IS : 1237 - 1980
(Reaffirmed 1996)

Indian Standard

SPECIFICATION FOR CEMENT CONCRETE FLOORING TILES

(First Revision)

Sixth Reprint JULY 1997

(Incorporating Amendment No. 1)

UDC 69.025.331.3

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

Gr 5 *June* 1980

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Indian Standard

SPECIFICATION FOR CEMENT CONCRETE FLOORING TILES

(First Revision)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Indian Standards Institution on 24 January 1980, after the draft finalized by the Flooring and Plastering Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 This standard was first published in 1959. The present revision has been taken up with a view to keeping abreast with the experience gained while applying the provisions of the earlier version and also to bringing in further additions and modifications in the light of comments received from manufacturers and users.

0.2.1 The sizes specified in the standard are the existing metric sizes which form the bulk of current production in the country. The concept of adopting dimensionally co-ordinated sizes is being excluded from this revision, however it is intended to incorporate them if the opportunity occurs during future revisions of the standard. The permissible wear of tiles have been increased based on actual observations and consequently a larger thickness of wearing layer has been permitted. A method to measure the thickness of the wearing layer has also been introduced. The method of test for abrasion resistance has been modified by which the tiles may be abraded in all possible directions. Additional physical tests like flatness, perpendicularity and straightness has been specified which might help in improving the quality. The requirements of abrasion powder has been modified to suit the indigenous manufacturers. Fresh sampling plan has been introduced from which plans can be selected for inspection by attributes and for inspection by count of defects.

0.3 In the formulation of this standard due weightage has been given to international co-ordination among the standards and practices prevailing in different countries in addition to relating it to the practices in the field in this country.

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 covers cement concrete flooring tiles of plain cement, plain coloured and terrazo types.

NOTE — The provision of this standard do not apply to chequered tiles.

2. TERMINOLOGY

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

2.1 Plain Cement Tiles — Tiles in the manufacture of which no pigments and stone chips are used in the wearing surface.

2.2 Plain Coloured Tiles — Tiles having a plain wearing surface wherein pigments are used but no stone chips.

2.3 Terrazo Tiles — Tiles at least 25 percent of whose wearing surface is composed of stone chips in a matrix of ordinary or coloured portland cement mixed with or without pigments and mechanically ground and filled.

3. CLASSIFICATION

3.1 Cement concrete flooring tiles shall be of two classes as given below depending on the duty they perform:

a) *General Purpose Tiles* — Used for flooring in such places where normally light loads are taken up by the floors; such as office buildings, schools, colleges, hospitals and residential buildings.

b) *Heavy Duty Floor Tiles* — Used for heavy traffic conditions; such as foot paths, entrances and staircases of public buildings, passages of auditoriums and storage godowns.

4. MATERIALS

4.1 Cement — Cement used in the manufacture of tiles shall be ordinary portland cement conforming to IS : 269-1976† or rapid

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

†Specification for ordinary and low heat portland cement (*third revision*).

hardening portland cement conforming to IS : 8041-1978* or white portland cement conforming to IS : 8042-1978† or portland pozzolana cement conforming to IS : 1489-1976‡.

4.2 Aggregates — Aggregates used in the backing layer of tiles shall conform to the requirements of IS : 383-1970§. For the wearing layer, unless otherwise specified aggregates shall consist of marble chips or any other natural stone chips of similar characteristics and hardness, marble powder or dolomite powder, or a mixture of the two.

4.3 Pigments — Pigments, synthetic or otherwise, used for colouring tiles shall have durable colour. It shall not contain matters detrimental to concrete and shall according to the colour required be one of the following or their combination:

Pigments	*Relevant Indian Standard*
a) Black or red or brown pigment	IS : 44-1969‖
b) Green pigments	IS : 54-1975¶
c) Blue pigments	IS : 55-1970** or IS : 56-1975†† or IS : 3574 (Part II)-1966‡‡
d) White pigments	IS : 411-1968§§
e) Yellow pigments	IS : 50-1979‖‖ or IS : 3574 (Part I)-1965¶¶

4.3.1 Colours other than mentioned above may also be used.

4.3.2 The pigments shall not contain zinc compounds or organic dyes.

4.3.3 Lead pigments shall not be used unless otherwise specified by the purchaser.

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*Specification for rapid hardening portland cement (*first revision*).
†Specification for white portland cement (*first revision*).
‡Specification for portland-pozzolana cement (*second revision*).
§Specification for coarse and fine aggregates from natural sources for concrete (*second revision*).
‖Specification for iron oxide pigments for paints (*first revision*).
¶Specification for green oxide of chromium for paints (*first revision*).
**Specification for ultramarine blue for paints (*first revision*).
††Specification for prussian blue (iron blue) for paints (*first revision*).
‡‡Specification for organic pigments for paints: Part II Phthalocyanines.
§§Specification for titanium dioxide for paints (*first revision*).
‖‖Specification for lead and scarlet chromes (*third revision*).
¶¶Specification for organic pigments for paints: Part I Azo pigments (toluidine red; chlorinated *p*-nitroaniline red; arylamide yellow; and para red).

5. MANUFACTURE

5.1 Cement concrete flooring tiles shall be manufactured from a mixture of cement, natural aggregates, and colouring material where required, by pressure process. During manufacture, the tiles shall be subjected to a pressure of not less than 14 N/mm² (140 kg/cm²).

5.2 The proportion of cement to aggregate in the backing of the tiles shall be not leaner than 1 : 3 by mass.

5.3 Where colouring material is used in the wearing layer, it shall not exceed 10 percent by mass of cement used in the mix.

5.4 On removal from the mould, the tiles shall be kept in moist condition continuously for such a period that would ensure their conformity to the requirements of this standard. Tiles shall be stored under cover.

6. DIMENSIONS

6.1 The size of cement concrete flooring tiles shall be as follows:

Length	*Breadth*	*Thickness*
mm	mm	mm
200	200	20
250	250	22
300	300	25

NOTE — The thickness shall be measured at two points situated approximately 50 mm from the ends on the fracture line of the tile that was tested for wet transverse strength according to **11.5**. The total thickness is the arithmetic mean of these two measurements.

6.1.1 Half tiles rectangular in shape shall also be available. Half tiles for use with full tiles in the floor shall have dimensions which shall be such as to make two half tiles when joined together, match with the dimensions of the one full tile.

7. TOLERANCES

7.1 Tolerances on length or breadth of tiles shall be ± 1 mm. In addition, the difference in length of side between the longest side and the shorter side in the sample shall not exceed 1 mm.

7.2 Tolerance on thickness shall be $+5$ mm. In addition the difference in thickness between the thickest and the thinnest tile in the sample shall not exceed 3 mm.

7.3 Thickness of Wearing Layer — The minimum thickness of wearing layer for the various classes of cement concrete flooring tiles shall be as specified in Table 1.

7.3.1 The thickness of the wearing layer shall be measured at several points along the fracture line of the tile that was tested for wet transverse strength in accordance with **11.5**. The arithmetic mean of the two measurements which yielded the lowest value shall be the minimum thickness of the wearing layer.

TABLE 1 THICKNESS OF WEARING LAYER

(*Clause* 7.3)

Sl No.	Class of Tile	Minimum Thickness of Wearing Layer
(1)	(2)	(3)
		mm
i)	Plain cement and plain coloured tiles for general purpose	5
ii)	Terrazo tiles with chips of size varying from the smallest up to 6 mm, for general purpose	5
iii)	Terrazo tiles with chips of size varying from the smallest up to 12 mm, for general purpose	5
iv)	Terrazo tiles with chips of size varying from the smallest up to 20 mm, for general purpose	6
v)	Plain cement and plain coloured tiles, for heavy duty	6

8. SPECIAL SHAPE AND SIZE

8.1 Shapes and sizes of tiles other than those specified in **6.1** may be manufactured when agreed upon between the supplier and the purchaser, provided that the tiles meet all the requirements of the standard.

NOTE — In rectangular tiles, the requirements for the difference in the length of sides as specified in **7.1** shall be applicable both to the length and width of the tiles.

9. GENERAL QUALITY

9.1 Unless otherwise specified, the tiles shall be supplied with initial grinding and grouting of the wearing layer. The wearing layer of the tiles shall be free from projections, depressions, cracks (hair cracks not included), holes, cavities and other blemishes. The edges of the wearing layer may be rounded.

10. FINISH

10.1 The colour and texture of the wearing layer shall be uniform throughout its thickness. No appreciable difference in the appearance of the tiles, from the point of view of colour of aggregate, its type and its distribution on the surface of the wearing layer shall be present.

NOTE 1 — When indenting for plain cement and plain coloured tiles, the purchaser should specify the colour by the code number of the appropriate or nearest matching colour given in IS : 1650-1973*. It should be noted that due to the nature of the product, the range of colours for flooring tiles is limited and the tiles may not be produced to match all the colours specified in IS : 1650-1973*. Purchasers are recommended to consult the manufacturers while selecting the colours of tiles which they wish to procure.

NOTE 2 — Exact matching of the shade of the colour may not be always possible in actual manufacture. There may be some variations in colour in different batches due to variations in the basic colour of raw materials.

10.2 When indenting for terrazo tile, the purchaser shall state the size of chips to be used in the wearing layer.

NOTE — It is recommended that the purchaser should consult the design cards of the manufacturers while specifying the size of chips. It is hardly possible to cover the colour for terrazo tiles in a comprehensive chart since numerous colour compositions are possible. The colour patterns will not only vary with the colour used but also with the sizes of chips and their distribution, and its choice is left to the mutual agreement between the purchaser and the supplier.

11. PHYSICAL REQUIREMENTS

11.0 The tests on tile shall not be carried out earlier than 28 days from the date of manufacture.

11.1 Flatness of the Tile Surface — The tiles when tested according to the procedure laid down in Appendix A, the amount of concavity and convexity shall not exceed 1 mm.

11.2 Perpendicularity — When tested in accordance with the procedure laid down in Appendix B, the longest gap between the arm of the 'square' and the edge of the tile shall not exceed 2 percent of the length of the edge.

11.3 Straightness — When tested according to the procedure given in Appendix C, the gap between the thread and the plane of the tile shall not exceed 1 percent of the length of the edge.

11.4 Water Absorption — When tested according to the procedure laid down in Appendix D, the average percentage of water absorption shall not exceed 10.

*Specification for standard colours for building and decorative finishes (*first revision*).

11.5 Wet Transverse Strength — When tested according to the procedure laid down in Appendix E, the average wet transverse strength shall not be less than 3 N/mm² (30 kgf/cm²).

11.6 Resistance to Wear — When tested in the manner specified in Appendix F, the wear shall not exceed the following value:

a) For general purpose tiles

1) Average wear	3·5 mm
2) Wear on individual specimen	4 mm

b) For heavy duty floor tiles

1) Average wear	2 mm
2) Wear on individual specimen	2·5 mm

12. MARKING

12.1 Tiles shall be legibly marked on the back with the name of the manufacturer or his trade-mark. Heavy duty tiles shall be marked ' H '.

12.1.1 Each tile 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.

13. PACKING

13.1 The tiles shall be packed according to the usual trade practice and adequately protected.

14. SAMPLING AND CRITERION FOR CONFORMITY

14.1 The consignment of cement concrete flooring tiles shall be divided into a number of lots in accordance with **14.1.1**. Each lot shall be inspected separately for ascertaining its conformity to the requirements of this specification.

14.1.1 *Lot* — All the cement concrete flooring tiles in a consignment which are of same type, class, shape and size and have been manufactured by a single manufacturer from identical raw material, under identical conditions of manufacture shall be grouped together to constitute a single lot.

14.2 The sample tiles for inspection and testing shall be chosen from a lot at random. For guidance in procedure of random selection IS : 4905-1968* may be referred.

14.3 Number of Samples and Criterion for Conformity — For each characteristic the number of sample tiles to be selected from a lot and the criterion for determining the conformity of the lot on the basis of the test results on those samples, shall be in accordance with inspection level I in Table 1 and AQL 6·5 percent in Table 3 of IS : 2500 (Part I)-1973†.

14.4 If the samples drawn for testing one characteristic can be utilized for testing any other characteristic, without introducing any prejudice in the test results of the latter, it would not be necessary to take fresh samples for the latter characteristics.

APPENDIX A

(*Clause* 11.1)

METHOD OF DETERMINATION OF FLATNESS OF TILE SURFACE

A-1. Six full size tiles selected in accordance with **14** shall be tested in the manner specified in **A-2** to **A-4.**

A-2. The flatness of the tile surface is tested by means of a metal ruler, whose length is not less than the tile diagonal.

A-3. For testing surfaces that are concave, the ruler is placed on the surface of the tile along one of the diagonals so that the ruler touches the tile at not less than two points. The largest gap is measured and the test is repeated along the second diagonal. The larger gap is the amount of concavity.

A-4. For testing surfaces that are convex, the ruler is placed on the surface of the tile along one of the diagonals so that the distances between the ruler and the tile, at the ends of the diagonal, are equal. The largest

*Methods for random sampling.

†Sampling inspection tables: Part I Inspection by attributes and by count of defects (*first revision*).

gap is measured between the ruler and the tile and the test is repeated along the second diagonal. The larger gap is the amount of convexity.

APPENDIX B

(*Clause* 11.2)

METHOD OF THE DETERMINATION OF PERPENDICULARITY

B-1. Six full size tiles selected in accordance with **14** shall be tested in the manner specified in **B-2.**

B-2. One arm of a 'square', the arms of which are longer than the sides of the tile, is placed along one of the edges of the tile, so that the corner of the 'square' touches the corner of the tile. The distance between the other arm of the 'square' and the other edge is measured at the end of the tile. The test is repeated such that two opposite edges shall be tested.

B-3. The largest gap between the arm of the 'square' and the edge of the tile shall be reported.

APPENDIX C

(*Clause* 11.3)

METHOD FOR DETERMINATION OF STRAIGHTNESS

C-1. Six full size tiles selected in accordance with **14** shall be tested in the manner specified in **C-2.**

C-2. Two corners of the tile surface shall be connected with a fine thread alongside one of the tile edges and the largest gap between the thread and the plane is recorded. The test is repeated alongside each of the other edges. The gap between the thread and the plane of the tile shall not exceed 1 percent of the edge length.

APPENDIX D

(*Clause* 11.4)

METHOD FOR DETERMINATION OF WATER ABSORPTION

D-1. Six full size tiles selected in accordance with **14** shall be used for the test. They shall be immersed in water for 24 hours, then taken out and wiped dry.

D-2. Each tile shall be weighed immediately after saturation and wiping as in **D-1**. The tile shall then be oven-dried at a temperature of 65 ± 1°C for a period of 24 hours cooled to room temperature and reweighed.

D-3. The water absorption for each tile shall be determined as follows:

$$\text{Water absorption, percent by mass} = \frac{M_1 - M_2}{M_2} \times 100$$

where

M_1 = mass in g of the saturated specimen, and
M_2 = mass in g of the oven-dried specimen.

D-4. The average value shall be reported.

APPENDIX E

(*Clause* 11.5)

METHOD FOR DETERMINATION OF WET TRANSVERSE STRENGTH

E-1. Six full size tiles selected in accordance with **14** shall be tested wet after soaking in water for 24 hours.

E-2. The specimen shall be placed horizontally on two parallel steel supports, with wearing surface upwards and its sides parallel to the supports. At least one of the supports shall be self-adjusting.

The load shall be applied by means of a steel rod parallel to the supports and midway between them. The length of the supports and of

the loading rod shall be longer than the tile. Their diameter shall be 12 mm. The surface of the rod and supports in contact with the tile shall be rounded. The span between the supports shall be as follows:

Size of Tile mm	*Span* mm
200 × 200	150
250 × 250	200
300 × 300	250

A plywood padding about 3 mm thick and 20 mm wide, shall be placed between the tile and each of the supports and between the tile and the steel rod. The length of the padding shall be at least as long as the tile.

The load shall be applied gradually and at a uniform rate not exceeding 2 000 N (200 kgf) per minute, until the tile breaks.

E-3. The load P which caused the breaking of the tile shall be recorded. The thickness t shall be determined as the average of two measurements at the location of the fracture, 50 mm from each edge (*see* **7.3**). The wet transverse strength f shall be calculated as follows:

$$f = \frac{3Pl}{2bt^2} \text{ N/mm}^2$$

where

P = breaking load in N,
l = span between supports in mm,
b = tile width in mm, and
t = tile thickness in mm.

E-4. The average wet transverse strength shall be reported.

APPENDIX F

(*Clause* 11.6)

METHOD FOR DETERMINATION OF RESISTANCE TO WEAR

F-1. METHOD

F-1.1 Six full size tiles selected in accordance with **14** shall be tested in the manner specified in **F-1.2** to **F-1.5.**

F-1.2 Preparation of Test Specimens — The test specimens shall be square in shape and of size 7·06 × 7·06 cm (that is, 50 cm^2 in area). They shall be sawn off one only from each tile, preferably from the central part of the tile. The deviation in the length of the specimen shall be within ±2 percent. The surface to be tested shall be ground smooth and filling removed.

F-1.3 Apparatus and Accessories

F-1.3.1 *Abrasion Testing Machine* — The abrasion of specimens shall be carried out in a machine conforming essentially to the requirements described in **F-2.**

F-1.3.2 The abrasive powder used for the test shall conform to the requirements given in **F-3.**

F-1.3.3 *Measuring Instrument* — A suitable instrument capable of measurements to an accuracy of 0·01 mm shall be used for determining the change in the thickness of the specimen after abrasion.

NOTE 1 — The arrangement for measurement of thickness with the instrument may be as given in Fig. 1. Shoulders *A* and *B* are at right angles and the base *C* is machined at top to an accuracy of 0·01 mm. The test specimen shall be placed on the base with its wearing surface upwards and sides in contact with the shoulders. The measuring instrument (or dial gauge) shall be set up firmly so that the contractor slightly presses on the surface of the specimen and the reading of the instrument taken. The position of the dial gauge and the sitting of the contractor shall be the same during the subsequent measurement after abrasion.

NOTE 2 — The measurement for thickness both before and after the test shall be taken at five points (one at the centre and four at the corners) as shown in Fig. 2.

F-1.4 Procedure of Test — The specimens shall be dried at 110° ± 5°C for 24 hours and then weighed to the nearest 0·1 g. The specimen after initial drying and weighing shall be placed in the thickness-measuring apparatus (*see* Note 1 below **F-1.3.3**) with its wearing surface upwards and the reading of the measuring instrument taken.

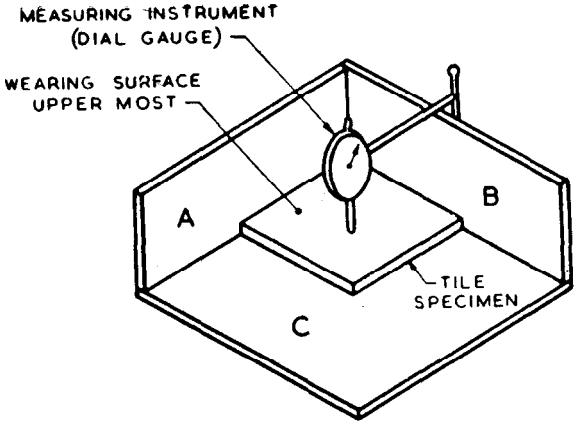
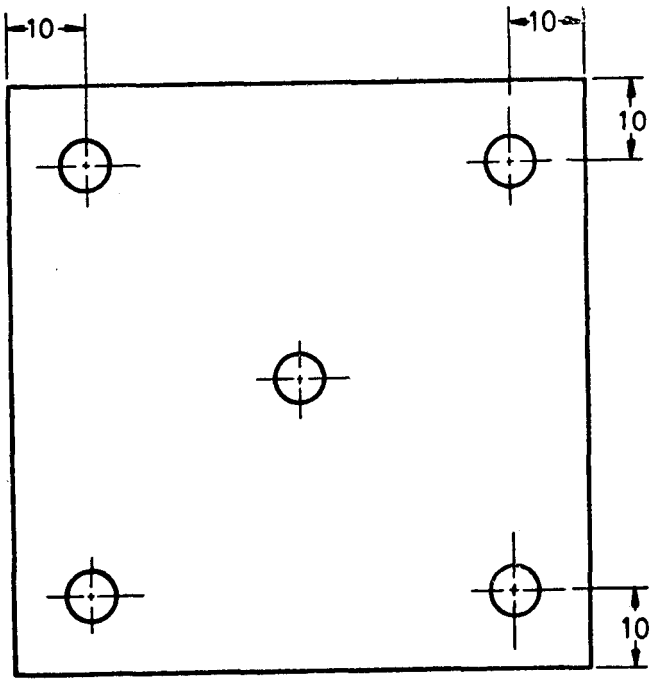


FIG. 1 ARRANGEMENT FOR MEASUREMENT OF THICKNESS



All dimensions in millimetres.

FIG. 2 POINTS SHOWING MEASUREMENT OF THICKNESS

F-1.4.1 The grinding path of the disc of the abrasion testing machine (*see* **F-2**) shall be evenly strewn with 20 g of the abrasive powder. The specimen shall then be fixed in the holding device with the surface to be ground facing the disc, and loaded at the centre with 300 N (30 kgf). The grinding disc shall then be put in motion at a speed of 30 rev/min and the abrasive powder is continuously fed back on to the grinding path so that it remains uniformly distributed in a track corresponding to the width of the test piece. After every 22 revolutions, the disc shall be stopped, the abraded tile powder and the remainder of the abrasive powder shall be removed from the disc, and fresh abrasive powder in quantities of 20 g applied each time. After every 22 revolutions the specimen shall be turned about the vertical axis through an angle of 90° in the clockwise direction and it should be repeated 9 times thereby giving total number of revolutions of 220. The disc, the abrasive powder and the specimen shall be kept dry throughout the duration of the test. After the abrasion is over, the specimen shall be reweighed to the nearest 0·1 g. It shall then be placed in the thickness measuring apparatus once again in an identical manner and the reading taken with the same position and setting of the dial gauge as for the measurement before abrasion.

NOTE — If, after the specimen has been subjected to the abrasion test, it is found that the tile has chipped off at any of the points of measurement, that measurement should be discarded in calculating the average. However, a minimum of three residual measurements on a specimen should be ensured.

F-1.5 Determination of Wear — The wear shall be determined from the difference in readings obtained by the measuring instrument before and after the abrasion of the specimen. The value shall be checked up with the average loss in thickness of the specimen obtained by the following formula:

$$t = \frac{(W_1 - W_2)\, V_1}{W_1 \times A}$$

where

t = average loss in thickness in mm,

W_1 = initial mass of the specimen in g,

W_2 = final mass of the abraded specimen in g,

V_1 = initial volume of the specimen in mm^3, and

A = surface area of the specimen in mm^2.

F-1.6 The average wear and the wear on individual specimens shall be repeated.

F-2. ESSENTIAL REQUIREMENTS OF THE ABRASION TESTING MACHINE

F-2.1 General — The testing apparatus shall be a grinding device consisting essentially of a horizontally fixed smooth grinding disc of about 750 mm diameter rotating about a vertical axis and furnished with a replaceable grinding path. The essential features are shown in Fig. 3.

F-2.2 Grinding Path

F-2.2.1 Cast iron shall be used as the material for grinding path. Its scaleroscope hardness shall lie between 30 and 50. This hardness shall be ascertained at least 10 times on the rim and at several points in the grinding path by means of a Shore's scaleroscope with diamond hammer.

F-2.2.2 The grinding path shall be a 200-mm wide annular space on the grinding disc between distances of 120 and 320 mm from the centre. The grinding path shall be repaired and restored when it has worn out by more than 0·5 mm after use or when the furrows formed in it exceed 0·2 mm in depth. When the grinding path is restored, its hardness shall be determined afresh. When irreparable it shall be changed.

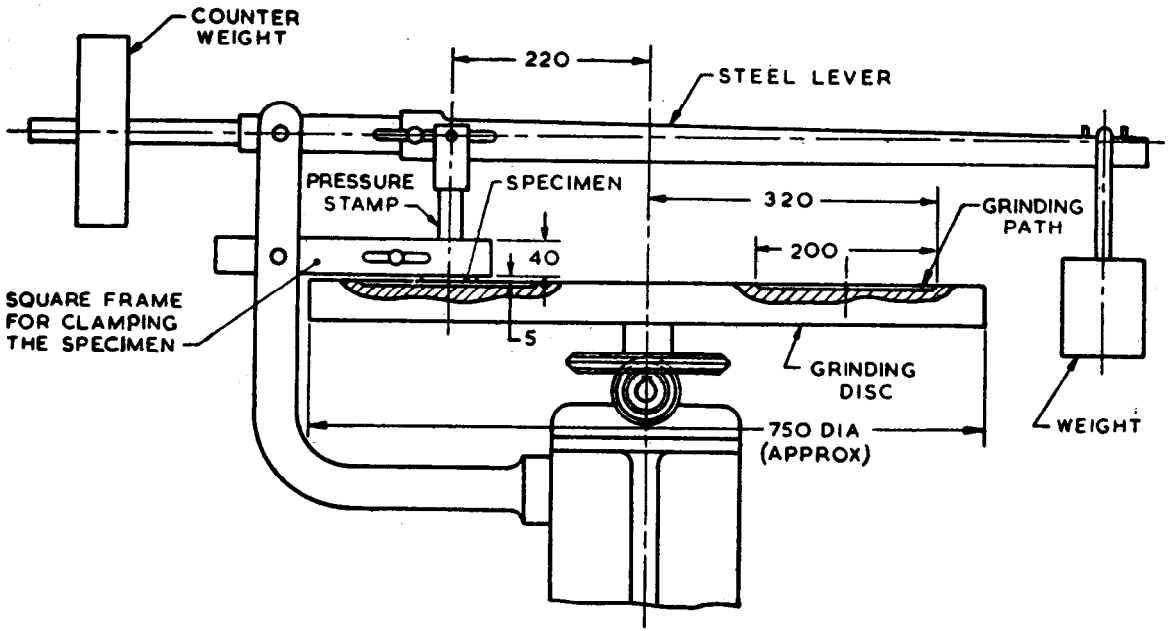
F-2.3 Rotation Disc — The disc shall be driven at 30 revolutions per minute. The speed of rotation shall not deviate by more than one revolution per minute. There shall be automatic mechanisms for counting, indicating the revolutions of the disc and for stopping the disc after every 22 revolutions. Such mechanisms shall be checked for reliability prior to the test.

F-2.4 Holding Device for Test Specimen — The holding device shall consist of a square frame, open on one side and made of cast iron or steel; it shall be of about 40 mm height, with its lower edge about 5 mm above the surface of the grinding disc and so positioned that its centre is at a distance of 220 mm from the centre of the disc. It shall necessarily, but loosely, hold the specimen.

F-2.5 Loading Device

F-2.5.1 The loading device shall consist of a steel lever. A short arm of the lever shall be provided with a counter weight just to balance the weight of the long arm and of the weighing disc, so that the pressure stamp just touches the specimen prior to the loading.

F-2.5.2 The lever shall move freely about the fulcrum without appreciable friction. During test, the lever shall remain nearly parallel to the upper surface of the disc. The connection of the pressure stamp to the lever shall be through a self-aligning joint permitting free relative movement but at the same time ensuring a central load on the specimen being tested.



All dimensions in millimetres.

FIG. 3 GENERAL FEATURES OF ABRASION TESTING MACHINE

F2.5.3 Suitable loading weight shall be applied at the end of the long arm of the lever so that, as magnified by the leverage, a net load of 300 N (30 kgf) is applied through the pressure stamp on to the specimen. The load shall be applied with a permissible deviation of one percent. The accuracy of the load shall be verified both by calculation and by measurement with suitable instruments.

F-3. REQUIREMENT FOR ABRASIVE POWDER TO BE USED IN THE ABRASION TEST

F-3.1 Chemical Composition

F-3.1.1 The abrasive powder shall have an aluminium oxide content of not less than 95 percent by mass.

F-3.2 Shape and Size — The grains shall be of rounded shape. The size shall conform to the requirements given in Table 2.

TABLE 2 REQUIREMENTS OF SIZE

Sl No.	Size	Percentage by Mass
(1)	(2)	(3)
i)	Retained on 355 micron IS Sieve	Nil
ii)	Retained on 250 micron IS Sieve	0-15
iii)	Retained on 212 micron IS Sieve	45 *Min*
iv)	Retained on 212 and 180 micron IS Sieve	70 *Min*
v)	Passing 150 micron IS Sieve	3 *Max*

F-3.3 Specific Gravity — The specific gravity of the grains shall be between 3.9 to 4.1.

F-3.4 Hardness — The grains shall generally have a hardness of 9 in Moh's scale.

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Printed at Printograph, New Delhi (INDIA).

AMENDMENT NO. 2 SEPTEMBER 1997
TO
IS 1237 : 1980 SPECIFICATION FOR CEMENT CONCRETE FLOORING TILES

(First Revision)

(*Page* 7, *Table* 1) — At the end, insert Sl No. (vi) as follows:

vi)	Terrazo tiles with chips of size varying from the smallest up to 20 mm, for heavy duty	6

(CED 5)

Reprography Unit, BIS, New Delhi, India

AMENDMENT NO. 3 MAY 2002
TO
IS 1237:1980 SPECIFICATION FOR CEMENT CONCRETE FLOORING TILES

(First Revision)

(*Pages* 4 *and* 5, *clause* **4.1**) — Substitute the following for the existing clause:

'**4.1 Cement** — Cement used in the manufacture of tiles shall be ordinary Portland cement conforming to IS 269 : 1989† or rapid hardening Portland cement conforming to IS 8041 : 1990* or white Portland cement conforming to IS 8042 : 1989† or Portland pozzolana cement (fly ash based) conforming to IS 1489 (Part 1) : 1991‡ or Portland pozzolana cement (calcined clay based) conforming to IS 1489 (Part 2) : 1991[1)] or 43 grade ordinary Portland cement conforming to IS 8112 : 1989[2)] or 53 grade ordinary Portland cement conforming to IS 12269 : 1987[3)] and Portland slag cement conforming to IS 459 : 1992[4)].'

[*Page* 4, *footnote with* (†) *mark*] — Substitute the following for the existing footnote:

'†Specification for ordinary Portland cement (*fourth revision*).'

(*Page* 5 *footnotes*) — Substitute the following for the existing first 3 footnotes:

†Specification for 33 grade ordinary Portland cement (*fourth revision*).

*Specification for rapid hardening Portland cement (*second revision*).

†White Portland cement — Specification.

‡Specification for Portland pozzolana cement : Part 1 Flyash based (*third revision*).

(*Page* 5, *footnotes*) — Insert the following footnotes at the end:

1)Specification for Portland-pozzolana cement : Part 2 Calcined clay based (*third revision*).

2)Specification for 43 grade ordinary Portland cement (*first revision*).

3)Specification for 53 grade ordinary Portland cement.

4)Corrugated and semi-corrugated asbestos cement sheets — Specification (*third revision*).

(CED 5)

Reprography Unit, BIS, New Delhi, India