2.1 The rolls of jointing selected according to **A-1.2** shall be examined for dimensions. If the number of rolls found not in conformity with the specified requirements is less than or equal to the corresponding number given in column (4) 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 rolls of jointing equivalent to the sample size indicated in column (5) of Table 1 shall be selected. This shall be subjected to tests for tensile strength, compressibility and compression set. The lot shall be declared conforming to the above requirements if all the rolls satisfy the relevant requirements.

A-2.3 In case of the lots which have been found satisfactory according to **A-2.2**, a number of rolls equivalent to the sample size indicated in col 5 of Table 1 shall be selected. These rolls shall be subjected to the tests for oil absorption, freedom from corrosive impurities, dimensional stability and, if desired by the buyer, also for flexibility and resistance to mould growth. The lot shall be declared conforming to the above requirements if all the rolls satisfy the relevant requirements,

A-2.4 The lot shall be declared conforming to the requirements of this standard if it is found satisfactory according to **A-2.1**, **A-2.2** and **A-2.3**.

ANNEX B

(Clause 9.1.3)

METHOD FOR DETERMINATION OF COMPRESSIBILITY AND COMPRESSION SET

B-1 APPARATUS

B-1.1 The test shall be carried out on a suitable compression testing machine fitted with smooth steel platens of diameter not less than 50 mm mounted so that their faces remain parallel to each other throughout the test. The load shall be applied normally to the faces of the platens.

B-1.2 The compressibility of the material shall be measured by means of two dial indicators graduated in millimetres and accurate to 2.5 μm which shall be rigidly attached to the upper loading platen at opposite ends of the diameter, with their spindles resting on the lower platen or other fixed datum level.

B-2 TEST SPECIMENS

B-2.1 The specimens circular in shape and of area 5 cm^2 shall be punched from the sample with a sharp die. For samples of thickness 1.60 mm and above, 20 such specimens shall be cut. For sample thicknesses between 0.80 and 1.60 mm, 40 such specimens shall be cut and from these a composite specimen for testing shall be prepared by pairing together two specimens selected at random without the use of adhesive.

B-2.2 Materials of thickness less than 0.80 mm cannot be tested owing to the practical difficulty in making satisfactory measurement.

B-3 CONDITIONING

The specimens shall be dried over silica gel for not less than 18 h and then exposed to an atmosphere of 65 ± 2 percent relative humidity and $27 \pm 2^\circ\text{C}$. Five of the specimens shall be weighed to an accuracy of 0.001 g immediately and at 24 h intervals thereafter. The specimens must show a gain in weight after the first 24 h period and when they show both gain nor loss in weight exceeding 1.0 percent in each of two consecutive 24 h periods, all the specimens may be considered to have reached equilibrium and testing may begin. Where it is not possible to carry out the compression testing in a conditioned room, the samples shall be removed from the conditioning atmosphere one at a time and transported to the test apparatus in a sealed container and tested immediately.

NOTE — The conditioning of specimens shall be strictly in accordance with the procedure laid down, as it is known that departure from this in any way may materially affect the subsequent results.

B-4 METHOD FOR DETERMINATION OF JIG YIELD

The jig yield is defined as the deflection of the apparatus caused by the increase from the pre-load to the major load. This jig yield shall be determined immediately prior to each series of tests by adopting the following procedure without the insertion of test specimens:

- a) Apply pre-load of 343.233 N (35 kgf) and maintain this for 2 min before recording the mean dial gauge readings (J_0). Increase the load at a steady rate to the major load of 4 412.99 N (450 kgf) and maintain this for 2 min before recording the mean dial gauge readings (J_1). Reduce the load to the pre-load of 343.233 N (35 kgf) and maintain this for 30 s before recording the mean dial gauge readings (J_2). The jig yield $J = J_1 - J_0$.

NOTE — If the values of J_0 and J_2 differ by more than 5 μm the apparatus is showing non-elastic yield and is not in a suitable condition for carrying out the tests. (1 kgf = 9.806 65 N)

- b) A sufficient number of such determinations shall be made until the maximum and minimum of five consecutive determinations do not differ by more than 7 μm . The mean of these five values shall constitute jig yield of the apparatus.

B-5 METHOD OF TEST

B-5.1 The pre-load of 343.233 N (35 kgf) shall be applied with no test specimen in place and the mean of two dial gauge readings (T_0) shall be recorded. The procedure shall be repeated with the specimens placed centrally between the platens and this load maintained constant for 2 min. The mean of the two dial gauge readings (T_1) shall be recorded. The load shall then be increased at a steady rate over a period of 20 to 30 s to the major load of 4 412.99 N (450 kgf). This load shall be maintained for 2 min when the mean of the two dial gauge readings (T_2) shall again be recorded. The total load shall then be removed and the sample allowed to recover for 2 min in the free state. The pre-load of 343.233 N (35 kgf) shall then be reapplied and after 30 s under this load the mean of the two dial gauge readings (T_3) shall again be recorded. Twenty determinations shall be carried out on each batch of material.

B-6 RESULTS

B-6.1 The results shall be calculated to the nearest 0.1 percent as follows:

$$\text{Compressibility} = \frac{(T_1 - T_2 - J)}{(T_1 - T_0)} \times 100 \text{ percent}$$

$$\text{Compressibility set} = \frac{(T_1 - T_3)}{(T_1 - T_0)} \times 100 \text{ percent}$$

B-6.2 The mean of twenty determinations of the compressibility of the material and the mean of twenty determinations of the compression set of the material shall be calculated to the nearest 0.5 percent.

ANNEX C

(Clause 9.1.4)

METHOD FOR DETERMINATION OF OIL ABSORPTION

C-1 TEST PIECES

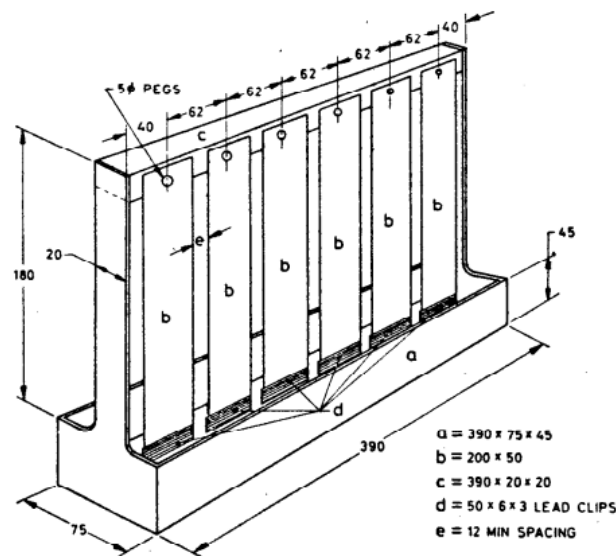
The test pieces shall be strips, 200 mm long and 50 mm wide, of which three will be cut in the machine direction and three in the cross direction of the material. They shall be cut in pairs, one pair from each edge and one pair from the centre of the sample sheet.

C-2 PROCEDURE

C-2.1 A line shall be marked across each test piece exactly 12.5 mm from the lower end. All the test pieces shall be suspended vertically from the suspension bar which is fixed above a suitable tank as shown in Fig. 1 so that the top of each specimen is in level with the top of the bar. Small lead clips shall be attached to the lower ends of the test pieces to prevent the test pieces from curling.

C-2.2 The assembly shall be placed in an oven maintained at a temperature of $100 \pm 2^\circ\text{C}$ with mineral hydraulic fluid in a separate vessel. The apparatus and oil shall be allowed to remain in the oven for not less than 1 h and sufficient oil shall then be carefully transferred to the tank by means of a funnel so that the surface of the oil is coincident with the lines marked on the test pieces. The apparatus shall be maintained at a temperature of $100 \pm 2^\circ\text{C}$ for 2 h.

C-2.3 The height to which the oil is seen to rise in each test piece after 2 h shall be noted.



All dimensions in millimeters.

FIG. 1 TYPICAL APPARATUS FOR OIL ABSORPTION TEST

ANNEX D

(Clauses 9.1.5.1, 9.1.5.2, and 9.1.5.3)

METHOD OF TEST FOR FREEDOM FROM CORROSIVE IMPURITIES**D-1 PREPARATION OF WATER EXTRACT****D-1.1 Apparatus**

The extraction apparatus shall consist of a 500 ml borosilicate glass flask to which is attached by means of a ground glass joint an efficient reflux condenser, fitted with a guard tube with a suitable reagent for the exclusion of carbon dioxide and atmospheric impurities.

D-1.2 Procedure

D-1.2.1 Cut out a portion of the sample of material into pieces about 6 mm², weigh about 10 g into the flask and add to this test portion 20 times its weight of demineralized water. Fit the reflux condenser and guard tube, heat the water to boiling point and continue boiling gently for 1 h. Replace the reflux condenser by a stopper and guard tube and cool to room temperature.

D-1.2.2 Immediately before preparing the water extract, boil about 100 ml of the demineralized water in the apparatus for 1 h. Stopper the flask and cool. The apparatus shall be considered to be satisfactory if the electrical conductivity of the water is not greater than 2 $\mu\Omega$ /cm.

D-2 DETERMINATION OF pH VALUE OF WATER EXTRACT

A portion of the water extract of the material shall be decanted into a suitable cell and the pH value determined in accordance with IS 1060 (Part 4/Sec 7). The determination shall be made as soon as the water extract has cooled to room temperature. The cell shall be rinsed with the demineralized water immediately before using.

D-3 DETERMINATION OF CHLORIDE AND SULPHATE CONTENTS

D-3.1 A suitable aliquot portion equivalent to *W* gram of sample of the extract prepared according to **D-1** shall be taken and evaporated to nearly 10 ml. Approximately 0.05 g of analytical reagent grade sodium hydroxide shall be added and allowed to dissolve. The solution shall be transferred quantitatively to a platinum crucible and evaporated to dryness. The crucible shall be heated in a muffle furnace for 4 h at $700 \pm 10^\circ\text{C}$, removed, allowed to cool, and placed in a beaker. The residue shall be dissolved in 25 ml of 5 percent (weight/volume) nitric acid, by warming if necessary, and the resulting solution boiled for 5 min to remove sulphide. The cooled solution shall be filtered into a 250 ml graduated flask and made up to volume with distilled water.

D-3.2 A blank determination, using the same reagent, shall be prepared in parallel with the above.

D-3.3 From these solutions, 100 ml shall be taken and used to determine chloride in accordance with clause **10** or **11** of IS 4202 and 100 ml to determine sulphate content in accordance with **10** of IS 4203.

D-3.4 The chloride content shall be calculated as follows:

a) By Gravimetric Method:

Sodium Chloride (NaCl) percent

$$= \frac{101.95 \times \text{wt of the precipitate (corrected for blank) g}}{W}$$

b) By Volumetric Method:

Sodium Chloride (NaCl) percent

$$= \frac{0.1462 \times \text{vol of N/ 100 Silver Nitrate (AgNO}_3\text{) used (corrected for blank) ml}}{W}$$

D-3.5 The sulphate content shall be calculated as follows:

Sodium sulphate (Na₂SO₄) percent

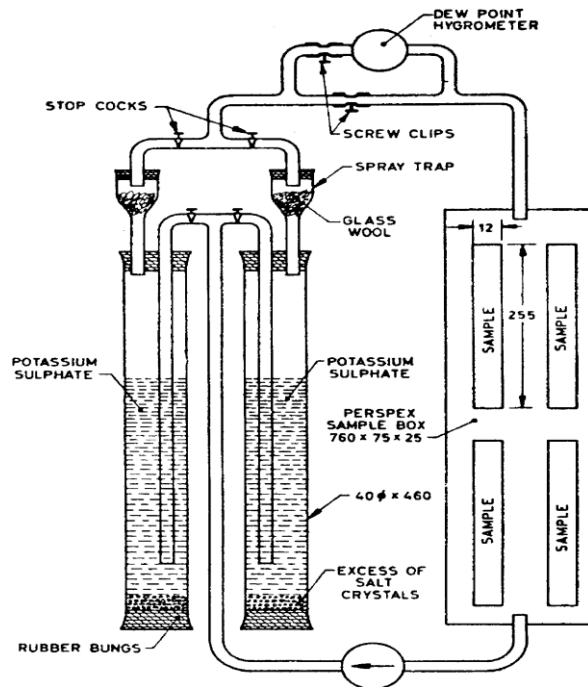
$$= \frac{152.075 \times \text{wt of precipitate (corrected for blank) g}}{W}$$

ANNEX E

(Clause 9.1.6)

METHOD FOR DETERMINATION OF DIMENSIONAL STABILITY**E-1 APPARATUS**

A suggested form of apparatus is shown in Fig. 2. Other equipment may be used provided that the humidity control and means of measurement are of comparable accuracy.



All dimensions in millimeters

FIG. 2 DIMENSIONAL STABILITY APPARATUS

E-2 TEST PIECES

Two test pieces, 255×12 mm with thickness of 1.60 mm maximum, shall be cut in the machine direction and two similar test pieces in the cross direction. Each piece shall bear two sharply defined marks approximately 200 mm apart, measured along the centre line of the piece.

E-3 PROCEDURE

Each strip shall be suspended vertically in the conditioning chamber from a point above the upper mark. The pieces shall be conditioned for 22 h at $20 \pm 2^\circ\text{C}$ and 23 percent relative humidity, the initial length L_1 measured (to the nearest of 0.02 mm) preferably without removal of the pieces from the controlled atmosphere. The pieces are re-conditioned at $20 \pm 2^\circ\text{C}$ and 97 percent relative

humidity for 22 h, and the re-conditioned length L_2 is measured (to the nearest of 0.02 mm), again preferably without removal of the pieces from the controlled atmosphere.

E-4 Result

E-4.1 The dimensional change shall be calculated as follows:

$$\text{Dimensional change, percent} = \frac{L_2 - L_1}{L_1} \times 100$$

NOTE – The air should be exchanged at a minimum rate of 800 cm³/min per specimen. The velocity of the air over the samples shall be 150 cm/min.

E-4.2 The mean values for each direction shall be quoted as a result.

ANNEX F

(Clause 9.2.2)

METHOD OF TEST FOR FLEXIBILITY

F-1 TEST PIECES

The test pieces used shall be strips 12.5 mm wide and 100 to 125 mm long, of which three shall be cut from the sample in the machine direction and three in the cross direction. They shall be conditioned at $27 \pm 2^{\circ}\text{C}$ and 65 ± 2 percent relative humidity for at least 18 h immediately before the test.

F-2 PROCEDURE

Each test piece shall be bent through 180° round a cylindrical mandrel having a diameter equal to five times the nominal thickness of the material. The time of bending shall be approximately 2 s and the test piece shall be maintained in the bent position for 10 s.

ANNEX G

(Clause 9.2.3)

METHOD FOR DETERMINATION OF RESISTANCE TO MOULD GROWTH

G-1 TEST PIECES

The test pieces used shall be strips approximately 100 mm long and 12 mm wide.

G-2 PREPARATION OF AQUEOUS SPORE SUSPENSION

G-2.1 The mixed aqueous spore suspension shall be freshly prepared by transferring a small mass of spores from each of the seven cultures listed in **G-2.2** to about 20 ml of distilled water conforming to IS 1070 in a spray bottle. The contents of the spray bottle shall be thoroughly shaken before use.

G-2.2 The cultures used for the preparation of the mixed spore suspension are the following:

- a) *Aspergillus niger*;
- b) *Aspergillus amstelodami*;
- c) *Paecilomyces varioti*;
- d) *Stachybotrys atra*;
- e) *Chaetomium globosum*;
- f) *Penicillium brevi-compactum*; and
Penicillium cyclopium.

G-3 PROCEDURE

G-3.1 Each test piece shall be inoculated with a fine spray of the mixed aqueous spore suspension described in **G-2**, care being taken not to saturate the material with water. Each test piece shall then be placed longitudinally in a test tube so that it is supported by the tube. The tube shall be placed upright over water in a closed glass container, such as a vacuum desiccator, fitted with a short capillary tube to retain the substantially stagnant atmosphere saturated with moisture but to allow slight breathing.

G-3.2 This container shall then be placed for 28 days in humidity control chambers capable of maintaining a temperature of $30 \pm 2^{\circ}\text{C}$ and relative humidity between 90 and 98 percent.

G-3.3 The test piece shall then be removed from the container and examined for mould growth.