

# इंटरनेट

# मानक

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IS 3951-1 (2009): Hollow clay tiles for floors and roofs,  
Part 1: Filler type - [CED 30: Clay and Stabilized Soil  
Products for Construction]



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भारतीय मानक

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भाग 1 फिलर प्रकार

( दूसरा पुनरीक्षण )

*Indian Standard*

HOLLOW CLAY TILES FOR FLOORS AND ROOFS —  
SPECIFICATION

PART 1 FILLER TYPE

( *Second Revision* )

ICS 91.060.30; 91.100.25

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

## FOREWORD

This Indian Standard (Part 1) (Second Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Clay Products for Buildings Sectional Committee had been approved by the Civil Engineering Division Council.

Burnt clay floor/roofing tiles have been used both as filler material and structural units. Investigations carried in recent years have established that a large variety of clays occurring in the country can be successfully utilized in the manufacture of such tiles. These tiles act as light weight material for floor and roof construction because of their hollowness and impart sound and thermal insulation to the building. Adequate caution may be observed as the porous nature of the ceramic body may induce corrosion process, if steel is not adequately protected by dense concrete or cement mortar. The grooves wherein the steel is required to be laid should be sufficiently big to ensure desired protection to the steel when the grooves are filled with concrete or mortar.

This standard was first published in 1967 and was subsequently revised in two parts. The other part in the series is:

### Part 2      Structural type

In the formulation of this standard due weightage has been given to international co-ordination among the standard and practices prevailing in different countries in addition to relating it to the practices in the field in this country. The modifications in this revision are in respect of general requirements, dimensions and tolerances, sampling procedure and in the procedure to determine water absorption of tiles. Also, the limit of water absorption has been revised from its earlier requirement of 20 percent.

The composition of the Committee responsible for formulation of this standard is given at Annex C.

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

*Indian Standard***HOLLOW CLAY TILES FOR FLOORS AND ROOFS —  
SPECIFICATION****PART 1 FILLER TYPE***( Second Revision )***1 SCOPE**

This standard (Part 1) covers the dimensions, quality and strength requirements of hollow clay filler tiles having perforations parallel to their length and intended for use in floors and roofs.

**2 REFERENCE**

The standard listed below contains provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the edition indicated was valid. All standards are subject to revision and parties to agreements based on this standard is encouraged to investigate the possibility of applying the most recent edition of the standard indicated below:

<i>IS No.</i>	<i>Title</i>
2248 : 1992	Glossary of terms relating to clay products for buildings ( <i>second revision</i> )

**3 TERMINOLOGY**

For the purpose of this standard, the definitions given in IS 2248 shall apply.

**4 GENERAL REQUIREMENTS**

**4.1** The tiles shall be made from suitable clay. Pulverized coal ash (fly ash, pond ash, mound ash,

bottom ash), crushed stone sand dust, etc, in suitable proportions may be added to clay such that the requirements prescribed in this standard are complied with. The tiles shall be of fairly uniform colour and shall be well burnt. The tiles shall be free from cracks, flaws or inclusions of any deleterious materials like lime nodules, soluble salts, etc.

**4.2** The tiles shall have at least one plane of symmetry in cross-section. When broken, the fractured face shall show a fine, compact and uniform texture.

**4.2.1** The tiles shall have serrations on all faces designed to be concreted, mortared or plastered. The serrations shall not be deeper than 3 mm and wider than 5 mm.

**4.3** The tiles shall be free from extensive winding or bowing and external angles shall be right angles. The tiles shall be tested for trueness of shape as specified in **4.3.1** to **4.3.3**.

**4.3.1 Winding or Bowing in the Longitudinal and Transverse Directions**

The tile shall be placed between two parallel straight-edges running along the direction of length or width and the distance between either straight-edge and the adjacent face of the tile at any point shall be not more than 3 mm/ 300 mm length or width (*see* Fig. 1).

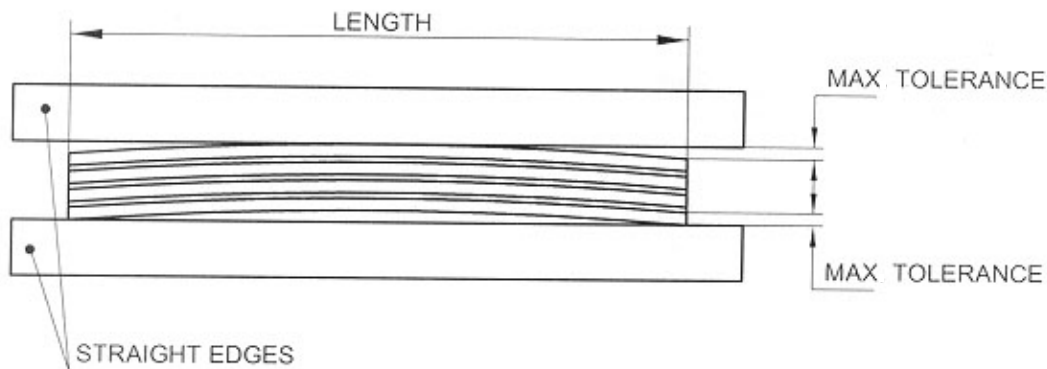


FIG. 1 TEST FOR WINDING OR BOWING



### 4.3.2 Concavity or Convexity in the External Faces of the Tiles

The tile shall be placed between two parallel straight-edges running diagonally across the face of the tile and the distance between either straight-edge and the adjacent face of the tile at any point shall not be more than 3 mm/300 mm, run at any point on either diagonal (see Fig. 2).

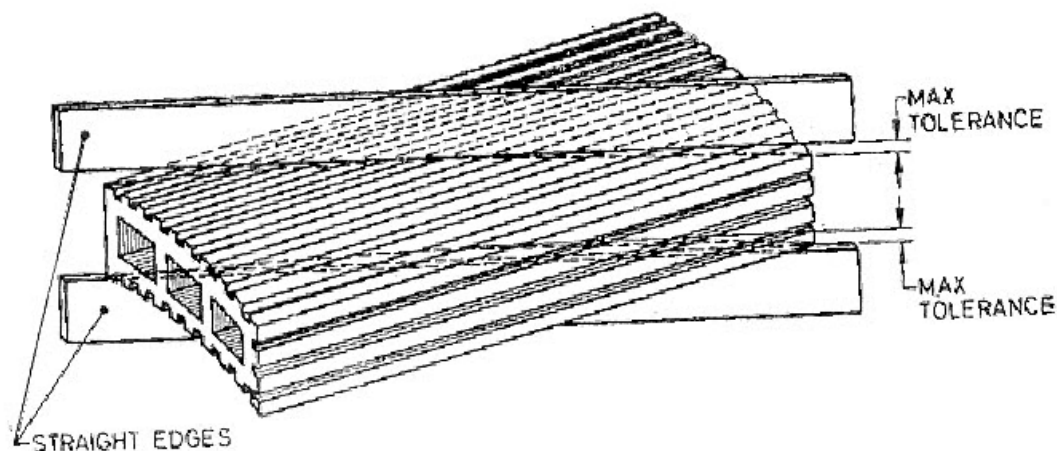


FIG. 2 TEST FOR CONCAVITY AND CONVEXITY

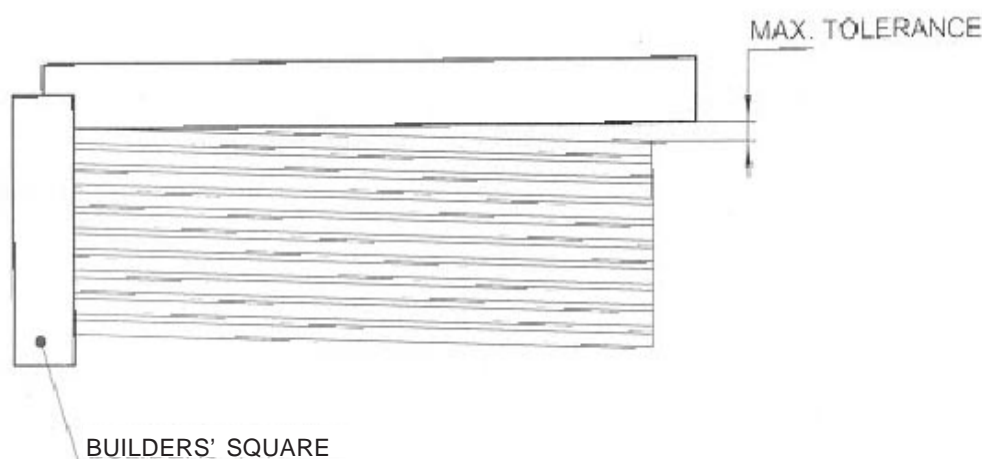


FIG. 3 TEST FOR CORRECTNESS OF EDGES

## 5 DIMENSIONS AND TOLERANCES

### 5.1 Dimensions

The standard sizes of tiles when measured according to 5.1.1 shall be as follows. The typical shapes are given in Fig. 4:

Length mm	Width mm	Height mm
340	350, 300, 250 or 200	80, 90, 100 or 110
390		
440		
490		
540		
590		
640		
690		
740		

### 4.3.3 Angles Between Sides and Joining Edges

In case of right angled sides and edges, any variation from the right angle in the angle contained by any side and a joining edge shall be measured by placing a builder's square against the side and the maximum distance between the inner edge of the square and the side shall be not more than 3 mm/300 mm run (see Fig. 3).

**5.1.1** The length of central line of the four longest faces shall be measured nearest to the millimetre and the length of the tile, expressed, in millimetre, as the average of these four measurements. The width and thickness of the tile shall also be similarly measured. The permissible deviation in length and width shall be  $\pm 5$  percent while the height can deviate from the specified value by  $\pm 3$  percent.

### 5.2 Thickness of Shell and Web

The thickness of any shell shall be not less than 10 mm and that of web not less than 7 mm.

## 6 BULK DENSITY

**6.1** The mean bulk densities of the tiles when tested as per method given in 6.1.1 shall not exceed

1 200 kg/m<sup>3</sup> and shall be not below 900 kg/m<sup>3</sup>.

**6.1.1** The test specimen shall be dried at 110°C to constant weight, cooled and weighed. The bulk volume of the tile is determined measuring the external dimensions without counting the grooves. Bulk density ( $D$ ) shall be calculated by the formula,  $D = w/v$ , where  $w$  is the weight of the dry sample and  $v$  is the bulk volume. The result shall be expressed in kg/m<sup>3</sup> to an accuracy of 0.1 units.

## 7 BREAKING STRENGTH

The breaking load of the tile determined in accordance with the procedure laid down in Annex A shall not be less than 10 kgf/cm length.

## 8 WATER ABSORPTION

The water absorption of the tile by mass, when tested in accordance with the procedure laid down in Annex B shall be not more than 15 percent.

NOTE – An alternate value of 10 percent, maximum water content may also be agreed upon, if specified by the purchaser.

## 9 SAMPLING

### 9.1 Procedure for Sampling

For checking the requirements specified in 4 to 7, 25 tiles shall be selected at random for every 2 500 tiles or fraction thereof in a lot, by the purchaser (or his representative). The number of tiles taken for tests shall be not less than 25 in any one lot.

## 10 MARKING

**10.1** Each tile shall be clearly and indelibly marked with the following:

- Identification of the source of manufacture,
- A mark 'Filler' or 'F' to indicate filler tile, and
- Batch/Control unit number.

### 10.2 BIS Certification Marking

Each tile may also be marked with the Standard Mark.

**10.2.1** The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act, 1986* and the Rules and Regulations made thereunder. The details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

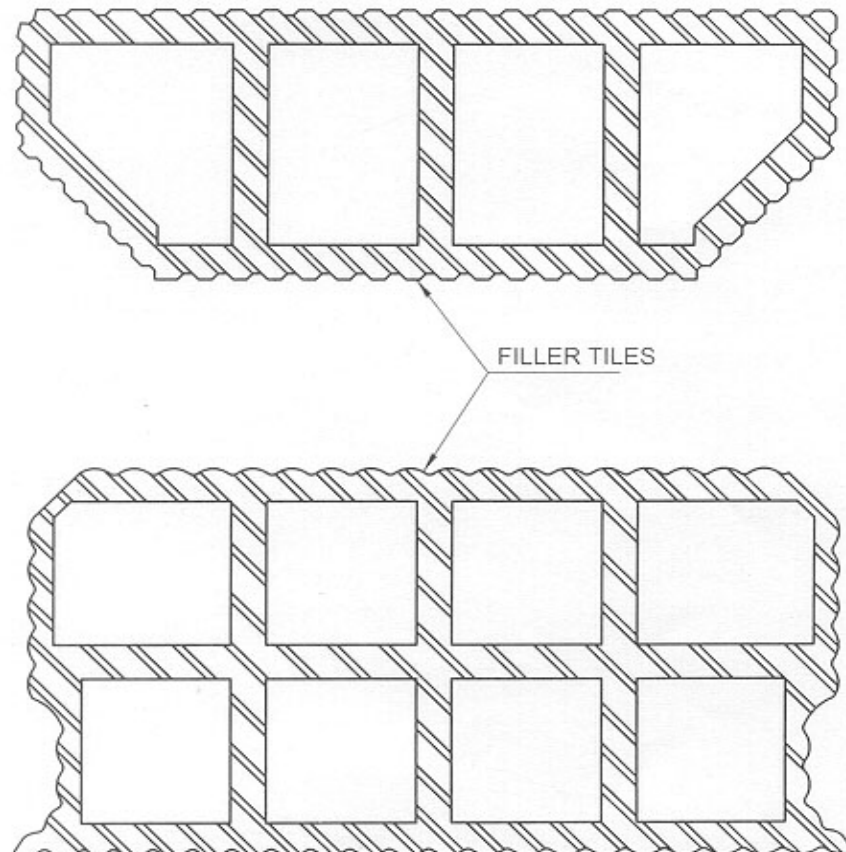


FIG. 4 TYPICAL SHAPE OF HOLLOW CLAY FILLER TILES



## ANNEX A

(Clause 7)

### METHOD OF TEST FOR DETERMINATION OF BREAKING STRENGTH

#### A-1 TEST SPECIMEN

At least six tiles shall be selected at random for this test from the samples selected in the manner described in 9.

#### A-2 PROCEDURE

**A-2.1** The tiles shall be suitably and simply supported without any mortar at the supports. The

supports shall be in the centre of extreme shell walls. A load of 10 kgf/cm length shall be applied on a steel plate 20 mm wide kept centrally over the entire length of the tile and parallel to the supports.

**A-2.2** The tiles under the loading as explained in **A-2.1** shall not break or crack.

## ANNEX B

(Clause 8)

### DETERMINATION OF WATER ABSORPTION TEST

#### B-1 TEST SPECIMEN

At least six tiles shall be selected at random for this test from the samples selected in the manner described in 8.

#### B-2 APPARATUS

The apparatus shall consist of a balance sensitive to within 0.1 percent of the mass of the specimen.

#### B-3 PROCEDURE

The test specimen shall be dried to constant mass in a ventilated oven at 110°C to 115°C. If the specimen is known to be relatively dry, this may be accomplished within 24 h; if wet, drying may be prolonged till constant mass is attained. The specimen shall then be cooled approximately to room temperature and weighed ( $W_1$ ). The cool specimen shall be completely immersed in clean water at  $27 \pm 2^\circ\text{C}$  for 24 h. Each specimen shall be

removed/ drained; the surface water wiped off with a damp cloth and weighed ( $W_2$ ). Weighing of each specimen shall be completed within 3 min after removal from water.

#### B-4 CALCULATION

The percentage of water absorption by mass shall be calculated as given below:

$$\text{Water absorption, percent by mass} = \frac{W_2 - W_1}{W_1} \times 100$$

where

$W_2$  = mass after soaking in water, and

$W_1$  = mass of the dry specimen.

#### B-5 RESULT

The average value of the specimens shall be taken as the water absorption of the lot.

**ANNEX C***(Foreword)***COMMITTEE COMPOSITION**

## Clay Products for Buildings Sectional Committee, CED 30

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In personal capacity (651/37, Ganga Enclave Sainik Colony, Roorkee 247667)	DR J. M. BHATNAGAR ( <i>Chairman</i> )
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Public Works Department, Chennai	SUPERINTENDING ENGINEER (PLANNING & DESIGN) EXECUTIVE ENGINEER (PLANNING) ( <i>Alternate</i> )
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*Member Secretary*

SHRI S. ARUN KUMAR  
Scientist 'B' (Civ Eng), BIS

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### Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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