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Indian Standard

METHOD OF TEST FOR DETERMINATION OF WATER ABSORPTION, APPARENT SPECIFIC GRAVITY AND POROSITY OF NATURAL BUILDING STONES

(First Revision)

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MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
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Indian Standard

METHOD OF TEST FOR DETERMINATION OF WATER ABSORPTION, APPARENT SPECIFIC GRAVITY AND POROSITY OF NATURAL BUILDING STONES

(First Revision)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Indian Standards Institution on 8 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. 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 had, therefore, been formulated to cover the standard method for determining the water absorption of natural building stones. This standard was published in 1957 and is being revised based on the actual use of the standard 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, besides water absorption the property of apparent specific gravity and porosity which was earlier covered in IS : 1122-1957* has also been covered as the same test pieces and method can be utilized for both purposes.

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†.

1. SCOPE

1.1 This standard lays down the procedure for determination of water absorption, apparent specific gravity, apparent porosity and true porosity of building stones used for constructional purposes.

*Methods for determination of specific gravity and porosity of natural building stones.

†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 stones 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 Stone from 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 specimens shall be obtained 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.

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

2.3 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 PIECES

3.1 The test pieces selected as in **2** shall be crushed or broken, and the material passing 20-mm IS Sieve and retained on 10-mm IS Sieve shall be used for the test.

4. APPARATUS

4.1 Cylindrical Measuring Glass Jars — of 1 000-ml and 100-ml capacity shall be used. The 100-ml capacity jar shall have graduation mark of 1 ml.

4.2 Glass Vessel — of about 1·5-litre capacity and two dry absorbent cloths of 0·5 m^2 area each.

4.3 Balance — of capacity 3 kg with an accuracy of 1 g.

4.4 Desiccator

4.5 Oven

5. PROCEDURE

5.1 The test piece weighing about 1 kg shall be washed to remove particles of dust and immersed in distilled water in a glass vessel at room

temperature 20 to 30°C for 24 hours. Soon after immersion and again at the end of soaking period, entrapped air shall be removed by gentle agitation achieved by rapid clock-wise and anti-clock-wise rotation of the vessel. The vessel shall then be emptied and the test piece be allowed to drain. The test piece shall then be placed on a dry cloth and gently surface dried with the cloth. It shall be transferred to a second dry cloth when the first one removes no further moisture. It shall be spread out not more than one stone deep on the second cloth and left exposed to atmosphere away from direct sunlight or any other source of heat for not less than 10 min until it appears to be completely surface dry. The sample shall then be weighed (B).

5.2 The sample shall then be carefully introduced in the 1 000-ml capacity measuring cylinder and distilled water shall be poured by means of 100-ml capacity measuring cylinder in the larger cylinder while taking care to remove entrapped air, until the level of water in the larger cylinder reaches 1 000 ml mark. The quantity of water thus added shall be recorded in ml or expressed in gram weight (C).

5.3 The water in the larger cylinder shall be drained and the sample shall be carefully taken out and dried in an oven at 100 to 110°C for not less than 24 hours. It shall then be cooled in a desiccator to room temperature and weighed (A). The room temperature during the test shall be recorded.

6. EVALUATION AND REPORT OF TEST RESULTS

6.1 The apparent specific gravity shall be calculated from the following formula:

$$\text{Apparent specific gravity} = \frac{A}{1\,000 - C}$$

where

A = weight of oven-dry test piece in g, and

C = quantity of water added in 1 000-ml jar containing the test piece in g.

6.1.1 The apparent specific gravity shall be expressed as a numerical value for saturated surface-dry sample at the recorded temperature and shall be the average of three determinations.

6.2 The water absorption shall be calculated from the following formula:

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

where

A = as given in **6.1**, and

B = weight of saturated surface-dry test piece in g.

6.2.1 The water absorption shall be expressed as percentage by weight of oven-dry sample and shall be the average of three determinations.

6.3 The apparent porosity shall be calculated from the following formula:

$$\text{Apparent porosity} = \frac{B - A}{1\,000 - C} \times 100$$

where A, B, C are as given in **6.1** and **6.2**.

6.3.1 The apparent porosity shall be expressed as a percentage and shall be the average of three determinations.

6.4 The true porosity shall be calculated from the following formula:

$$\text{True porosity} = \frac{\text{True specific gravity} - \text{Apparent specific gravity}}{\text{True specific gravity}}$$

NOTE — True specific gravity determined as in IS : 1122-1974* and apparent specific gravity as in **6.1**.

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

6.6 The size and shape of test pieces used in the tests shall be indicated.

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

*Method of test for determination of true specific gravity of natural building stones (*first revision*).

BUREAU OF INDIAN STANDARDS

Headquarters:
Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002
Telephones: 323 0131, 323 3375, 323 9402
Fax : 91 11 3234062, 91 11 3239399, 91 11 3239382

Telegrams : Manaksanstha
(Common to all Offices)

	Telephone
Central Laboratory:	
Plot No. 20/9, Site IV, Sahibabad Industrial Area, Sahibabad 201010	8-77 00 32
Regional Offices:	
Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002	323 76 17
*Eastern : 1/14 CIT Scheme VII M, V.I.P. Road, Maniktola, CALCUTTA 700054	337 86 62
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T.C. No. 14/1421, University P.O. Palayam, THIRUVANANTHAPURAM 695034	6 21 17
*Sales Office is at 5 Chowringhee Approach, P.O. Princep Street, CALCUTTA 700072	27 10 85
†Sales Office is at Novelty Chambers, Grant Road, MUMBAI 400007	309 65 28
‡Sales Office is at 'F' Block, Unity Building, Narashimaraja Square, BANGALORE 560002	222 39 71

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