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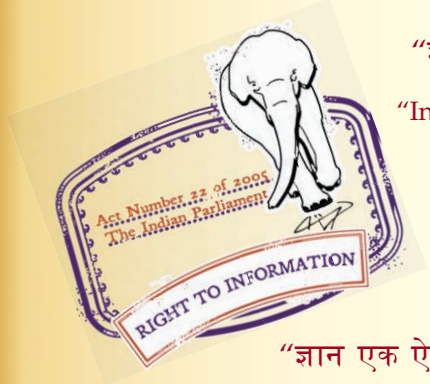

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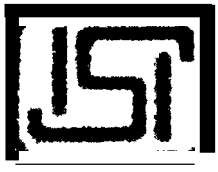
IS : 3462 - 1986
(Reaffirmed 2006)

Indian Standard

SPECIFICATION FOR UNBACKED FLEXIBLE PVC FLOORING

(Second Revision)

UDC 691·335·6 : 678·743·22



INDIAN STANDARDS INSTITUTION
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SPECIFICATION FOR UNBACKED FLEXIBLE PVC FLOORING

(Second Revision)

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AMENDMENT NO. 1 MAY 1994
TO
IS 3462 : 1986 SPECIFICATION FOR UNBACKED FLEXIBLE PVC FLOORING

(Second Revision)

[*Page* 6, *Table* 1, *Sl No.* (xi), *col* 2] — Add the following:

'(only for laminated PVC flooring)'

(CED 5)

Reprography Unit, BIS, New Delhi, India

Indian Standard

SPECIFICATION FOR UNBACKED FLEXIBLE PVC FLOORING

(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 Flexible PVC flooring have been in use in the country for more than a decade. It provides dust free, noise absorbing resilient and decorative surface for buildings of various types. The floor covering is available in different shades and designs.

0.2.1 There are two kinds of PVC floorings. One is flexible, which is available in sheet form and the other is rigid which is available in standard tile sizes. Flexible PVC flooring is suitable for comparatively lighter traffic, either for rigid floors such as concrete and stone flooring or for flexible floors such as timber flooring, etc. Asbestos PVC flooring tiles are rigid, comparatively more suitable for heavy traffic and for rigid floors. Flexible PVC flooring are not suitable for areas and surfaces exposed to sun and light.

0.2.2 PVC flexible flooring is liable to be charred by cigarette burns, leaving a permanent mark.

0.3 This standard was first published in 1966 and subsequently revised in 1979. The important changes made in this revision are:

a) The clause for conditioning the samples has been included and the conditioning of test specimens in water has been excluded.

b) Thickness of wearing layer of laminate type flooring has been excluded.

c) The requirements for tile size variation has been increased to 0·13 from 0·10 percent with a maximum variation limited to 0·40 mm.

d) Requirements of colour fastness to daylight has been changed to standard No. 4 when tested in accordance with IS : 9766-1981*.

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.

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1. SCOPE

1.1 This standard specifies requirements of unbacked homogeneous flexible PVC flooring, including laminated PVC flooring in which the composition of each of the laminate is substantially the same.

1.1.1 The flooring may be supplied in continuous lengths or in tile form.

2. DEFINITION

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

2.1 Elastic Product — The product of the tensile strength (expressed in MN/m^2) and the elongation at break (expressed by the increase in length as a fraction of the original length).

3. MATERIALS

3.1 The flexible PVC flooring shall consist of a thoroughly blended composition of thermoplastic binder, fillers and pigments. The thermoplastic binder shall consist substantially of one or both of the following:

a) Vinyl chloride polymer, and

b) Vinyl chloride copolymer.

3.1.1 The polymeric material shall be compounded with suitable plasticizers and stabilizers.

4. CONDITIONING OF SAMPLES

4.1 Unless otherwise stated in the relevant Appendix, all the samples shall be conditioned at a temperature of 27 ± 2°C in air for not less than 60 minutes and tested at a temperature of 27 ± 2°C.

---

*Specification for flexible PVC compounds.

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

5. DIMENSIONS AND TOLERANCES

5.1 Linear Dimensions

5.1.1 *Sheets or Rolls* — The standard width of flooring sheets or rolls in continuous lengths shall be 1 000 mm, 1 500 mm and 2 000 mm.

5.1.2 *Tiles* — The tiles shall be 250 mm, 300 mm, 600 mm and 900 mm square.

5.2 Thickness — The standard thickness of floor covering shall be 1·5 mm, 2·0 mm, 2·5 mm and 3 mm.

5.3 Tolerances — The tolerance on the specified widths of sheets/rolls, tile sizes and thicknesses shall be as given in Table 1.

TABLE 1 REQUIREMENTS OF FLEXIBLE PVC FLOORING

(*Clauses* 5.3, 5.4 *and* 7.1)

Sl No.	Characteristic	Requirement	Method of Test (Ref to Relevant Cl of IS : 3464-1986*)
(1)	(2)	(3)	(4)
i)	Thickness	The mean thickness shall not differ by more than 0·13 mm from that specified. The variation between any two measurements shall not exceed 0·20 mm	3
ii)	Width of sheet or roll	Width shall be not less than that specified and not more than 6 mm greater than that specified	3
iii)	Tile size	The dimensions shall not vary from the specified dimensions by more than 0·13 percent or ±0·4 mm whichever is less	3
iv)	Squareness (for tiles only)	Gap between the sides of the tiles and the arms of the metal jig shall not be greater than 0·15 mm towards the farther end from the junction of the arms	4
v)	Dimensional stability	Change in any linear dimension shall not exceed 0·4 percent for sheet and 0·25 percent for tiles. After the test the specimen shall show no signs of curling	5
vi)	Colour fastness to daylight	Shall be rated not less than standard 4 when tested in accordance with the 4.3 of IS : 9766-1981†	—

(*Continued*)

TABLE 1 REQUIREMENTS OF FLEXIBLE PVC FLOORING — *Contd*

Sl No.	Characteristic	Requirement	Method of Test (Ref to Relevant Clause of IS : 3464-1986*)
(1)	(2)	(3)	(4)
vii)	Curling (for tiles)	Shall not exceed 0·75 mm	8
viii)	Residual indentation	Shall not exceed 0·10 mm	10
ix)	Flexibility	Shall not break, crack or show any other signs of failure	Appendix A
x)	Resistance to various substances (*see* Note)	The average scratch width obtained after immersion shall not exceed 2·0 mm. The colour of the treated pieces shall show no significant change when compared with untreated material	11
xi)	Ply adhesion	Adhesion between plies in any test piece shall not be less than 1·05 kN/m	12
xii)	Moisture movement	Change in any linear dimensions shall not exceed 0·4 percent	Appendix B
xiii)	Heat ageing and exudation	No exudation of plasticizer shall be apparent nor shall there be any change in appearance. The mandrel test shall not produce surface cracking	Appendix C
xiv)	Elastic product	The mean product of tensile strength and elongation shall be not less than 2 MJ/m^3	Appendix D

NOTE — This requirement is related to the situation of the use and the purchaser shall specify the substances to which the PVC flooring materials shall have resistance as tested by the method given in IS : 3464-1986*.

*Method of test for plastic flooring and wall tiles (*second revision*).
†Specification for flexible PVC compounds.

5.4 Non-standard Sizes — The sheets or rolls and tiles may be supplied in sizes and thicknesses other than those mentioned in **5.1** and **5.2** where agreed between the purchaser and the supplier but shall meet the same requirements on tolerances as given in Table 1.

6. COLOUR AND SURFACE CHARACTERISTICS

6.1 The flooring shall have a uniform wearing surface. The colour and also the pattern, marbling or mottling, if present, shall extend through the full thickness of the flooring, when the flooring is not laminated.

In case of laminated flooring, it shall extend to the full thickness of the top layer. The colour and the pattern shall match the sample that is agreed upon by the purchaser and the supplier.

NOTE — In normal manufacture, flooring from different batches may vary somewhat in shade of the colour. A variation in marbling or mottling is characteristic of the process.

7. REQUIREMENTS

7.1 The material when tested in accordance with the methods given in IS : 3464-1986* shall conform to the requirements specified in Table 1.

8. TESTS

8.1 The tests shall be of three categories as given in **8.1.1** to **8.1.3**.

8.1.1 *Type Tests* — Tests carried out to prove conformity to the requirements of this standard. These tests are intended to check the general qualities and design of the flooring.

8.1.2 *Acceptance Tests* — Tests carried out on samples of flooring selected from a lot for purposes of acceptance of the lot.

8.1.3 *Routine Tests* — Tests carried out on each and every tile/roll/sheet to check the requirements which are likely to vary during production.

8.2 Categories of Tests

8.2.1 *Type Tests* — The following shall comprise the type tests (*see* **8.1.1**):

a) Colour and finish,
b) Dimensions and tolerances,
c) Squareness,
d) Dimensional stability,
e) Colour fastness to daylight,
f) Moisture movement,
g) Curling,
h) Heat ageing and exudation,
j) Residual indentation,
k) Flexibility,
m) Resistance to various substances,
n) Ply adhesion, and
p) Elastic product.

*Methods of test for plastic flooring and wall tiles (*second revision*).

8.2.2 *Acceptance Tests* — The following shall comprise the acceptance tests (*see* **8.1.2**). Acceptance tests shall be made on samples selected from each lot in accordance with the sampling procedure detailed in Appendix E.

a) Dimensions and tolerances,

b) Squareness, and

c) Dimensional stability.

8.2.3 *Routine Tests* — The tests on colour and finish shall comprise the routine tests to be carried out on each and every tile or roll or sheet.

9. MARKING

9.1 Each package of the sheet or roll shall be legibly and indelibly marked with the following information:

a) Manufacturer's name or trade-mark, and

b) Manufacturer's batch number and year of manufacture.

9.1.1 Tiles shall be legibly marked on the back with the name of the manufacturer or his trade-mark, manufacturer's batch number and year of manufacture.

9.1.2 The package of sheet or roll and the tiles may also be marked with the ISI Certification Mark.

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

APPENDIX A

[*Table* 1, *Item* (ix)]

METHOD OF TEST FOR FLEXIBILITY

A-1. OBJECT

A-1.1 To determine the flexibility of PVC flexible flooring.

A-2. APPARATUS

A-2.1 A 40-mm diameter mandrel and a low temperature equipment capable of maintaining a temperature of 0 ± 0·5°C.

A-3. PROCEDURE

A-3.1 The test piece shall be a strip of the flooring 50 mm wide and 225 mm long. Six test pieces shall be tested cut at random from the sample. In the case of tiles, test pieces from separate tiles shall be tested. Three test pieces shall be cut with their long dimensions parallel to the grain of the flooring and three with these dimensions at right angles to the grain. Each test piece shall be conditioned at a temperature of 0 ± 0·5°C for at least 60 minutes in air, immediately prior to testing. The mandrel shall be cooled to the test temperature. The test piece shall be bent by hand over the mandrel with the wearing surface outwards, through an arc of 180° in approximately three seconds.

A-4. REPORT

A-4.1 The bent portion of the test piece shall be examined in good lighting and under magnification of × 4, and shall be reported for crack, breaks or other signs of failure.

APPENDIX B

[*Table* 1, *Item* (xii)]

METHOD OF MEASURING MOISTURE MOVEMENT

B-1. OBJECT

B-1.1 To evaluate the percentage moisture movement of PVC flexible flooring.

B-2. APPARATUS

B-2.1 Shallow Tray — Approximately 300 × 300 mm, 50 mm in depth with a layer of glass balls, approximately 5 mm diameter, in the bottom and filled to a depth of 40 mm with distilled water.

B-2.2 Steel Plate — 180 mm square and 13 mm thick, for keeping the test specimen flat during measurement.

B-2.3 Travelling Microscope

B-2.4 Desiccator — containing dry silica gel.

B-3. PROCEDURE

B-3.1 The test piece shall consist of a piece of the flooring not less than 225 mm^2 Two test pieces shall be tested. Test pieces shall be conditioned as given in **4.1**.

B-3.1.1 The test pieces shall be marked for the dimensional stability test in accordance with 5 of IS : 3464-1986*. After maintaining at a temperature of 27 ± 2°C in the desiccator for not less than 24 hours, the test pieces shall be placed on a perfectly flat surface, with the steel plate on top of it, and the distance between each pair of marks to the nearest 0·01 mm shall be measured. The steel plate shall then be removed and the test piece shall then be placed on the layer of glass balls in the tray containing water (*see* Fig. 1) for 72 hours at 27 ± 2°C. It shall be removed from the water and the distance between each pair of reference marks as previously described shall be remeasured.

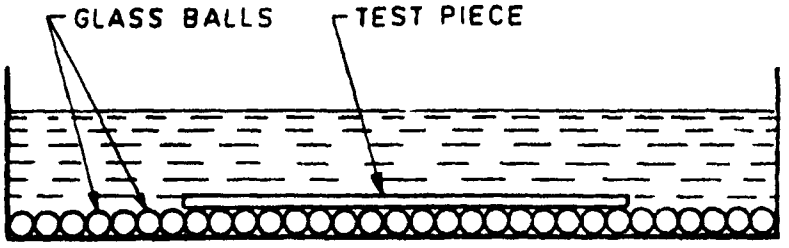

FIG. 1 APPARATUS FOR MOISTURE MOVEMENT

B-4. EXPRESSION OF RESULTS

B-4.1 The change in the distance between the corresponding marks of a pair shall be expressed as a percentage of the original distance. The average value for the three pairs of marks in a direction shall be taken as the moisture movement in that direction.

B-5. REPORT

B-5.1 The maximum value shall be reported.

APPENDIX C

[*Table* 1, *Item* (xiii)]

MEASURING HEAT AGEING AND EXUDATION

C-1. OBJECT

C-1.1 To determine the quality of PVC flexible flooring after ageing and to assess the flexibility.

*Methods of test for plastic flooring and wall tiles (*second revision*).

C-2. APPARATUS

C-2.1 A circulating air oven capable of maintaining a temperature of 70 ± 1°C and a 25 mm diameter mandrel.

C-3. PROCEDURE

C-3.1 The test specimen shall be a strip of the flooring 50 mm wide and 225 mm long. Three specimens cut from widely separated parts of the flooring shall be taken and shall be maintained at a temperature of 70 ± 1°C in the circulating air oven for 15 days. At the end of this time the specimen shall be removed from the oven, and then allowed to cool. After a further period of 60 minutes at 27 ± 2°C the specimens shall be examined for exudation by lightly rubbing the wearing surface with a clean white filter paper. A greasy stain on the paper shows that exudation has occurred and constitutes a failure of the test.

C-3.2 Having conditioned the specimens as specified in **4.1**, they shall be bent around the mandrel, with the wearing surface outwards, through an arc of 180° in approximately three seconds. The bent portion of the specimen shall be examined in good lighting and under magnification of 4 and shall be reported for cracks, breaks or other signs of failure caused by loss of flexibility.

APPENDIX D

[*Table* 1, *Item* (xiv)]

METHOD OF TEST FOR ELASTIC PRODUCT

D-1. OBJECT

D-1.1 To evaluate the product of tensile strength and elongation at break of PVC flexible flooring.

D-2. APPARATUS

D-2.1 A constant rate of extension machine provided with a means of obtaining the force applied to the specimen and the corresponding extension of the specimen at the breaking point. Under conditions of use, the force at break shall be within one percent of true value.

D-3. PROCEDURE

D-3.1 Each test piece shall be rectangular, 25 mm wide and at least 75 mm long. Six pieces shall be cut from the sample, three with their long sides as nearly as possible parallel to the calendering axis and three

with their long sides at right angles to this direction. The samples shall be conditioned as given in 4.1. The specimen shall then be mounted in the tensile testing machine in axial alignment with the direction of pull in such a way that the unclamped part of the specimen between the grips shall be 50 mm in length. The specimen shall be loaded by separating the grips at such a speed that the rate of extension of the specimen is 100 percent per minute.

D-4. CALCULATION OF RESULTS

D-4.1 The tensile strength of the specimen shall be calculated from the force to break and the original area of cross section and expressed in MN/m^2. The elongation of the specimen at break shall be the increase in distance between the grips. The product of tensile strength and elongation for each piece shall be obtained and the mean of six determinations as the elastic product of the sample shall be reported.

APPENDIX E

(*Clause* 7.2.2)

SAMPLING AND CRITERION FOR CONFORMITY FOR ACCEPTANCE TESTS

E-1. TILES

E-1.1 Lot — All the tiles of the same type, size and manufactured from the same batch in one consignment shall constitute a lot.

E-1.2 Selection — The number of tiles to be selected at random from the lot shall depend upon the size of the lot and shall be in accordance with col 1 to 4 of Table 2.

E-1.2.1 The tile shall be selected at random from the lot, and in order to ensure the randomness of selection, random number tables (*see* IS : 4905-1968*) may be used. In case random number tables are not available, the following procedure may be adopted for the selection of tiles:

> Starting from any tile in the lot, count them as 1, 2, 3,..... , (r, and so on in one order. Every rth tile thus counted may be selected till the requisite number of tiles for the sample is obtained, r being the integral part of N/n, where N is the number of tiles in the lot and n is the number of tiles to be selected in the samples.

E-1.3 Criteria for Conformity — The number of tiles in the first sample (*see* col 2 and 3 of Table 2) shall be subjected to the acceptance tests (*see* 7.2.2). If in the first sample the number of defective tiles, that

*Method for random sampling.

is, those failing to satisfy anyone or more of the acceptance tests is less than or equal to the corresponding acceptance number *a* (col 5 of Table 2) the lot shall be considered as conforming to the requirements of the acceptance tests. If the number of defective tiles in the first sample is more than or equal to the corresponding rejection number *r* (col 6 of Table 2), the lot shall be considered as not conforming. If the number of defective tiles in the first sample lies between the corresponding value of *a* and *r*, a second sample (*see* col 2 and 3 of Table 2) shall be selected and subjected to the acceptance tests. If in the combined sample, the number of defective tiles is less than or equal to the corresponding acceptance number *a*, the lot shall be considered as conforming, and if the number of defective tiles is more than or equal to the corresponding rejection number *r*, the lot shall be considered as not conforming.

TABLE 2 SAMPLE SIZE AND CRITERION FOR CONFORMITY FOR TILES

(*Clauses* E-1.2 *and* E-1.3)

No. of Tiles in the Lot	Sample	Sample Size	Cumulative Sample Size	Acceptance Number (*a*)	Rejection Number (*r*)
(1)	(2)	(3)	(4)	(5)	(6)
Up to 300	First	13	13	0	2
	Second	13	26	1	2
301 to 500	First	20	20	0	2
	Second	20	40	1	2
501 to 1 000	First	32	32	0	3
	Second	32	64	3	4
1 001 to 3 000	First	50	50	1	4
	Second	50	100	4	5
3 001 and above	First	80	80	2	5
	Second	80	160	6	7

E-2. ROLLS AND SHEETS

E-2.1 Lot — All the rolls or sheets of the same type, size and manufactured from the same batch, in one consignment, shall constitute a lot.

E-2.2 Selection — The number of rolls or sheets to be selected at random from the lot shall depend upon the size of the lot and shall be in accordance with col 1 and 2 of Table 3.

E-2.2.1 The rolls or sheets shall be selected at random from the lot, and in order to ensure the randomness of selection, random number tables (*see* IS : 4905-1968*) may be used. In case random number

*Methods for random sampling.

tables are not available, the following procedure may be adopted for the selection of rolls or sheets:

Starting from any roll or sheet in the lot, count them as 1, 2, 3, ..., r, and so on in one order. Every rth roll or sheet thus counted may be selected till the requisite number of rolls or sheets for the sample is obtained, r being the integral part of N/n, where N is the number of rolls or sheets in the lot and n is the number of rolls or sheets to be selected in the sample.

TABLE 3 SAMPLE SIZE AND CRITERION FOR CONFORMITY FOR ROLLS AND SHEETS

(*Clauses* E-2.2 *and* E-2.3)

No. of Rolls or Sheets in the Lot	No. of Rolls or Sheets to be Selected in Sample	Permissible No. of Defective Rolls or Sheets
(1)	(2)	(3)
Up to 50	3	0
51 to 150	5	0
151 to 300	8	0
301 to 500	13	0
501 to 1 000	20	0
1 001 and above	32	1

E-2.3 Criteria for Conformity — The number of rolls or sheets selected in accordance with **E-2.2** and **E-2.2.1** shall be subjected to all the acceptance tests (*see* **7.2.2**). If the number of defective rolls or sheets, that is, those failing to satisfy any one or more of the acceptance tests is less than or equal to the corresponding permissible number of defective rolls or sheets (col 3 of Table 3), the lot shall be considered as conforming to the requirements of acceptance tests. If the number of defective rolls or sheets is more than the corresponding permissible number of defectives, the lot shall be considered as not conforming.

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