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IS 13317 (1992): Clay roofing country tiles, half round and flat tiles -Specification [CED 30: Clay and Stabilized Soil Products for Construction]



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भारतीय मानक

खपरैल, अर्धगोलाकार और सपाट — विशिष्ट

*Indian Standard*

CLAY ROOFING COUNTRY TILES, HALF  
ROUND AND FLAT TILES — SPECIFICATION

UDC 666.762.2

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BUREAU OF INDIAN STANDARDS  
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NEW DELHI 110002

## FOREWORD

This Indian Standard 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.

Clay roofing country tiles, half round and flat tiles are used in large scale in different parts of the country. Different practices for the manufacture of tiles are being adopted in the country and with a view to improve the manufacturing operations and utilizing the existing knowledge and experience gained in the manufacture of better quality of tiles, this standard has been prepared to unify the practice followed and to guide the producer of burnt clay roofing country tiles.

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.

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*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

## Indian Standard

# CLAY ROOFING COUNTRY TILES, HALF ROUND AND FLAT TILES — SPECIFICATION

### 1 SCOPE

**1.1** The standard covers the specifications of hand made half round and flat country tiles.

### 2 REFERENCES

**2.1** The Indian Standard mentioned below is necessary adjuncts to this standard:

<i>IS No.</i>	<i>Title</i>
2248 : 1991	Glossary of terms relating to clay products for building ( <i>second revision</i> )

### 3 TERMINOLOGY

**3.1** For the purpose of this standard, the definition of terms given in IS 2248 : 1991 shall apply.

### 4 CLASSIFICATION

**4.1** Half round and flat country tiles shall be of two classes each, namely Class AA and Class A and shall be classified as specified in Table 1.

### 5 GENERAL QUALITY

**5.1** The roofing tiles shall be made from suitable clay of even texture and shall be well burnt. They shall be free from irregularities, such as twists, bends, cracks and laminations.

**5.2** The roofing tile shall be free from impurities like particles of stone, lime or other foreign materials visible to the naked eye either on the surface or on the fractured face of the tile obtained by breaking the tile. However, occasional particles up to 2 mm in size may be permissible. When struck, the tile shall give a characteristic ringing sound and when broken the fracture shall be clean and sharp at the edges. The Class AA tile shall be of uniform colour.

#### 5.3 Shape

When the half round or flat country tile is placed on a plane surface, the gap at the corners shall be not more than 8 mm. The cross section of the half round and flat country tiles shall be such as to give the tile structural rigidity.

### 6 DIMENSIONS AND TOLERANCES

#### 6.1 Dimensions

There shall be two sizes of these tiles with principal dimensions as given in Table 2

(Fig. 1). The tolerances in length and width are given in 6.2.

**6.1.1** The overall minimum overlap in both the type of tiles shall be 60 mm length wise. There is no overlap width wise in these tiles.

#### 6.2 Tolerances

The tolerances in length and width shall be below  $\pm 5$  percent.

#### 6.3 Weight

The average weight of the six half round and six flat tiles when dried at 105° to 110°C to constant weight and weighed shall be not less than 5 N (0.5 kg for half round tiles) and 7 N (0.7 kg for flat tiles) and not more than 8 N (0.8 kg for half round tiles) and 10 N (1 kg for flat tiles).

**6.3.1** The weight of tile shall be noted to the nearest 0.05 N (0.005 kg).

### 7 SAMPLING

**7.1** The sample for testing shall be taken by the purchaser or his representative or by any person appointed to superintend the works for the purpose of which the tiles are required or by the latter's representative.

#### 7.2 Lot

In any consignment all the tiles of the same class and size and from the same batch of manufacture shall be grouped into a minimum number of lots of 10 000 tiles or part thereof.

**7.3** The number of tiles to be selected at random from the lot shall depend upon its size and shall be in accordance with col 1 and 2 of Table 3.

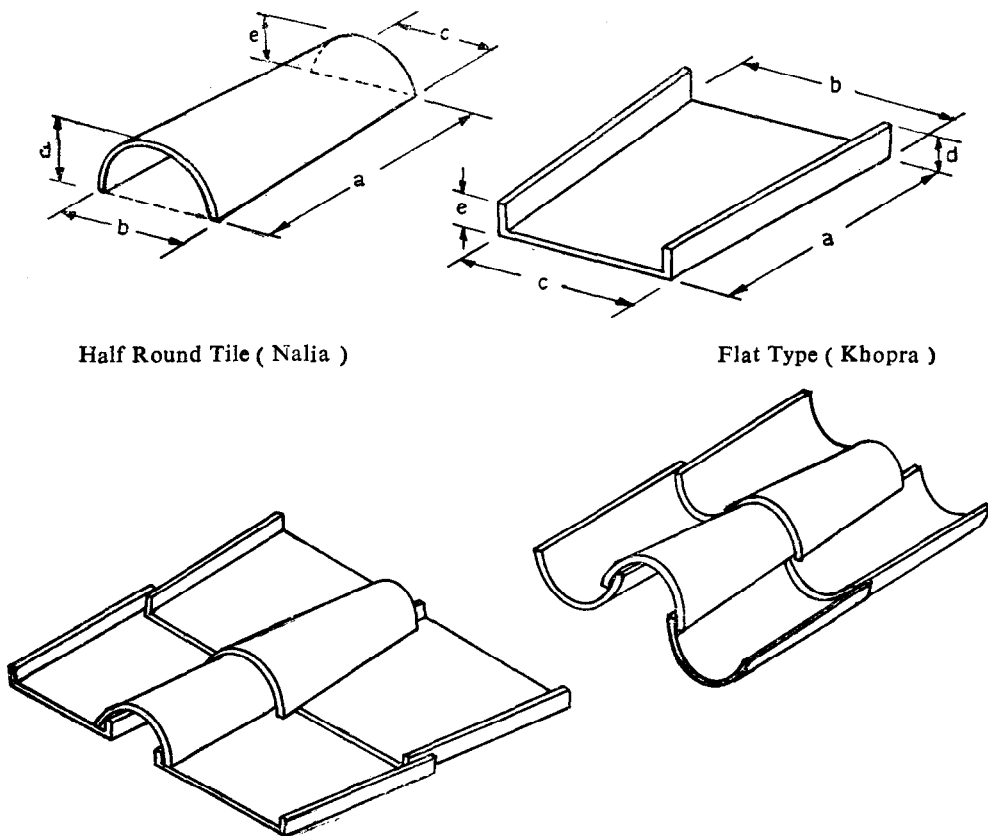
#### 7.4 Number of Tests

**7.4.1** All the tiles selected as in 7.3 shall be examined for shape (*see* 5.3), dimensions (*see* 6.1) and weight (*see* 6.3).

**7.4.2** Eighteen tiles shall be selected out of those already examined as in 7.4.1, six each for water absorption test, breaking load test and permeability test (*see* 8).

#### 7.5 Criteria for Conformity

**7.5.1** The lot shall be considered as conforming to the requirements of the specification if the conditions mentioned under 7.5.2 to 7.5.5 are all satisfied.



Half Round Tile ( Nalia )

Flat Type ( Khopra )

	Dimensions mm				
	a	b	c	d	e
<i>Half Round Tile</i>					
Size I	200	105	85	50	40
Size II	250	120	95	60	45
<i>Flat Tile</i>					
Size I	200	175	145	20	20
Size II	250	200	160	25	25

FIG. 1 TYPICAL DETAILS OF COUNTRY ROOFING TILES AND THEIR LAYING PATTERNS

Table 1 Classification of Clay Country Roofing Tiles  
( Clause 4.1 )

Sl No.	Characteristic	Requirement			
		Half Round Tile		Flat Tile	
		Class AA (3)	Class A (4)	Class AA (5)	Class A (6)
(1)	(2)				
i)	Water absorption percent, <i>Max</i>	19	24	19	24
ii)	Breaking load, kN, <i>Min</i>				
	a) Average	0.40 ( 40 kg )	0.30 ( 30 kg )	0.35 ( 35 kg )	0.25 ( 25 kg )
	b) Individual	0.35 ( 35 kg )	0.25 ( 25 kg )	0.30 ( 30 kg )	0.20 ( 20 kg )

Table 2 Dimensions of Tiles  
( Clause 6.1 )

All dimensions in millimetres.

Sl No.	Half Round Tile			Flat Tile		
	Overall Length	Overall Width		Overall Length	Overall Width	
		Wide end	Narrow end		Wide end	Narrow end
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i) Size I	200	105	85	200	175	145
ii) Size II	250	120	95	250	200	160

**Table 3 Sample Size and Criterion for Conformity**

( Clause 7.3 )

Lot Size	Sample Size	Permissible Number of Defective Tiles
(1)	(2)	(3)
Up to 2 000	22	3
2 001 to 5 000	35	5
5 001 to 10 000	50	7
10 000 and above	80	10

**7.5.2** The number of tiles failing to satisfy the requirements of any of the characteristics mentioned in 7.4.1 shall not exceed the corresponding number given in col 3 of Table 3.

**7.5.3** From the test results for water absorption, the average ( $\bar{X}$ ) and range ( $R$ ) shall be calculated. The value of the expression ( $\bar{X} + 0.5 R$ ) shall be less than or equal to the corresponding limit given in Table 1.

**7.5.4** All the individual values of breaking load shall be above the corresponding minimum value specified for individual in Table 1. The average of the six test results shall be above the corresponding minimum limit specified for the average in Table 1.

**8 STRENGTH REQUIREMENTS****8.1 Water Absorption Test**

The water absorption of tiles shall conform to the requirements laid down in Table 1, when determined in accordance with the procedure laid down in Annex A.

**8.2 Breaking Load Test**

The breaking load of tiles shall conform to the requirements laid down in Table 1, when determined in accordance with the procedure laid down in Annex B.

**9 NON-COMPLIANCE WITH TESTS**

**9.1** If any of the roofing tiles in the sample fails to comply with the requirements of any of the tests specified in 8 another sample shall be similarly drawn and tested. If any of the tiles in the second sample also fails to comply with the requirements of tests specified in 8, then the whole lot from which the samples were taken be rejected as not complying with this standard.

**10 MARKING**

**10.1** Each roofing tile shall be legibly and indelibly marked with the indication of source of manufacture. The marking shall not cover more than five percent of the area of the specimen.

**10.1.1** Each brick may also be marked with the Standard Mark.

**ANNEX A**  
( Clause 8.1 )

**WATER ABSORPTION TEST****A-1 TEST SPECIMEN**

**A-1.1** Six tiles shall be used for this test from the sample selected in the manner given under 6.

**A-2 PROCEDURE**

**A-2.1** Dry the six tiles selected in an oven at a temperature of 105 to 110°C till they attain constant weight and then cool and weigh. When cool, immerse the dry specimens completely in clean water at 24 to 30°C for 24 h. Remove each specimen, wipe off the surface water carefully with a damp cloth and weigh the specimen. Weigh the specimen nearest to a gram within three minutes after removing the specimen from the tank.

**A-3 EVALUATION AND REPORT OF TEST RESULTS**

**A-3.1** The percentage water absorption shall be calculated using the following formula:

$$\text{Percentage absorption} = \frac{B - A}{A} \times 100$$

where

$B$  = weight of the specimen after 24 h immersion in cold water, and

$A$  = weight of the dry specimen.

**A-3.2** The average percentage water absorption of the six tiles shall be calculated and reported as the percentage water absorption.



## ANNEX B

### ( Clause 8.2 )

#### DETERMINATION OF BREAKING LOAD

##### B-1 TEST SPECIMEN

**B-1.1** Six tiles shall be used for this test from the sample selected in the manner as given under 7.

##### B-2 APPARATUS

**B-2.1** The apparatus ( see Fig. 2A ) shall consist of a rigid m.s. plate of size  $350 \times 250$  mm so as to have free vertical movement with the help of a screw action operable with hand. The country tile ( half round or flat ) shall be placed in the centre and the pressure is applied by the upward movement of whole assembly with the help of screw action. The load is measured in terms of proving ring reading attached to the upper steel bearer ( half cut cylindrical section, rounded to 25 mm diameter ) ( Fig. 2B ) and placed mid way between middle line of tile along the length.

The loading shall be at a uniform rate of 200 to 250 N/min ( 20 to 25 kg/min ) by the screw action operated manually. The proving ring ( 1 000 kg capacity ) reading is noted at the time of final breaking of tiles. The breaking load value obtained in terms of proving ring reading is converted into load ( kg ) and is reported as breaking load strength.

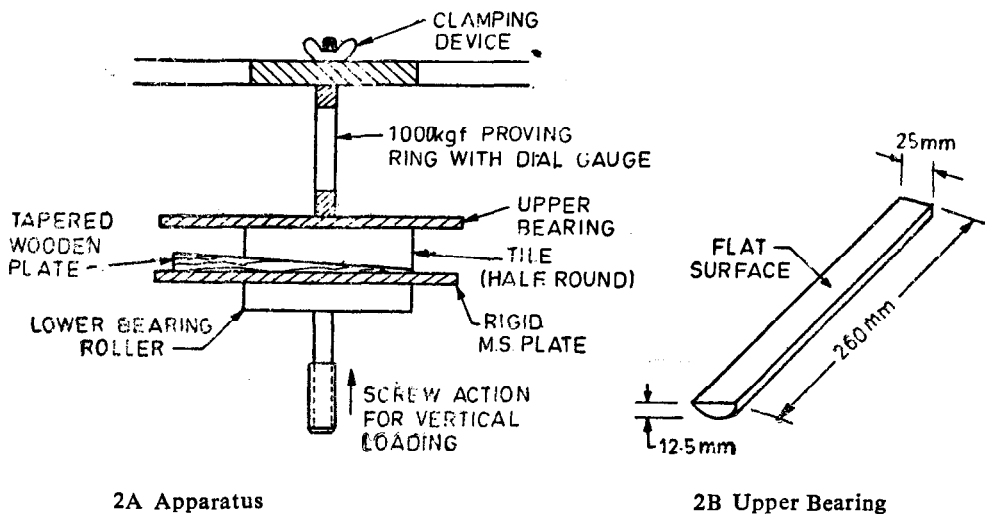
##### B-3 PROCEDURE

**B-3.1** Test three ( half round and/or flat country tile ) tiles after soaking in water at  $27 \pm 2^\circ\text{C}$  for 24 hours in the wet condition and three tiles in dry condition. Support the half round tile evenly on tapered wooden plank so that the sprit level placed on half round tile indicate the perfect horizontal line at all levels on which rigid upper steel bearer is placed ( Fig. 1 ). In

the case of flat country tile, plain plywood of thickness 5 mm may be used for supporting the inverted base of the tile ( Fig. 2 ). The steel bearer is placed on the horizontal surface along the mid length of the tile. Apply the load with the direction of the load perpendicular to the horizontal upper line at the apex of the tile, at a uniform rate of 200 to 250 N/min ( 20 to 25 kg/min ). The weight of the upper bearer must be added to the ultimate breaking load of the tile.

##### B-4 EVALUATION AND REPORT OF TEST RESULTS

**B-4.1** The individual breaking load of each of the three tiles separately in wet and dry condition shall be recorded and the average calculated.



2A Apparatus 2B Upper Bearing

**FIG. 2 SET UP FOR BREAKING LOAD STRENGTH MEASUREMENT OF COUNTRY TILE**

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