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SPECIFICATION FOR RUBBERIZED COIR SHEETS FOR CUSHIONING

(First Revision)

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BUREAU OF INDIAN STANDARDS
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NEW DELHI 110002

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Indian Standard

SPECIFICATION FOR RUBBERIZED COIR SHEETS FOR CUSHIONING

(First Revision)

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(*Continued on page* 18)

Indian Standard

SPECIFICATION FOR RUBBERIZED COIR SHEETS FOR CUSHIONING

(First Revision)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Indian Standards Institution on 10 February 1987, after the draft finalized by the Coir and Coir Products Sectional Committee had been approved by the Textile Division Council.

0.2 This standard was first published in 1977. It has now been revised to make it up to date on the basis of the experience gained during its use.

0.3 In the present revision, the following major changes have been incorporated:

a) Tolerances have been introduced on 'indentation hardness index' of various grades and requirement for density has been prescribed for guidance.

b) Modifications have been made in the method for determination of chloride content.

c) Opportunity has also been availed to modify certain other clauses of the specification so that the same are in line with current manufacturing and trade practices.

0.4 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.

1. SCOPE

1.1 This standard prescribes the requirements and methods of test for rubberized coir sheets for cushioning.

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

1.2 It does not cover articles made from shredded rubberized coir or fabricated articles consisting of a cover of rubberized coir sheets enclosing springs or other cushioning material. or industrial and packaging material.

2. TERMINOLOGY

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

2.1 Rubberized Coir — A resilient product of porous structure containing curled coir fibre suitably coated and bonded with natural rubber, synthetic rubber or a combination of both containing suitable ingredients, and vulcanized for the final set to the desired size and shape.

2.2 Indentation Hardness Index — The indentation hardness index is the load in kilograms required to produce an indentation in the sample equivalent in depth to 40 percent of the original thickness of the sample.

2.3 Original Thickness — The thickness determined by needle gauge method for the whole sample will be termed as original thickness.

NOTE — For samples having thickness less than 38 mm, the original thickness shall be determined by superimposing minimum number of pieces to give a total thickness of about 38 mm and the average taken as the original thickness of the sample.

3. GRADES

3.1 The rubberized coir sheets for cushioning shall be graded on the basis of the indentation hardness index and density as given below:

Grade	*Indentation Hardness Index*	*Density g/dm³*
Soft	3·0 — 5·9	40 — 59
Medium	6·0 — 8·9	60 — 69
Firm	9·0 — 11·9	70 — 79
Extra firm	12·0 — 14·9	80 — 99

However, density requirement is optional and has been given for guidance only. Further, a tolerance of + 10 percent shall be applicable on the declared value within the range in respect of indentation hardness index.

NOTE — The tolerance on indentation hardness index has been provided to take care of the agreement between the purchaser and the manufacturer in respect of this requirement when it is desired to have different value in any portion of the coir sheet.

4. MANUFACTURE, WORKMANSHIP AND FINISH

4.1 Rubberized coir sheets shall be manufactured using unretted coir fibre mechanically extracted and curled to effectively utilize the resiliency of the fibre material, the fibres being bonded to each other by vulcanized rubber to keep them in position, utilizing rubber latex containing compounding ingredients of such nature and quality that the finished product complies with the requirements of this specification.

4.2 Rubberized coir sheets shall be of a resilient nature and porous structure, in the form of sheetings or in fabricated sheets. Any special characteristics other than those prescribed in this specification which may be desired for specific application shall be as agreed to between the purchaser and the supplier.

4.3 The rubberized coir sheets shall present a uniform appearance throughout the structure and shall not contain loose fibres or voids.

4.4 Due to manufacturing conditions, the material may have to be altered or repaired. The repaired or altered material shall be acceptable provided the material used in such repairs or alterations is of the same composition and quality as the original product and provided such alterations do not affect the requirements given in this specification. The odour of rubberized coir shall be as mild as possible and shall not be objectionable.

5. SHAPE AND DIMENSIONS

5.1 Rubberized coir sheets may be supplied in fabricated shapes or in sheet form as specified by the purchaser.

5.2 The dimensions of rubberized coir sheets, when tested according to the method prescribed in Appendix A, shall be as specified by the purchaser subject to the tolerance given below:

Length or Width	*Permissible Tolerance* (mm)
Up to 1 m	± 6
1 m to 1·5 m	± 9
Over 1·5 m	± 12

Thickness	*Permissible Tolerance* (mm)
Up to 12 mm	+ 3 — 0
Over 12 mm up to 38 mm	+ 6 — 3
Over 38 mm up to 100 mm	+ 12 — 6
Over 100 mm	+ 15 — 6

6. REQUIREMENTS

6.1 Indentation Hardness — When tested according to method given in Appendix B, different grades of rubberized coir products shall have the indentation hardness as prescribed under **3.1**.

6.2 Resistance to Ageing — When tested according to method prescribed in Appendix C, the indentation hardness of the sample after ageing shall not vary by more than ± 20 percent of the value obtained with unaged sample.

6.3 Resistance to Flexing — When tested according to the method given in Appendix D, the indentation hardness of the test specimen shall not vary by more than ± 25 percent. This shall be calculated on the resultant thickness.

6.4 Compression Set — The compression set of the sample, when determined by the method prescribed in Appendix E, shall not exceed 25 percent. When tested under atmospheric conditions, the compression set shall not exceed 15 percent after 3 hours recovery.

6.5 *p*H Value — The *p*H value of the aqueous extract of the material, when determined by the method prescribed in Appendix F, shall be within 5 to 8·5.

6.6 Chloride Content — The chloride content of the material calculated as 'Cl', when determined by the method prescribed in Appendix F, shall not exceed 0·3 percent by weight.

6.7 Sulphate Content — Sulphate content of the aqueous extract of the material prepared as in **F-2** and tested by the method prescribed in **IS** : 4203-1967*, shall not exceed 0·2 percent by weight.

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*Method for determination of sulphate content in textile materials.

7 OPTIONAL REQUIREMENT

7.1 Density — For the guidance of the manufacturers, density corresponding to various grades are as given in 3.1. The method of test shall be as given in Appendix G.

8. TESTS

8.1 Preparation and Conditioning of Samples

8.1.1 Wherever practicable, the tests shall be conducted on the whole rubberized coir sheet.

8.1.2 The specimen shall be cut from the centre of the sample piece as far as possible and the specimen shall be subjected to test, preferably within 24 hours of cutting.

8.1.3 When the finished product does not lend itself to testing or to the preparation of test pieces because of complicated shape, small size or other reasons, standard test slabs shall be prepared.

8.1.4 When difference due to the difficulty in obtaining suitable test pieces from the finished product arise, the manufacturer and the purchaser may agree on acceptable deviations. This can be done by comparing results of standard test pieces and those obtained on actual product.

8.1.5 Test shall be carried out not before 48 hours after vulcanization of the sample. Samples and test pieces shall be protected from light as completely as possible and from any stress or strain whenever they are not actually in the process of being tested.

8.1.6 *Conditioning* — Each sample selected for test shall be conditioned for a minimum period of 24 hours at 27 $\pm$ 2°C and 65 $\pm$ 5 percent relative humidity (*see* IS : 6359-1971*) prior to testing and testing shall be in the same atmosphere; when the testing cannot be carried out in the same atmosphere then the testing shall be commenced within two minutes of withdrawal of specimen from the conditioning atmosphere.

9. SAMPLING

9.1 Lot — All rubberized coir sheets of the same grade, size and shape manufactured under similar conditions shall constitute a lot.

9.2 Sample — That part of the lot which is drawn randomly to represent the lot.

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*Method for conditioning of textiles.

9.3 Test Specimen — An appropriately shaped piece taken from the sample for use in physical and chemical tests.

10. MARKING OR LABELLING

10.1 Each rubberized coir sheets for cushioning shall be attached with a label bearing the following information:

a) Name of the material;

b) Manufacturer's name, initials, trade-mark or any other identification mark;

c) Grade; and

d) Dimensions.

10.1.1 The products may also be marked with the Standard Mark.

10.1.2 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 the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

11. PACKING

11.1 The rubberized coir sheets shall be packed as agreed to between the purchaser and the supplier.

12. INSTRUCTIONS FOR STORAGE

12.1 Rubberized coir sheets shall be kept in well ventilated store in an atmosphere free from the products of combustion from any heating appliance and free solvent vapours, out of contact with damp surfaces. Under no circumstances shall the products be stored in direct sunlight or exposed to ultraviolet light. When products are stacked in stores, care shall be taken to avoid undue compression or distortion. Special care shall be taken when stacking fabricated products of irregular shape.

APPENDIX A

(*Clause* 5.2)

METHOD OF TEST FOR MEASUREMENT OF DIMENSIONS

A-1. DETERMINATION OF LENGTH AND WIDTH

A-1.1 Measure the length and width of the sample using a steel rule nearest to 1 mm, ensuring the measurement along a line perpendicular to opposing faces of the sample.

A-2. DETERMINATION OF THICKNESS

A-2.1 A test specimen 100 × 100 mm cut out from the sample shall be placed between two larger horizontal plates with a load of 200 g on its upper surface. The distance between the plates is determined at about the middle on each side correct to the nearest mm and the average of the four readings taken as the thickness of the sample.

A-2.2 Determination of Thickness of the Whole Sample — The instrument for measuring the thickness consists of a 250 mm long, rigid, narrow measuring needle made out of the suitable material and finished to give a smooth polished surface, one end of which is fixed vertically to the centre of a polished plate of 3 mm thickness and 50 × 50 mm size, the other end being tapered to a point, to facilitate insertion of the rod through the rubberized coir sheet. The needle is calibrated in millimetre all along its length starting with the point fixing it with the plate as 0, every 5 and 10 mm from this point being prominently marked out. A disc of 35 mm diameter, weighing 200 g with a central hole to facilitate movement of the weight all along the length of the calibrated needle also forms part of the measuring instrument.

A-2.2.1 *Procedure* — For measuring the thickness of the sample, the calibrated needle measuring instrument is inserted through the bottom side of the rubberized coir sheets, so that the needle is in a plane perpendicular to the free surface of the rubberized coir sheets and the base plate of the instrument is in contact with the bottom side of the rubberized coir sheets. Thereupon, the sliding weight is introduced on the projecting part of the needle and the combined thickness of the rubberized coir sheets and that of the sliding weight read directly, correct to the nearest 1 mm, on the calibrated needle. The thickness of the sliding weight is deducted from this reading to obtain the thickness of the test sample. The measurements are recorded at last at four points at random on the test piece and the average value taken as the thickness of the test material.

APPENDIX B

(*Clause* 6.1)

METHOD FOR DETERMINATION OF INDENTATION HARDNESS INDEX

B-1. TEST SPECIMEN

B-1.1 Cut out a test specimen measuring 100 × 100 mm, leaving a space of 25 mm from the edges of the whole piece.

B-2. APPARATUS

B-2.1 The testing apparatus shall be capable of applying an indentor in such a way that the load is applied on the sample at a uniform rate and shall have a dial scale platform balance of suitable capacity for measuring the load required to produce the specified indentation. The sample shall be placed on the smooth flat horizontal surface of the platform of the dial scale balance, the surface of the platform being larger than the size of the sample

B-2.2 The essential parts of the testing apparatus (*see* Fig. 1) are an adjustable indentor of the dimension specified in **B-2.2.1,** which can be moved vertically up or down by a threaded shaft, working through a sleeve of same pitch and dimension, operated by a hand wheel. The sleeve is fitted to a framework which rests on the horizontal surface of a table without having contact with the platform of a dial scale balance of 20 kg capacity graduated in 50 g sub-division. The thickness of the sample can be measured by means of a pointer mounted on the indentor with suitable guides and sliding in front of a vertical scale graduated in millimetres. The pointer is so adjusted that when the indentor touches the platform of the balance, the reading of the pointer on the scale is zero.

B-2.2.1 *Indentor* — A 105-mm square mild steel plate of 3 mm thickness shall constitute the indentor, fitted to the threaded shaft by a ball and socket joint, so that the surface of the indentor can adjust itself to the contour of the test specimen.

B-3. TEST PROCEDURE

B-3.1 The test specimen shall be of size minimum 100 × 100 mm. Raise the indentor to a height greater than the thickness of the sample and place the sample over the platform of the balance below the indentor. Note the weight of the sample recorded by reading on the dial scale of the balance (*x* g) Lower the indentor by rotating the handle so as to press

the sample against the platform of the balance. When the balance reads (200 g + xg), note the reading of the pointer on the scale to record the thickness of the sample (t_1). Gradually lower the indentor to apply a load at the rate of 0·5 kg/min until the sample is pressed to a thickness of 60 percent of t_1. The load recorded on the dial scale for this indentation is taken as the Indentation Hardness Index of the specimen.

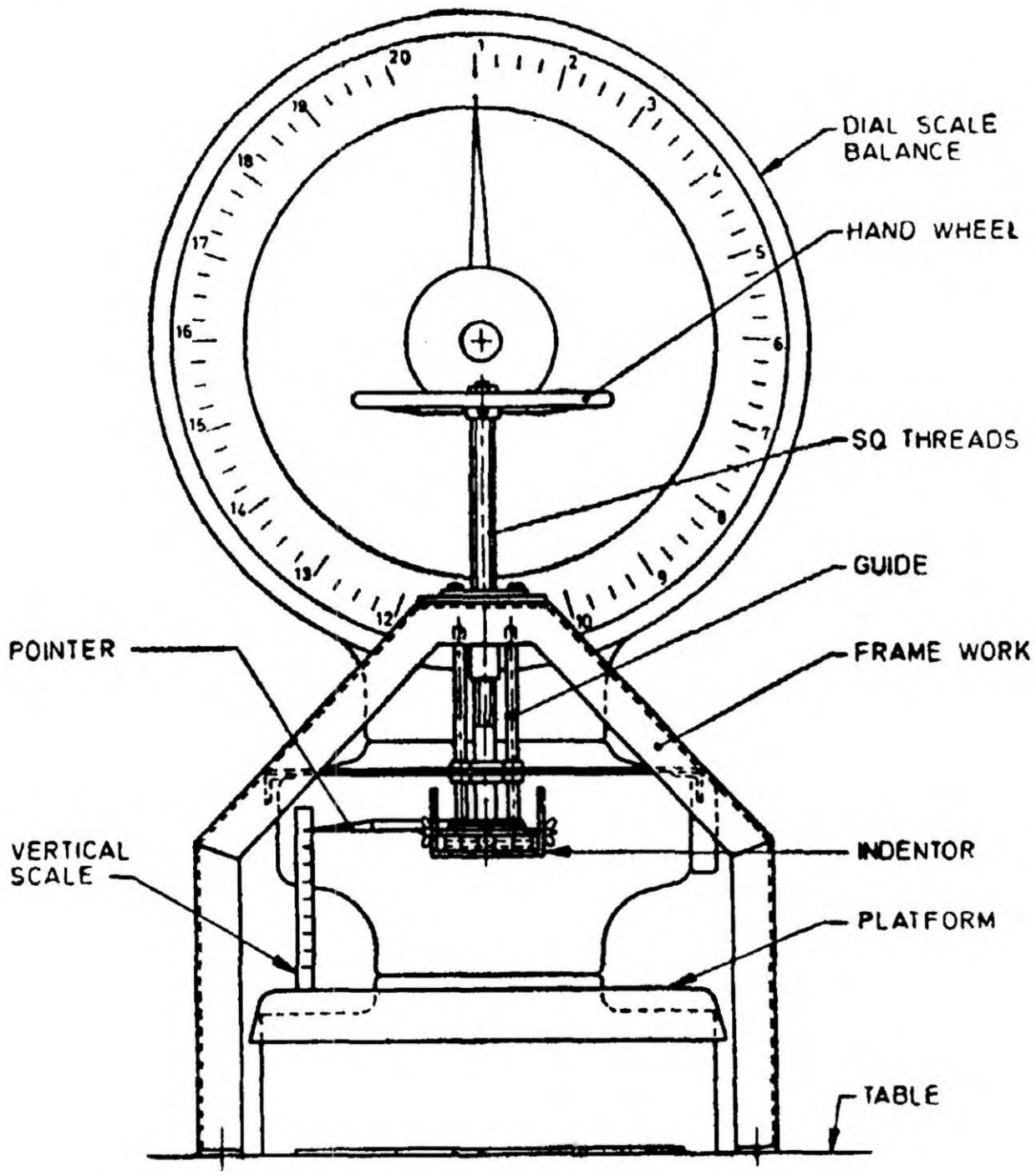

FIG. 1 APPARATUS FOR INDENTATION TEST

APPENDIX C

(*Clause* 6.2)

METHOD FOR DETERMINATION OF RESISTANCE TO AGEING

C-1. PRINCIPLE

C-1.1 The ageing test consists of subjecting samples to controlled deterioration by air at elevated temperature and atmospheric pressure after which the physical properties are measured and compared with those of unaged samples. The deterioration is measured by the observed change in indentation hardness index.

C-2. TEST SPECIMEN

C-2.1 From each sample cut out two test specimens of size 100 × 100 mm and mark the specimens as 1 and 2. Take one of the specimen for ageing test and the other specimen shall be used for comparing with the aged specimen.

C-3. PROCEDURE

C-3.1 Arrange for an air oven of such size that the total volume of test specimens does not exceed 10 percent of the free space in the oven. Make provision for suspending specimens so that they are not within 12 mm of each other or the oven sides. Control the temperature of the oven thermostatically so that the test specimens are kept at 70 ± 2°C. Place thermometer near the centre of the oven to record the actual ageing temperature.

C-3.2 Adjust the oven to 70 ± 2°C. Place the test specimens in the oven adjusted as indicated in **C-3.1**. Arrange the test specimens so that they are stationary, free from strain, freely exposed to air on all sides and not exposed to light. Continue the ageing for 48 hours. At the completion of the ageing period, remove the test specimens from the oven and place on a flat surface to cool to room temperature. Allow them to cool for not less than 24 hours. Measure the indentation hardness index of the aged specimens as in Appendix B.

C-3.3 Test the unaged test specimen also for indentation hardness requirements within 24 hours period of commencing of the ageing of the other sample.

C-3.4 Compare the indentation hardness index of both aged and unaged test specimens.

APPENDIX D

(*Clause* 6.3)

METHOD FOR DETERMINATION OF RESISTANCE TO FLEXING

D-1. METHOD

D-1.1 The method involves subjecting a sample to continued flexing with an indentor for 250 000 cycles at 4 cycles/sec and measuring the loss in indentation hardness.

D-2. TEST SPECIMEN

D-2.1 Cut out a test specimen measuring 100 × 100 mm, leaving 25 mm from the edges of the whole piece.

D-3. APPARATUS

D-3.1 The essential parts of the apparatus (*see* Fig. 2), which has been found suitable, consists of an indentor of dimensions specified in **D-3.2**, connected through a threaded adaptor and held by a locking nut to a push rod. This push rod is constrained to move vertically by fixed sleeves and is driven vertically by a motor which rotates a crank disc, the crank disc and push rod being joined by a connecting rod. This connecting rod is adjustably mounted in a radial slit in the crank disc, the length of the strokes, therefore, being adjustable. The motor is mounted upon a steel beam above the table upon which the specimen to be tested is placed. A square frame made of mild steel angles with a clear internal dimension of 107 × 107 mm is positioned on the table just below the indentor to prevent lateral movement of the specimen in the course of its repeated flexing by the indentor. The fixtures are adjusted for effecting four flexes per second. A revolution counter is attached to the machine to record the number of flexes for the specimen.

D-3.2 A 105-mm square mild steel plate of 3 mm thickness shall constitute the indentor.

D-4. PROCEDURE

D-4.1 Measure the thickness of the sample as described in **A-2**. Determine the indentation hardness index as given in Appendix B. Adjust the stroke of the crankshaft for a depression of the indentor by a distance equal to 40 percent of the thickness of the sample. This is done by adjusting the position of the connecting rod in the crank disc. Raise the indentor to the topmost position of the stroke and place the test specimen

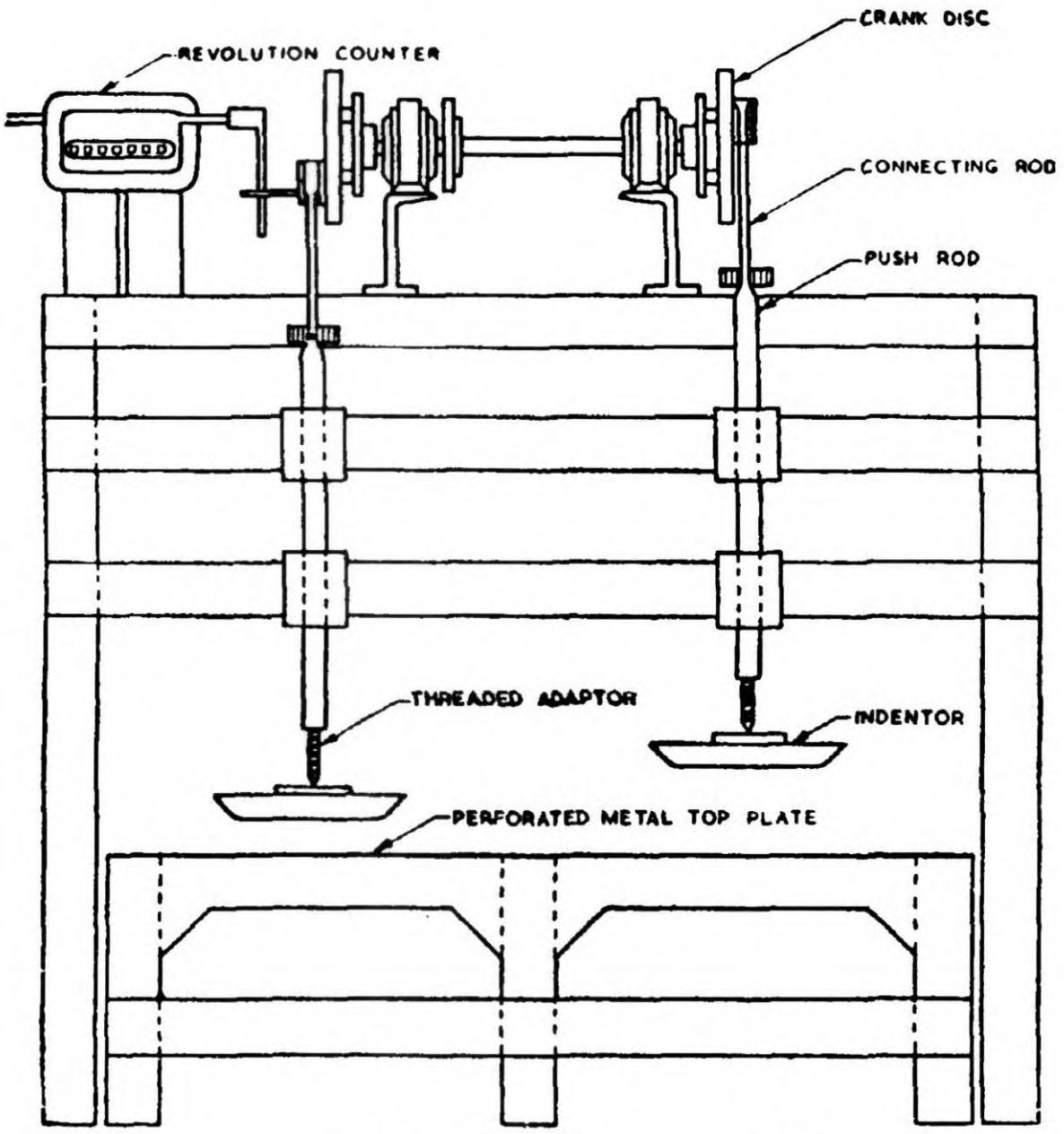

FIG. 2 APPARATUS FOR FLEXING TEST

in the mild steel angle box below the indentor. Place wooden blocks of suitable thickness below the specimen to ensure that the top surface of the specimen is in contact with the bottom side of the indentor when the indentor is at the topmost position of the stroke. Subject the specimen to flexing at a rate of 4 flexes per second. After flexing 250 000 cycles, allow the sample to remain for 30 minutes. Thereafter, determine the indentation hardness index by test described in Appendix B. The variation in the indentation hardness index is calculated as percentage of the initial hardness index.

APPENDIX E

(Clause 6.4)

METHOD FOR DETERMINATION OF COMPRESSION SET

E-1. PRINCIPLE

E-1.1 The compression set under constant deflection is the measure of the residual strain in a test piece after it has been strained under compression to a given extent for a given time and then allowed to recover for a given time, the temperature being substantially constant during the test.

E-2. TEST SPECIMEN

E-2.1 The test piece shall be of size 100 × 100 mm.

E-3. APPARATUS

E-3.1 The compression device shall consist of two flat steel plates, between the parallel faces of which the test piece is compressed. Steel spacers in the form of bars and of thickness such as to give the required 40 percent compression shall be provided to control the thickness of the piece during the test.

E-4. PROCEDURE

E-4.1 Measure accurately the initial thickness of the test piece as in A-2. Compress the test piece by 40 percent of its original thickness between the parallel steel plates, which shall be larger than the test piece. Use steel spacers between the plates, sufficient clearance being allowed for tilting of the test piece and care being taken to avoid displacement of the test piece. After being compressed for 22 hours at a temperature of 70 ± 2°C, remove the test piece from the clamp while still at the test temperature and allow to recover for 3 hours at room temperature. Then measure the thickness of the test piece again. Test at least two test pieces and take the average of test results.

E-4.1.1 *Calculation* — Calculate the compression set as follows:

$$\text{Compression set at constant strain, percent} = \frac{T_o - T_r}{T_o} \times 100$$

where

T_o = original thickness of the test piece, and
T_r = thickness of the test piece after recovery.

APPENDIX F

(*Clauses* 6.5, 6.6 *and* 6.7)

METHOD FOR DETERMINATION OF *p*H VALUE AND CHLORIDE CONTENT

F-1. TEST SPECIMENS

F-1.1 Draw a square piece of rubberized coir sheet weighing about 10 g.

F-2. PREPARATION OF AQUEOUS EXTRACT

F-2.1 Cut the piece taken into about 5 mm square pieces and weigh. Transfer to a clean, chemically resistant glass flask, fitted with ground glass joint for reflux condenser. Add distilled water (*see* IS : 1070-1977*) weighing 20 times the weight of the rubberized coir under test, to the flask. Fit the flask to the reflux condenser and heat the contents of the flask to boil. Continue boiling for 1 hour. Remove the flask and close while the liquid is still boiling gently using a clean ground glass stopper. Cool to room temperature.

F-3. DETERMINATION OF *p*H VALUE

F-3.1 Transfer a portion of the aqueous extract to the electrode of *p*H meter (IS : 2711-1979†) and determine the *p*H.

F-4. DETERMINATION OF CHLORIDE CONTENT

F-4.0 Principle — Chlorides are determined volumetrically by titration with standard silver nitrate solution.

F-4.1 Reagents

F-4.1.1 *Calcium Carbonate* (*Chloride Free*)

F-4.1.2 *Standard Silver Nitrate Solution* — 0·1 N.

F-4.1.3 *Potassium Chromate Solution* — Five percent (Dissolve 50 g of potassium chromate in distilled water. Add silver nitrate solution till a definite red precipitate is formed. Allow it to stand for overnight and filter. Dilute the filtrate to 1 litre with distilled water).

F-4.2 Procedure — Take a portion of the aqueous extract as prepared in F-2. Neutralize with calcium carbonate till a pale yellow colour is

*Specification for water for general laboratory use (*second revision*).
†Specification for direct reading *p*H meters (*second revision*).

obtained (usually 0·5 g is sufficient). Add 1 ml of potassium chromate indicator solution and titrate with standard silver nitrate solution till a red colour is obtained.

F-4.3 Calculation

$$\text{Chloride (as Cl), percent by mass} = \frac{3{\cdot}546\,(V_1 - V_2)\,N}{W}$$

where

V_1 = volume in ml of standard silver nitrate solution used in the titration with the material,

V_2 = volume in ml of standard silver nitrate solution used in the blank determination,

N = normality of standard silver nitrate solution, and

W = mass in g of the material out of which the aqueous extract was made (*see* **F-2.1**) for chloride content test only.

APPENDIX G

(*Clause* 7.1)

METHOD FOR DETERMINATION OF DENSITY

G-1. Determine the length, width and thickness of the sample as described in Appendix A.

G-1.1 Weigh the test specimen correct to 0·1 g.

G-1.2 Determine the density of the sample by dividing the mass in grams by the volume in cubic decimetres.

(*Continued from page* 2)

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	53/5 Ward No. 29, R.G. Barua Road, 5th By-lane, GUWAHATI 781003	3 31 77
	5-8-56C L. N. Gupta Marg, (Nampally Station Road) HYDERABAD 500001	23 10 83
	R14 Yudhister Marg, C Scheme, JAIPUR 302005	6 34 71
	117/418 B Sarvodaya Nagar, KANPUR 208005	21 68 76
	Plot No. A-9, House No. 561/63, Sindhu Nagar, Kanpur Road, LUCKNOW 226005	5 55 07
	Patliputra Industrial Estate, PATNA 800013	6 23 05
	District Industries Centre Complex, Bagh-e-Ali Maidan, SRINAGAR 190011	—
	T. C. No. 14/1421, University P. O., Palayam, THIRUVANANTHAPURAM 695034	6 21 04
Inspection Offices (With Sale Point) :		
	Pushpanjali, First Floor, 205-A West High Court Road, Shankar Nagar Square, NAGPUR 440010	52 51 71
	Institution of Engineers (India) Building, 1332 Shivaji Nagar, PUNE 411005	5 24 35

*Sales Office Calcutta is at 5 Chowringhee Approach, P. O. Princep Street, CALCUTTA — 27 68 00

† Sales Office is at Novelty Chambers, Grant Road, BOMBAY — 89 65 28

‡ Sales Office is at Unity Building, Narasimharaja Square, BANGALORE — 22 39 71

Reprography Unit, BIS, New Delhi, India