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Indian Standard

METHOD OF TEST FOR TOUGHNESS OF NATURAL BUILDING STONES

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

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Indian Standard

METHOD OF TEST FOR TOUGHNESS OF NATURAL BUILDING STONES

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 19 July 1969, after the draft finalized by the Stone Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 The property of toughness of stone is resistance to failure under impact. Stones of low toughness are apt to fail when exposed to rough usage, as occurs on steps, flooring of factories, stories, warehouses, godown, etc. This standard provides a method for measuring toughness of stones.

0.3 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.

0.4 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 lays down the procedure for determination of toughness of natural building stones.

2. SAMPLING

2.1 The sample shall be selected by the purchaser or his authorized representative from the quarried stone or taken from the natural rock as described in **2.2** and **2.3** so as to represent a true average of the type or grade of stone under consideration.

2.2 Stone 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 and structure shall be observed. Separate samples of stone weighing at least 25 kg each of unweathered type shall be obtained

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

from all strata that appear to vary in colour and structure. Pieces that have been damaged by blasting shall not be included in the sample.

2.3 Field Stone and Boulders — A detailed inspection of the deposits of field stone and boulders, over the area where the supply is to be obtained, shall be made. The different kinds of stone and their condition in the various deposits shall be recorded. Separate samples shall be selected of all classes of stone that would be considered for use in construction as indicated by visual inspection.

2.4 When perceptible variations occur in the quality of rock, the purchaser shall select as many samples as are necessary for determining the range in properties.

3. TEST SPECIMENS

3.1 Test specimens shall be cylinders 25 mm long and 25 mm in diameter.

3.2 Three test specimens shall constitute a test set.

3.3 One set of specimens shall be drilled perpendicular and another parallel to the plane of structural weakness of the stone, if such plane is apparent. If such plane is not apparent one set shall be drilled at random.

3.4 The specimen shall be cut from the samples with core drills or in any other way which will not induce incipient fracture, but shall not be chipped or broken off with a hammer. After sawing, the ends of the specimens shall be ground plane with water and carborundum or emery, on a cast iron lap, until the cylinders are of the size mentioned in **3.1**.

3.5 The ends of the cylinders shall be plane surfaces at right angles to the axis of the cylinders.

4. APPARATUS

4.1 Toughness Testing Machine — The toughness test shall be carried out in a machine conforming essentially to the requirements described in Appendix A.

5. TEST PROCEDURE

5.1 The cylindrical test specimen shall be securely held in the anvil without rigid lateral support, and under the plunger in such a way that the centre of its upper surface shall, throughout the test, be tangential to the spherical end of the plunger at its lowest point. The hammer shall be given a free fall of 1 cm for the first blow; 2 cm for the second blow, and an increase of 1 cm fall for each succeeding blow until failure of the test specimen occurs.

6. REPORT OF THE TEST

6.1 The height of the blow at failure shall be the toughness of the specimen.

6.2 In cases when a plane of structural weakness is apparent, the individual and average toughness of the three specimens in each set shall be reported and identified.

6.3 The individual and average toughness of three specimens shall be reported when no plane of structural weakness is apparent.

6.4 Any peculiar condition of a test specimen which might effect the result, such as the presence of seams, fissures, etc, shall be noted and recorded with the test results.

APPENDIX A

(*Clause* 4.1)

REQUIREMENTS OF TOUGHNESS TESTING MACHINE

A-1. GENERAL

A-1.1 Any form of impact machine which will comply with the following essentials may be used in making the test.

a) *Holding Device for Test Specimen* — A cast-iron anvil, weighing not less than 50 kg firmly fixed upon a solid foundation.

b) *Striking Hammer* — A hammer weighing 2 kg arranged so as to fall freely between suitable guides.

c) *Plunger* — A plunger made of hardened steel and weighing 1 kg arranged to slide freely in a vertical direction in a sleeve, the lower end of the plunger being spherical in shape with a radius of 1 cm.

d) Means for raising the hammer and for dropping it upon the plunger from any specified height from 1 cm to not less than 75 cm and means for determining the height of the fall to approximately 1 mm.

e) Means for holding the cylindrical test specimen securely in the anvil, without rigid lateral support, and under the plunger in such a way that the centre of its upper surface shall throughout the test, be tangential to the spherical end of the plunger at its lowest point.

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