



## DRAFT TANZANIA STANDARD

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### Cement Concrete Flooring Tiles — Specification

**TANZANIA BUREAU OF STANDARDS**

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## 0.National foreword

The Tanzania Bureau of Standards is the statutory national standards body for Tanzania, established under the act.No.3 of 1975, amended by act.No.2 of 2009

This draft Tanzania Standard is being prepared by the BCDC 9 Roofing and Finishes Technical Committee, under the supervision of the Building and Construction Divisional Standards Committee (BCDC)

In the preparation of this Tanzania Standard assistance was derived from:

**IS 1237: 2012 Cement Concrete Flooring Tiles — Specification** *published by Indian Bureau of Standards*



# CEMENT CONCRETE FLOORING TILES — SPECIFICATION

## 1 SCOPE

These standard covers cement concrete flooring tiles of plain cement, plain coloured and terrazzo types.

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

## 2 REFERENCES

The standards listed in Annex A contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated in Annex A.

## 3 TERMINOLOGY

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

**3.1 Plain Cement Tiles** — Tiles having a plain wearing surface, in the manufacture of which pigments and stone chips are not used in the wearing surface.

**3.2 Plain Coloured Tiles** — Tiles having a plain wearing surface wherein pigments are used but not stone chips.

**3.3 Terrazzo Tiles** — Tiles at least 25 percent of whose wearing surface is composed of stone chips in a matrix of plain or coloured Portland cement, mixed with or without pigments and mechanically ground and filled, if required.

**3.4 Single Layer/Monolayer Tiles** — Tiles, plain or terrazzo, in which there is only one layer that is wearing layer, and which do not contain a backing layer.

**3.5 Double Layer Tile** — Tiles which contain a wearing layer as well as a backing layer.

## 4 CLASSIFICATION

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

- a) *General Purpose Tiles* — Used in such places where normally light loads are taken up by the floors; such as office buildings, schools,

colleges, hospitals and residential buildings (usually indoor floors).

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

## 5 MATERIALS

### 5.1 Cement

Cement used in the manufacture of tiles shall conform to TJS 727

### 5.2 Aggregates

Aggregates used in the backing layer of tiles shall conform to the requirements of TJS 58. 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.

### 5.3 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:

<i>Pigments</i>	<i>Ref to IS No.</i>
Black or red or brown pigment	IS 44
Green pigments	IS 54
Blue pigments	IS 55 or IS 56 or IS 3574 (Part 2)
White pigments	IS 411
Yellow pigments	IS 50 or IS 3574 (Part 1)

**5.3.1** Colours other than mentioned above may also be used.

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**5.3.2** The pigments shall not contain zinc compounds or organic dyes.

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

## 6 MANUFACTURE

**6.1** Cement concrete flooring tiles shall be manufactured from a mixture of cement, natural aggregates and colouring material where required, by pressure process (with or without vacuum dewatering) or vibration (with or without vacuum dewatering) or a combination of both, so that the tiles meet the requirements specified in the standard.

NOTE — When manufactured by pressure process alone, the tiles shall be subjected to a pressure of not less than 14 N/mm<sup>2</sup>.

**6.2** The tiles shall be manufactured in single layer/monolayer or in double layer.

**6.3** The proportion of cement to aggregate in the backing of the double layer tiles shall be not leaner than 1:3 by mass. Single layer/monolayer tiles shall have only the wearing layer.

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

**6.5** 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.

## 7 DIMENSIONS

**7.1** The size of cement concrete flooring tiles shall be as given in Table 1.

**Table 1 Size of Cement Concrete Flooring Tiles**

Sl No.	Length	Breadth	Minimum Thickness	
			Single Layer or Monolayer Tile mm	Double Layer Tile mm
(1)	(2)	(3)	(4)	(5)
i)	200	200	10	15
ii)	250	250	12	16
iii)	300	300	14	20
iv)	400	400	16	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 12.6. The total thickness is the arithmetic mean of these two measurements.

two half tiles when joined together match with the dimensions of the one full tile.

## 8 TOLERANCES

**8.1** Tolerances on length or breadth of tiles shall be  $\pm 1$  mm. In addition, the difference in length between the longest side and the shortest side in the sample shall not exceed 1 mm.

**8.2** Tolerance on thickness shall be +15 percent of the minimum thickness (no tolerance on the negative side shall be permitted). In addition, the difference in thickness between the thickest and the thinnest tile in the sample shall not exceed 10 percent of the minimum thickness.

### 8.3 Thickness of Wearing Layer of Double Layer Tiles

**8.3.1** The minimum thickness of wearing layer for the various classes of double layer cement concrete flooring tiles shall be as specified in Table 2.

**Table 2 Thickness of Wearing Layer for Double Layer Tiles**

Sl No.	Class of Tile	Minimum Thickness of Wearing Layer for Double Layer Tile mm
(1)	(2)	(3)
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
vi)	Terrazo tiles with chips of size varying from the smallest up to 20 mm, for heavy duty	6

available. Half tiles for use with full tiles in the floor shall have dimensions which shall be such as to make

**7.1.1** Half tiles rectangular in shape shall also be

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**8.3.2** The thickness of the wearing layer for double layer tiles shall be measured at several points along the fracture line of the tile that was tested for wet transverse strength in accordance with **12.6**. The arithmetic mean of the two measurements which yielded the lowest value shall be the minimum thickness of the wearing layer.

## **9 SPECIAL SHAPE AND SIZE**

Shapes and sizes of tiles other than those specified in **7.1** may be manufactured when agreed upon between the supplier and the purchaser, provided that the tiles meet all other requirements of the standard.

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NOTE — In rectangular tiles, the requirements for the difference in the length of sides as specified in 8.1 shall be applicable both to the length and width of the tiles.

### 10 GENERAL QUALITY

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.

### 11 FINISH

**11.1** 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.

#### NOTES

1 When indenting for plain cement and plain coloured tiles, the purchaser should specify the colour. 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. Purchasers are recommended to consult the manufacturers while selecting the colours of tiles which they wish to procure.

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.

**11.2** When indenting for terrazzo 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 terrazzo 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.

### 12 PHYSICAL REQUIREMENTS

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

#### 12.2 Flatness of the Tile Surface

When tested in accordance with the procedure laid down in Annex B, the concavity and convexity in the tiles shall not exceed 1 mm.

#### 12.3 Perpendicularity

When tested in accordance with the procedure laid down in Annex C, the maximum gap between the arm of the square and the edge of the tile shall not exceed 2 percent of the length of the edge of the tile.

#### 12.4 Straightness

When tested in accordance with the procedure given in Annex D, the gap between the thread and the plane of the tile shall not exceed 1 percent of the length of the edge of the tile.

#### 12.5 Water Absorption

When tested in accordance with the procedure laid down in Annex E, the average percentage of water absorption shall not exceed 10.

#### 12.6 Wet Transverse Strength

When tested in accordance with the procedure laid down in Annex F, the average wet transverse strength shall not be less than 3 N/mm<sup>2</sup>.

#### 12.7 Resistance to Wear

When tested in the manner specified in Annex G, the wear shall not exceed the following values:

- a) For general purpose floor 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

### 13 MARKING

**13.1** 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'.

#### 13.2 Certification Marking

Each tile may also be marked with the Standard Mark.

### 14 PACKING

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

### 15 SAMPLING AND CRITERION FOR CONFORMITY

**15.1** The consignment of cement concrete flooring tiles shall be divided into a number of lots in accordance with 15.1.1. Each lot shall be inspected separately for ascertaining its conformity to the requirements of this standard.



**15.1.1 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.

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

**15.3 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 1).

**15.4** 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.

**ANNEX A**

(Clause 2)

**LIST OF REFERRED STANDARDS**

<i>IS No.</i>	<i>Title</i>	<i>IS No.</i>	<i>Title</i>
		(Part 1) : 1991	Fly ash based ( <i>third revision</i> )
44 : 1991	Iron oxide pigments for paints — Specification ( <i>second revision</i> )	(Part 2) : 1991	Calcined clay based ( <i>third revision</i> )
50 : 1980	Specification for lead and scarlet chromes ( <i>third revision</i> )	2500 (Part 1) : 2000	Sampling inspection procedures: Part 1 Attribute sampling plans indexed by acceptable quality level (AQL) for lot-by-lot inspection ( <i>third revision</i> )
54 : 1988	Specification for green oxide of chromium for paints ( <i>second revision</i> )	3574	Specification for organic pigments for paints:
55 : 1970	Specification for ultramarine blue for paints ( <i>first revision</i> )	(Part 1) : 1965	AZO pigments (Toluidine red, chlorinated <i>p</i> -Nitroaniline red, arylamide yellows; and para red)
56 : 1993	Specification for Prussian blue (iron blue) for paints ( <i>second revision</i> )	(Part 2) : 2000	Phthalocyanines ( <i>first revision</i> )
269 : 1989	Specification for 33 grade ordinary Portland cement ( <i>fourth revision</i> )	4905 : 1968	Methods for random sampling
383 : 1970	Specification for coarse and fine aggregates from natural sources for concrete ( <i>second revision</i> )	TZS 177	Portland cement — Ordinary and rapid hardening-specification
411 : 1991	Specification for titanium dioxide, anatase, for paints ( <i>third revision</i> )		
455 : 1989	Specification for Portland slag cement ( <i>fourth revision</i> )		
727	Cement — Part 1: Composition, specification and conformity criteria for common cement		

**ANNEX B**  
(Clause 12.2)

**METHOD FOR DETERMINATION OF FLATNESS OF TILE SURFACE**

**B-1** Six full size tiles selected in accordance with 15 shall be tested in the manner specified in B-2 to B-4.

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

**B-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.

**B-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 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.

**ANNEX C**  
(Clause 12.3)

**METHOD FOR DETERMINATION OF PERPENDICULARITY**

**C-1** Six full size tiles selected in accordance with 15 shall be tested in the manner specified in C-2.

**C-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.

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

**ANNEX D**  
(Clause 12.4)

**METHOD FOR DETERMINATION OF STRAIGHTNESS**

**D-1** Six full size tiles selected in accordance with 15 shall be tested in the manner specified in D-2.

**D-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.

**ANNEX E**  
(Clause 12.5)

**METHOD FOR DETERMINATION OF WATER ABSORPTION**

**E-1** Six full size tiles selected in accordance with 15 shall be used for the test. They shall be immersed in water for 24 h, then taken out and wiped dry.

**E-2** Each tile shall be weighed immediately after saturation and wiping as in E-1. The tile shall then be oven-dried at a temperature of  $65 \pm 1^\circ\text{C}$  for a period of 24 h, cooled to room temperature and reweighed.

**E-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 of the saturated specimen, in g; and

$M_2$  = mass of the oven-dried specimen, in g.

**E-4** The average value shall be reported.

## ANNEX F

(Clause 12.6)

### METHOD FOR DETERMINATION OF WET TRANSVERSE STRENGTH

**F-1** Six full size tiles selected in accordance with 15 shall be tested wet after soaking in water for 24 h.

**F-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
400 × 400	350

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/min, until the tile breaks.

**F-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 8.3*). The wet transverse strength  $f$  shall be calculated as follows:

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

where

$P$  = breaking load, in N;

$I$  = span between supports, in mm;

$b$  = tile width, in mm; and

$t$  = tile thickness, in mm.

**F-4** The average wet transverse strength shall be reported.

## ANNEX G

(Clause 12.7)

### METHOD FOR DETERMINATION OF RESISTANCE TO WEAR

#### G-1 METHOD

**G-1.1** Six full size tiles selected in accordance with 15 shall be tested in the manner specified in G-1.2 to G-1.5.

#### G-1.2 Preparation of Test Specimens

The test specimens shall be square in shape and of size 70.6 mm × 70.6 mm (that is, 5 000 mm<sup>2</sup> 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.

#### G-1.3 Apparatus and Accessories

##### G-1.3.1 Abrasion Testing Machine

The abrasion of specimens shall be carried out in a machine conforming essentially to the requirements described in G-2.

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

##### G-1.3.3 Measuring Instrument

A suitable instrument capable of measurements to accuracy of 0.01 mm shall be used for determining the change in the thickness of the specimen after abrasion.

#### NOTES

**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 contactor 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 contactor shall be the same, during the subsequent measurement after abrasion.

**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.

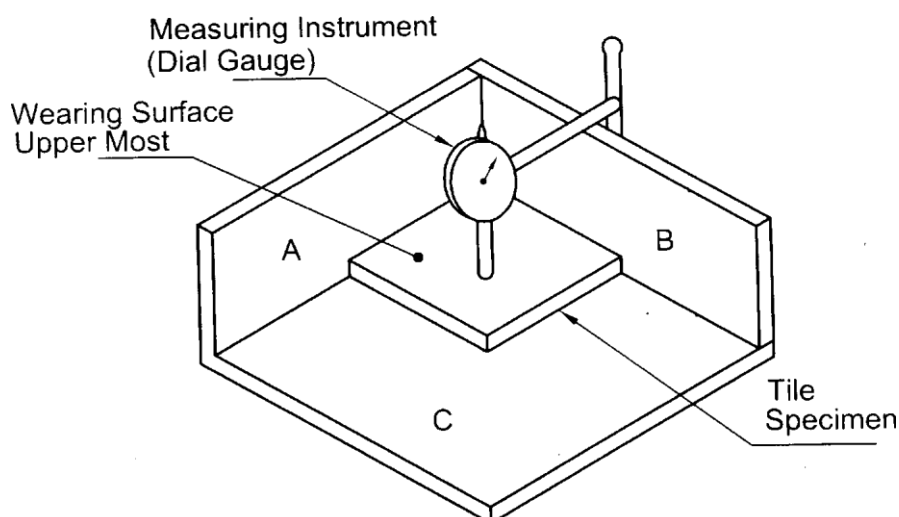
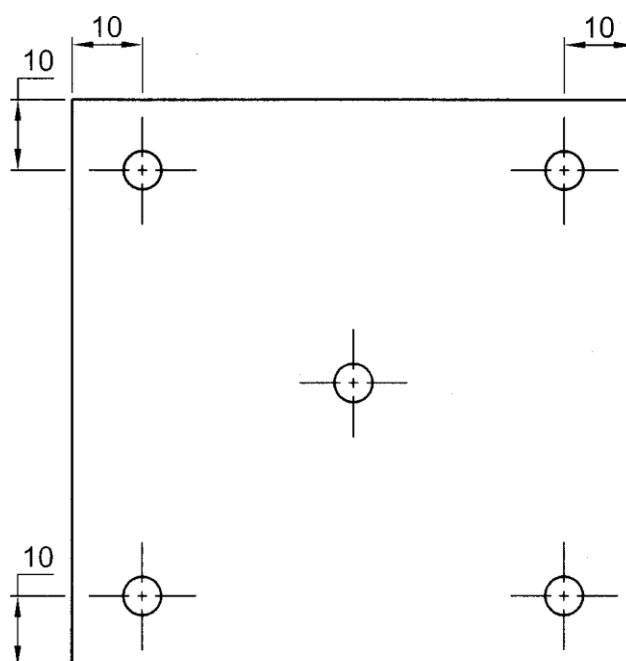


FIG. 1 ARRANGEMENT FOR MEASUREMENT OF THICKNESS



All dimensions in millimetres.

FIG. 2 POINT SHOWING MEASUREMENT OF THICKNESS

#### G-1.4 Procedure of Test

The specimens shall be dried at  $110 \pm 5^\circ\text{C}$  for 24 h 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 under **G-1.3.3**) with its wearing surface upwards and the reading of the measuring instrument taken.

**G-1.4.1** The grinding path of the disc of the abrasion testing machine (*see* **G-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. 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.

### G-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:

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

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<sup>3</sup>;
- and
- $A$  = surface area of the specimen, in mm.

**G-1.6** The average wear and the wear on individual specimens shall be reported.

## G-2 ESSENTIAL REQUIREMENTS OF THE ABRASION TESTING MACHINE

### G-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.

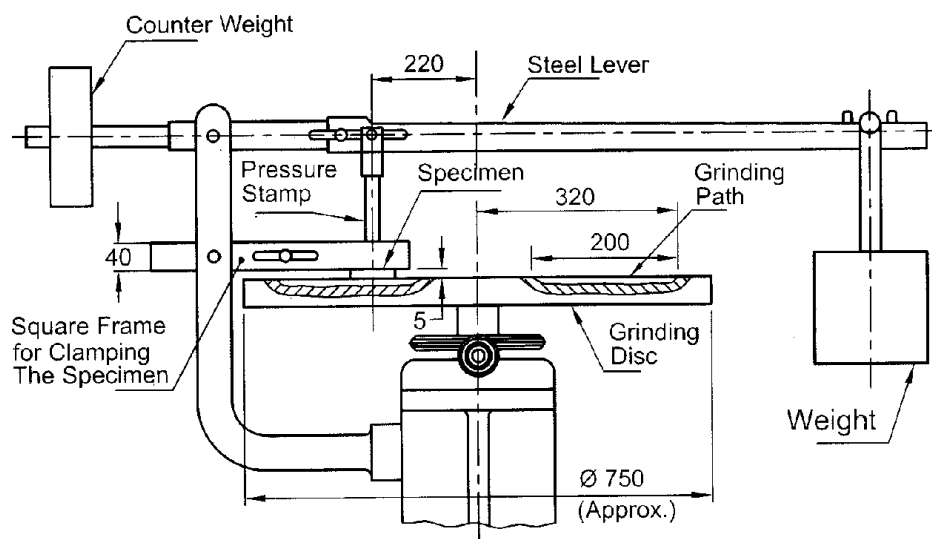
### G-2.2 Grinding Path

**G-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.

**G-2.2.2** The grinding path shall be a 200 mm wide annular space on the grinding disc between distances of 120 mm 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.

### G-2.3 Rotation Disc

The disc shall be driven at 30 rev/min. The speed of rotation shall not deviate by more than 1 rev/min. 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.



All dimensions in millimetres.

FIG. 3 GENERAL FEATURES OF ABRASION TESTING MACHINES

#### G-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.

#### G-2.5 Loading Device

**G-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.

**G-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.

**G-2.5.3** 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 is applied through the pressure stamp on to the specimen. The load shall be applied with a permissible deviation of 1 percent. The accuracy of the load shall

be verified both by calculation and by measurement with suitable instruments.

### G-3 REQUIREMENT FOR ABRASIVE POWDER TO BE USED IN THE ABRASION TEST

#### G-3.1 Chemical Composition

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

#### G-3.2 Shape and Size

The grains shall be of rounded shape. The size shall conform to the requirements given in Table 3.

#### G-3.3 Specific Gravity

**Table 3 Requirements for 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, <i>Min</i>
iv)	Retained on 212 and 180 micron IS Sieve	70, <i>Min</i>
v)	Passing 150 micron IS Sieve	3, <i>Max</i>

The specific gravity of the grains shall be between 3.9 to 4.1.

#### G-3.4 Hardness

The grains shall generally have a hardness of 9 in Moh's scale.