

IS : 1121 (Part II) - 1974

*Indian Standard*

METHODS OF TEST FOR  
DETERMINATION OF STRENGTH PROPERTIES  
OF NATURAL BUILDING STONES

PART II TRANSVERSE STRENGTH

*( First Revision )*

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BUREAU OF INDIAN STANDARDS  
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NEW DELHI 110002

*Indian Standard*METHODS OF TEST FOR  
DETERMINATION OF STRENGTH PROPERTIES  
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# *Indian Standard*

## METHODS OF TEST FOR DETERMINATION OF STRENGTH PROPERTIES OF NATURAL BUILDING STONES

### PART II TRANSVERSE STRENGTH

### *( First Revision )*

#### 0. FOREWORD

**0.1** This Indian Standard (Part II) (First Revision) was adopted by the Indian Standards Institution on 1 October 1974, after the draft finalized by the Stones Sectional Committee had been approved by the Civil Engineering Division Council.

**0.2** Building stones are available in large quantity in various parts of the country and to choose and utilize them for their satisfactory performance, it is necessary to know the various strength properties determined according to standard procedure. This standard has, therefore, been formulated to cover the standard method for determining the strength properties of various stones. This standard covering compressive, transverse and shear strength properties was published in 1957 and is being revised based on the actual use of it in the past 17 years and the experience gained in testing of building stones for these properties in the various research laboratories of this country. In this revision, property of tensile strength has also been added which is also important for assessing the suitability of stone.

**0.2.1** This standard is now being issued in four parts, each part covering a specific property to facilitate the use of this standard. Part II covers the determination of transverse strength of natural building stones.

**0.3** In reporting the results of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS : 2-1960\*.

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#### 1. SCOPE

**1.1** This standard (Part II) lays down the procedure for the determination of transverse strength of natural building stones used for constructional purposes.

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

## 2. SELECTION OF SAMPLES

**2.1** The sample shall be selected to represent a true average of the type or grade of stone under consideration.

**2.2** The sample shall be selected from the quarried stone or taken from the natural rock, as described in **2.2.1** and **2.2.2** and shall be of adequate size to permit the preparation of the requisite number of test pieces.

**2.2.1** *Stones from Ledges or Quarries* — The ledge or quarry face of the stone shall be inspected to determine any variation in different strata. Differences in colour, texture and structure shall be observed. Separate samples of stone weighing at least 25 kg each of the unweathered specimens shall be obtained from all strata that appear to vary in colour, texture and structure. Pieces that have been damaged by blasting, driving wedges, heating, etc, shall not be included in the sample.

**2.2.2** *Field Stone and Boulders* — A detailed inspection of the stone and boulders over the area shall be made where the supply is to be obtained. The different kinds of stones and their condition at various quarry sites shall be recorded. Separate samples for each class of stone that would be considered for use in construction as indicated by visual inspection shall be selected.

**2.3** When perceptible variations occur in the quality of rock, as many samples as are necessary for determining the range in properties shall be selected.

## 3. TEST PIECES AND CONDITIONING

**3.1** Test pieces shall be made from samples selected in accordance with **2** and shall be blocks of size  $20 \times 5 \times 5$  cm. The test pieces shall be measured at the centre section. The width shall be measured to the nearest 0.2 mm and the thickness shall be taken as the average of three measurements to the nearest 0.2 mm, one taken at centre and the other two near edges.

**3.2** The direction of the rift shall be carefully marked on each test piece after finishing.

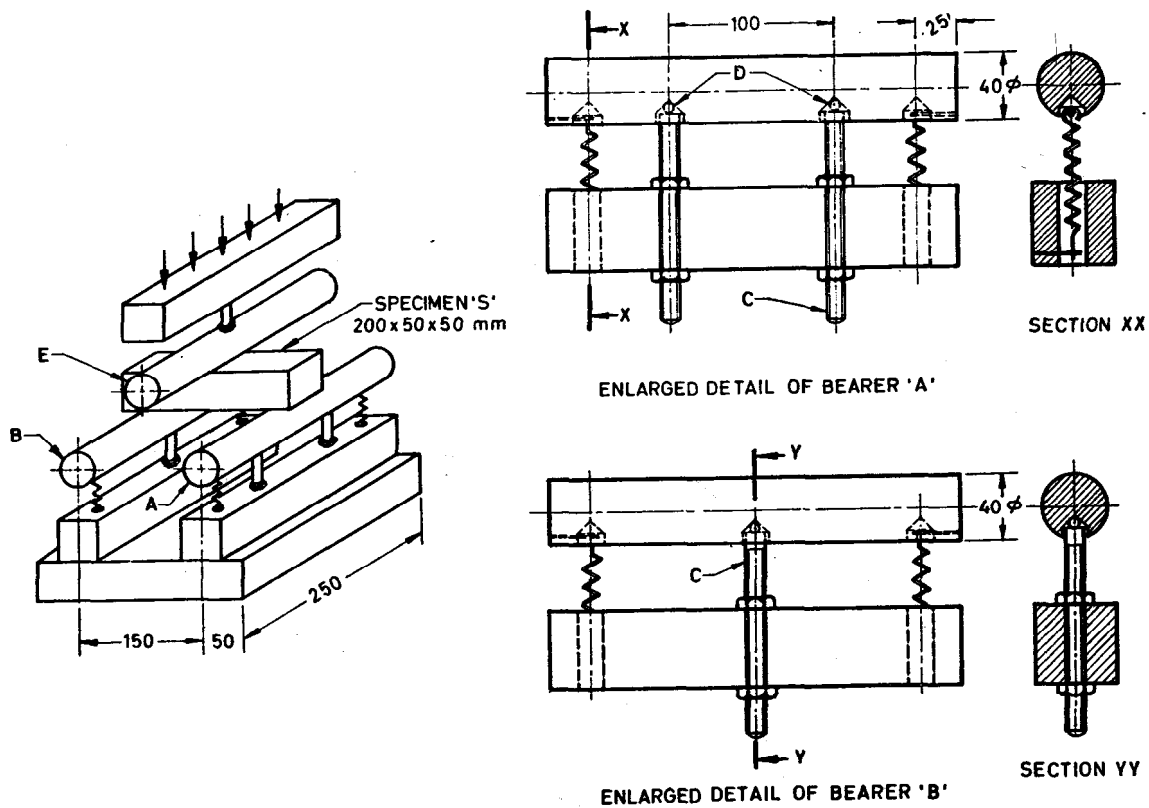
**3.3** Three test pieces shall be used for conducting the test in each of the conditions mentioned in **3.3.1** and **3.3.2** separately.

**3.3.1** The test pieces shall be immersed in water maintained at 20 to 30°C for 72 h before testing and shall be tested in saturated condition.

**3.3.2** The test pieces shall also be tested in dry condition and shall be dried in an oven at  $105 \pm 5^\circ\text{C}$  for 24 h and cooled in a desiccator to room temperature (20 to 30°C).

## 4. APPARATUS

**4.1** A suitable form of apparatus is shown in Fig. 1.



All dimensions in millimetres.  
 FIG. 1 APPARATUS FOR DETERMINATION OF TRANSVERSE STRENGTH

## 5. PROCEDURE

**5.1** Each test piece to be tested shall be evenly supported upon two self-aligning bearers (*A* and *B* in Fig. 1) 4 cm in diameter, the distance between the centres of bearers being 15 cm. Bearer *A* is supported horizontally on two bearer screws (*C* in Fig. 1), which carry hardened steel balls (*D* in Fig. 1) concentric with the bearer. Bearer *B* is supported on one such bearer screw and ball.

**5.2** The load shall then be applied centrally at a uniform rate of 200 kg/min through a third bearer (*E* in Fig. 1), also 4 cm in diameter, placed midway between the supports upon the upper surface of the specimen (*S* in Fig. 1) and parallel to the supports. The length of all bearers shall exceed the maximum width of the specimen to be tested.

## 6. EVALUATION AND REPORT OF TEST RESULTS

**6.1** The transverse strength of the specimen tested shall be calculated as follows :

$$R = \frac{3WL}{2bd^2}$$

where

*R* = transverse strength in kg/cm<sup>2</sup>,

*W* = central breaking load in kg,

*L* = length of span in cm,

*b* = average width in cm of the test piece at the mid section, and

*d* = average depth in cm of the test piece at the mid section.

**6.2** The average of all the three results (separately for saturated and dry condition) shall be taken for the purpose of determining transverse strength of the sample.

**6.3** In case any specimen gives a value of as much as 15 percent below the average, it may be examined for defects and if the low value appears to be due to a flaw or faulty test piece, a fresh test shall be made and the average of three tests taken.

**6.4** The transverse strength of the sample shall be expressed in kg/cm<sup>2</sup>.

**6.5** Identification of the sample, date when the sample was taken and type of stone shall be reported.

**6.6** The size and shape of the test piece used in the test shall be indicated.

**6.7** A description of the way in which the test pieces were prepared shall be included.

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