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IS 3952 (1988): burnt clay hollow bricks for walls and partitions - Specification [CED 30: Clay and Stabilized Soil Products for Construction]



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Indian Standard

**SPECIFICATION FOR
BURNT CLAY HOLLOW BRICKS FOR WALLS
AND PARTITIONS**

(Second Revision)

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

Indian Standard

SPECIFICATION FOR BURNT CLAY HOLLOW BRICKS FOR WALLS AND PARTITIONS

(*Second Revision*)

0. FOREWORD

0.1 This Indian Standard (Second Revision) was adopted by the Bureau of Indian Standards on 7 June 1988, after the draft finalized by the Clay Products for Building Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 Burnt clay hollow bricks at present are being used on a limited scale for walls and partitions in this country. These bricks are light in weight and being hollow, impart thermal insulation to the building. Further, with the setting up of a number of mechanised plants for clay building products in different parts of the country, these bricks will be produced in larger quantities and will find greater application in general building construction.

0.3 This standard was first published in 1967

and revised in 1978. In the second revision, dimensions of the bricks have been given in millimetres. Furthermore, tolerances on dimensions of bricks have been reduced and the method of measurement of tolerances has been specified on the basis of measurement of dimensions of a minimum of 20 bricks.

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.

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

1. SCOPE

1.1 This standard covers the dimensions, quality and strength requirements of hollow bricks made from burnt clay and having perforations through and at right angle to the bearing surface.

2. TERMINOLOGY

2.1 For the purpose of this standard, the definitions of terms given in IS : 2248-1981* shall apply.

3. GENERAL REQUIREMENTS

3.1 The blocks shall be made from suitable clay. The bricks shall be free from cracks, flaws and nodules of free lime. They shall be of uniform colour and shall be adequately burnt. They shall have plane rectangular faces with parallel sides and shall have sharp straight edges at right angle. They shall have a fine compact and uniform texture.

3.2 The bricks shall be free from excessive winding or bowing and where necessary all external angles shall be right angles. The bricks shall be tested for trueness of shape as specified in 3.2.1 to 3.2.3.

3.2.1 Winding or Bowing in the Length Dimension — The bricks shall be placed between two parallel straight edges running along the length (*see* Fig. 1) and the distance between either straight edge and the adjacent face of the brick at any point shall not be more than 5 mm.

3.2.2 Concavity or Convexity in the External Face of the Bricks — The brick shall be placed between two parallel straight edges running diagonally across the face of the brick (*see* Fig. 2) and the distance between either straight edge and the adjacent face of the brick shall not be more than 5 mm at any point on either diagonal.

3.2.3 Angles Between Sides and Joining Edges — Any variation from a right angle in the angle contained by any side and a joining edge shall be limited so that if a builder's steel square is

*Glossary of terms relating to clay products for building (*first revision*).

placed against the angle, the maximum distance between the inner edge of the square and the side shall not be more than 5 mm (see Fig. 3).

4. TYPES

4.1 The bricks shall be of the following types:

- a) *Type A* — Bricks with both faces keyed for plastering or rendering,
- b) *Type B* — Bricks with both faces smooth and suitable for use without plastering or rendering on either side, and
- c) *Type C* — Bricks with one face keyed and one face smooth.

5. DIMENSIONS

5.1 The size of burnt clay hollow bricks when measured according to 5.2 shall be as follows:

<i>Length</i>	<i>Width</i>	<i>Height</i>
mm	mm	mm
190	190	90
290	90	90
290	140	90

5.1.1 The thickness of any shell shall not be less than 11 mm and that of any web not less than 8 mm.

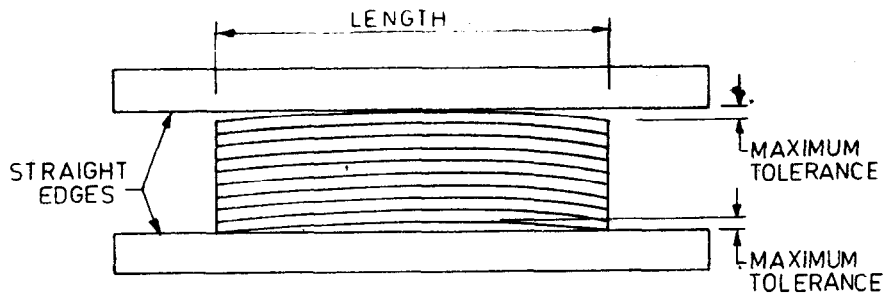


FIG. 1 TEST FOR WINDING OR BOWING IN THE LENGTH DIMENSION

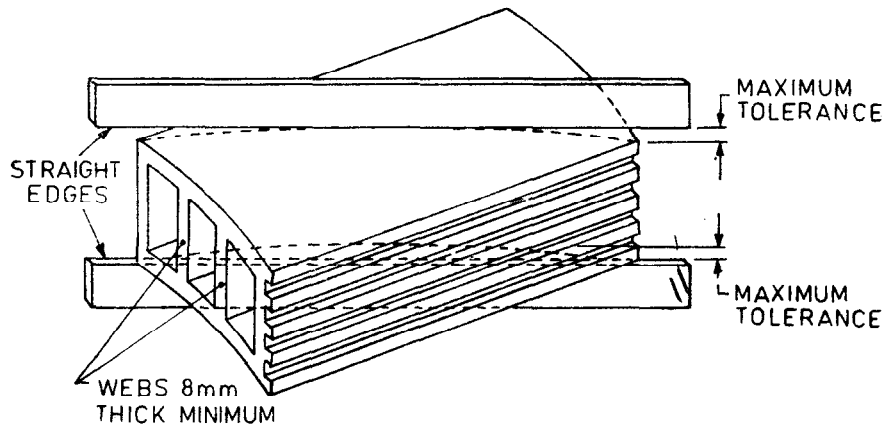


FIG. 2 TEST FOR CONCAVITY OR CONVEXITY

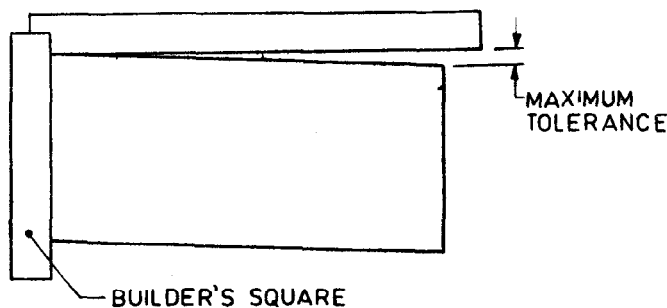


FIG. 3 TEST FOR CORRECTNESS OF EDGES

5.2 The length of central line of the four longest faces shall be measured nearest to the next millimetre and the length of the brick expressed in millimetre as the average of these four measurements. The width and height of the brick shall be similarly measured.

5.3 Tolerances — The permissible tolerances on dimensions specified in 5.1 shall be as follows:

Dimensions	Overall Measurements of 20 Bricks (mm)	
	Min	Max
290	5680	5920
190	3720	3880
140	2740	2860
90	1760	1840

5.3.1 Twenty (or more according to the size of stack) whole bricks shall be selected at random from the sample selected under 9. All blisters, loose particles of clay and small projections shall be removed. They shall then be arranged upon a level surface successively in contact with each other and in a straight line. The overall length of the assembled bricks shall be measured with a steel tape or other suitable inextensible measure sufficiently long to measure the whole row at one stretch. Measurement by repeated application of short rule or measure shall not be permitted. If, for any reason, it is found impracticable to measure bricks in one row, the sample may be divided into rows of 10 bricks each which shall be measured separately to the nearest millimetre. All these dimensions shall be added together.

5.3.2 In addition, the size of any individual brick in the sample shall not exceed the corresponding modular size as given in the following table:

Dimension of Bricks	Modular Size
mm	mm
290	300
190	200
140	150
90	100

6. CRUSHING STRENGTH

6.1 The minimum average crushing strength of

the bricks when determined in accordance with the procedure laid down in Appendix A shall be 3.5 N/mm^2 ($\approx 35 \text{ kgf/cm}^2$).

6.2 The crushing strength of any individual brick shall not fall below the minimum average crushing strength by more than 20 percent.

7. WATER ABSORPTION

7.1 The average water absorption of the bricks by mass when tested in accordance with the procedure laid down in Appendix B shall be not more than 20 percent.

8. EFFLORESCENCE

8.1 The bricks when tested in accordance with the procedure laid down in IS : 3495 (Part 3)-1976* shall have a rating not more than 'slight'.

9. SAMPLING

9.1 Procedure for Sampling — For checking requirements specified in 3 to 8, at least six bricks shall be selected at random for every 1 000 bricks or fraction thereof in a lot. The number of bricks taken from a lot for tests shall be not less than 20 in any one lot. All the bricks shall be checked for requirements given in 3, 4 and 5.

10. MARKING

10.1 Each brick shall be marked in a suitable manner with the manufacturer's identification mark or initials.

10.1.1 The brick may also be marked with the Standard Mark.

NOTE — 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 Standard 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 BIS and operated by the producer. Standard marked products are also continuously checked by BIS for conformity to that standard as a further safeguard. 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.

*Methods of tests for burnt clay building bricks: Part 3 Determination of efflorescence (second revision).

APPENDIX A

(Clause 6.1)

METHOD OF TEST FOR DETERMINATION OF CRUSHING STRENGTH

A-1. TEST SPECIMENS

A-1.1 Six bricks shall be used for this test from the sample selected in the manner described in 9.

A-2. PREPARATION OF SPECIMEN

A-2.1 Each brick shall be immersed in water, maintained at $27 \pm 2^\circ\text{C}$ for a period of 24 hours and then bedded with cement-sand mortar as follows:

A steel plate not less than 10 mm thick, machined on one side to give a smooth plane surface, shall be firmly supported with the machined surface uppermost and levelled in two directions at right angles by means of a spirit-level. The machined face shall be coated with a film of mould oil to prevent mortar adhering. A layer of cement-sand mortar, composed of one part of cement to one part of clean sand (of grade 2.36 mm or less) by volume, shall then be placed on the plate and one bearing face of the brick pressed firmly into the layer to form a bed as uniform as possible in thickness. The perforations (in case these are perpendicular to the bearing surface) shall be closed with paper so that the mortar does not penetrate deeply in these holes. The mortar bed shall at no point be less than 6 mm in thickness. The mortar bed over each cavity shall be pierced by a small hole formed while the mortar is still plastic. This will allow the removal of water from the cavities before testing.

The surplus mortar shall be trimmed off flush with the sides of the block. The brick and mortar shall then be covered with a damp cloth and shall remain undisturbed for a minimum period of 24 hours after which the bedded brick shall be carefully removed from the steel plate without damaging the mortar and inverted. The second bearing face shall be

bedded in the same manner as the first, using the same cement-sand mix and water-cement ratio as before. The two mortar faces shall be made parallel to each other by levelling the specimen in two directions at right angles on the second mortar layer by means of a spirit-level on the face of the new uppermost first mortar facing. After bedding, the brick shall again be covered with a damp cloth for another 24 hours and then immersed in water until tested. The period of immersion shall be such that 75 mm mortar cubes, made from the same batch used for bedding the second bed face and stored under identical conditions shall have a crushing strength of not less than 28 N/mm^2 ($\approx 280 \text{ kgf/cm}^2$) and not more than 42 N/mm^2 ($\approx 420 \text{ kgf/cm}^2$).

A-3. MEASUREMENT OF CRUSHING STRENGTH

A-3.1 When the mortar strength has attained the required value of not less than 28 N/mm^2 and not more than 42 N/mm^2 , the specimen shall be crushed between 3-ply plywood sheets approximately 3 mm thick. The load shall be applied axially at a uniform rate, of 14 N/mm^2 ($\approx 140 \text{ kgf/cm}^2$) per minute till the failure occurs.

A-4. CALCULATION OF RESULTS

A-4.1 The maximum load in N supported by the specimen before failure occurs, divided by the area (see A-4.1.1) of the unit in square millimetres, shall be taken as the crushing strength of the brick. The arithmetic mean of the crushing strength of 6 bricks shall be taken as the crushing strength of the batch under test.

A-4.1.1 The two surfaces of the brick that would normally be placed horizontally in the wall shall be treated as the bearing faces. The overall dimension of each bed face shall be measured to the nearest millimetre and the area (gross area) of that face having the smaller area shall be taken as the area of the specimen for calculating the crushing strength.

APPENDIX B*(Clause 7.1)***WATER ABSORPTION TEST****B-1. TEST SPECIMEN**

B-1.1 Six bricks shall be selected at random for this test from the samples selected in the manner described in 9.

B-2. APPARATUS

B-2.1 The apparatus shall consist of a balance, sensitive to within 0.1 percent of the mass of the specimen; and a ventilated oven.

B-3. PROCEDURE

B-3.1 The test specimen shall be dried to constant mass in the ventilated oven at 110 to 115°C. If the specimen is known to be relatively dry, this may normally be accomplished in 48 hours but if the specimen is wet, several additional hours may be required to attain constant mass. The specimen shall then be cooled approximately to room temperature and weighed. In a ventilated room bricks properly separated require four hours for cooling, unless an electric fan passes air over them continuously, in which

case two hours may suffice. Specimens noticeably warm to touch shall not be used for the absorption test. The dry specimens shall be completely immersed without preliminary partial immersion in clean water at $27 \pm 2^\circ\text{C}$ for 24 hours. Each specimen shall then be removed, the surface water wiped off with a damp cloth and weighed. Weighing of any one specimen shall be completed within three minutes after removing the specimen from water.

B-3.2 The percentage of water absorption by mass shall be calculated as given below:

Water absorption,

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

where

M_2 = mass after soaking in water, and

M_1 = mass of the dry specimen.

B-3.3 The average value of the six specimens shall be taken as the water absorption of the lot.

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002

Telephones: 3310131, 3311375

Telegrams: Manaksanstha
(Common to all offices)

Regional Offices:

Telephone

Central: Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002 3310131, 3311375

*Eastern: 1/14 C.I.T. Scheme VII M, V.I.P. Road, Maniktola, CALCUTTA 700054 362499

Northern: SCO 445-446, Sector 35-C, CHANDIGARH 160036 21843, 31641

Southern: C.I.T. Campus, MADRAS 600113 412442, 412519, 412916

†Western: Manakalaya, E9 MIDC, Marol, Andheri (East), BOMBAY 400093 6329295

Branch Offices:

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Peenya Industrial Area, 1st Stage, Bangalore-Tumkur Road, BANGALORE 560058 384955, 384956

Gangotri Complex, 5th Floor, Bhadbhada Road, T.T. Nagar, BHOPAL 462003 66716

Plot No. 82/83, Lewis Road, BHUBANESHWAR 751002 53627

53/5 Ward No.29, R.G. Barua Road, 5th By-lane, GUWAHATI 781003 —

5-8-56C L.N. Gupta Marg (Nampally Station Road), HYDERABAD 500001 221083

R14 Yudhister Marg, C Scheme, JAIPUR 302005 63471, 69832

117/418 B Sarvodaya Nagar, KANPUR 208005 216876, 218292

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T.C. No. 14/1421, University P.O., Palayam, TRIVANDRUM 695035 62104, 62117

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