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IS 3464 (1986): Methods of Test for Plastic Flooring and Wall Tiles [CED 5: Flooring, Wall Finishing and Roofing]



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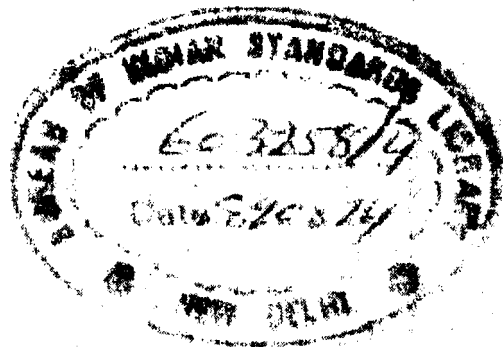


IS : 3464 - 1986

(Reaffirmed 2006)

Indian Standard
METHODS OF TEST FOR
PLASTIC FLOORING AND WALL TILES
(*Second Revision*)

UDC 692.535.6 + 691.434.3 : 620.1



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

Indian Standard
**METHODS OF TEST FOR
 PLASTIC FLOORING AND WALL TILES**
(Second Revision)

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Indian Standard
**METHODS OF TEST FOR
PLASTIC FLOORING AND WALL TILES**
(Second Revision)

0. FOREWORD

0.1 This Indian Standard (Second Revision) was adopted by the Indian Standards Institution on 31 January 1986, after the draft finalized by the Flooring and Plastering Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 Indian Standard specifications for PVC asbestos floor tiles, flexible PVC flooring and polystyrene wall tiles are covered in separate Indian Standard specifications. Methods of tests to assess the qualitative requirement of these products have been covered in this standard and is an essential adjunct to IS : 3461-1980*, IS : 3462-1986† and IS : 3463-1966‡.

0.3 This standard was first published in 1966 and subsequently revised in 1980. In this revision, the method of colour fastness to daylight has been given in accordance with IS : 9766-1981§. Figures for the apparatus for measuring curl in the tiles have been given. Grade of ethyl acetate conforming to IS : 229-1972|| has been given. Method of conditioning for test specimen in water has been deleted.

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.

*Specification for PVC asbestos floor tiles (*first revision*).

†Specification for flexible PVC flooring (*second revision*).

‡Specification for polystyrene wall tiles.

§Specification for flexible PVC compounds.

||Specification for ethyl acetate (*second revision*).

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

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1. SCOPE

1.1 This standard covers the methods for carrying out the following tests on flexible PVC flooring, PVC asbestos floor tiles and polystyrene wall tiles:

<i>Method of Test</i>	<i>Clause No.</i>
a) Dimensions	3
b) Squareness	4
c) Dimensional stability	5
d) Colour fastness to daylight	6
e) Volatile matter	7
f) Curling	8
g) Indentation	9
h) Residual indentation	10
j) Resistance to various substance	11
k) Ply adhesion	12
m) Deflection	13
n) Impact	14
p) Opacity	15
q) Cracks and crazing	16
r) Resistance to heat deformation	17
s) Water absorption	18
t) Surface spread of flame	19
u) Abrasion resistance	20

2. CONDITIONING

2.1 Unless otherwise specified, all samples shall be conditioned at a temperature of $27 \pm 2^\circ\text{C}$ in air for at least 60 minutes.

3. DIMENSIONS

3.1 Object — To determine the length, width and thickness of flexible PVC flooring, PVC asbestos floor tiles and polystyrene wall tiles.

3.2 Measurement of Thickness

3.2.1 Apparatus — A micrometer or any instrument capable of measuring to an accuracy of 0.01 mm.

3.2.2 Procedure — Immediately after conditioning as given in 2, the thickness of the sheets or rolls shall be measured at twenty scattered points.

NOTE — For polystyrene wall tiles the cavity depth of the specimen shall be measured on the rear surface of each tile with suitable depth gauge.

3.2.3 Report — The average of all the observations shall be reported.

3.3 Measurement of Length and Width of Tiles

3.3.1 Apparatus — A travelling microscope or any instrument capable of measuring to an accuracy of 0.01 mm.

3.3.2 Procedure — Immediately after conditioning as given in 2, each tile shall be measured for length and width at the three-quarter points in each direction (see Fig. 1).

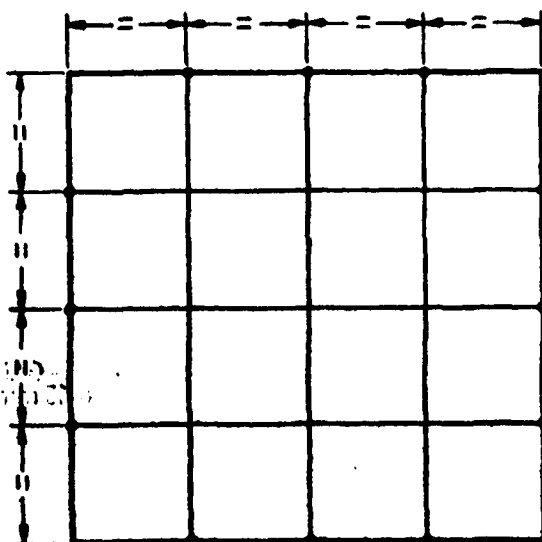


FIG. 1 MEASUREMENT OF LENGTH AND WIDTH OF TILE

3.3.3 Report — The average of the three measurements in each direction shall be reported as the length or width of the tile in that direction.

3.4 Measurement of Width of Sheets or Rolls

3.4.1 Apparatus — A steel tap capable of measuring to the nearest 3 mm.

3.4.2 Procedure — Immediately after conditioning as given in 2, the sheet or roll shall be laid on a flat surface so as to fully expose the width without distortions. The width of the specimen shall be measured in at least three places spaced equally along its length. During measurement, the tap shall be placed as nearly as possible at right angle to the edge of the sheet or roll.

3.4.3 Report — The average of the readings shall be reported.

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4. SQUARENESS

4.1 Object — To check the squareness of PVC asbestos floors tiles, flexible PVC floor tiles and polystyrene wall tiles.

4.2 Apparatus — An L-shaped metal jig comprising two arms each of length greater than the side of the tile to be tested and of approximately some thickness set in the shape of a true right angle on a metal base plate. The plate shall be perfectly flat and free from surface defects.

A set of feeler gauges or travelling microscope capable of measuring to 0.01 mm.

4.3 Procedure — Immediately after conditioning as given in 2, the tile shall be placed against the jig, each corner in turn being inserted into the right angle and one side of the tile held against one side of the jig with light pressure. Any gap between the sides of the tile and the metal arms shall be measured with the feeler gauge or microscope (*see* Fig. 2).

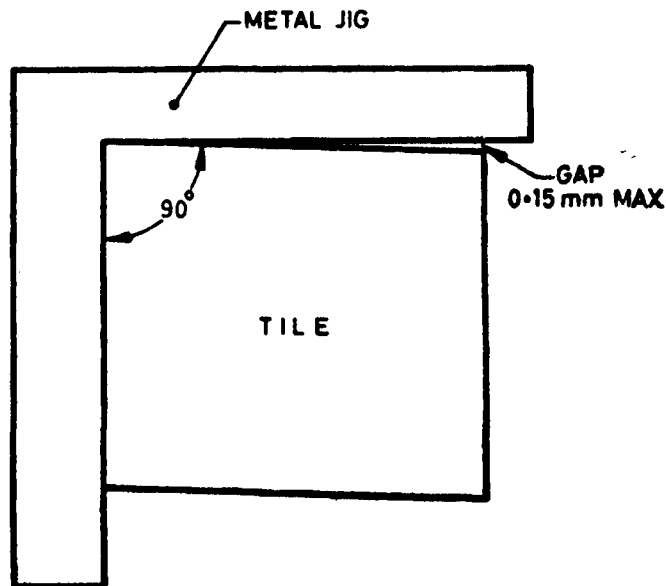


FIG. 2 METHOD OF CHECKING SQUARENESS OF TILE

4.4 Report — The gap measured shall be reported.

5. DIMENSIONAL STABILITY

5.1 Object — To determine the dimensional stability of PVC flexible flooring and PVC asbestos floor tiles.

5.2 Apparatus

5.2.1 A circulating air oven having thermostatic control that will maintain a temperature of $80 \pm 2^\circ\text{C}$ and equipped with horizontal rigid metal plates or wired shelves for supporting the test piece. The shelves shall be at least 25 mm larger than the test piece in each direction.

5.2.2 A travelling microscope or suitable scale capable of measuring to an accuracy of 0.01 mm.

5.2.3 A steel plate 180×180 mm and 12.5 mm thick for keeping the test piece flat during measurement.

5.3 Test Specimen — Test specimen shall not be less than 200×200 mm. Three sets of equally spaced reference marks shall be marked along each linear dimension of the surface of the test specimen the marks in each set being 180 mm apart (see Fig. 3). Two test specimens shall be tested.

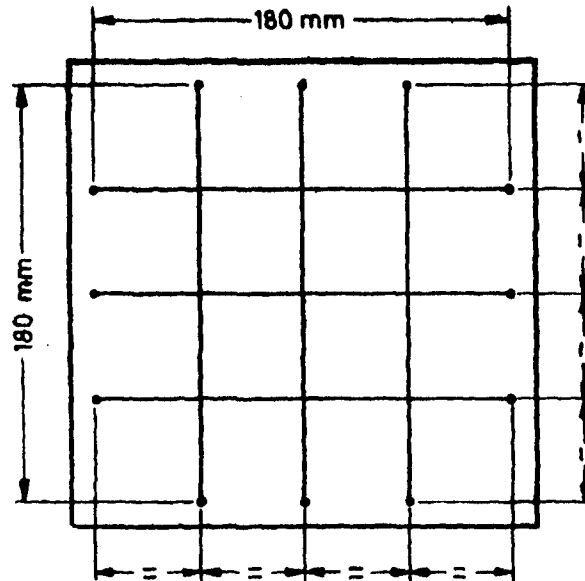


FIG. 3 REFERENCE MARKS ON TEST SPECIMEN

5.4 Procedure — Immediately after conditioning as given in 2, the test specimen shall be placed on a perfectly flat surface with the 12.5 mm thick steel plate on top of it, and the distance between each pair of marks shall be measured to the nearest 0.01 mm. The steel plate shall then be removed and test specimen shall be placed horizontally on one of the

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shelves of the oven, with its wearing surface upwards and maintained at a temperature of $80 \pm 2^\circ\text{C}$ for six hours. The test piece shall then be removed from the oven allowed to cool to room temperature and then shall again be conditioned as given in 2. The distance between each pair of reference marks shall then be measured.

5.5 Report — Any change in the distance between each pair of marks shall be calculated as a percentage of the original distance and the average value of the changes in the distance of the three pairs of marks in each linear direction shall be reported as the dimensional stability in that direction.

6. COLOUR FASTNESS TO DAYLIGHT

6.1 Object — To determine the colour fastness to daylight of flexible PVC flooring, PVC asbestos floor tiles and polystyrene wall tiles.

6.2 The colour fastness shall conform to 4.3 of IS : 9766-1981*.

7. VOLATILE MATTER

7.1 Object — To determine the volatile matter contained in PVC asbestos floor tiles.

7.2 Apparatus

7.2.1 A circulating air oven having thermostatic control that will maintain a temperature of $100 \pm 2^\circ\text{C}$.

7.2.2 Balance — Capable of measuring to 0.01 g.

7.3 Test Specimen — Test pieces each measuring 200×50 mm shall be cut from tile samples.

7.4 Procedure — The test piece shall be weighed individually to the nearest 0.01 g and then placed in the oven and maintained at a temperature of $100 \pm 2^\circ\text{C}$ for 6 hours. At the end of this time, they shall be removed, allowed to cool in air to $27 \pm 2^\circ\text{C}$ and reweighed.

7.5 Report — The loss in mass shall be expressed as a percentage of the original mass, and the average value, calculated to the nearest 0.1 percentage shall be recorded.

8. CURLING

8.1 Object — To determine the amount of curl in flexible PVC flooring and PVC asbestos floor tiles.

*Specification for flexible PVC compounds.

8.2 Apparatus

8.2.1 A curl gauge of sufficient length to span the diagonals of the specimen and equipped with a dial gauge graduated at 0.1 mm intervals, suitably located so as to measure the curl at the centre of the specimen. A suitable apparatus is shown in Fig. 4.

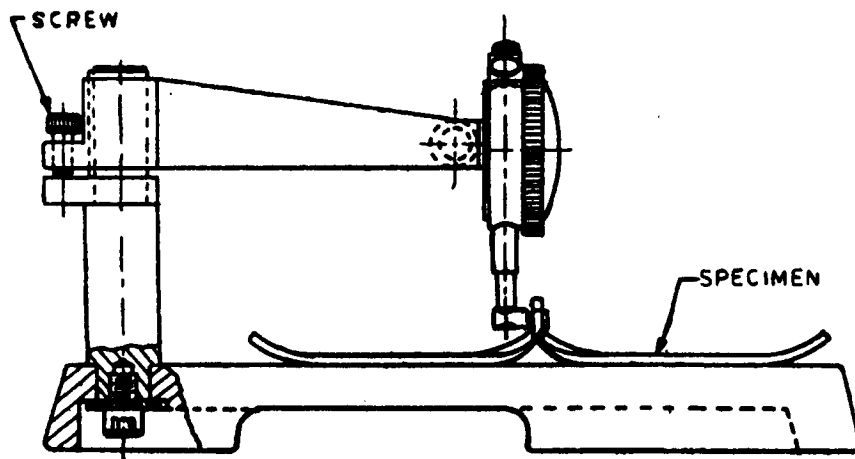
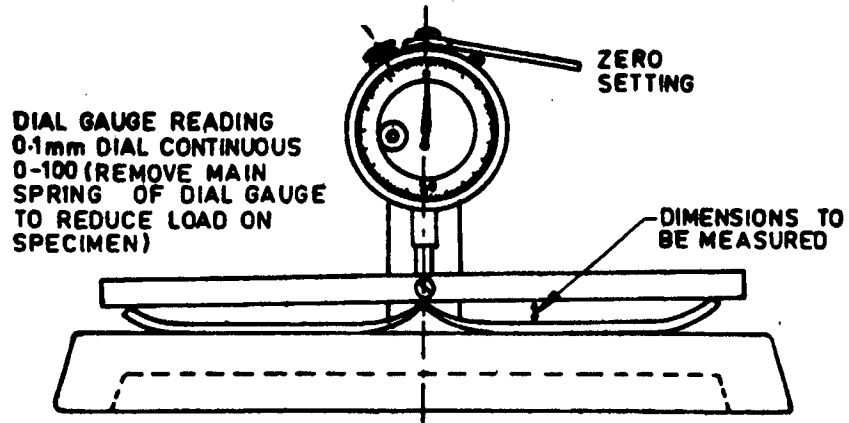


FIG. 4 TYPICAL APPARATUS FOR CURLING TEST

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8.2.2 Flat slabs of plate glass at least 5 mm thick, or marble slabs at least 30 mm thick, or similar non-metallic non-warpable material. The slabs shall be larger than the specimen and shall not exceed 200 × 200 mm.

8.2.3 Water bath of such size that the slabs can be partially immersed to within 3 mm of their upper surface.

8.2.4 Wick material consisting of two sheets of absorbent paper.

8.3 Test Specimen — Test pieces each measuring 150 × 150 mm shall be flat enough not to rock when either face is placed on a plane surface. The gap between the tile surface and a light straight edge placed on each pair of diagonally opposite corners shall not exceed 0.1 mm. Two test specimens shall be tested.

8.4 Procedure — The slab shall be placed in the water bath so that the water level is approximately 3 mm below that of the slab surface. The wick material shall be so arranged that it covers the slab surface and extends into the water on all 4 sides of the slab. The test piece then shall be placed with its wearing face upwards, on the wick material and shall be allowed to remain there for a period of 72 hours during which the temperature of water shall be maintained at $27 \pm 2^\circ\text{C}$. At the beginning and end of this period the gap between the test piece surface and a light straight edge placed on each pair of diagonally opposite corners shall be determined to the nearest 0.1 mm.

8.5 Report — The average of the amount of curling obtained for each test piece shall be reported as the amount of curling.

9. INDENTATION

9.1 Object — To determine the amount of indentation obtained at $27 \pm 2^\circ\text{C}$ and $46 \pm 2^\circ\text{C}$ for PVC asbestos floor tiles.

9.2 Indentation at $27 \pm 2^\circ\text{C}$

9.2.1 Apparatus

9.2.1.1 Indentation test — Consisting essentially of a rod with a hemispherical end of 6.35 mm diameter through which a load of 9 N (0.9 kgf) and a total load of 136 N (13.6 kgf) can be applied to the surface of the test piece and a dial gauge from which the amount of indentation can be read.

9.2.1.2 Flat rigid plate — At least 6.35 mm thick for supporting the test piece during the test.

9.2.1.3 Water bath — That can maintain the required temperature.

9.2.2 Test Specimen — The test pieces shall be whole size tiles.

9.2.3 Procedure — The test piece together with the indenting rod shall be maintained at a temperature of $27 \pm 2^\circ\text{C}$ for at least 60 minutes in air prior to testing. The test piece shall then be placed on the horizontal flat rigid plate with the base of the indentation tester resting on its surface. The hemispherical end of the indenting rod shall be applied to the surface of the test piece under a load of 9 N (0.9 kgf) and the reading of the dial gauge noted. An additional load of 127 N (12.7 kgf) shall then be applied to the indenting rod within 5 seconds, and the reading of the dial gauge 1-minute and 10-minute after the application of this load shall be noted. The difference between these readings and the original one shall be the 1 minute and 10 minutes indentations respectively.

9.2.4 Report — Readings shall be taken at three scattered points on the test piece and the average shall be reported.

9.3 Indentation at $46 \pm 2^\circ\text{C}$

9.3.1 Apparatus — Same as in 9.2.1.

9.3.2 Test Specimen — Same as in 9.2.2.

9.3.3 Procedure — The procedure shall be the same as in 9.2.3 except that the test piece and the indenting rod shall be maintained in the water bath at a temperature of $46 \pm 2^\circ\text{C}$ for at least 15 minutes prior to testing and the additional load of 127 N (12.7 kgf) shall be applied to the indenting rod within 5 seconds, and reading of the dial gauge shall be taken 50 seconds after the application of this load.

9.3.4 Report — Readings shall be taken at three scattered points on the test piece and the average shall be reported.

10. RESIDUAL INDENTATION

10.1 Object — To determine the amount of residual indentation obtained at $27 \pm 2^\circ\text{C}$ on PVC flexible flooring and PVC asbestos floor tiles.

10.2 Apparatus

10.2.1 Indentation Tester — Consisting essentially of a smooth steel plate for supporting the test piece and an indenting tool in the form of a cylindrical steel rod of 4.5 mm diameter at the final contact point through which a load of 360 N (36 kgf) can be applied. The edge of the indenting tool shall have a radius of 0.15 mm.

10.2.2 Dial gauge capable of exerting a pressure of $0.14 \pm 0.035 \text{ N/mm}^2$ ($1.4 \pm 0.35 \text{ kgf/cm}^2$) on a foot not more than 4 mm in diameter.

10.3 Test Specimen — Four test pieces each measuring $50 \times 50 \text{ mm}$ shall be cut from different tiles or from widely separated parts of the specimens in case of roll or sheet.

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10.4 Procedure — The thickness of the test piece shall be measured to an accuracy of 0.01 mm. It shall be then placed on the steel plate of the indenter. The indenter shall be allowed to rest on the wearing surface and the reading on the dial gauge noted. A load of 360 N (36 kgf) shall be applied to the wearing surface for a period of 10 minutes, by means of the indenting tool. The pressure shall be applied at the same point at which the thickness was measured. At the end of 10 minutes the load shall be completely removed from the test piece and the test piece is allowed to stand at a temperature of $27 \pm 2^\circ\text{C}$ for a period of 60 minutes. At the end of this time the depth of indentation shall be measured at the point of indentation to the nearest 0.01 mm.

10.5 Report — The average of the values for all the test pieces shall be reported.

11. RESISTANCE TO VARIOUS SUBSTANCES

11.2 Apparatus — A suitable tester consisting of a horizontal table rotatable about a vertical axis and a loading beam which rotates in a vertical plane about a horizontal shaft. The table is 100 mm in diameter and may be rotated by hand. The test specimen is fixed securely to it by clamps (*see* Fig. 5). The loading beam pivot, about 100 mm from the axis of the rotating table, can be adjusted vertically to allow the loading beam to remain horizontal whatever thickness of specimen is used. The loading beam is arranged to apply a load of 5 N (0.5 kgf) to a scratch tool of tungsten carbide 4.8 mm wide and ground to a radius of 25 mm, held at a shear angle of 22° to the direction of the motion of the specimen and its leading edge at an angle of 45° to the specimen.

11.3 Test Reagents

11.3.1 Isopropyl Alcohol — *See* IS : 2631-1976*.

11.3.2 Light Mineral Oil — minimum aniline point 66°C .

11.3.3 Cotton Seed Oil — *See* IS : 543-1968†.

11.3.4 To percent aqueous solution of sodium hydroxide.

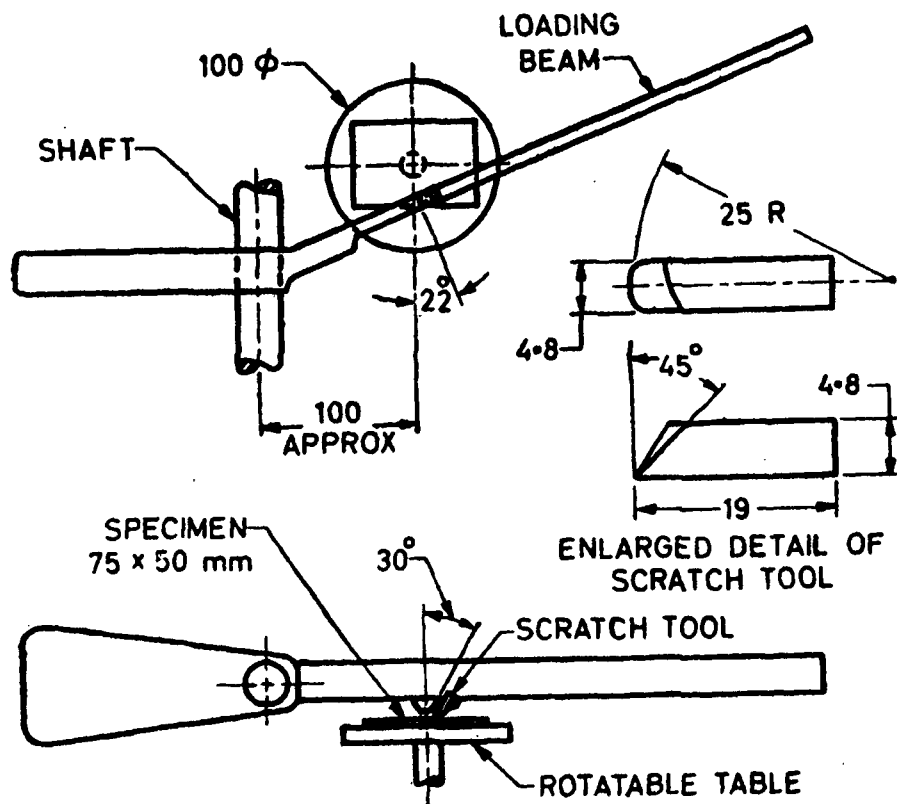
11.4 Test Specimen — Three sets of five test pieces each measuring 50×75 mm shall be cut from the tiles or from the specimen sheets or rolls.

11.4.1 Preparation of the Test Specimen — One test piece from each set shall be set aside for checking the sharpness of the scratch tool and the remainder shall be immersed individually in each of the above reagents

*Specification for iso-propyl alcohol (*first revision*).

†Specification for cotton seed oil (*second revision*).

for a period of $46 \pm \frac{1}{2}$ hours. The test pieces shall be immersed in the reagents maintained at a temperature of $27 \pm 2^\circ\text{C}$ and shall be maintained at that temperature for the duration of the test. If more than one test piece is immersed in a single container it shall be separated by a distance of approximately 3 mm from other test piece to ensure that each test piece is fully immersed in the medium. The test pieces in each container shall be limited to those cut from one tile or from one sheet of flooring. At the end of the immersion period, the test pieces shall be removed from the immersion medium, blotted (not rubbed) with a soft absorbent tissue and immediately examined visually from any colour changes and then subjected to scratch test.



All dimensions in millimetres.

FIG. 5 TESTER FOR RESISTANCE TO VARIOUS SUBSTANCES

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11.4.2 Preparation of Scratch Tool — The scratch tool shall produce a scratch of 1.1 to 1.4 mm in width when unimmersed test pieces are tested in accordance with 11.5. If it produces a scratch greater than 1.4 mm width, it shall be dulled to produce the required width by drawing it across unimmersed test pieces. Care shall be taken in handling and storing the tool to ensure that the cutting edge is not damaged.

11.5 Procedure for Making the Scratch — The test piece shall be clamped firmly on the table by means of the test piece holder. The loading beam with the scratch tool in position shall be gently lowered, until the scratch tool rests on the test piece under a total load of 5 N (0.5 kgf). The tool shall be at least 6.35 mm from any edge of the test piece at all times. The table shall be rotated slowly and steadily by hand, in a counter clockwise direction, until a scratch of 25 mm in length is obtained. The loading and the width of the scratch shall be measured to the nearest 0.1 mm at three equally spaced places. The order of testing shall be, firstly an unimmersed test piece and then those that have been immersed in the order as given in 11.3. The order of testing shall be repeated until the required number of test pieces have been tested.

11.6 Report

11.6.1 Scratch Resistance — The average of the three sets of values shall be recorded to the nearest 0.01 mm as the scratch resistance of the test piece to that substance.

11.6.2 Colour — An unimmersed test piece and an immersed one from each set shall be placed on a plane surface beside each other and examined in a bright or north light for any change in colour in the immersed test piece.

12. PLY ADHESION

12.1 Object — To determine the ply adhesion of PVC flexible flooring.

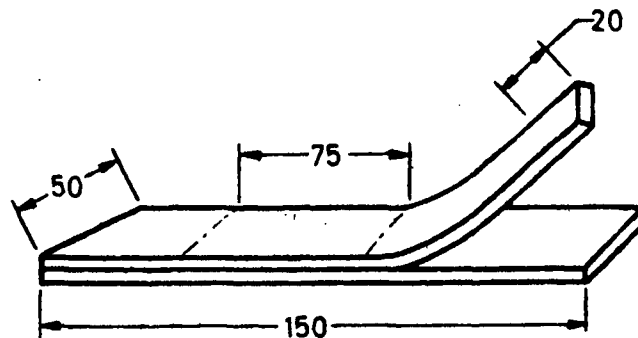
12.2 Apparatus — A tensile testing machine having the rate of movement of 280 ± 25 mm per minute of the driven grip measured before each series of tests with the machine at zero load. The machine shall be capable of reading to 0 ± 2 N (0.2 kgf).

12.3 Test Reagent — Ethyl acetate of pure grade conforming to IS : 229-1972*.

12.4 Test Specimen — Six test pieces each measuring 150×50 mm shall be cut from the specimens, having the long axis parallel to the grain and equal number at right angles to the grain.

*Specification for ethyl acetate (second revision).

12.5 Procedure — The width of each test piece shall be measured at the three-quarter points and the average shall be regarded as the width of the test piece. Three parallel lines shall be marked on the surface of each test piece (see Fig. 6). Each test piece shall then be supported vertically for a period of 45 minutes in ethyle acetate to a depth of not more than 20 mm. After immersion that part of the laminate which has been in the solvent shall be separated by hand but without undue force. (Wet PVC tend to break easily.) The test pieces shall then be allowed to dry at a temperature of $27 \pm 2^\circ\text{C}$ until all the solvent has evaporated and in any case for not less than 90 minutes. Each test piece shall then be separated in the tensile testing machine. The load for separation of 75 mm marked section of the test piece shall be noted and the average of six readings recorded.



All dimensions in millimetres.

FIG. 6 PLY ADHESION TEST PIECE

12.6 Report — The ply adhesion for each test piece shall be calculated in kN/m as follows:

$$\text{Ply adhesion} = \frac{\text{Average load of separation (N)}}{\text{Width of test piece (mm)}}$$

12.6.1 The lowest value shall be reported.

13. DEFLECTION

13.1 Object — To determine the amount of deflection of PVC asbestos floor tiles.

13.2 Apparatus

13.2.1 Two parallel steel rods of 6.35 mm diameter with their centres spaced 200 mm apart, shall be provided for supporting the test piece. A third steel rod of the same diameter shall occupy a position midway

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between and parallel to the supports and shall be attached to a mechanism whereby it may be moved in a plane perpendicular to the surface of test piece at the rate of 100 ± 3 mm per minute.

13.2.2 A scale or gauge shall be provided to measure the deflection of the test piece at a point midway between the supports to the nearest 1 mm.

13.3 Test Specimen — Test pieces each measuring 200×50 mm shall be cut from separate tiles, having the long axis parallel to the grain and equal number at right angles to the grain.

13.4 Procedure — Immediately after conditioning as specified in 2, the test piece shall be supported, wearing surface upwards, on the two supporting rods so that its centre line is in midway between them. The centre line of the test piece shall be then deflected downwards at the rate of 100 ± 3 mm per minute by moving the third rod till deflection of at least 25 mm is attained without break.

13.5 Report — The average amount of deflection without break shall be reported.

14. IMPACT

14.1 Object — To determine the resistance to impact of PVC asbestos floor tiles.

14.2 Apparatus

14.2.1 Impact Tester — Consisting essentially of three steel balls each 25 mm diameter, equally spaced on a circle, 125 mm in diameter, on a rigid steel base plate weighing not less than 4.5 kg including the mass of the balls.

14.2.2 A device suitable for the release and guidance of a freely falling weight to the centre of the circle formed by three balls from the height specified shall be used.

14.2.3 Weight — Spherical steel balls of 25 mm diameter and weighing 65 ± 1 g.

14.3 Test Specimen — Test pieces each measuring 150×150 mm shall be cut from different tiles.

14.4 Procedure — After conditioning as given in 2, the test piece shall be supported on the three balls of the apparatus wearing face down. The weight shall be allowed to fall freely from the specified height so as to strike the test piece at the centre. The weight shall be dropped 4 times successively in case of 3, 2.5 and 2, mm thick tiles and only once

for 1.5 mm thick tile. The height from which the weight should be dropped shall be as follows:

<i>Thickness</i>	<i>Height of Drop</i>
mm	mm
3.0	500
2.5	300
2.0	200
1.5	125

14.5 Report — The test pieces shall be examined visually for cracks in good illumination and without flexing.

15. OPACITY

15.1 Object — To determine the opacity of polystyrene wall tiles.

15.2 Apparatus

15.2.1 Base Plate — The base plate shall consist of two pieces of opaque glass of approximately equal size, one black and the other white, cemented to a rigid base. The portion of these plates not covered by the tiles shall be marked out.

15.2.2 The total reflectances for light incident normally, when compared to that of magnesium oxide, rated as 100 percent, shall not be greater than 5 percent for the black glass and shall be equal to 85 ± 2.5 percent for the white glass.

15.2.3 Lamp — A 200-W gas-filled tungsten filament lamp, clear type.

15.3 Test Specimen — The test pieces shall be whole size tiles.

15.4 Procedure — The base plate shall be placed directly under the lamp at a distance of 600 mm from it. Each test piece shall be tested in turn, by placing cavity side down on the base plate. The portion of the tile overlying the black and white surfaces shall be examined visually from all directions with the eyes shielded from direct rays of the illuminating lamp.

15.5 Report — Record any contrast observed when the tiles are placed on the black and white surface.

16. CRACKS AND CRAZING

16.1 Object — To detect the existence of cracks and crazing on polystyrene wall tiles.

16.2 Reagent — White spirit with a boiling range of 145 to 200°C and an aromatic content of between 16 to 22 percent.

16.3 Test Specimen — The test pieces shall be whole size tiles.

16.4 Procedure — The test piece shall be kept vertically without touching each other in a suitable rack, and kept immersed for 60 ± 2 seconds in the white spirit, maintained at $27 \pm 2^\circ\text{C}$.

16.4.1 The rack with the test pieces shall then be drained for at least 30 minutes at $27 \pm 2^\circ\text{C}$.

16.5 Report — The test pieces shall be examined visually immediately after the 30-minute draining in a well lighted area, for any cracks or crazing of the surface and the average shall be reported.

17. RESISTANCE TO HEAT DEFORMATION

17.1 Object — To determine the amount of deformation to heat on polystyrene wall tiles.

17.2 Test Specimen — The test pieces shall be whole size tiles.

17.3 Procedure — The test pieces shall be kept vertically without touching each other in a wire basket, and immersed for 10 minutes in 5 litres of water maintained at a temperature of $70 \pm 2^\circ\text{C}$.

17.3.1 The basket with the test pieces shall then be placed in air at a temperature of $27 \pm 2^\circ\text{C}$ for at least 10 minutes.

17.3.2 The faces of the tiles shall be examined for changes in appearance. The deformation of the edges from a straight line shall be assessed by using a straight edge and feeler gauge.

17.4 Report — Visible changes in appearance and the deformation on the edges of the tiles from a straight line shall be examined, and the average reported.

18. WATER ABSORPTION

18.1 Object — To determine the percentage water absorption of polystyrene wall tiles.

18.2 Test Specimens — Test pieces measuring 50×50 mm shall be cut out from different tiles.

18.3 Procedure — The hessian backing of the test piece shall be removed and weighed. The test piece shall then be immersed completely in distilled water maintained at a temperature of $27 \pm 2^\circ\text{C}$ for 24 hours. Immediately, after removal from water, the surfaces of the test piece shall be wiped dry with filler paper and reweighed.

18.3.1 The water absorption of the test piece shall be calculated as follows:

$$\text{Percentage water absorption} = \frac{M_2 - M_1}{M_1} \times 100$$

where

M_2 = mass (g) of the test piece after immersion, and

M_1 = mass (g) of the test piece before immersion.

18.4 Report — The average of all the determinations shall be reported.

19. SURFACE SPREAD OF FLAME

19.1 Object — To determine the area of char of the polystyrene wall tiles.

19.2 Apparatus and Materials

19.2.1 Specimen Support — Suitable means shall be provided for supporting the specimen during the test at an angle of 45°, with the upper and lower edges of the plane of support being horizontal. This may be accomplished by resting the specimen on four points; but it is necessary, whatever method of support be employed, that: (a) the central portion of the specimen shall not be shielded from the flame, (b) the supports shall not prevent access of air from combustion, and (c) the apparatus shall be such that the progress of the test can be observed. A suitable apparatus is shown in Fig. 7.

19.2.2 Flame Source — A flat bottomed cup of 2.2 mm in internal diameter and 7 mm in depth shall be placed on a support composed of corkboard. The cup shall be made of sheet iron about 0.8 mm thick. It shall be so supported that the centre of its base is 25 mm vertically below a point on the lower surface of the test piece, 75 mm from its lower horizontal edge, and midway between the inclined edges.

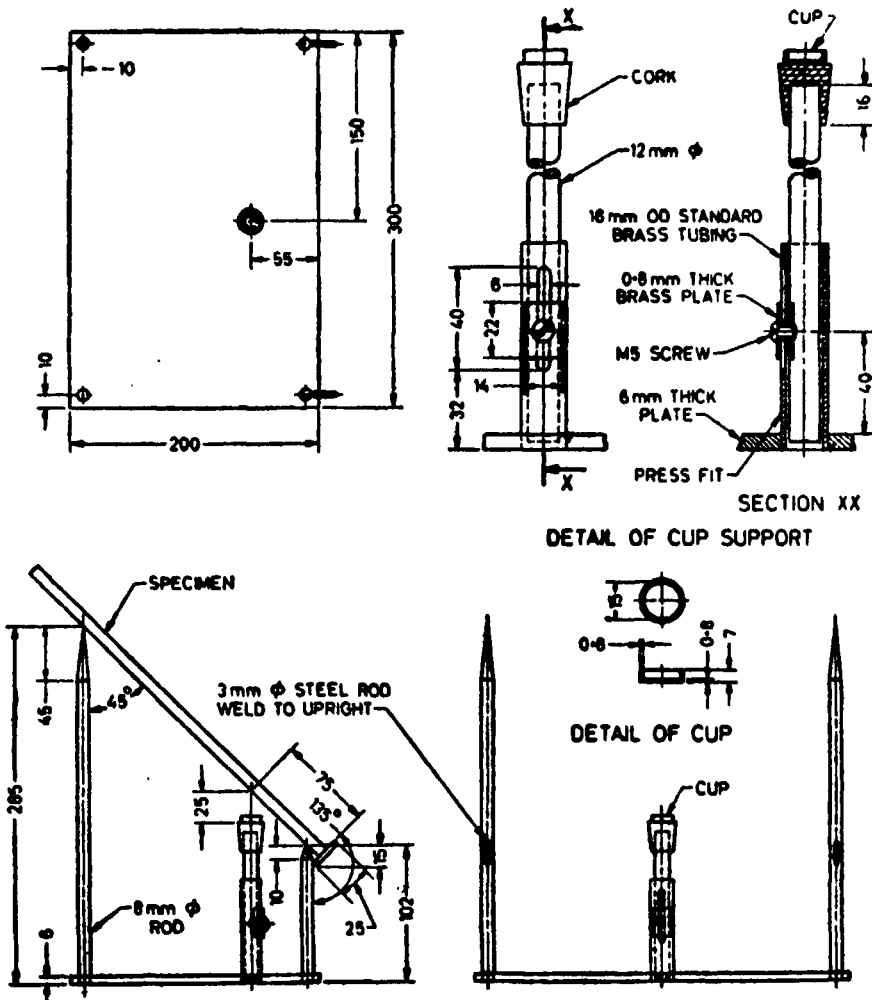
19.2.3 Alcohol — Absolute ethyl alcohol conforming to IS : 321-1964*.

19.3 Test Specimens — The test pieces shall be whole size tiles.

19.4 Procedure

19.4.1 Place the specimen on the test apparatus. Place 1 cc of absolute ethyl alcohol in the cup from a suitable pipette or other means and ignite (with the test specimen in place) by a small gas or oil jet or other suitable source of heat, which shall be removed as soon as the alcohol is lighted. The cup shall be at room temperature before each test. The test shall be made in a draft-free room or enclosure with a subdued light.

*Specification for absolute alcohol (revised).



All dimensions in millimetres.

FIG. 7 APPARATUS FOR TESTING SURFACE SPREAD OF FLAME

19.4.2 One minute after the fuel has been exhausted, extinguish any flame and glow on the specimen, and determine the area of char. If the duration of flaming is less than one minute, extinguish any smouldering, and measure the area of char. Determine the area of char by cutting slots approximately along the major and minor axis of the elliptical char

area. Determine the length of these axis by taking the terminal of each line as that point where a definite charring or decomposition of the flooring material has taken place.

19.5 Calculation and Report

19.5.1 Using the major and minor axis, a and b , of the area of char determined in accordance with 19.4.2 as those of a true ellipse, calculate the area of char as follows:

$$\text{Area of char} = \frac{\pi ab}{4}$$

19.5.2 Report the area of char and the duration of flaming.

20. ABRASION RESISTANCE

20.1 Object — To determine the resistance to wear of PVC asbestos floor tiles.

20.2 Apparatus — The Du Pont Croydon abrasion tester with the following components (see Fig. 8).

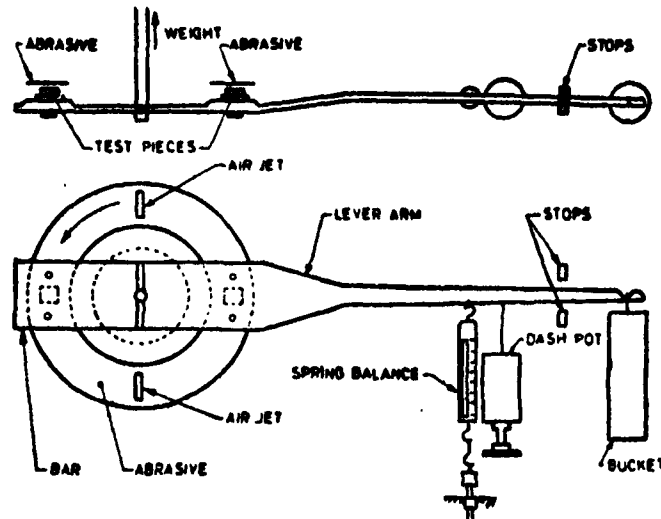


FIG. 8 DU PONT CROYDON ABRASION TESTER

20.2.1 A disc which carries an abrasive surface is mounted on a shaft and rotated at a uniform speed 34 rev/min to 40 rev/min. The provision of a revolution counter is desirable.

20.2.2 The test pieces are mounted, with their faces on the abrasive on a bar, diametrically disposed across the disc so that the centre of each specimen is 63.5 mm from the centre of rotation.

20.2.3 The specimens are held in contact with the abrasive by a force of 36.2 N (3.62 kgf) by any suitable means free from friction and able to follow axial movement of the specimen holder as wear takes place [If the abrasive disc is also horizontal, dead weight may be used; if the abrasive disc is vertical, a wire led through a central hole in the shaft with a weight of 36.2 N (3.62 kgf) attached at the rear may be used, as in the current design of the Du Pont machine].

20.2.4 A lever arm attached to the specimen holder is provided with means (weights and/or a spring balance) to restrain rotation and enable measurement of frictional torque to be made, if desired.

20.2.5 The abrasive in the form of an annular disc of 165 mm outside diameter with a central hole of 70 mm diameter for fixing the disc to the rotating member.

20.2.5.1 Silicon carbide abrasive grains conforming to IS : 715 (Part 2)-1976* mounted on stiff paper have been found to be suitable and the paper backing shall have the following characteristics:

- a) The weight of paper substance shall be at least 224 g/m² with a tolerance of ± 5 percent, and
- b) The paper and the adhesive used to bond the abrasive grains shall be waterproof so that a minimum of softening occurs under moist conditions.

20.2.6 Paper shall be capable of at least 6 hours useful life and shall generally be discarded when the rate of weight loss from the standard compound has fallen by about 10 percent, but not more, of the rate of loss at the first measurement after the running-in period.

20.2.7 The abrasive surface is continuously cleaned by means of air jets, directed on the working surface at two positions between the specimens. The air supply is at a pressure of not less than 0.175 N/mm² (1.75 kgf/cm²) and free from oil or water.

20.2.8 On each side there is a set of jets radially disposed and consisting of three 1-mm holes, 5 mm apart, arranged to leave a space of about 6 mm between the jets and the surface of the abrasive. The addition of stiff bristle brushes, set at an angle to the track, is advantageous in some circumstances, but their use is optional.

*Specification for coated abrasives: Part 2 Special and mechanized application (*third revision*).

20.3 Test Specimen — The test pieces shall be 200 × 200 mm and approximately 10 mm thick, the necessary specimen thickness shall be arrived at by cementing several layers on top of each other. Two test pieces shall be tested at the same time and compared with two test pieces of the standard comparison rubber compound.

20.4 Conditioning of the Test Specimen — Each specimen shall be conditioned as given in 2.

20.5 Standard Comparison Rubber — This shall conform as given below:

<i>Compounding Ingredients</i>	<i>Standard Compound Parts by Weight</i>
Natural rubber, smoked sheet, RMA 1	100.0
Zinc oxide	4.0
Stearic acid	3.0
E.P.C. black	60.0
H.A.F. black	—
Di-(2 ethyl hexyl) phthalate	3.0
Paraffin oil	—
Whiting	60.0
Benzothiazyl disulphide	—
Mercaptobenzthiazole	1.0
Sulphur	3.0
Phenyl-beta-naphthylamine	1.0
Cyclohexylbenzthiazyl sulphenamide	—
Curing time and temperature	40 min at 153°C

NOTE — A high standard of mixing technique shall be employed in the preparation of the compound to ensure proper dispersion of the ingredients.

20.6 Procedure

20.6.1 The test shall be carried out at $27 \pm 2^\circ\text{C}$. Mount the test pieces in the holder without undue distortion of the abraded surface, but with no possibility of movement of the test pieces on the bar of the sample holder.

20.6.2 Allow a running-in-period to give even seating of the specimens on the abrasive without weighing. In the case of a new abrasive disc, use preferably the first 20 minutes for running-in, before starting actual weighings. Change of cutting power appears to be less rapid after this initial period.

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20.6.3 Arrange the specimens replaced for successive runs to rub in the same direction on the abrasive.

20.6.4 Employ systematic reversal of order in a set of tests to overcome bias due to gradual change of abrasive cutting power.

20.6.5 Record the duration of test in terms of revolutions of the abrasive.

20.7 Report and Expression of Results — Express results as a figure of merit or abrasion resistance index of which higher values denote better performance derived as follows:

$$\text{Abrasion resistance index} = \frac{S}{T} \times 100$$

where

S = volume loss in ml/1 000 revolutions of the abrasive, from the standard comparison rubber compound; and

T = volume loss in ml/1 000 revolutions of the abrasive, from the test pieces of the PVC flooring material.

20.7.1 Obtain the volume losses derived from weight losses by dividing the latter by the density of the specimen, determined by the usual weight of air and water method. The values of S and T as well as the type of abrasive used and the temperature of test shall be stated.